SYSTEMATICS OF THE NORTH AMERICAN SCORPION SUBFAMILY SYNTROPINAE

(SCORPIONES: VAEJOVIDAE)

By

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VOLUME I

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This manuscript has been read and accepted for the Graduate Faculty in Biology in satisfaction of the dissertation requirement for the degree of Doctor of Philosophy.

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ABSTRACT

SYSTEMATICS OF THE NORTH AMERICAN SCORPION SUBFAMILY SYNTROPINAE (SCORPIONES: VAEJOVIDAE)

by

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The first phylogenetic analysis and taxonomic revision of the North American vaejovid scorpion subfamily Syntropinae Kraepelin, 1905 are presented. The phylogeny is based on a simultaneous analysis of DNA (5 loci) and morphological characters (continuous and discrete). The current classification of the subfamily (Soleglad and Fet, 2008) was tested for monophyly and the relative positions of insertae sedis taxa putatively related to the subfamily were investigated. Nodal stability and nodal support for the resultant topologies were high; although the molecules and morphology had dissimilar phylogenetic signals, simultaneous analyses enhanced the overall signal and thus generated the hypothesis with the most explanatory power. Syntropinae and Stahnkeini Soleglad and Fet, 2008 were recovered as monophyletic. The Syntropinae comprised six monophyletic groups that contradicted the current classification. The following taxonomic emendations are proposed. The tribe Paravaejovini Soleglad and Fet, 2008 and subtribe Thorellina Soleglad and Fet, 2008 are synonymized with Syntropinae; the Syntropinae is redefined with eleven genera. Six new genera are described, *Balsateres* **n. gen.**, *Chihuahuanus*, **n. gen.**, *Konetontli*, **n. gen.**, *Maaykuyak*, **n. gen.**, *Mesomexovis*, **n. gen.**, and *Vizcaino*, **n. gen.** *Hoffmannius*, **syn. n.** is synonymized with *Paravaejovis* and 15 species are transferred to other genera. Five subspecies are elevated to species, two restored from synonymy

and 26 new species described. Possible scenarios of the evolution and biogeography of the genera and species are presented, from a historical and ecological perspective.

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INTRODUCTION

THE SUBFAMILY SYNTROPINAE

The North American vaejovid subfamily Syntropine Kraepelin, 1905, including 11 genera and 80 described species, is among the most diverse clades of Nearctic scorpions. A new putative synapomorphy is proposed for the subfamily: the presence of a retrospinose distal margin of the mating plug of the male hemispermatophore. The distribution of Syntropinae extends from the U.S. state of Oregon to the Isthmus of Tehuantepec in Mexico but the greatest diversity of the Syntropinae occurs in the Baja California Peninsula and the states along the Pacific coast and center of Mexico.

Many Syntropinae are adapted to particular substrata, which may be responsible for their diversity. Most species from the southwestern U.S.A. and the Baja California Peninsula are psammophilous whereas most species from mainland Mexico are lapidicolous. Many Syntropinae are endemic to particular geological formations and have restricted distributions (Williams, 1980, 1987). Some aestivate during the dry season but are very active in the rainy season. Syntropinae are often the dominant scorpion species at particular localities. Consequently, these scorpions represent an important component of arid ecosystems, regulating other arthropod populations (Polis, 1990).

THE PROBLEMS WITH THE SYSTEMATICS OF SYNTROPINAE

The subfamily Syntropinae has remained problematic for scorpion systematists for several reasons. Although Syntropinae are quite diverse, there is no contemporary synthesis of its evolutionary history. Preliminary results (González-Santillán et al., 2007; González-Santillán and Prendini, 2010) suggest that the subfamily as defined in the most recent assessment (Soleglad and Fet, 2008), as well as four tribes, two subtribes, and three genera, are not monophyletic. Furthermore, the character systems traditionally used to delimit species in this subfamily often overlap between closely related populations, hindering the identification and delimitation of species. Several putative species have very broad distributions, and may constitute more than one species. A few regional studies and revisions of small groups of species treat the diversity of species in the U.S.A., but the more diverse Mexican fauna is covered only in two old monographs (Hoffmann, 1931; Williams, 1980). No comprehensive modern revisionary synthesis exists for all the species in this diverse group of scorpions and at least 26 new species await description.

THE DISSERTATION GOALS

The goals of this dissertation are to provide a phylogenetic hypothesis for Syntropinae based on simultaneous analysis of morphological and molecular data obtained for most species in the subfamily. The monophyly of the subfamily and genera are tested, and each monophyletic genus revised, with comparative diagnoses, illustrated descriptions, detailed distribution maps and identification keys for all species. The chapters of this dissertation are summarized as follows.

Chapter 1 tests the generic relationships within the subfamily using simultaneous analyses of new and published morphological characters and five genetic markers for previously described species. The homoplasy of different sources of evidence in the preferred hypothesis is investigated.

Chapter 2 presents a revised diagnosis for the subfamily and a generic revision. Revised diagnoses are provided for all genera and six new genera are described. Illustrations of diagnostic characters, distribution maps and an identification key to the genera are provided.

Chapter 3 presents a taxonomic revision of the species of Syntropinae. All previously described species are redescribed and 26 new species described. Descriptions are fully illustrated with habitus, diagnostic characters and detailed distribution maps. Identification keys for the species of each genus are provided.

Chapter 4 provides a re-analysis of Syntropinae phylogeny based on all species, including the 26 new species described in chapter 3, and comprehensive sampling of populations within species, to more rigorously test generic and species hypotheses by simultaneous analysis of morphology and molecules. The implications of the phylogeny for the diversity and distribution of Syntropinae are discussed.

CHAPTER 1
PHYLOGENY OF THE NORTH AMERICAN SUBFAMILY SYNTROPINAE (VAEJOVIDAE: SCORPIONES) BASED ON MORPHOLOGY AND DNA

ABSTRACT

The first phylogenetic analysis of the North American vaejovid scorpion subfamily Syntropinae based on morphology and molecular evidence is presented here. A recent classification proposed by Soleglad and Fet (2008) is compared against the results obtained. Syntropinae is consistently recovered with a different composition, comprising six monophyletic groups. The tribes Paravaejovini, Smeringurini, Syntropini and Stahnkeini and the subtribes Syntropina and Thorellina, proposed by Soleglad and Fet (2008) are not monophyletic. The genus *Hoffmannius* Soleglad and Fet, 2008 is also not monophyletic. The genus *Kuarapu* is consistently recovered within Syntropinae and, together with other three genera, forms a monophyletic group referred to as the *Kochius* group. The subaculear tubercle is a convergent character but it can be used to support local clades. The relative position of *Vaejovis pequeno* Hendrixson, 2001 and related species is clarified and they are assigned to Stahnkeini.

INTRODUCTION

The family Vaejovidae Thorell, 1876 is the most diverse component of the Nearctic scorpion fauna. Vaejovids occur in most terrestrial habitats, from sand dunes to rocky landscapes, from the intertidal zone to altitudes above 3500 m. Several species are substratum specialists (Polis, 1990; Prendini, 2001) that occupy particular regions and consequently represent endemic fauna.

A major component of Vaejovidae comprises the putatively monophyletic crown clade, subfamily Syntropinae (Stockwell, 1989; Soleglad and Fet, 2008). Syntropinae are restricted to North America, extending from southern Oregon, throughout the western U.S.A. to western Texas and as far south as the Isthmus of Tehuantepec in the states of Oaxaca and Chiapas, Mexico (figure 1). The putative synapomorphy here proposed for the subfamily is the presence of a retrospinose distal margin of the mating plug of the male hemispermatophore. The sclerotized mating plugs of Stahnkeini and other species of subfamily Vaejovinae are similar, but do not have retrospinose distal margin.

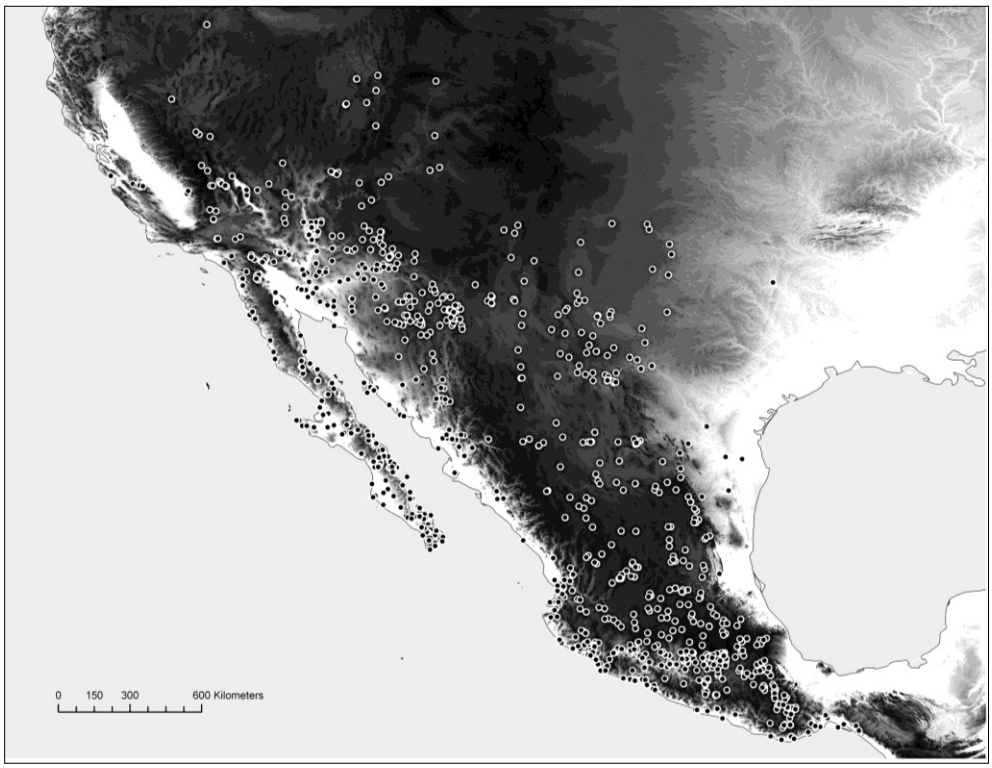


Figure 1. Known records of Syntropinae demarcating approximate distribution of the subfamily. Note extensive gaps in the southwestern U.S.A. and northern Pacific coastal regions of Mexico are artifacts of sampling.

Originally, Syntropinae contained only the monotypic genus, *Syntropis* Kraepelin, 1900, endemic to the peninsula of Baja California and it remained that way for several decades. The seminal work of Hoffmann (1931) recognized three groups of scorpions within the genus *Vaejovis* C.L. Koch, 1836 including several species now assigned to Syntropinae. Although he studied large numbers of specimens from mainland Mexico, Hoffmann was unable to study scorpions from northern and western Mexico, including *Syntropis*.

Subsequently, Williams (1969, 1970a, 1970b, 1971a, 1971b, 1980) conducted extensive fieldwork in the Baja California Peninsula and other states of northern Mexico, resulting in the description of several new species, and the definition of *Paravaejovis* Williams, 1980 and the following species groups of *Vaejovis* C.L. Koch, 1836, now placed in Syntropinae: *eusthenura* and *punctipalpi*. Williams (1969) collected fresh material of *Syntropis* and discovered a second species, *Syntropis longiunguis* Williams, 1969 for which Stahnke (1974) created *Vejovoidus*. The monographs by Williams and Hoffmann remained the primary sources for the knowledge of scorpions from North America, although gradually complemented by occasional taxonomic studies (Soleglad, 1973b; Sissom and Francke, 1985; Sissom, 1989a, 1989b).

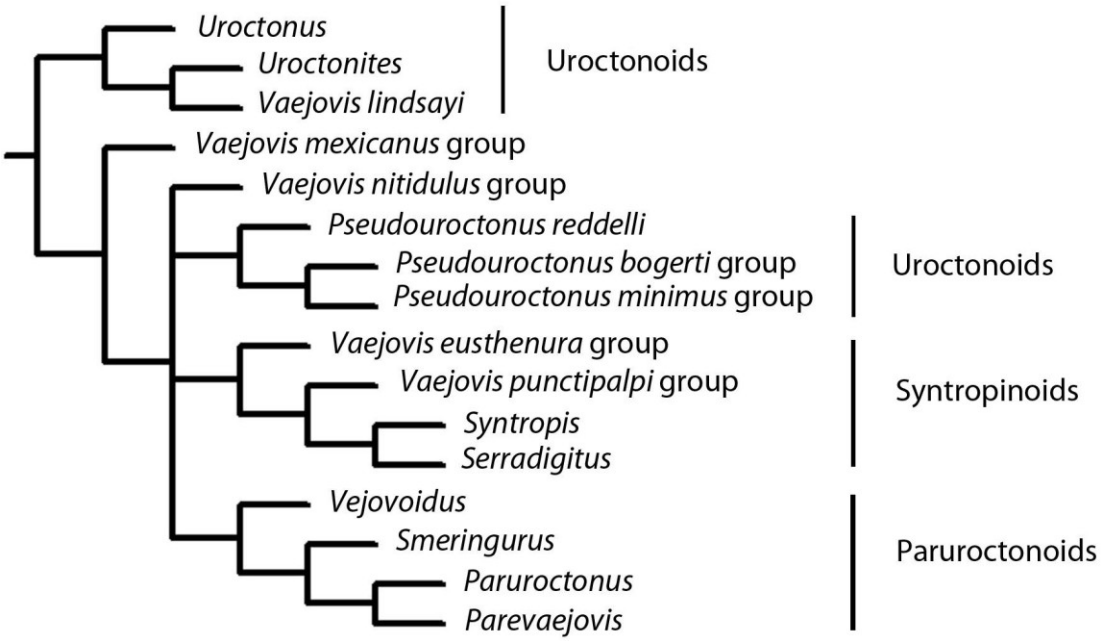


Figure 2. Cladogram illustrating hypothesized relationships within family Vaejovidae after Stockwell (1989). Stockwell included the four species groups within *Vaejovis* recognized by Sissom (1990) except for the *intrepidus* group, which was never mentioned by Stockwell.

Sissom (1990) challenged the composition of Syntropinae as defined by Stahnke (1974), arguing that the ventral median carinae of the metasomal segments evolved independently in *Syntropis* and *Vejovoidus*, but did not suggest any specific changes to the classification. Stockwell (1989) presented a phylogenetic hypothesis for the family Vaejovidae, part of his unpublished PhD dissertation (figure 2). Stockwell (1989) recognized that *Syntropis* was closely related to the *eusthenura* and *punctipalpi* groups of *Vaejovis* (proposed earlier by Williams, 1970a, 1971b) and *Serradigitus* Stahnke, 1974. Based on the results of his dissertation, Stockwell (1992) synonymized subfamily Syntropinae and transferred *Vejovoidus* to the paruroctonoid group of vaejovids.

Sissom (2000) followed Stockwell (1989) in rejecting the subfamilies of Vaejovidae, recognizing the relationship of the *eusthenura* and *punctipalpi* groups of *Vaejovis* to *Syntropis* and *Serradigitus*, and adding the *intrepidus* group of Hoffmann (1931). Two new species of *Vaejovis* in the *eusthenura* group, two in the *punctipalpi* group (Sissom and Hendrixson, 2005a; Santibáñez-López and Sissom, 2010) and two new *Syntropis* (Soleglad et al., 2007) were described subsequently.

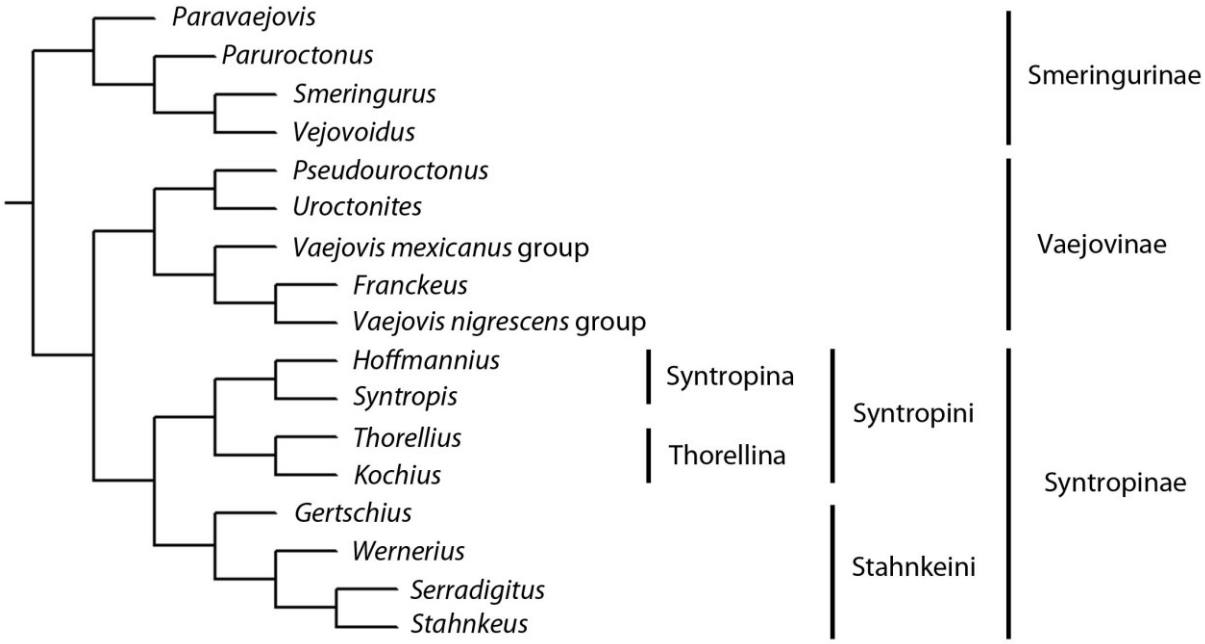


Figure 3. Phylogram showing hypothesized relationships within Vaejovidae after Soleglad and Fet (2008).

Soleglad and Fet (2008) proposed three subfamilies within Vaejovidae: Smeringurinae (including four genera), Syntropinae (including two tribes, two subtribes, and eight genera), and Vaejovinae (including eight genera) (figure 3; table 6). Three new genera were created to accommodate the former species groups of *Vaejovis*: *eusthenura* group = *Hoffmannius*, *intrepidus* group = *Thorellius*; *punctipalpi* group = *Kochius*.

Francke and Ponce-Saavedra (2010) described another new genus, *Kuarapu*, possibly related to Syntropinae based on the presence of spines on the distal margin of its mating plug. Francke and Ponce-Saavedra (2010) noted that the classification of Soleglad and Fet (2008) has not been rigorously assessed and that several of its components may not be monophyletic.

This chapter presents the results of a comprehensive phylogenetic analysis of generic relationships in Syntropinae, which demonstrates that Soleglad and Fet's (2005, 2008) generic and suprageneric taxonomy is based on para- or polyphyletic groups. The composition and limits of Syntropinae are redefined and a novel scheme of relationships among its components proposed. Results of the analyses justify the creation of six new genera (González-Santillán and Prendini, in litt.): *Balsateres* González-Santillán and Prendini, in litt., *Chihuahuanus* González-Santillán and Prendini, in litt., *Konetontli* González-Santillán and Prendini, in litt., *Maaykuyak* González-Santillán and Prendini, in litt., *Mesomexovis* González-Santillán and Prendini, in litt., and *Vizcaino* González-Santillán and Prendini, in litt.

MATERIALS AND METHODS

Fieldwork and materials

Material examined comprised specimens collected across the entire geographical range of the subfamily Syntropinae (figure 1) supplemented with museum material (appendices 1 and 2). Scorpions were collected at night using portable ultraviolet light lamps or by turning rocks during the day. Specimens were fixed with 80% ethyl alcohol for morphological studies Juveniles and, when available, an adult voucher were preserved in 100% ethyl alcohol for DNA isolation following standard procedures (Prendini et al., 2002). Voucher specimens for DNA isolation were catalogued and assigned a unique specimen identifier using the following format: AMNH– #.

Taxon sampling and terminals

Hoffmannius Soleglad and Fet, 2008; *Kochius* Soleglad and Fet, 2008; *Kuarapu purhepecha* Francke and Ponce-Saavedra, 2010; *Syntropis* Kraepelin, 1900; *Thorellius* Soleglad and Fet, 2008, all genera of Syntropini Soleglad and Fet, 2008; the putative smeringurine, *Paravaejovis pumilis* Williams, 1970, and four putative Vaejovinae from Mexico, with a subaculear tubercle, were selected as the ingroup terminals based on preliminary investigations of vaejovid phylogeny. Forty-nine of the 54 described species and subspecies in the subfamily were included in the analyses. Only *Syntropis aalbui* Lowe, Soleglad and Fet, 2007; *Vaejovis flavus* Banks, 1900; *V. galbus* Williams, 1970; and *Vaejovis kuarapu* Francke and Ponce-Saavedra, 2005 were unavailable for these analyses. Two or more specimens per species were included when available (appendix 2). The total number of ingroup terminals comprised 138.

Sixteen exemplars comprising 15 species of Smeringurinae and Vaejovinae (*sensu* Soleglad and Fet, 2008) served as outgroup taxa (appendix 2). Analyses were rooted on *Smeringurus grandis* (Williams, 1970) because preliminary results (González-Santillán et al., 2007) retrieved it basal within Smeringurinae, which was in turn recovered basal within the family Vaejovidae. Additionally, rooting on *S. grandis* allowed testing the monophyly of Smeringurinae and Paravaejovini and the relative position of *P. pumilis*. The total number of terminals was 143.

Preliminary analyses (González-Santillán et al., 2007) suggested that *Wernerius* Soleglad and Fet, 2008 and several Mexican species with a subaculear tubercle might be related to Syntropinae, although Soleglad and Fet (2008) assigned these species to the *mexicanus* group of Vaejovinae. For this reason, the following species with subaculear tubercles were included in the analyses: *Vaejovis acapulco* Armas and Martín-Frías, 2001; *V. chamelaensis* Williams, 1986; *V. nayarit* Armas and Martín-Frías, 2001; *V. pattersoni*, Williams and Haradon, in Williams, 1980; an undescribed species related to these taxa; and *Wernerius spicatus* (Haradon, 1974). Other species deemed important to include in the analyses were *Vaejovis pequeno* Hendrixson, 2001 and an undescribed *Serradigitus* sp. These species lack the putative synapomorphy of Stahnkeini, i.e. the serrated dentition of the cutting edge of the pedipalp finger, but share with Stahnkeini a smooth distal margin of the mating plug. Hendrixson (2001) suggested that the closest relatives of *V. pequeno* might be *Hoffmannius waueri* (Gertsch and Soleglad, 1972), considered a syntropine, or *Serradigitus agilis* Sissom and Stockwell, 1991, considered a stahnkeine. Based on these observations, Hendrixson (2001) regarded *V. pequeno* as *incertae sedis*. The inclusion of *V. pequeno* and the undescribed *Serradigitus* species was intended: (1) to establish the

affinities between these two species; and (2) to determine whether they belong in Syntropini, Stahnkeini or elsewhere.

Morphological characters

Character and character state definition is based on direct examination of adult male and female specimens comprising 146 lots. This approach ensures consistency and repeatability (Prendini et al., 2003), avoids misrepresentations, and allows reinterpretation of prior work. The morphological dataset comprises 251 morphological characters, including 206 discrete characters from 17 character systems: (1) carination of pedipalp segments (30 characters); (2) ornamentation of pedipalp segments (17 characters); (3) carination of metasomal segments (20 characters); (4) ornamentation of metasomal segments (5 characters); (5) ornamentation of telson (characters); (6) hemispermatophore microstructure (14 characters); (7) genital opercula (2 characters); (8) ornamentation of tergites and sternites (9 characters); (9) pectinal teeth (5 characters); (10) ornamentation of chelicerae (4 characters); (11) ornamentation of carapace (9 characters); (12) pedipalp chela finger lobes and notches (12 characters); (13) pedipalp chela finger dentition (8 characters); (14) pedipalp trichobothrial pattern (18 characters); (15) leg macrosetal patterns (14 characters); (16) leg spinule patterns (5 characters); and (17) infuscation and coloration (25 characters). Another 45 continuous characters representing setal counts of the pedipalp and metasomal carinae (appendices 3–5) were added. The number of setae on paired carinae varied in some specimens and hence these characters were scored as ranges. This coding of setae as continuous characters is used here for the first time in a phylogenetic analysis.

Continuous characters were analyzed as such (Goloboff et al., 2006) and treated as additive or ordered (Wagner, 1961; Farris, 1970). This procedure differs from discretization of

characters (Mickevich and Johnson, 1976; Archie, 1985; Goldman, 1988; Felsestein, 1988; Thiele, 1993; Rae, 1998; Wiens, 2001) in that the values maintain the phylogenetic signal as originally obtained and problems with overlapping ranges are avoided. To scale extreme characters, for example those that ranged between 0.000 and 30.000, a standardization method was applied to bring the values to between 0.000 and 2.000. This procedure was accomplished by running the stand.run script, written by P. Goloboff (Goloboff et al., 2006), in TNT with argument 2.

Of the 251 characters coded, 61 legacy characters were modified from matrices published by Lamoral (1980), Stockwell (1989), Prendini (2000), Fet et al., (2001), Soleglad and Sissom (2001), Soleglad and Fet (2003b), Prendini (2004), Francke and Prendini (2008), and Prendini et al. (2010). The remaining 190 characters were newly devised. The original definition of legacy characters was critically assessed by examination of specimens. As result, some characters were reinterpreted, merged, split or abandoned due to inconsistency. To maintain the logical and biological independence of characters (Wilkinson, 1995), several assessments of potentially redundant characters were made to avoid using dependent characters that overweigh evidence and introduce redundancy, e.g. as implied by reference to serial structures with the same character state (Fitzhugh, 2006). Presumed dependent characters were identified by observation of characters with co-variation, i.e. character states with the same derivation in one or more characters, and merged to mitigate this issue.

Characters were defined using binary and multistate coding. An effort was made to avoid coding inapplicable (-) by using both composite coding (Maddison, 1993; Wilkinson, 1995; Strong and Lipscomb, 1999), and redefining characters (Fitzhugh, 2006).

The final matrix comprised 118 binary, 88 multistate, and 45 continuous characters. No assumptions were made for transformation series and, thus, characters were treated as unordered or nonadditive (Fitch, 1971).

Morphological terminology follows Vachon (1974) for trichobothria, Sissom (1991a) for hemispermatophore, and Stahnke (1970) for other characters, except as noted. The terms 'internal' and 'external' are substituted with 'prolateral' and 'retrolateral', following Acosta et al. (2008). Pedipalp carination follows a system developed by Prendini et al. (in prep.). The pedipalp chela finger dentition of Soleglad and Sissom (2001) is redefined to maintain consistency with the terminology for pedipalp segments. Leg setation and spinules are modified from McWest (2009). Metasomal carination is modified from Ochoa et al. (2010).

Selection, acquisition and sequencing of DNA markers

Genomic DNA sequences have provided a wealth of information for discerning phylogenetic relationships among scorpions (Gantenbein et al., 1999, 2001; Prendini et al., 2003; Borges et al., 2010; Sousa et al., 2010; Sousa et al., 2011). The use of multiple loci acquired from nuclear and mitochondrial genomes for phylogenetic reconstruction is now standard practice (Avise, 1989; Doyle, 1992; Brower and DeSalle, 1994; Maddison, 1997).

Five loci were selected to reconstruct the phylogeny of Syntropinae. Partial 28S rDNA (ca. 520 base-pairs) and partial 18S rDNA (1,763 base-pairs) were used from the nuclear genome. Partial 16S rDNA (ca. 485 base-pairs), partial 12S rDNA (ca. 335 base-pairs), and partial Cytochrome Oxidase Subunit I, COI (ca. 1,078 base-pairs) were used from the mitochondrial genome.

The 18S and 28S fragments have been used in phylogenetic studies of arthropods at high and low taxonomic levels (e.g., Wheeler et al., 2001; Arnedo et al., 2004; Edgecombe and Giribet, 2006; Prendini et al., 2005; Miller et al., 2010). The 16S fragment was included because studies have shown significant intraspecific and interspecific variation in scorpions (e.g., Gantenbein et al., 2001; Fet et al., 2001; Gantenbein and Largiader, 2002; Prendini et al., 2003; Parmakelis et al., 2006). The slightly more conserved 12S locus has helped elucidate the internal relationship of several groups of arthropods, including scorpions (e.g., Fang et al., 2000; Edgecombe et al., 2002; Bruvo-Madaric et al., 2005; Starret and Hedin, 2007; Wood et al., 2007). The variable COI fragment reveals relationships among arthropods, insects, and arachnids (Arnedo et al., 2002; Giribet et al., 2001; Borges et al., 2010; Sousa et al., 2010), contains potentially useful information at species level, and is the locus for DNA barcoding (Heber et al., 2003; Stoeckle, 2003). The use of these five markers permits the inference of phylogenetic relationships at family, genus, and species levels of the Syntropinae.

Genomic material was extracted from the fourth leg of specimens using Quiagen Dneasy Tissue Kits. DNA was amplified using Eppendorff thermocyclers programmed to complete the following thermal profile: 94°C for 3:00 min, 94°C for 0:30 min, 55–42°C (depending on the locus) 0:30 min, 72°C 0:45 min and ending at 72°C 7:00 min for 35–40 cycles. Primers are provided in table 1. The PCR reaction was conducted using PureTaq-Ready-To-Go PCR Beads (GE Healthcare), 1 μl of each direction primer, 2 μl of DNA template and 21 μl of DNA grade H_2O.

PCR products were verified on a 1% agarose-TBE electrophoresis gel stained with CYBR Safe. Amplified products were cleaned using Ampure Magnetic Beads (Beckman-Coulter) and re-suspended in 40 μl DNA grade water by using a Beckman Coulter Biomek NX

robot. Amplification products were sequenced in both directions. Each 8 μl sequencing reaction mixture included 1 μl of Big Dye, 1μl of Big Dye Terminating buffer, 1 μl of 3.2 pm primer and 5 μl of gene amplification product. Samples were sequenced in a thermocycler Eppendorff Mastercycler cycling 35 times using the following thermal profile: 96°C for 0:15 min, 50°C for 0:15 min, 60°C for 4:00 min and hold at 4°C∞. Cycle-sequenced products were cleaned using CleanSeq magnetic beads on a Biomex NX robot. Products were re-suspended in EDTA and 33 μl were run on an Applied Biosystems, Inc. Prism 3730xl automated DNA sequencer.

Complementary strands of DNA were assembled into consensus sequences using Sequencher version 5 (Gene Codes Corporation, 2010). Primers were removed from the sequences, and the quality of each sequence was checked for mismatches among strands by direct observation of chromatographs. In the event of conflicting nucleotides on complementary strands, the entire fragment was discarded and re-sequenced.

Multiple alignment

Edited sequences of the four genes were aligned in MAFFT version 6 (Katoh et al., 2005) using the G-INS-I strategy, a Needleman-Wunsch algorithm, which assumes that large sections of the sequence can be aligned globally (Katoh et al., 2005). The G-INS-I strategy is the most appropriate to align this dataset because of the limited variation in sequence length and short gap openings expected (appendices 6–10). All other settings for the alignments, including the default gap opening penalty of 1.53 and the scoring matrix for nucleotide sequences 1/PAM κ=2, were as recommended by Katoh et al. (2005). Sequences were aligned using the online version of MAFFT at http://mafft.cbrc.jp/alignment/server/ (Katoh et al., 2002; Katoh et al., 2005; Katoh

and Toh, 2008; Katoh et al., 2009). Alignments obtained with MAFFT were analyzed for nucleotide composition using MEGA 5.05.

Phylogenetic analyses

Nine partitions were defined: five genetic markers, each representing one partition (12S, 16S, 18S, 28S, COI); combined mitochondrial genes and combined nuclear genes, representing one partition each; and continuous and discrete morphological characters, representing one partition each. Combined molecular and combined morphological partitions were analyzed separately to assess their relative phylogenetic signals. Simultaneous analyses of all partitions were used to identify the preferred phylogenetic hypothesis because they test all available evidence and thus maximize explanatory power, convey several sources of independent characters, and allow the emergence of secondary signals (Farris, 1983, 1986; Farris and Kluge, 1986; Nixon and Carpenter, 1996).

Separate and simultaneous analyses were run with parsimony as optimality criterion in TNT (Goloboff et al., 2003) using three new technology analyses. Initial test runs were conducted to establish an appropriate searching strength. The program was set to complete 300 random addition sequences; 10 rounds of sectorial searches using RSS, CSS and XSS, fusing trees 5 times during each search; 200 iterations of the ratchet; 10 rounds of tree fusing with global fusing every 3 hits, dumping fused trees to avoid clogging, and a final round of TBR. This aggressive search ensured that the shortest tree was recovered at least 50 times. Trees were prepared with Winclada 1.00.08 (Nixon, 2002) and edited with Photoshop CS5.1.

Table 1. List of primers used to amplify molecular markers.

Name		Reference
	5′	3′
	12S rDNA	
12SAI	AAACTAGGATTAGATACCCTATTAT	Kocher et al., (1989)
12SBI	AAGAGCGACGGGCGATGTGT	Kocher et al., (1989)
	16S rDNA	
16SB	CTCCGGTTTGAACTCAGATCA	Simon et al., (1994)
16SA	CGCCTGTTTATCAAAAACAT	Simon et al., (1994)
	COI	
NANCY	CCCGGTAAAATTAAAATATAAACTTC	Simon et al., (1994)
HCOEXTERNB	CCTATTGAWARAACATARTGAAAATG	Simon et al., (1994)
HCOEXTERNA	GAAGTTTATATTTTAATTTTACCTGG	Simon et al., (1994)
HCO	TAAACTTCAGGGTGACCAAAAAATCA	Folmer et al., (1994)
LCO1490	GGTCAACAAATCATAAAGATATTGG	Folmer et al., (1994)
HCOOUTOUT	GTAAATATATGRTGDGCTC	Prendini et al., (2003)
CI-J01718-spider	GGNGGATTTGGAAATTGRTTRGTTCC	Simon et al., (1994)
CI-N02776-spider	GGATAATCAGAATANCGNCGAGG	Simon et al., (1994)
CruzR	CATACCCAAAGARCCAAAAGG	Valdez-Cruz et al., (2004)
	28S rDNA	
28SA	GACCCGTCTTGAAGCACG	Nunn et al. (1996)
28SBout	CCCACAGCGCCAGTTCTGCTTACC	Prendini et al., (2005)
	18S rDNA	
18Sa1.0	GGTGAAATTCTTGGAYCGTC	Whiting et al., (1997)
18s a2.0	ATGGTTGCAAAGCTGAAAC	Wheeler et al., (1993)
18Sa3.5	TGGTGCATGGCCGYTCTTAGT	Whiting et al., (1997)
18Sai	CCTGAGAAACGGCTACCACATC	Wheeler et al., (1993)
18Sbi	GAGTCTCGTTCGTTATCGGA	Wheeler et al., (1993)
18SB2.9A	TATCTGATCGCCTTCGAACCTCT	Whiting et al., (1997)
18SB3.0	GACGGTCCAACAATTTCACC	Whiting et al., (1997)
18SB3.9	TGCTTTRAGCACTCTAA	Whiting et al., (1997)
18SB5.0	TAACCGCAACAACTTTAAT	Wheeler et al., (1993)
18S1F	TACCTGGTTGATCCTGCCAGTAG	Giribet et al., (1996)
18S3F	GTTCGATTCCGGAGAGGGA	Giribet et al., (1996)
18S5R	CTTGGCAAATGCTTTCGC	Giribet et al., (1996)
18S4R	GAATTACCGCGGCTGCTGG	Giribet et al., (1996)
18S6F	AAACTTAAAGGAAT	Giribet et al., (1996)
18S7F	GCAATAACAGGTCTGTGATGCCC	Whiting (2002)
18S7R	GCATCACAGACCTGTTATTGC	Whiting (2002)
18S8R	ACGGGCGGTGTGTAC	Giribet et al., (1996)
18S9R	GATCCTTCCGCAGGTTCACCTAC	Giribet et al., (1996)
18Sa0.79	TTAGAGTGCTYAAAGC	Whiting et al., (1997)
18s a0.7	ATTAAAGTTGTTGCGGTT	Whiting et al., (1997)

Sensitivity analyses

The sensitivity of the data to different weighting regimes against homoplasy was explored with equal weighting and implied weighting under different values of the concavity constant (*k*) (Goloboff, 1993; Prendini, 2000; Prendini et al., 2003; Goloboff et al., 2008; Álvarez et al., 2009; Lopardo et al., 2010). Implied weighting against homoplasy has been demonstrated to improve support values and the performance of phylogenetic analyses in general (Goloboff et al., 2008). The settings explored in the initial test runs allowed searches to be optimized (faster and less aggressive).

Several batch scripts for windows were written to perform searches using implied weights with *k* values 1–20, increasing one unit, and 20–100, increasing 10 units, (27 *k* values) for each set of analyses. The strength of searches was categorized as strong (1–3), mild (4–10), and weak (15–100). The command string for each search was **piwe=*x***; **hold 1200 xmult= level 10**, where '**piwe**' establishes the strength of the weighting; '*x*' represents *k* values; '**hold 1200**' specifies the number of trees saved in memory (here 1200); and '**xmult= level 10**' is the most stringent heuristic search strategy, which runs 14 replications of Wagner tree builds as starting point for each hit autoconstrained, including TBR, constrained and random sectorial searches with 36 iterations of tree drifting, and 10 rounds of tree fusing, localizing best score one time and doing a final round of fusing after hitting the best score (Goloboff et al., 2003). This strategy was used after it was confirmed to find the same length and tree topology as the initial aggressive search.

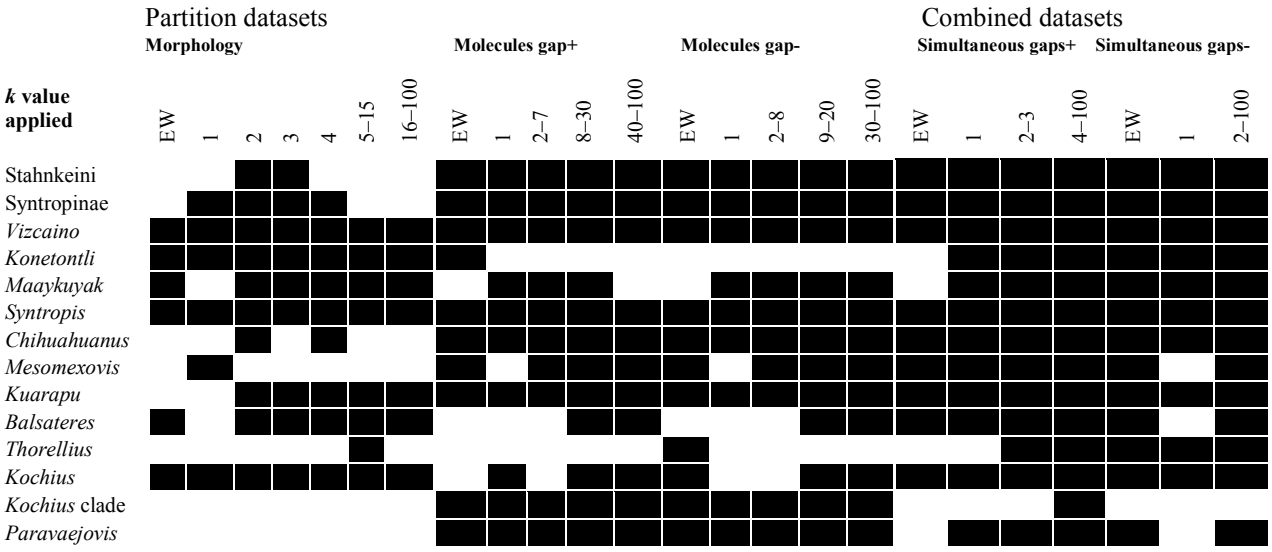


Figure 4. Nodal stability according to variation in weighting regime (equal weighting, EW, or implied weighting with a range of *k* values) and gap treatment (as a fifth state or missing). Selected clades correspond to the generic classification of González-Santillán and Prendini, in litt. The *Kochius* clade comprises *Balsateres*, *Kochius*, *Kuarapu*, and *Thorellius*.

Stability to the *k* value results for the sensitivity analyses are presented as majority rule trees with cutoff 50% (Nixon and Carpenter, 1996). These trees represent stability of nodes under different parameters. The clades of interest were organized according to the combination of partitions and parameter set in which they were recovered (figure 4), to plot nodal stability as interpreted by Giribet (2003). Further analyses were conducted to explore the effect of gaps treated as a fifth state and as missing data, using the search strategies described above.

Resampling and node support

Resampling and node support were calculated with TNT. Jackknifing with a removal probability of 36%, and symmetric resampling with a removal probability of 33% were conducted with 1000 pseudoreplicates each. The highest resampling values served as the optimality criterion (Källersjö et al., 1999) to select the most parsimonious tree from among the results of simultaneous analyses with gaps as a fifth state. Jackknife values were considered high if ≥ 80, medium if between 79–63 and low if <62 (Farris et al., 1996). Jackknife values are expressed in terms of gc frequency difference (group prence\contradicted).

Absolute and relative Bremer support (ABS and RBS) up to 65 extra steps was calculated with TNT (Bremer, 1994; Goloboff and Farris, 2001; Goloboff et al., 2003; Goloboff et al., 2008). Successive calculation of trees one step longer, retaining up to 1000 trees in memory at each search, were obtained with the command **sub hold 1000**; **bb=tbr fillonly**, generating 65,000 trees. Whereas ABS was calculated from this set of trees, RBS was calculated using the reduced set of trees used to calculate absolute support values (Goloboff and Farris, 2001). Absolute Bremer support is difficult to interpret and cannot be compared to results of different data matrices (Goloboff and Farris, 2001; Brower, 2006). However, these values gave an

estimation of support for the preferred hypothesis in units of fit. Because RBS is scaled from 0–100 in terms of the evidence contradicting and supporting nodes (Goloboff and Farris, 2001) these values provide a finer assessment of support for the preferred hypothesis. Informative characters were used to calculate CI, RI and fit for the preferred hypothesis as well as CI and RI for each morphological character, to evaluate levels of homoplasy/information content. The threshold between high and low homoplasy for the morphological characters is difficult to establish, so the values were only compared among character systems. Indices for trees and characters were calculated using scripts (stats.run, CharStats.run) available online at http://tnt.insectmuseum.org/index.php/Scripts. Unambiguous optimizations of characters were produced as a list for selected clades in the preferred hypothesis (appendix 11).

Partitioned Bremer support (PBS) (Baker and DeSalle, 1997) was calculated to assess the contribution of each partition to the total Bremer support. The calculation was accomplished by using the script "pbsup.run" written by Carlos Peña available online at http://nymphalidae.utu.fi/cpena/software.html.

RESULTS

DNA sequence data

A total of 146 samples and 730 sequences were processed, belonging to 66 vaejovid species (appendix 6–10). Sequence lengths are summarized in table 2. The 12S fragment was the most variable among the genetic markers, ranging from 332 to 335 base pairs in the outgroup and 228 to 335 in the ingroup. The 16S fragment varied from 480 to 486 in the outgroup and 480 to 483 in the ingroup, with the outgroup variation being larger among the fragments. As expected, there was limited variation in length among the18S and 28S sequences and none

among the COI sequences. The sample *Kochius punctipalpi*_1679 was partially amplified for COI, with 358 base pairs.

The total number of parsimony-informative sites within the concatenated genes was 789, which represents 19% of the 4221 aligned nucleotides. As anticipated, the nuclear genes presented the lowest site variation (2% and 5% for 18S and 28S respectively) and, thus, were less parsimony-informative (table 3). In contrast, the mitochondrial genes were more variable and parsimony-informative with 44%, 36% and 37% of the sites being informative for 12S, 16S and COI, respectively. Low variation in 28S and 18S length produced alignments with few gaps and, because there was no variation in sequence length and 99% of the sequences were complete, alignment of COI was trivial. The 12S ribosomal gene was less conserved than the other ribosomal markers, as observed by Prendini et al. (2003).

The 12S and 16S fragments had more gaps due to the presence of loops and other secondary structures characteristic of ribosomal genes. The percentage content of purine and pyrimidine coincided with reports in other arthropods (DeSalle et al., 1987; Edgecome et al., 2000; Prendini et al., 2003). The mitochondrial 12S, 16S and COI are typically A/T-rich, as observed with 41.80/37.38%, 37.39/36.62% and 23.41/41.48%, respectively. The total A/T content with respect to the total number of nucleotides in 12S, 16S and COI was 79.18%, 74.01% and 64.89%, respectively. This bias is likely due to the tendency of methylation in adenine and thymine, documented extensively in vertebrates and more recently in invertebrates, especially arthropods (Glastad et al., 2011; Lyko and Maleszka, 2011). In contrast, each nucleotide was more evenly represented (approximately 25%) in the nuclear genes. The proportion of C/G was high in 28S and 18S, as reported by Prendini et al. (2003). The rate of individual transitions (ts) and transvertions (tv) and the ratio of ts:tv for 28S and 18S was similar.

Although a 1:2 ratio of ts:tv was expected, assuming there are twice the number of transversions than transitions and that substitutions are equally likely, ratios of 2.38 and 2.41 (i.e. more than twice the number of transitions than transversions) were observed for 28S and 18S respectively. The ts: tv ratios were similar in the 12S and 16S ribosomal genes but the transitions G→A and C→T were more abundant with 18.61% and 27.92% for the 12S, respectively, and 24.12% and 21.04% for the 16S, respectively. The mitochondrial 12S and 16S genes had lower ts:tv ratios (0.93% and 1.22%, respectively) than the nuclear ribosomal genes.

Table 2. Length variation among genetic markers. Numbers to left indicate sequence length, to right indicate number of sequences of that length. Outgroup is indicated in *italics* and ingroup in **bold** font. The sample *Kochius punctipalpi*_1679 is 288 base pairs shorter than other COI sequences.

12S	16S	18S	28S	COI
332/6	*480/1*	*1761/7*	*514/11*	*1078/16*
333/4	*481/1*	*1762/1*	*516/5*	**790/1**
334/2	*482/9*	*1763/8*	**514/123**	**1078/129**
335/4	*483/3*	**1761/130**	**515/3**	
228/1	*484/1*		**516/4**	
329/23	*486/1*			
330/59	**480/6**			
331/31	**481/24**			
332/10	**482/66**			
333/4	**483/34**			
335/2				

Table 3. Number of base pairs, variable, informative and conserved sites, and transition/transversion bias in aligned genetic markers used for phylogenetic analyses of the subfamily Syntropinae. Calculations were conducted using the maximum composite likelihood test (mcl) under the Tamura-Nei (Tamura et al., 2004) model of substitution. Numbers in parentheses for the COI fragment represent content of each nucleotide per codon from 1st 2nd and 3th position. Values for nucleotide composition are expressed as percentages.

	Nuclear		**Mitochondrial**			**Total**
	Ribosomal				**Protein-coding**	
Nucleotides	*18S*	*28S*	*12S*	*16S*	*COI*	
Length	1764	520	366	493	1078	4221
Variable	45	52	211	216	442	966
Info+gaps (%)	30 (2)	28 (5)	162(44)	175(36)	394(37)	789(19)
Conserved	1718	466	143	271	636	3234
A	25.44	22.56	41.8	37.39	23.41(27.95)(27.23)(15.02)	27.41
C	27.58	32.07	13.40	14.89	20.80(15.67)(29.04)(17.70)	24.04
G	23.55	25.99	8.14	11.10	13.96(3.36)(14.64)(23.92)	19.10
T	23.43	19.38	37.38	36.62	41.48(53.02)(29.08)(43.36)	29.45
ts rate						
AG	10.02	16.60	6.07	9.6	22.27(17.39)(8.77)(41.95)	16.75
GA	10.17	11.68	18.61	24.12	25.07(31.02)(8.22)(35.61)	19.09
TC	24.09	24.70	6.08	6.38	4.18(1.87)(26.04)(3.19)	8.28
CT	24.78	18.43	27.92	21.04	12.54(29.5)(51.72)(5.78)	12.77
tv rate						
AC	3.43	3.71	1.68	2.16	2.51(0.43)(0.38)(1.61)	4.12
TA	3.71	3.22	8.49	7.27	4.21(2.83)(0.72)(1.01)	5.91
CG	4.02	4.59	2.77	2.89	3.74(1.58)(0.76)(1.19)	5.18
GT	3.41	2.77	7.72	7.11	7.52(5.36)(0.76)(2.92)	4.12
ts:tv	2.38	2.41	0.93	1.22	1.57(2.35)(15.40)(5.18)	1.30

The fragment COI comprised 1078 base-pairs, corresponding to 359 amino acids, and contained 442 variable sites, 394 of which were informative and 636 conserved. Nucleotide proportions in each position varied considerably, but there was low proportion of guanine (3.36%) and high proportion of thymine (53.02%) at the first position which had the lowest ts:tv ratio This may be related to the high tv ratio observed in the first position when there was a change from G→T. The ts:tv ratio was lowest (2.35%) at the first position and highest (15.40%) at the second position.

Phylogenetic analyses

Results of sensitivity analyses to assess variation in weight regime and gap treatment are presented in table 4. The shortest trees were obtained with equal weights but, as expected, fit, CI and RI varied among the implied weights analyses (Goloboff, 1993, 1995; Goloboff et al., 2008). The preferred hypothesis was selected by using the highest average resampling value as an optimality criterion. Symmetric resampling values were strongly correlated to jackknife support are not reported or discussed.

Morphological analyses

Analyses of the morphology partition resulted in 119 most parsimonious trees. The shortest tree, obtained with equal weights, had CI 0.25, RI 0.8 and length 130.65 (table 4). Syntropinae was retrieved as monophyletic only under the strongest concavity values 1–3 and mild value 4. *Kochius*, *Konetontli*, *Syntropis* and *Vizcaino* were consistently recovered as monophyletic (figure 4). *Balsateres*, *Kuarapu*, and *Maaykuyak* were recovered in more than 99%

of the analyses, *Chihuahuanus*, *Mesomexovis*, and *Thorellius* were each obtained at least once and *Paravaejovis* and the *punctipalpi* group were never recovered.

The majority rule consensus (figure 5A) of trees obtained from all concavity values explored did not recover Syntropinae or Stahnkeini as monophyletic. *Kochius*, *Konetontli*, and *Vizcaino* were consistently retrieved. *Chihuahuanus*, *Mesomexovis*, and *Paravaejovis* were polyphyletic. *Maaykuyak* was retrieved as monophyletic in 97% of the analyses but placed between *Chihuahuanus* and *Mesomexovis*. *Paravaejovis pumilis* consistently grouped with species related to the former *eusthenura* group = *Hoffmannius*, instead of with *Smeringurus*, near the root.

The topology with the best average jackknife values (figure 5B) is a consensus of five most parsimonious trees obtained with implied weights under $k = 100$ with length = 1652.516, CI = 0.25, RI = 0.8 and fit = 11.51. As with the majority rule consensus, this tree recovers Syntropinae as polyphyletic. However, *Maaykuyak*, *Konetontli*, *Kochius*, *Syntropis*, *Balsateres*, and *Vizcaino* were obtained with moderate to high jackknife values (78, 89, 99, 100, and 100 respectively). Other clades with considerable jackknife support were a group comprising *C. crassimanus C. russelli*, and *C. cazieri* (94); *Paravaejovis confusus*, *P. coloradensis*, and *P. waeringi* (98) and; *C. globosus*, *C. kovariki*, and *C. glabrimanus* (81).

Combined molecular analyses

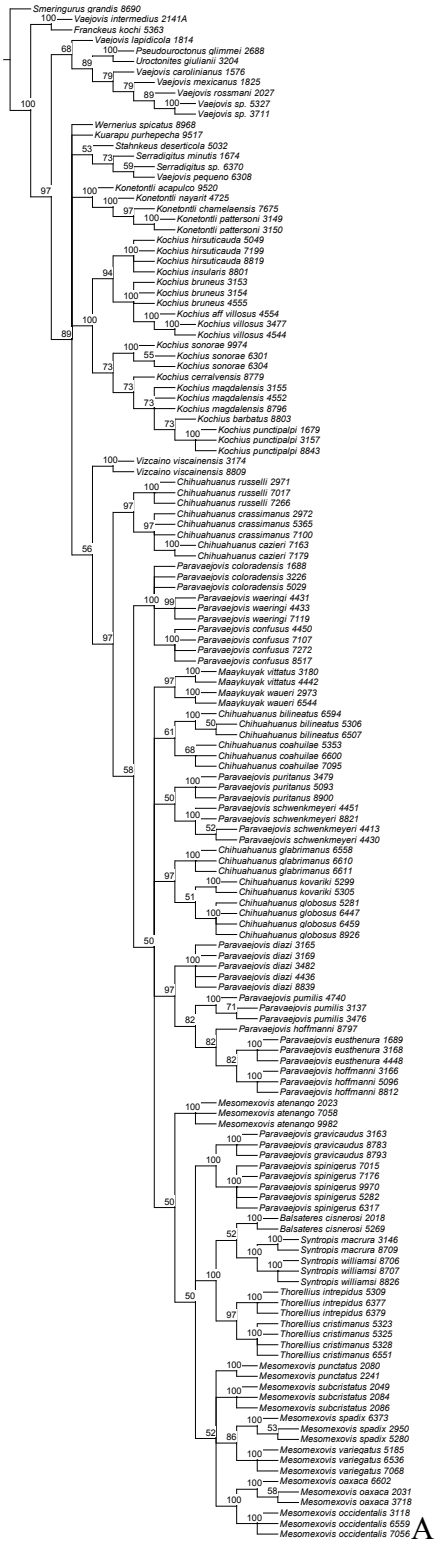
Analyses of the five concatenated genes under different weighting regimes resulted in 36 most parsimonious trees when gaps were treated as an additional state, and 31 most parsimonious trees when they were treated as missing data. The minimum lengths for gaps as fifth state or gaps as missing data were obtained with equal weighting (table 4).

Clades consistently recovered by the molecular dataset were Syntropinae and Stahnkeini, *Vizcaino*, *Syntropis*, *Chihuahuanus*, *Kuarapu*, *Paravaejovis*, the *Kochius* clade (comprising *Thorellius*, *Kochius*, and *Balsateres*). *Maaykuyak* was recovered under all weights explored except analyses with gaps as fifth state under equal weights and implied weights with $k = 40–100$ and the analysis with gaps as missing data under equal weights. *Mesomexovis* was retrieved in most of the analyses except for equal weights with gaps as a fifth state or as missing data. *Thorellius* was monophyletic only in the analysis with equal weights and gaps as missing data, whereas *Kochius* and *Balsateres* were monophyletic only with implied weighting under $k = 1, 8–100$ with gaps as fifth state and under $k = 9–100$ with gaps as missing data.

The best average jackknife score for analyses with gaps as a fifth state, obtained with implied weighting under $k = 15$, had length = 9054, CI = 0.18, RI = 0.6 and fit = 292.77 (figure 8; table 4). Although the analyses with gaps as missing had lower length, CI, RI and higher fit, both analyses generated similar topologies, differing only in the relationships of some clades, such as the *Kochius* clade (figures 6A and 6B). Both majority rule consensus trees recovered the following monophyletic groups: Syntropinae, Stahnkeini, *Maaykuyak*, *Syntropis*, *Kochius*, *Paravaejovis*, *Mesomexovis*, *Chihuahuanus*, the *Kochius* clade (comprising *Thorellius*, *Kochius*, and *Kuarapu*).

Table 4. Summary statistics for the most parsimonious trees (MPT) obtained by simultaneous and partitioned analyses with equal weighting (EW) and implied weighting (IW) under a range of concavity values (*k*) representing significant change in fit, topology, and length (results for intermediate values not shown). Gaps were treated as fifth state and as missing data. Tree length (TL), consistency index (CI), retention index (RI) and fit are provided for each analysis. Values in bold correspond to the preferred hypothesis with the highest jackknife values expressed in terms as gc for the morphological partition (41.3), the combined molecules (74.1) and the simultaneous analysis (80.9) with gaps treated as fifth state.

Analysis	W, *k*	MPT	TL	CI	RI	FIT
Morphology	IW, 1	3	1803.478	0.229	0.771	169.99
	IW, 2	4	1714.127	0.241	0.786	145.86
	IW, 3	5	1704.522	0.242	0.788	128.15
	IW, 6	5	1677.428	0.246	0.792	95.62
	IW, 10	5	1666.414	0.248	0.794	72.19
	IW, 15	4	1666.414	0.248	0.794	55.58
	IW, 20	5	1656.894	0.249	0.794	45.26
	IW, 40	2	1653.247	0.250	0.796	26.06
	IW, 100	**5**	**1652.516**	**0.250**	**0.796**	**11.51**
	EW	3	1651.991	0.250	0.796	130.65
Molecules combined gaps 5th state	IW, 1	1	9262.000	0.179	0.567	587.77
	IW, 2	1	9121.000	0.182	0.575	512.62
	IW, 3	1	9081.000	0.183	0.578	460.88
	IW, 6	1	9070.000	0.183	0.578	364.71
	IW, 10	**1**	**9054.000**	**0.184**	**0.579**	**292.77**
	IW, 15	1	9043.000	0.184	0.580	238.23
	IW, 20	1	9034.000	0.184	0.580	202.17
	IW, 40	1	9026.000	0.184	0.580	128.05
	IW, 100	1	9024.000	0.184	0.581	62.13
	EW	7	9024.000	0.184	0.581	463.13–463.61
Molecules combined gaps missing	IW, 1	1	9046.000	0.175	0.569	575.23
	IW, 2	1	8990.000	0.176	0.572	502.79
	IW, 3	1	8951.000	0.177	0.574	452.81
	IW, 6	1	8927.000	0.177	0.576	359.37
	IW, 10	1	8912.000	0.177	0.576	288.98
	IW, 15	1	8897.000	0.178	0.577	235.39
	IW, 20	1	8894.000	0.178	0.577	199.87
	IW, 40	1	8886.000	0.178	0.578	126.76
	IW, 100	1	8880.000	0.178	0.578	61.56
	EW	4	8879.000	0.178	0.578	455.58–455.62
Simultaneous gaps 5th state	IW, 1	1	11163.245	0.186	0.616	765.16
	IW, 2	1	10993.392	0.189	0.623	665.13
	IW, 3	1	10963.057	0.189	0.624	595.66
	IW, 6	1	10915.041	0.190	0.626	466.61
	IW, 10	1	10895.459	0.190	0.627	370.62
	IW, 15	1	**10884.593**	**0.191**	**0.627**	**289.77**
	IW, 20	1	10882.507	0.191	0.627	251.85
	IW, 40	1	10882.507	0.191	0.627	157.20
	IW, 100	1	10881.507	0.191	0.627	75.27
	EW	2	10876.346	0.191	0.628	599.18–599.24
Simultaneous gaps missing	IW, 1	1	10975.305	0.182	0.616	752.65
	IW, 2	1	10843.845	0.184	0.622	655.47
	IW, 3	1	10809.382	0.184	0.623	587.80
	IW, 6	1	10750.401	0.185	0.626	461.28
	IW, 10	1	10752.459	0.185	0.625	366.76
	IW, 15	1	10740.273	0.186	0.626	295.89
	IW, 20	1	10735.187	0.186	0.626	249.54
	IW, 40	1	10735.187	0.186	0.626	155.88
	IW, 100	1	10732.257	0.186	0.626	74.67
	EW	3	10730.063	0.186	0.626	589.67–589.82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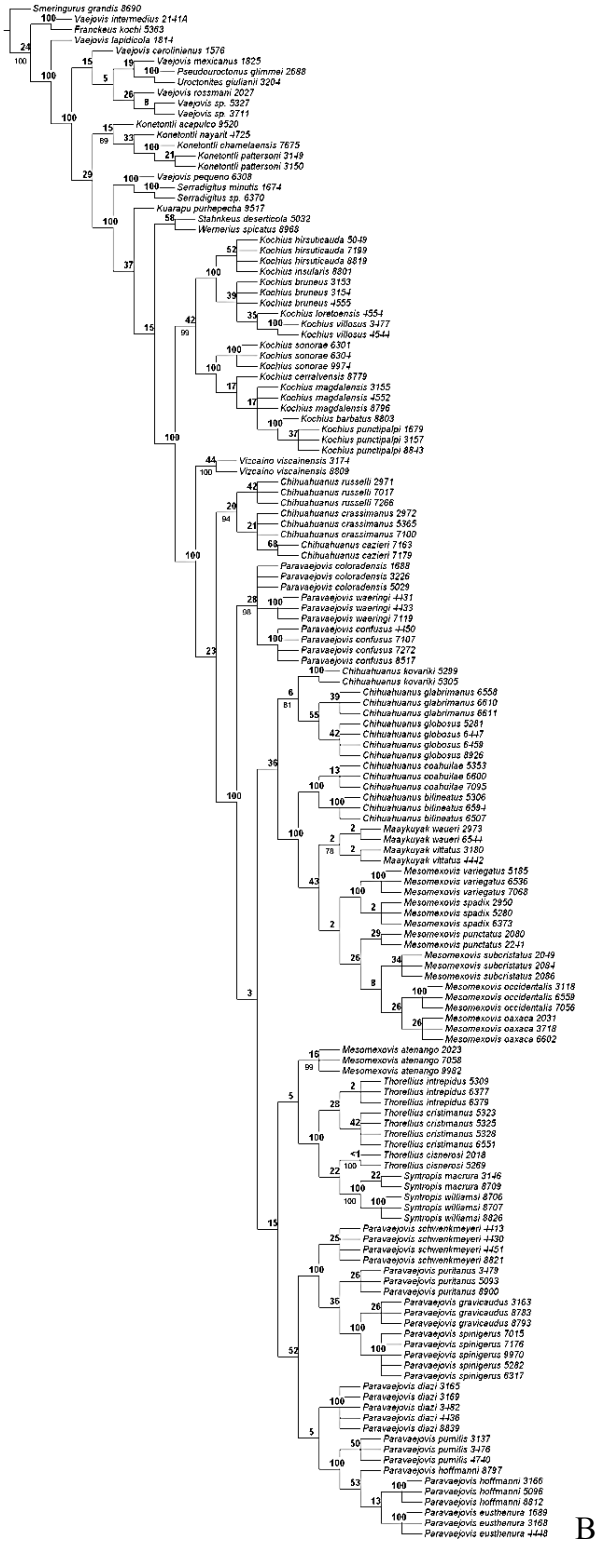
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Chihuahuanus glabrimanus 6611
Chihuahuanus bilineatus 5281
Chihuahuanus globosus 6447
Chihuahuanus globosus 6459
Chihuahuanus globosus 8926
Chihuahuanus coahuilae 5353
Chihuahuanus coahuilae 6600
Chihuahuanus coahuilae 7095
Chihuahuanus bilineatus 5306
Chihuahuanus bilineatus 6594
Chihuahuanus bilineatus 6507
Maaykuyak waueri 2973
Maaykuyak waueri 6544
Maaykuyak vittatus 3180
Maaykuyak vittatus 4442
Mesomexovis variegatus 5185
Mesomexovis variegatus 6536
Mesomexovis variegatus 7068
Mesomexovis spadix 2950
Mesomexovis spadix 5280
Mesomexovis spadix 6373
Mesomexovis punctatus 2080
Mesomexovis punctatus 2241
Mesomexovis subcristatus 2049
Mesomexovis subcristatus 2084
Mesomexovis subcristatus 2086
Mesomexovis occidentalis 3118
Mesomexovis occidentalis 6559
Mesomexovis occidentalis 7056
Mesomexovis oaxaca 2031
Mesomexovis oaxaca 3718
Mesomexovis oaxaca 6602
Mesomexovis atenango 2023
Mesomexovis atenango 7058
Mesomexovis atenango 9982
Thorellius intrepidus 5309
Thorellius intrepidus 6377
Thorellius intrepidus 6379
Thorellius cristimanus 5323
Thorellius cristimanus 5325
Thorellius cristimanus 5328
Thorellius cristimanus 6551
Thorellius cisnerosi 2018
Thorellius cisnerosi 5269
Syntropis macrura 3146
Syntropis macrura 8709
Syntropis williamsi 8706
Syntropis williamsi 8707
Syntropis williamsi 8826
Paravaejovis schwenkmeyeri 4413
Paravaejovis schwenkmeyeri 4430
Paravaejovis schwenkmeyeri 4451
Paravaejovis schwenkmeyeri 8821
Paravaejovis puritanus 3479
Paravaejovis puritanus 5093
Paravaejovis puritanus 8900
Paravaejovis gravicaudus 3163
Paravaejovis gravicaudus 8783
Paravaejovis gravicaudus 8793
Paravaejovis spinigerus 7015
Paravaejovis spinigerus 7176
Paravaejovis spinigerus 9970
Paravaejovis spinigerus 5282
Paravaejovis spinigerus 6317
Paravaejovis diazi 3165
Paravaejovis diazi 3169
Paravaejovis diazi 3482
Paravaejovis diazi 4436
Paravaejovis diazi 8839
Paravaejovis pumilis 3137
Paravaejovis pumilis 3476
Paravaejovis pumilis 4740
Paravaejovis hoffmanni 8797
Paravaejovis hoffmanni 3166
Paravaejovis hoffmanni 5096
Paravaejovis hoffmanni 8812
Paravaejovis eusthenura 1689
Paravaejovis eusthenura 3168
Paravaejovis eusthenura 4448

B

Figure 5. **A**. Majority rule consensus (50% cutoff) of 119 trees obtained by analyses of morphological partitions with equal weighting and implied weighting under 27 *k* values. **B**. Strict consensus of five trees obtained by analyses of morphological partitions under $k = 100$ with the highest average jackknife value expressed in frequency difference, the preferred hypothesis for the morphological partitions. Numbers above nodes indicate frequencies with which nodes were retrieved.

Smerinqurus qrandis 8690
Pseudouroctonus qlimmei 2688
Uroctonites giulianii 3204
Vaejovis lapidicola 1814
Vaejovis rossmani 2027
Vaejovis mexicanus 1825
Vaejovis sp. 5327
Vaejovis sp. 3711
Vaejovis intermedius 2141A
Franckeus kochi 5363
Vaejovis carolinianus 1576
Wernerius spicatus 8968
Serradigitus minutis 1674
Serradigitus sp. 6370
Stahnkeus deserticola 5032
Vaejovis pequeno 6308
Konetontli chamelaensis 7675
Konetontli navarit 4725
Konetontli pattersoni 3149
Konetontli pattersoni 3150
Konetontli acapulco 9520
Vizcaino viscainensis 3174
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Maaykuyak vittatus 3180
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Kuarapu ourhepecha 9517
Balsateres cisnerosi 2018
Balsateres cisnerosi 5269
Thorellius cristimanus 6551
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Thorellius cristimanus 5325
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Kochius sonorae 9974
Kochius sonorae 6301
Kochius sonorae 6304
Kochius punctipalpi 8843
Kochius punctipalpi 1679
Kochius punctipalpi 3157
Kochius bruneus 3153
Kochius bruneus 3154
Kochius bruneus 4555
Kochius aff villosus 4554
Kochius hirsuticauda 8819
Kochius hirsuticauda 5049
Kochius hirsuticauda 7199
Kochius insularis 8801
Kochius villosus 3477
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Kochius barbatus 8803
Kochius magdalensis 8796
Kochius magdalensis 3155
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Paravaejovis confusus 4450
Paravaejovis confusus 7272
Paravaejovis confusus 8517
Paravaejovis coloradensis 5029
Paravaejovis coloradensis 1688
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Paravaejovis gravicaudus 8783
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Mesomexovis occidentalis 7056
Mesomexovis oaxaca 6602
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Mesomexovis oaxaca 3718
Chihuahuanus bilineatus 5306
Chihuahuanus bilineatus 6594
Chihuahuanus bilineatus 6507
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Chihuahuanus cazieri 7179
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Chihuahuanus russelli 7017
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Mesomexovis occidentalis 3118
Mesomexovis occidentalis 7056
Mesomexovis oaxaca 6602
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Mesomexovis oaxaca 3718
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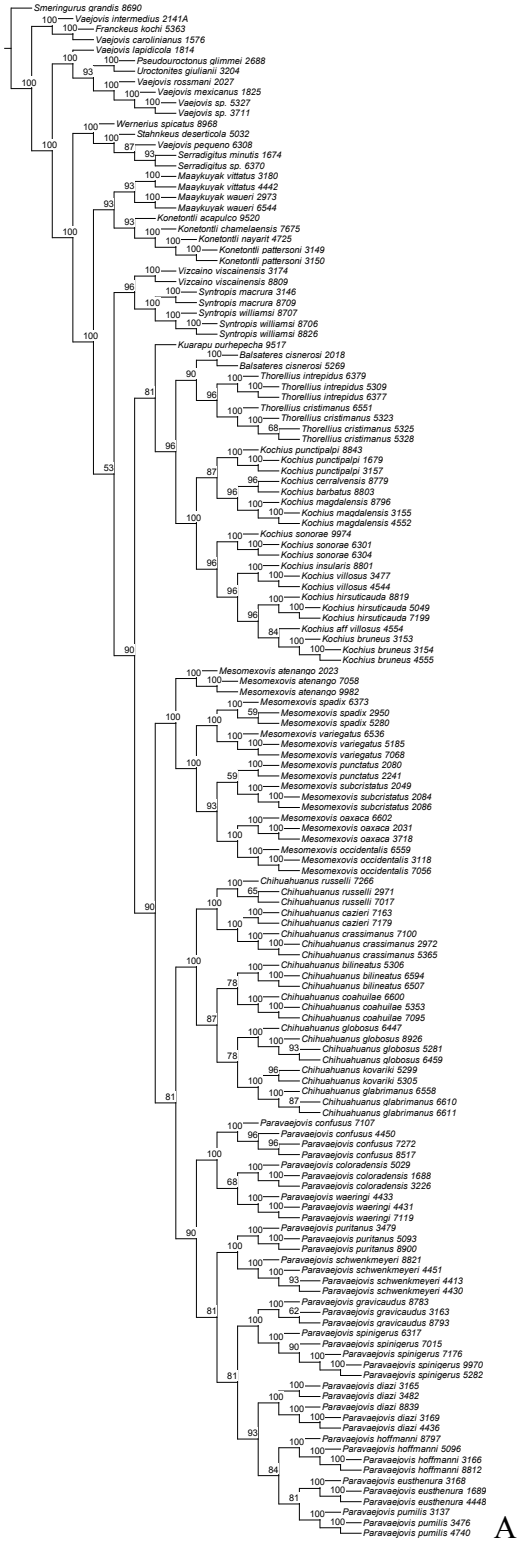
Chihuahuanus crassimanus 7100
Chihuahuanus globosus 6447
Chihuahuanus globosus 8926
Chihuahuanus globosus 5281
Chihuahuanus globosus 6459

B

Figure 6. **A**. Majority rule consensus (50% cutoff) of 36 trees obtained by analyses of the molecular partitions treating gaps as an additional state with equal weighting and implied weighting under 27 *k* values. **B**. Majority rule consensus (50% cutoff) of 31 trees obtained by analyses of molecular partitions treating gaps as missing data with equal weighting and implied weighting under 27 *k* values. This topology corresponds to the only tree obtained by analyses of molecular partitions treating gaps as an additional state with implied weighting under $k = 10$, which resulted in the highest average jackknife value, and is the preferred hypothesis for the molecular partitions. Numbers above nodes indicate frequencies with which nodes were retrieved.


Smeringurus grandis 8690
Vaejovis intermedius 2141A
Franckeus kochi 5363
Vaejovis carolinianus 1576
Vaejovis lapidicola 1814
Pseudouroctonus glimmei 2688
Uroctonites giulianii 3204
Vaejovis rossmani 2027
Vaejovis mexicanus 1825
Vaejovis sp. 5327
Vaejovis sp. 3711
Wernerius spicatus 8968
Stahnkeus deserticola 5032
Vaejovis pequeno 6308
Serradigitus minutis 1674
Serradigitus sp. 6370
Maaykuyak vittatus 3180
Maaykuyak vittatus 4442
Maaykuyak waueri 2973
Maaykuyak waueri 6544
Konetontli acapulco 9520
Konetontli chamelaensis 7675
Konetontli nayarit 4725
Konetontli pattersoni 3149
Konetontli pattersoni 3150
Vizcaino viscainensis 3174
Vizcaino viscainensis 8809
Syntropis macrura 3146
Syntropis macrura 8709
Syntropis williamsi 8707
Syntropis williamsi 8706
Syntropis williamsi 8826
Kuarapu ourhepecha 9517
Balsateres cisnerosi 2018
Balsateres cisnerosi 5269
Thorellius intrepidus 6379
Thorellius intrepidus 5309
Thorellius intrepidus 6377
Thorellius cristimanus 6551
Thorellius cristimanus 5323
Thorellius cristimanus 5325
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Kochius punctipalpi 8843
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Kochius magdalensis 3155
Kochius magdalensis 4552
Kochius sonorae 9974
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Kochius sonorae 6304
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Kochius villosus 4544
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Kochius hirsuticauda 5049
Kochius hirsuticauda 7199
Kochius aff villosus 4554
Kochius bruneus 3153
Kochius bruneus 3154
Kochius bruneus 4555
Mesomexovis atenango 2023
Mesomexovis atenango 7058
Mesomexovis atenango 9982
Mesomexovis spadix 6373
Mesomexovis spadix 2950
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Mesomexovis oaxaca 6602
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Mesomexovis occidentalis 6559
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Chihuahuanus russelli 7266
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Chihuahuanus bilineatus 6507
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Chihuahuanus coahuilae 5353
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Chihuahuanus globosus 5281
Chihuahuanus globosus 6459
Chihuahuanus kovariki 5299
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Chihuahuanus glabrimanus 6558
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Paravaejovis spinigerus 6317
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Paravaejovis hoffmanni 5096
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A

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Paravaejovis eusthenura 4448
Paravaejovis pumilis 3137
Paravaejovis pumilis 3476
Paravaejovis pumilis 4740
Paravaejovis puritanus 3479
Paravaejovis puritanus 5093
Paravaejovis puritanus 8900
Paravaejovis schwenkmeyeri 8821
Paravaejovis schwenkmeyeri 4451
Paravaejovis schwenkmeyeri 4413
Paravaejovis schwenkmeyeri 4430
Paravaejovis gravicaudus 8783
Paravaejovis gravicaudus 3163
Paravaejovis gravicaudus 8793
Paravaejovis spinigerus 6317
Paravaejovis spinigerus 7015
Paravaejovis spinigerus 7176
Paravaejovis spinigerus 9970
Paravaejovis spinigerus 5282

B

Figure 7. **A**. Majority rule consensus (50% cutoff) of 32 trees obtained by simultaneous analyses treating gaps as an additional state with equal weighting and implied weighting under 27 *k* values. **B**. Majority rule consensus (50% cutoff) of 33 trees obtained by simultaneous analyses treating gaps as missing data with equal weighting and implied weighting under 27 *k* values. Numbers above nodes indicate frequencies with which nodes were retrieved.

Simultaneous analyses

Simultaneous analysis generated 32 most parsimonious trees when gaps were treated as a fifth state or as missing data. The optimal length for both analyses resulted with equal weights. However the best fit was located under the strongest *k* value. Analyses with gaps as fifth state retrieved all the clades monophyletic with implied weighting under *k* = 4–100 (figure 7A). In the analyses with *k* = 2–3, the *Kochius* clade was not monophyletic. In the analyses with *k* = 1, *Thorellius* and the *Kochius* clade were not monophyletic. In the analyses with equal weighting, *Konetontli*, *Maaykuyak*, *Thorellius*, the *Kochius* clade, and *Paravaejovis* were not monophyletic (figure 4). In the analyses with gaps as missing data, at least one genus was always not monophyletic, but the rest were mostly monophyletic (figure 7B). In the analyses with *k* = 1, *Thorellius*, the *Kochius* clade and *Paravaejovis* were not monophyletic and in the analyses with equal weights and with implied weighting under *k*= 2–100, the *Kochius* clade was not monophyletic (figure 4).

Analyses with gaps treated as an additional state or as missing data produced nearly the same topology and differed only in the frequencies with which some genera were obtained among the different *k* values. The analysis with the highest average jackknife was obtained with implied weighting under *k* = 15 with a length = 10884.593, CI = 0.19, RI = 0.63 and fit = 289.77

(figure 8; table 4). The subfamilies received high jackknife resampling values and mild absolute and relative Bremer support values: Stahnkeini with 100, 0.6, and 76 and Syntropinae with 99, 0.63, and 67, respectively. The resampling values and support for nodes are similar for the following genera: *Maaykuyak*, *Konetontli*, *Vizcaino*, *Syntropis*, *Kochius*, and *Chihuahuanus*. *Paravaejovis* received mild to low values and *Mesomexovis* and *Thorellius* received low values.

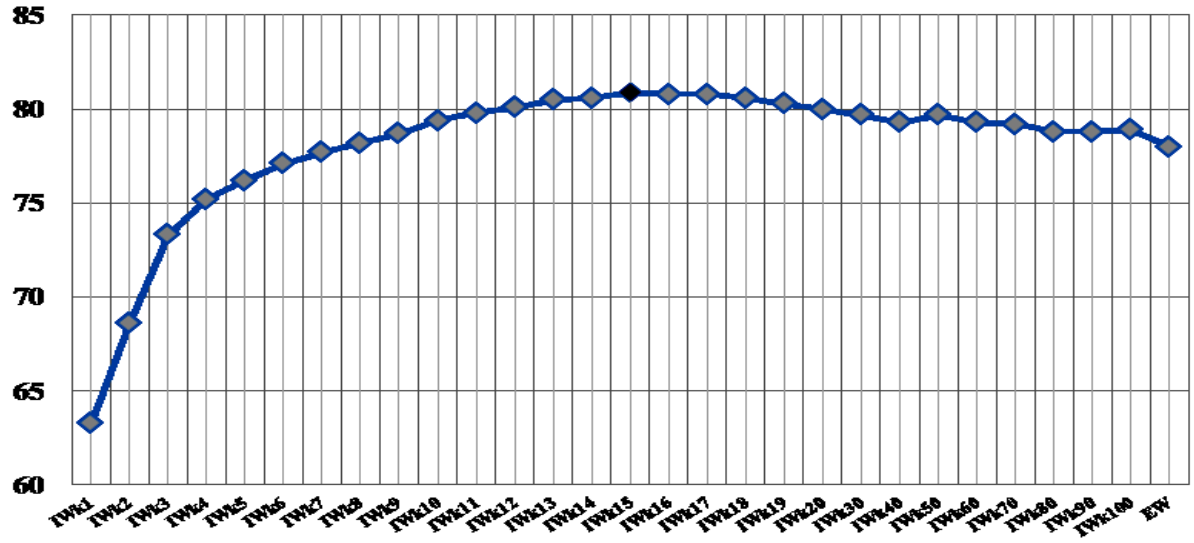


Figure 8. Average jackknife resampling values expressed in frequency difference for analyses of simultaneous data with gaps as an additional state. The preferred hypothesis was recovered with implied weighting under $k = 15$, a black diamond with average of 80.9.

The morphological characters supporting Syntropinae are as follows. Syntropinae possess prolateral dorsal carina of the pedipalp chela, vestigial, expressed medially and smooth or partial, extending from mid chela to the distal aspect of the manus, and granular (character 50). The pedipalp patella retrolateral median carina is either obsolete or reduced to a vestigial ridge distally, and granular. This character reversed in *Kochius* and some *Thorellius*, which present complete and granular retrolateral median carina, as observed in the outgroup, for example *Stahnkeus deserticola* (Williams, 1970) (character 72). The unambiguous synapomorphy for the subfamily is the retrospinose margin of the sclerotized mating plug of the male hemispermatophore (characters 50, 72, 127,). Additionally, 25 synapomorphic nucleotides support the subfamily (appendix 11).

Levels of homoplasy in morphological characters

Of the 251 morphological characters used to generate the preferred hypothesis, 241 were informative. Homoplasy content by morphological character system is presented in figure 9A–E. Sixteen characters had consistency and retention indices of 1. All continuous characters were informative at different levels.

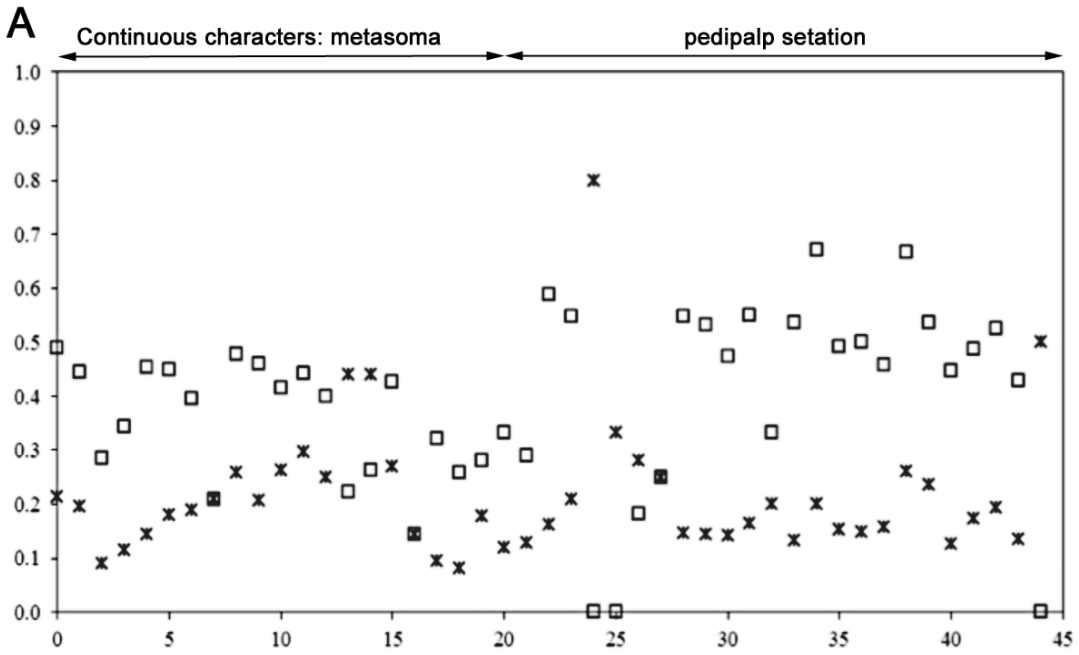
Continuous characters were grouped in two sets: setation on the metasomal carinae (characters 0–20); setation on the carinae of the pedipalp femur, patella, and chela (characters 21–45). The first group had consistency indices from 0.1 to over 0.4 and retention indices lower than 0.5. The second set had similar consistency indices except for characters 24 and 44, which were higher, but with higher retention indices (figure 9A).

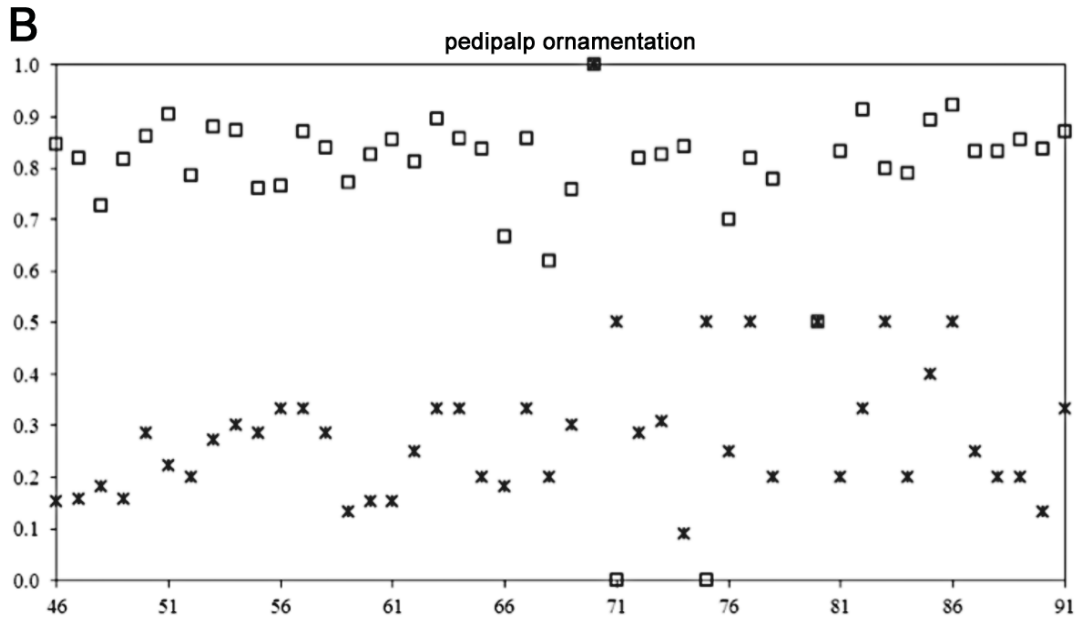
Figure 9B shows the characters of pedipalp ornamentation that had similar consistency indices to the continuous characters but higher retention indices. The exception was character 70

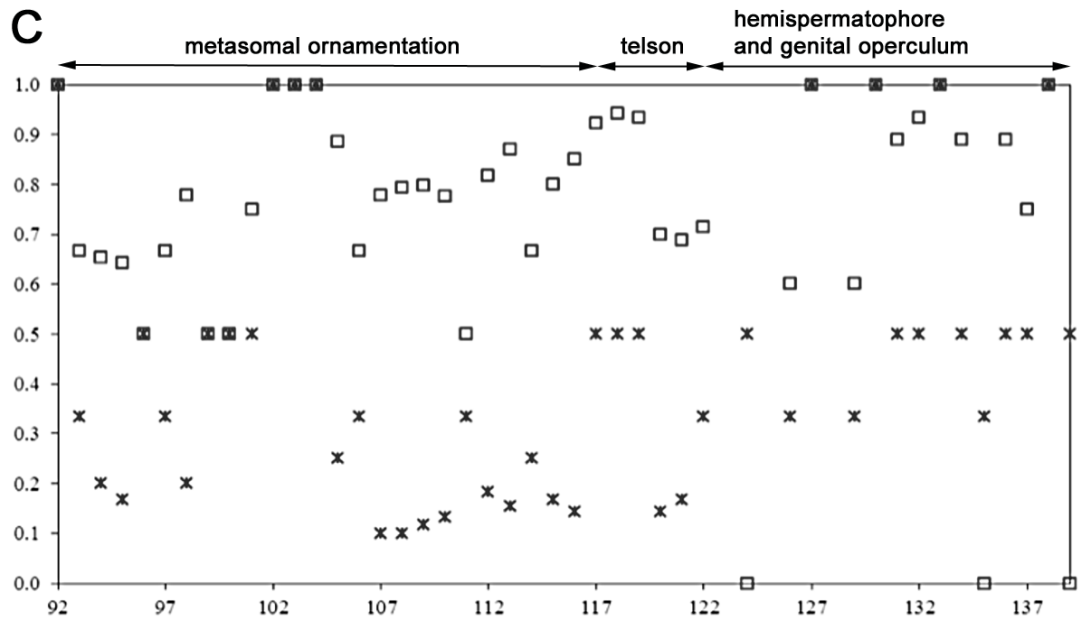
with consistency and retention indices of 1 and five characters with low consistency indices but similar values of retention index to the continuous characters.

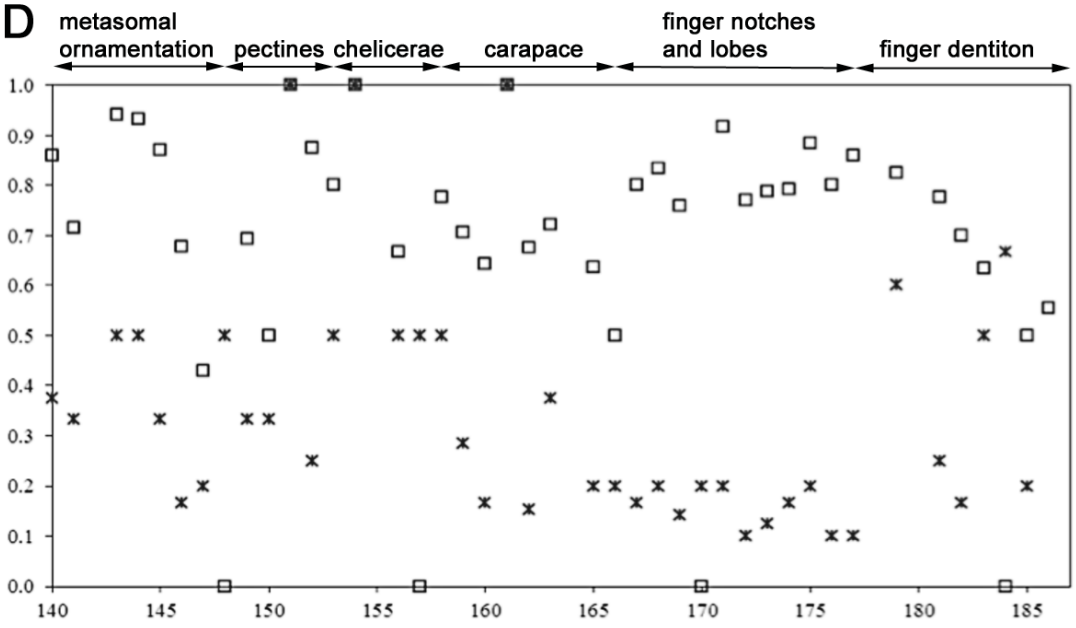
Figure 9C shows the consistency and retention indices for metasomal ornamentation, telson, hemispermatophore, and genital operculum. Characters 92, 102–104 had consistency and retention indices of 1 and four other characters showed modest homoplasy. Whereas homoplasy levels were high for other characters of metasomal ornamentation, telson, hemispermatophore, and genital operculum systems showed lower levels of homoplasy, the hemispermatophore being the least homoplastic with characters 127, 130 and 133, consistency and retention indices of 1 and six mildly homoplastic characters. These results for the hemispermatophore are similar to those obtained by Mattoni et al. (2011).

Figure 9D presents six character systems, mesosomal ornamentation, pectines, chelicerae, carapace ornamentation, pedipalp finger lobes and notches, and pedipalp finger dentition. One character of pectines, one of chelicerae and one of carapace had consistency and retention indices of 1. Few characters in these systems had low consistency and retention indices, most had high levels of homoplasy, the most homoplastic being the pedipalp finger lobes and notches with consistency indices below 0.2 and retention indices higher than 0.7.


A
Continuous characters: metasoma
pedipalp setation
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
0
5
10
15
20
25
30
35
40
45


B
pedipalp ornamentation
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
46
51
56
61
66
71
76
81
86
91


C
metasomal ornamentation
telson
hemispermatophore
and genital operculum
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
92
97
102
107
112
117
122
127
132
137


D
metasomal
ornamentation
pectines
chelicerae
carapace
finger notches
and lobes
finger dentiton
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
140
145
150
155
160
165
170
175
180
185

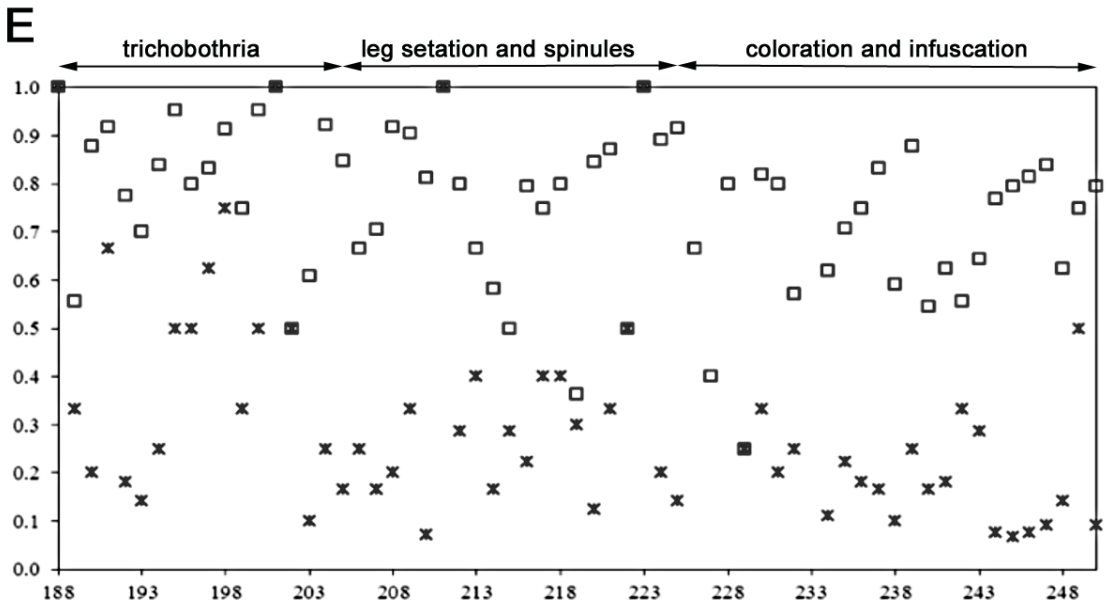


Figure 9. **A**–**E**. Statistics of informative characters obtained from the preferred hypothesis (figure 10). The CI (asterisks) and RI (squares) per character system are provided. Ten uninformative characters are not shown.

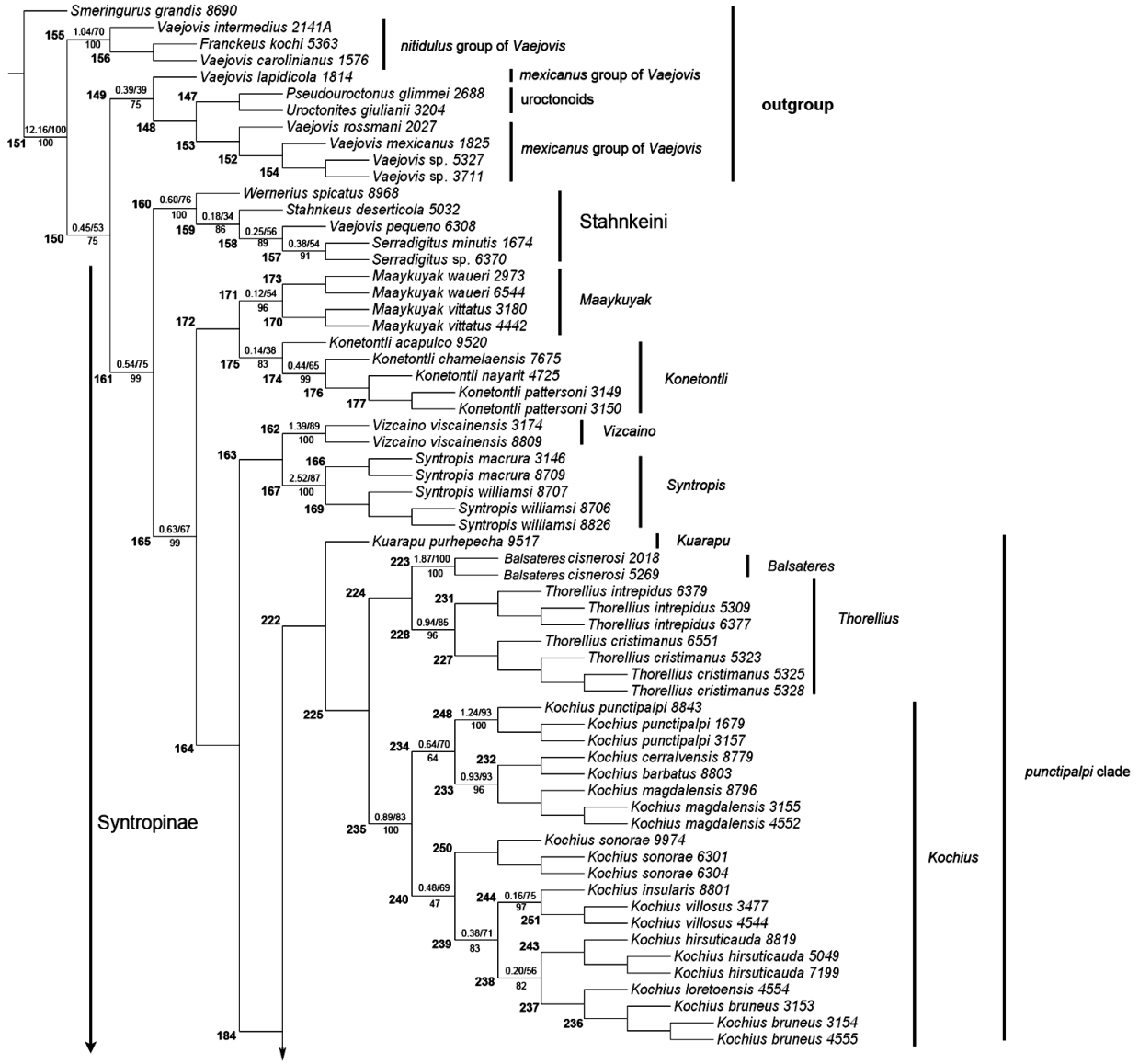

Smeringurus grandis 8690
Vaejovis intermedius 2141A
Franckeus kochi 5363
Vaejovis carolinianus 1576
nitidulus group of Vaejovis
Vaejovis lapidicola 1814
mexicanus group of Vaejovis
Pseudouroctonus glimmei 2688
Uroctonites giulianii 3204
uroctonoids
outgroup
Vaejovis rossmani 2027
Vaejovis mexicanus 1825
Vaejovis sp. 5327
Vaejovis sp. 3711
mexicanus group of Vaejovis
Wernerius spicatus 8968
Stahnkeus deserticola 5032
Vaejovis pequeno 6308
Serradigitus minutis 1674
Serradigitus sp. 6370
Stahnkeini
Maaykuyak waueri 2973
Maaykuyak waueri 6544
Maaykuyak vittatus 3180
Maaykuyak vittatus 4442
Maaykuyak
Konetontli acapulco 9520
Konetontli chamelaensis 7675
Konetontli nayarit 4725
Konetontli pattersoni 3149
Konetontli pattersoni 3150
Konetontli
Vizcaino viscainensis 3174
Vizcaino viscainensis 8809
Vizcaino
Syntropis macrura 3146
Syntropis macrura 8709
Syntropis williamsi 8707
Syntropis williamsi 8706
Syntropis williamsi 8826
Syntropis
Kuarapu purhepecha 9517
Kuarapu
Balsateres cisnerosi 2018
Balsateres cisnerosi 5269
Balsateres
Thorellius intrepidus 6379
Thorellius intrepidus 5309
Thorellius intrepidus 6377
Thorellius cristimanus 6551
Thorellius cristimanus 5323
Thorellius cristimanus 5325
Thorellius cristimanus 5328
Thorellius
Kochius punctipalpi 8843
Kochius punctipalpi 1679
Kochius punctipalpi 3157
Kochius cerralvensis 8779
Kochius barbatus 8803
Kochius magdalensis 8796
Kochius magdalensis 3155
Kochius magdalensis 4552
Kochius sonorae 9974
Kochius sonorae 6301
Kochius sonorae 6304
Kochius insularis 8801
Kochius villosus 3477
Kochius villosus 4544
Kochius hirsuticauda 8819
Kochius hirsuticauda 5049
Kochius hirsuticauda 7199
Kochius loretoensis 4554
Kochius bruneus 3153
Kochius bruneus 3154
Kochius bruneus 4555
Kochius
punctipalpi clade
Syntropinae

Figure 10. Preferred hypothesis, a single most parsimonious tree resulting from simultaneous analysis of five gene markers, continuous and discrete morphological characters with implied weighting under *k*= 15. Tree length 10884.593, CI 0.191, RI 0.627 and fit 289.77. Gaps were treated as an additional state, discrete characters unordered and continuous characters ordered. Jackknife values expressed in frequency difference greater than 63 are presented below nodes. Symmetric resampling was strongly correlated with jackknifing so values are omitted. Absolute Bremer support in units of fit is presented above nodes on the left and relative Bremer support above nodes on the right. Node numbers in bold refer to synapomorphies in appendix 11. Genera within subfamily Syntropinae are indicated as well as the *Kochius* clade comprising four genera (see discussion for details).

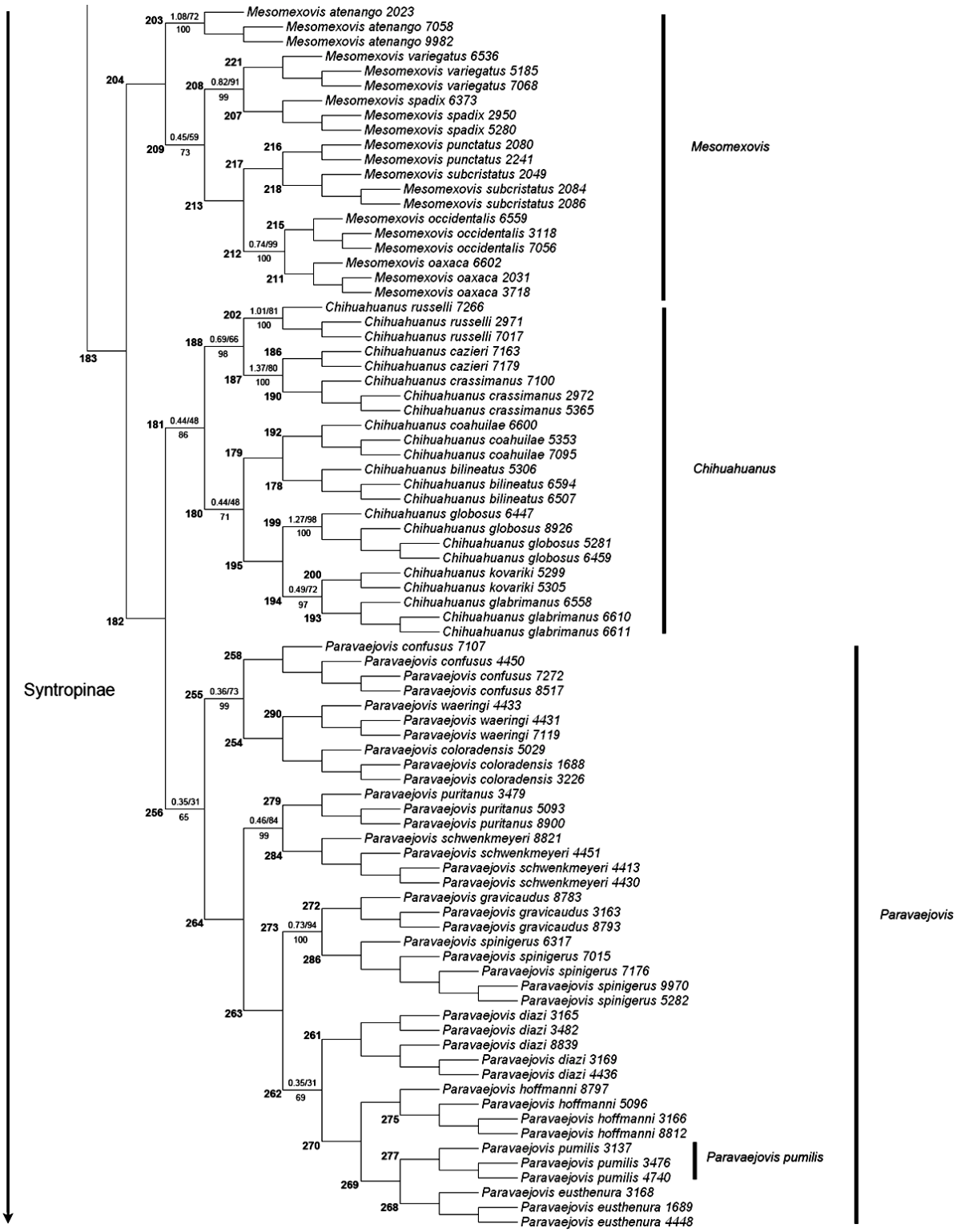


Figure 10 (continued).

Partitioned Bremer support for preferred hypothesis

Partitioned Bremer support values for clades of interest are presented in table 5. Although morphological characters had lower contribution to support than the gene markers, morphological characters either support or contradict all clades, that is to say some gene markers are ubiquitous for some clades. Continuous characters supported 10 clades and contradicted only two. Discrete characters supported seven clades and contradicted five.

The COI gene supported more clades, and with higher support values ranging from 2.0 to 27.0 than other genes, had no effect on support for *Thorellius*, and contradicted three clades. The 12S gene supported seven clades with values ranging from 1.0 to 13.0, but contradicted three clades. The 16S fragment had eight contradictory and only supported three clades. Of the nuclear fragments, 18S contributed support to four basal clades. The 28S fragment affected the same clades as the 18S and supported two more, but contradicted two other clades.

Stahnkeini was only contradicted by 16S and received no support from the 12S partition, being mildly supported by the other partitions. Syntropinae was supported by five partitions, receiving most support from 16S and COI, and contradicted by two. *Vizcaino* received support from all partitions except 18S, which had no effect. The discrete morphology and COI had the highest support for *Vizcaino* with values of 22.0 and 23.0, respectively. The two morphological partitions supported *Konetontli*, three partitions contradicted the genus, and two nuclear partitions had no effect. *Maaykuyak* was supported by 12S and 18S and contradicted by the other partitions. *Balsateres*, *Syntropis*, and *Vizcaino*, received support from all partitions, the most from COI. *Chihuahuanus* was supported by three partitions and contradicted by three. *Mesomexovis* was supported by four partitions and contradicted by two. *Thorellius* was supported by two and contradicted by two, with no effect from three. *Kochius* had a similar

pattern to *Thorellius*, but was supported by three partitions and contradicted by two, with most support from continuous morphological characters. The difference between *Thorellius* and *Kochius* is that the former had almost the same values for support and contradiction and the latter received among the highest support values from the continuous morphological characters. The *Kochius* clade was supported and contradicted by the same number of partitions as *Kochius* but it was supported by the two morphological partitions and 12S partitions and contradicted by 16S and COI, whereas discrete morphological, 28S and COI supported the *Kochius* clade and was contradicted by continuous morphological and 16S. *Paravaejovis* was supported by four partitions and contradicted by two.

Table 5. Summary of nodal support, nodal stability, apomorphies, and partitioned support for selected clades. Resampling values correspond to Jackknife values (Jack) expressed in frequency difference, support corresponds to relative Bremer support (RBS) and apomorphies (morphological and molecular) represent branch length (BL) in the preferred hypothesis. Results of the sensitivity analysis for the partitions of morphology, molecules treating gaps as fifth state and treating gaps as missing data for 27 implied weighting regimes explored are presented as percentages of clades recovered. Yellow cells indicate lower percentage recovery. The analysis of partitioned Bremer support includes seven partitions: discrete morphological characters (DISC), continuous morphological characters (CONT), and the five gene markers corresponding to the mitochondrial (12S, 16S, and COI) and nuclear (18S and 28S) genomes. Blue cells indicate no support and green cells contradictory support.

	Resampling and Support		Apomorphies	Sensitivity analysis (%)			Partitioned Bremer Support						
Clades	Jack	RBS	BL	Mor	Mol+	Mol-	DISC	CONT	12S	16S	18S	28S	COI
Stahnkeini	100	76	32	7	100	100	1.7	3.0	0	-1.0	2.0	2.0	5.0
Syntropinae	99	75	20	15	100	100	0.1	-0.5	-3.0	12.0	2.0	3.0	14.0
Vizcaino	100	89	63	100	100	100	0.9	22.0	3.0	2.0	0	1.0	23.0
Konetontli	83	38	12	100	4	0	1.6	1.0	-1.0	-1.0	0	0	-4.0
Maaykuyak	96	54	30	96	96	100	-2.4	-3.0	7.0	-3.0	7.0	-2.0	-5.0
Syntropis	100	89	91	100	100	100	8.6	4.0	13	15	3.0	4.0	27.0
Chihuahuanus	86	48	14	7	100	100	-0.4	3.0	1.0	-1.0	0	-2.0	2.0
Mesomexovis	60	29	15	4	96	96	1.4	-2.0	1.0	-1.0	0	2.0	3.0
Kuarapu	-	-	101	93	100	100	-	-	-	-	-	-	-
Balsateres	100	100	71	96	70	70	1.5	9	2	7	2	2	47
Thorellius	96	85	29	4	0	4	1.1	-1.0	-1.0	1.0	0	0	0
Kochius	100	83	26	100	78	75	2.8	17.0	1.0	-3.0	0	0	-5.2
Kochius clade	38	46	14	0	100	100	1.9	-1.0	0	-4.0	0	1.0	4.0
Paravaejovis	65	31	14	0	100	100	0.7	1.0	2.0	-2.0	0	-1.0	2.0

DISCUSSION

Redefining the subfamily Syntropinae

The analyses consistently separated the outgroup, comprising *Franckeus*, the *nitidulus* group, the *mexicanus* group, uroctonoids, and the subfamily Stahnkeini, from the ingroup (figure 10). The clade comprising *Serradigitus*, *Stahnkeus*, and *Wernerius* agrees with the interpretations of Sissom (1993), Francke and Ponce-Saavedra (2005) and Soleglad and Fet (2008) (figure 10). However, this clade also included *Vaejovis pequeno* and the related undescribed *Serradigitus* sp. _6370, suggesting that Stahnkeini is paraphyletic and *V. pequeno* will be placed within that tribe. The sister-group relationship between Syntropinae and Stahnkeini is consistently retrieved in the analyses. The implications of this relationship, and the description of *Gertschius* within Stahnkeini, might support the recognition of Stahnkeini at subfamily rank, as the corresponding clades comprise two large monophyletic groups.

Paravaejovis was consistently associated with the members of the former *Hoffmannius* and not *Smeringurus grandis*, rendering both Smeringurinae and Paravaejovini paraphyletic (figures 3 and 10). The inclusion of *Paravaejovis* within *Hoffmannius* renders the latter genus polyphyletic. Thus prior hypotheses of relationship proposed by Haradon (1984b) and followed by Sissom, 2000 and Soleglad and Fet (2008), suggesting that *Paravaejovis* is more closely related to *Paruroctonus* and *Smeringurus* or grouping the three genera as Smeringurinae, are rejected.

The group comprising scorpions with a subaculear tubercle, currently part of the *mexicanus* group of *Vaejovis* (Soleglad and Fet, 2008), was monophyletic and placed within subfamily Syntropinae, which justifies the creation of the new genus *Konetontli* (chapter 2). This

circumscription also revealed that the subaculear tubercle is a homoplastic character. The terminals *Vaejovis* sp._5327 and *Vaejovis* sp._3711 resemble the species of *Konetontli* especially in having mottled pigmentation, small body size, and a conspicuous subaculear tubercle but did not group with *Konetontli*. These terminals were placed within the *mexicanus* group of *Vaejovis* suggesting that this character was derived independently in these taxa.

Besides the inclusion of *Konetontli* and *Paravaejovis*, two unexpected monophyletic groups, *Vizcaino* and *Maaykuyak* emerged from these analyses. Both were long considered part of the *eusthenura* group (Williams 1970a, 1980; Lourenço and Sissom, 2000; Sissom, 2000) and subsequently transferred to *Hoffmannius* (Soleglad and Fet, 2008). Furthermore, two large monophyletic groups where identified inside the main core of the former *Hoffmannius* (Soleglad and Fet, 2008). These clades are named *Mesomexovis* and *Chihuahuanus* (chapter 2).

Basal clades of Syntropinae

Two monophyletic groups can be distinguished at the base of the Syntropinae (figure 10). Although they received low resampling and support values, there were recovered in most simultaneous analyses (figure 4). One clade comprises *Maaykuyak* and *Konetontli*, the other *Vizcaino* and *Syntropis* (figure 10). *Maaykuyak* and *Vizcaino* were formerly placed in the *eusthenura* group (Lourenço and Sissom, 2000; Sissom, 2000) and subsequently transferred to *Hoffmannius* (Soleglad and Fet, 2008). This relationship is not supported by the topology recovered here.

The basal clades are a rather heterogeneous group of scorpions with different ecomorphological adaptations. *Vizcaino* is psammophilous, found exclusively in sandy habitats (Williams, 1970b, 1980). *Syntropis* on the other hand is one of the better-known examples of

lithophilous scorpions (Polis, 1990; Lourenço and Sissom, 2000; Sissom, 2000), which prompted early researchers to place it sister to *Serradigitus*, another well-known lithophilous genus (Stahnke, 1974; Stockwell, 1989, 1992; Sissom, 2000; Soleglad and Fet, 2008). *Maaykuyak* and *Konetontli* have less modified morphology, except for the relative small body size and subaculear tubercle of the latter, and no obvious ecomorphological adaptations. Nevertheless, these small scorpions occur in mesic climates and vegetated areas, as compared to the arid and desolate areas inhabited by the other two genera. These four clades appear to be relictual members of an earlier radiation, most members of which have been replaced by a more recent diversification represented by the more diverse clades *Thorellius*, *Kochius*, *Mesomexovis*, *Chihuahuanus* and *Paravaejovis* (figure 10). This idea is further supported by the existence of other relictual taxa inhabiting the same region, for example *Nullibrotheas allenii* (Wood, 1863) of the Chactidae, a family most diverse in South America, and *Superstitionia donensis* Stahnke, 1940, considered the only epigean species of the Superstitioniidae, the rest being restricted to caves or leaf litter (Prendini et al., 2010). *Nullibrotheas* and *Superstitionia* inhabit the Baja California Peninsula, where *Vizcaino*, *Syntropis*, one species of *Maaykuyak*, and one species of *Konetontli* are also distributed. These taxa may represent an ancient community of scorpions established well before the separation of the Baja California Peninsula.

Although externally diverse, the basal clades share a synapomorphy. The hemispermatophores of these genera have the primary and secondary laminar hooks visibly separated, whereas in the rest of the genera these hooks are partially to completely fused into a single hook. These two hooks are mentioned and illustrated by Stockwell (1989) but he regarded them unique to *Syntropis.*

Maaykuyak is unique among Syntropinae in possessing a glandular spot of hyaline to whitish coloration on the dorsomedian surface of the telson, which is more developed in males (character 119). *Maaykuyak* also tend to have more hirsute metasomal segments, especially on the ventral and lateral surfaces, than other taxa (characters 6, 8, 9–11, 15), the most setose species being *M. waueri*. Although this hypertrichosis is observed in some species of *Paravaejovis* and *Mesomexovis*, it is uncommon. *Maaykuyak* is distinguished from other taxa by having only two retrolateral ventral (retroinferior in McWest, 2009 terminology) macrosetae, instead of three, on telotarsus IV. Furthermore this genus possesses 13 apomorphic nucleotides (appendix 11).

It was previously suggested that the species with a well-expressed subaculear tubercle should be placed in their own group (Armas and Martín-Frías, 2001) including three other species currently placed in *Wernerius*, supported solely by the presence of a conspicuous subaculear tubercle. The evidence presented here refutes the subaculear tubercle as a potential synapomorphy for all vaejovids that bear it. The *mexicanus* group, Stahnkeini and *Konetontli* are fairly well supported groups and are not closely related (figure 10). Each of these monophyletic groups includes at least one species with a subaculear tubercle: thus this structure has evolved at least three times in the family Vaejovidae. Additionally, Sissom (1993) convincingly established the differences among the three currently recognized species of *Wernerius* and those there assigned to *Konetontli*. As Sissom (1993) noted, the modified basal pectinal tooth of females, at least in *W. mumai* (Sissom, 1993), clearly relates the members of this genus to the taxa now assigned to Stahnkeini. Moreover, examination of the hemispermatophore of terminal *Vaejovis* sp. 5327 and 3711, with a subaculear tubercle, belonging to the *mexicanus* group, confirmed the absence of a sclerotized mating plug, which places these last terminals definitively in the

mexicanus group of *Vaejovis*, further reinforcing the relationships in figure 10. Soleglad and Fet's (2008) placement of the species assigned to *Konetontli*, in the *mexicanus* group, is similarly rejected.

Syntropis is a morphologically distinctive genus. *Syntropis* has several apomorphies related to lithophilous habitats, e.g., the relatively shallow median ocular tubercle (character 165), elongated appendages and metasoma, dorsoventrally compressed mesosoma and metasoma, reflected for example in the fifth metasomal segment, which is wider than high (character 21). Related to their large size, these scorpions tend to have numerous pectinal teeth in males and females (characters 1, 2). The pedipalp movable finger is unique in having eight retrolateral denticles (character 181). The basitarsi of these species have eight retrolateral ventral and six ventral macrosetae, unlike other taxa. Another diagnostic character of *Syntropis* is the presence of a flat white glandular surface on sternite VII more pronounced in males than females (character 144). This character is homologous to the structures of other Syntropinae species, which express a different state.

Vizcaino is another distinctive genus, with ecomorphological adaptations to psammophilous habitats. Acuminate clustered telotarsal ventral spinules, setal combs in both sexes (characters 205–207, 222, 223), and a pale, immaculate cuticle are psammophilous characteristics. The psammophilous ecomorphotype also accounts for its restricted distribution in the sandy Vizcaino desert of Baja California Sur, Mexico. The possession of five median denticles on the pedipalp chela movable finger, and the absence of the first row comprising one to three granules, is unique among Syntropinae (characters 185, 186). Although *Vizcaino* shares some characters with *Serradigitus* and *Syntropis*, several synapomorphies separate it from these genera. The relative positions of trichobothria *ib* and *it* differs; they are located more distally on

the finger in *Serradigitus*, in a basal position in *Syntropis* (as in most Syntropinae) and an intermediate position in *Vizcaino* (characters 197, 198).

The *Kochius* clade

A diverse, derived clade, hereafter referred to as the *Kochius* clade, comprising *Kuarapu*, *Thorellius*, *Balsateres*, and *Kochius*, was recovered with a pectinate arrangement (figure 10). Although weakly supported, the *Kochius* clade was recovered in all molecular and most simultaneous analyses (figure 4). Synapomorphies supporting the *Kochius* clade include low setal counts on the pedipalp and metasomal carinae (characters 5, 15, 23, 34, 38, 39) and six apomorphic nucleotides (appendix 11). *Kuarapu* and *Kochius* share the presence of a white elevated glandular boss on the sternite VII of male.

The *Kochius* clade comprises morphologically disparate taxa. At one extreme, *Kuarapu* presents a lithophilous ecomorphotype (Francke and Ponce-Saavedra, 2010). *Kuarapu* superficially resembles *Serradigitus* and *Stahnkeus*, especially in the elongated pedipalps, pedipalp chela trichobothrial pattern, and serrated denticles on the chela fingers. However, these characters are not exclusive to *Kuarapu*, the finger trichobothrial position of which is more similar to that of *Vizcaino* than to *Serradigitus* and *Stahnkeus*.

Thorellius and *Kochius* are specialized morphologically and ecologically. These taxa shelter under rocks and other objects, and are not adapted to particular substrates. Although Williams (1980) and Sissom (2000) suggested that *Kochius* is a burrower, there are no field observations to confirm this assertion. In contrast, *Balsateres* burrows in compacted sandy to loamy soils (Ponce-Saavedra and Sissom, 2004). The four genera differ greatly in pedipalp shape and carination; *Kuarapu* has an attenuated manus with obsolete carinae, whereas *Thorellius*, and

Kochius have the most robust pedipalp manus and granular carinae observed among Syntropinae. *Balsateres* has a robust manus and smooth carinae.

Williams (1980) contributed significantly to knowledge of the *punctipalpi* group but never mentioned a possible relation between the *intrepidus* and *punctipalpi* groups. Sissom (1989b) was the first to suggest a close relationship. Soleglad and Fet (2008) subsequently erected *Kochius* for the *punctipalpi* group.

Francke and Ponce-Saavedra (2010) discussed the placement of *Kuarapu* in the context of the classification proposed by Soleglad and Fet (2008), suggesting that *Kuarapu* belongs in Syntropinae. The evidence presented here confirms Francke and Ponce-Saavedra's (2010) suggestion. However, Francke and Ponce-Saavedra (2010) failed to compare appropriate taxa in their discussion of phylogenetic relationships. According to Francke and Ponce-Saavedra (2010), the 'medial' position of trichobothria *ib* and *it* on the pedipalp fixed finger is a putative synapomorphy for *Kuarapu*, *Stahnkeus*, and *Serradigitus*. The positions of these trichobothria were reinterpreted here, however: *it* is situated between the fifth and sixth prolateral denticles, and *ib* is situated at or close to the sixth prolateral denticle in *Kuarapu* (appendix 11; figure 26C), whereas *it* is situated between the fourth and fifth prolateral denticles, and *ib* situated at or close to the fifth prolateral denticle in *Stahnkeus* and *Serradigitus*. The trichobothrial positions in *Kuarapu* are also observed in *Vizcaino* and the *confusus* group of *Paravaejovis.* Therefore this character is not a synapomorphic for *Kuarapu*, *Stahnkeus*, and *Serradigitus*. Trichobothrial positions defined on the basis of finger length may be unreliable: several unrelated taxa (*Syntropis*, *Serradigitus*, and *Stahnkeus*) exhibit distal trichobothria, not only in the prolateral (internal) series *ib–it* but also in the retrolateral (external) *eb–et* series, perhaps a consequence of a lithophilous ecomorphotype. Landmark denticles (retrolateral, prolateral and median) and setae

associated with them facilitated establishment of more robust hypotheses of homology (appendix 11).

Francke and Ponce-Saavedra (2010) suggested that *Kuarapu* and Stahnkeini might be related based on the serrated pedipalp finger dentition and the hook-like termination of the fingers. Except for *Gertschius* Graham and Soleglad, 2007 and *Wernerius* Soleglad and Fet, 2008, Stahnkeini exhibit prominent, laterally compressed prolateral and median denticles, compared with the smaller, more rounded retrolateral denticles. In contrast, Syntropinae the prolateral and median denticles are less compressed laterally, smaller, and similar in size to the retrolateral denticles, although the denticles of *Kuarapu* tend to be sharper than those of other Syntropinae (figure 26C). This character may be convergent in *Kuarapu* due to the lithophilous ecomorphotype.

Francke and Ponce-Saavedra claimed that the retrospinose distal margin of the hemi-mating plug of the male hemispermatophore might have evolved more than once, in *Kuarapu* and in Syntropinae. However, the topology obtained here suggests that the retrospinose distal margin is a synapomorphy for Syntropinae (character 227), and evolved once only.

The presence of five (but most often four) ventrodistal spinules of the telotarsi in *Kuarapu* is confirmed (Francke and Ponce-Saavedra, 2010) and supported the placement of this genus within Syntropinae.

As noted by Ponce-Saavedra and Sissom (2004), *Balsateres* is unique in having the dorsal and lateral carinae of the metasoma smooth and obsolete and the lowest setal count among vaejovids. *Balsateres* not only has smooth carinae, but one of the smoothest body integuments of all Syntropinae (character 92, 94, 140, 159).

Soleglad and Fet (2008) separated *Thorellius* from *Kochius* on the basis of four morphological characters: absence of indentation on carapace anterior edge in *Thorellius* vs. "well defined, but subtle, anterior emargination" in *Kochius*; morphometric ratio of metasomal segment IV–V for males and females; carinae of metasomal segments I–III smooth to granular in *Thorellius* vs. crenatoserrate moniliform in *Kochius*; and 'chelal carinae usually smooth to strongly marbled' in *Thorellius* vs. moderate to finely granular in *Kochius*. The emargination of the carapace (character 160), a common feature in Syntropinae, is a homoplastic character. Few species possess a straight or concave anterior carapace margin, e.g., *Smeringurus* and *Vaejovis* sp. of the outgroup and *Vizcaino*, *Syntropis*, *Kuarapu*, *P. pumilis*, and *P. eusthenura* of the ingroup. Other species possess a shallow (*Mesomexovis oaxaca*), moderate (*Thorellius cristimanus*) or deep (*Chihuahuanus crassimanus*) emargination. The morphometric analyses conducted by these authors, based on 'selected species', reflect preconceived notions of putatively monophyletic groups that were not tested. Thus, although the morphometrics used to diagnose genera by Soleglad and Fet (2008) are objective, the analyses of a larger taxonomic sample presented here, conflicts with their results. Appropriate methods, e.g. multivariate analyses including principal component analysis (PCA) and canonical variate analyses (CVA) or more advanced techniques such as geometric morphometric, were not investigated. The third character presented by Soleglad and Fet (2008) subsumes the entire range of variation in carinal ornamentation on any part of the body, and cannot be considered diagnostic relative to other genera. The final character is difficult to interpret, because 'smooth' refers to the ornamentation whereas 'marbled' refers to pigmentation. *Thorellius* has smooth carinae on the chela whereas *T. intrepidus* has seven granular carinae (characters 47, 52, 53, 57, 60, 61, 63). Although the chelal carinae are granular in *Kochius*, the diagnostic characters regarding carinal development and

ornamentation occur on the patella and femur (characters 62, 72, 73, 87), the retrolateral dorsosubmedian (rlds) and ventral median (vm) carinae being strongly granular, unlike those of other Syntropinae.

Two species previously placed in *Thorellius*, *T. occidentalis*, and *T. subcristatus*, were placed in *Mesomexovis* (chapter 2). Soleglad and Fet (2008) noted the comparatively slender chelae and weak granulation of these species but ignored these differences in their diagnoses and erroneously placed them in *Thorellius.*

Five species previously placed in the *punctipalpi* group (*sensu* Williams, 1971a, 1971b; Lourenço and Sissom, 2000; Sissom, 2000), and later assigned to *Kochius* by Soleglad and Fet (2008), i.e. *K. russelli*, *K. kovariki*, *K. cazieri*, *K. crassimanus*, and *K. atenango*, belong to different genera (figures 2 and 10). The first four grouped with *Chihuahuanus* with mild support values. *Chihuahuanus kovariki* was nested well inside that genus, sister to *C. glabrimanus*, whereas the other three species formed a basal monophyletic group. *Chihuahuanus kovariki* and *C. glabrimanus* are superficially similar, but the other three species resemble the species of *Kochius* as reflected in their basal position in the topology. The false impression of a relationship with *Kochius* assumed by Soleglad and Fet (2008) arose from the presence of fine granulation on the metasomal and pedipalp carinae, and 'A well defined, but subtle, anterior emargination… extending to the lateral eyes… In addition, a small median indentation is present' (Soleglad and Fet, 2008). *M. atenango* does not share diagnostic characters with *Kochius*, for example the presence of an elevated white boss distally on sternite VII (character 144). In addition, the five species lack the strong granular development of patellar carinae rlds and rlm (character 72, 87), unique to *Kochius* and further separating that genus from *Thorellius*. Notwithstanding the questionable statistics used by Soleglad and Fet (2008), they noted that the metasoma and

pedipalp of the five species previously mentioned were distinctive and represent one of the extremes of variation, compared to other species of *Kochius*: slender pedipalp chelae, reduced granulation, and wider metasomal segments.

Crown clades of the Syntropinae

Three monophyletic groups were situated in the terminal part of the tree (figure 10). Although *Mesomexovis* was weakly supported, it was recovered in most molecular analyses and all simultaneous analyses (figure 4). *Chihuahuanus*, and *Paravaejovis* were less well supported. *Chihuahuanus* was recovered in all molecular and all simultaneous analyses and *Paravaejovis* in all molecular and most simultaneous analyses (figure 4).

Mesomexovis, *Chihuahuanus*, and *Paravaejovis* represent the former genus *Hoffmannius*, created by Soleglad and Fet (2008) to accommodate the former *eusthenura* group of *Vaejovis*. The diagnosis presented by Soleglad and Fet (2008) compared *Hoffmannius* with *Syntropis* as the putatively closest relative. This hypothesis was unsupported by the analyses presented here (figures 3 and 10), invalidating the comparison between *Hoffmannius* and *Syntropis*. *Hoffmannius* was synonymized with *Paravaejovis* based on the sister group relationship of the type species, *P. eusthenura* and *P. pumilis* (figure 10) and the nomenclatural priority of *Paravaejovis*.

Mesomexovis, *Chihuahuanus*, and *Paravaejovis* are each distributed in areas recognized as biogeographical units due to their physiography, geology, fauna and flora (i.e. Goldman and Moore, 1945; Morrone et al., 2002; Riddle and Hafner, 2006). *Mesomexovis* is distributed along the Pacific coast of Mexico and the slopes of the Trans-Mexican Volcanic Belt. *Chihuahuanus* is restricted to the Chihuahuan desert. *Paravaejovis* extends from the Baja California Peninsula to

the Sonora, Mojave, and Great Basin deserts of the U.S.A. and Mexico. *Chihuahuanus coahuilae*, *C. bilineatus*, and *P. spinigerus* are morphologically similar to the species of *Mesomexovis*, sharing pigmentation patterns on carapace, tergites and metasoma (ventral carinae pigmented) and usually have smooth carinae on pedipalpal chelae and metasomal segments. These superficially similar characters are among the main reasons these species were long recognized as members of the same group (Lourenço and Sissom, 2000; Sissom, 2000; Soleglad and Fet, 2008).

Chihuahuanus is distinguished from other genera by the presence of a white fusiform glandular spot on the dorsal surface of the telson, at base of the aculeus (character 181), unique among vaejovids. This structure also occurs in *Maaykuyak*, in which it is expressed as a larger, oval spot. *Chihuahuanus* also has trichobothrium *et* situated closer to or in line with the third prolateral denticle (character 194) and has 11 unique synapomorphic nucleotides (appendix 11). *Chihuahuanus* was monophyletic in all molecular and simultaneous analyses.

Paravaejovis is the most derived genus (figure 10) with low to intermediate support values. The position of trichobothrium *db*, situated in the proximal third of the fixed finger (character 190) and trichobothrium *Et*5, separated from *Et*4, are unique to this genus. *Paravaejovis* possesses 13 unique synapomorphic nucleotides. *Paravaejovis* was retrieved in all molecular and most simultaneous analyses (figure 4). The circumscription of *Paravaejovis* presented here was first advanced by Stockwell (1992) as an alternative to Haradon's (1984b) hypothesis that *Paravaejovis pumilis* forms part of the paruroctonoid clade, Smeringurinae (figure 2). However, Stockwell (1992) considered Haradon's (1984b) hypothesis more plausible, based on the marked psammophilous adaptations (streamlined metasoma and telson, elongated basi- and telotarsal macrosetae, pale, smooth cuticle, elongated ungues; Polis, 1990; Fet et al.,

1998; Prendini, 2001) of *P. pumilis* and the Smeringurinae. The analyses presented here explain these ecomorphological similarities most parsimoniously by convergence.

Mesomexovis species differ from other genera in possessing eight retrolateral ventral macrosetae on basitarsus III (character 208), the RV series in the terminology of McWest (2009) and setose carinae on metasomal segments III–V (characters 4–6, 11). This genus was also supported by nine molecular synapomorphies. It was recovered in most molecular analyses and all simultaneous analyses. The tree topology obtained here (figure 10) reflects the morphology of its component species. *Mesomexovis atenango*, the most basal species, can be distinguished by its pale integument and weak but visible carination of the metasomal and pedipalpal chelae (Francke and González-Santillán, 2007). The other two groups retrieved as sister to *M. atenango* represent a novel combination of taxa. Since Hoffmann's (1931) 'second section' of *Vaejovis*, subsequently redefined as the *intrepidus* group (Sissom, 1989b; Lourenço and Sissom, 2000; Sissom, 2000) and eventually as *Thorellius* (Soleglad and Fet, 2008), *M. occidentalis* and *M. subcristatus* were considered members of this group. However, the two species were consistently placed within *Mesomexovis* in the analyses presented here. *M. occidentalis* and *M. subcristatus* were placed in *Thorellius* in part because they have not been studied since Sissom's (1989b) redescription, but more importantly because important characters were omitted from Soleglad and Fet's (2008) revision. These authors repeatedly adopted preconceived concepts of phylogenetic relationship (Prendini and Wheeler, 2005) and *Thorellius* is no exception. Soleglad and Fet's (2008) morphometric analyses indicated that *M. occidentalis* and *M. subcristatus* exhibit less robust pedipalp chelae, at the end of the variation within the group to which they were assigned. Additionally, *M. occidentalis* and *M. subcristatus* possess only eight retrolateral ventral macrosetae on basitarsus III, not nine as in *Thorellius*. The two species are relatively

smaller than other species of *Thorellius*, as reflected not only in total length, but also in the number of pectinal teeth in both sexes (characters 0, 1), which are more numerous in *Thorellius.*

Resampling, nodal support, nodal stability and partitioned Bremer Support

The sensitivity analyses identified the complementarity of clades recovered by different datasets, whereby the morphological dataset recovered some clades not recovered with the DNA dataset, and vice versa (figure 4; table 5). The topology obtained by simultaneous analysis was more resolved than the topologies obtained by the analysis of the partitioned datasets, and was resilient to variation in weighting regime and gap treatment (figure 4). It has been suggested that resampling values may be correlated to nodal stability in the phylogenetic hypotheses (Giribet, 2003). However, no comprehensive study had demonstrated this. The results presented here suggest that such correlation is not universal (figures 4, 10; table 5). Although most clades agreed in resampling and nodal stability, some like *Thorellius* with high jackknife values were seldom retrieved in the sensitivity analysis. An explanation is suggested by the PBS analysis (table 5). *Thorellius* was supported by discrete morphological characters and 16S but contradicted by continuous morphological characters and 12S; the other partitions had no contribution to the support of this genus. Perhaps the contradiction in support between the morphological and molecular partitions produced instability in this clade in spite of the fact that it received high resampling (96) and RBS (85) values in the simultaneous analysis. This observation not only illustrates the different behavior of nodal stability and nodal support but also emphasizes the importance of simultaneous analysis. Although the calculation of jackknife and Bremer support values derive from different theoretical backgrounds, these values were generally related (figure 10, table 5).

The partitioned Bremer support analyses revealed that the data partitions included in this analysis carried largely incongruent signals, as observed in other groups of arthropods (Wahlberg and Nylin, 2003; Álvarez-Padilla et al., 2009; Lopardo et al., 2011). Although the partitions were incongruent, the inclusion of independent sources of evidence (morphology, and molecules) ultimately improved explanatory power and allowed the emergence of secondary signals (Farris, 1983, 1986; Farris and Kluge, 1986; Nixon and Carpenter, 1996).

Whereas the continuous and discrete morphological characters supported most clades, only 12S and COI had a considerable positive contribution among the molecular partitions. 18S had little contribution to crown clades, in agreement with the hypothesis that nuclear genes evolve slower than mitochondrial genes. Although a similar result was expected for the nuclear 28S nuclear gene, it contributed to the support of more clades than 18S, suggesting that it may have sufficient signal to resolve subfamilial relationships in other scorpion taxa. In contrast, 16S, one of the most widely used genetic markers in phylogenetic studies of scorpions had the most contradictory signal (table 5), calling into question the results of earlier analyses of scorpion phylogeny in which only 16S was used (e.g. Gantenbein et al., 2001; Fet et al., 2001; Fet et al., 2003). Whether 16S is very homoplastic in all scorpion taxa is unknown, however.

CONCLUSIONS

The simultaneous analyses presented here produced a phylogenetic hypothesis in which Stahnkeini and Syntropinae are reciprocally monophyletic. The uncertain position of *Vaejovis pequeno* was clarified, establishing that it belongs to Stahnkeini. A new hypothesis of relationships for the genera of Syntropinae, comprising six monophyletic groups (figure 10) and 11 genera (chapter 2) was proposed. The placement of *Kuarapu* in Syntropinae was confirmed.

The two tribes and corresponding subtribes created by Soleglad and Fet (2008), and the genus *Hoffmannius* were unsupported and are synonymized in chapter 2.

CHAPTER 2

REDEFINITION OF THE SCORPION SUBFAMILY SYNTROPINAE KRAEPELIN, 1905 (VAEJOVIDAE, SCORPIONES) AND DESCRIPTION OF SIX NEW GENERA.

ABSTRACT

The scorpion subfamily Syntropinae is redefined on the basis of quantitative phylogenetic analyses. The tribe Paravaejovini Soleglad and Fet, 2008 and the subtribe Thorellina Soleglad and Fet, 2008 are synonymized with Syntropinae. Eleven genera are recognized, *Kochius* Soleglad and Fet, 2008; *Kuarapu* Francke and Ponce-Saavedra, 2010; *Paravaejovis* Williams, 1980; *Syntropis* Kraepelin, 1900; and *Thorellius* Soleglad and Fet, 2008. Six new genera are described: *Balsateres*, **n. gen.**, *Chihuahuanus*, **n. gen.**, *Konetontli*, **n. gen.**, *Maaykuyak*, **n. gen.**, *Mesomexovis*, **n. gen.**, and *Vizcaino*, **n. gen.** *Hoffmannius*, **syn. n.** is synonymized with *Paravaejovis* and 10 species are relocated therein. Five species formerly placed in *Kochius* and *Thorellius* are transferred to corresponding new genera: *Chihuahuanus cazieri* (Williams, 1968), **n. comb.**, *Chihuahuanus crassimanus* (Pocock, 1898), **n. comb.**, *Chihuahuanus russelli* (Williams, 1971), **n. comb.**, *Chihuahuanus kovariki* (Soleglad and Fet, 2008), **n. comb.**, and *Mesomexovis atenango* (Francke and González-Santillán, 2007), **n. comb.**, *Mesomexovis subcristatus* (Pocock, 1898), **n. comb.**, and *Mesomexovis occidentalis* (Hoffmann, 1931), **n. comb.** Finally, *Kochius barbatus* (Williams, 1971), **n. stat.**, *Kochius cerralvensis* (Williams, 1971), **n. stat.**, *Kochius villosus* (Williams, 1971), **n. stat.**, *Mesomexovis spadix* (Hoffmann, 1931), **n. comb.**, **n. stat.**, and *Mesomexovis variegatus* (Pocock, 1898), **n. comb.**, **n. stat.** are

elevated to species and *Paravaejovis schwenkmeyeri* (Williams, 1970), **n. comb.** is removed from synonymy.

INTRODUCTION

The scorpion subfamily Syntropinae comprises a diverse group of scorpions both morphologically and ecologically. Lapidicolous, psammophilous and lithophilous species are present in this subfamily (figure 11). Not only the largest, most robust vaejovid scorpions, but also the smallest occur in this subfamily. Syntropinae are endemic to North America, extending from the U.S. state of Oregon to the Isthmus of Tehuantepec in Mexico (figures 12–15) and occur in most habitats from sand dunes to rocky landscapes, from intertidal zone to altitudes above 3500 m (figure 16). Several species are substratum specialists (Polis, 1990; Prendini, 2001) that occupy particular regions and are narrowly endemic.

The sclerotized mating plug of the male hemispermatophore of syntropine species is comparable to that of Stahnkeini Soleglad and Fet, 2008 and other species of Vaejovinae, but among Vaejovidae, no other subfamily possesses a spinose retro margin on the mating plug, which is synapomorphic for the subfamily (figures 17A–E).

Historically, family Vaejovidae comprised five subfamilies (Kraepelin, 1905) that underwent progressive modification (Stahnke, 1974; Francke and Soleglad, 1981; Stockwell, 1992; Sissom, 2000). Syntropinae was among the first subfamilies erected within Vaejovidae and contained only *Syntropis macrura* Kraepelin, 1900, a species endemic to the Baja California Peninsula, Mexico.

Hoffmann produced (1931) the first monograph on scorpions of Mexico, in which vaejovids were grouped in three ‘sections’. Hoffmann’s first and second sections are the first reference to species groups that make up Syntropinae. Hoffmann grossly divided these two sections by the presence of granulation on the ventral submedian and ventral lateral carinae of the metasomal segments, large total size and the heavily carinated pedipalp chela manus. These features are absent in the first section and present in the second section.

Figure 11. Representative Syntropinae. **A**. *Syntropis macrura* Kraepelin, 1900, ♀ (AMNH). **B**. *Paravaejovis confusus* (Stahnke, 1940), ♂ (AMNH). **C**. *Thorellius intrepidus* (Thorell, 1876), ♀ (AMNH). **D**. *Thorellius wixarika*, **n. sp.**, ♂ (AMNH). **E**. *Chihuahuanus coahuilae* (Williams 1968), ♂ (AMNH). **F**. *Paravaejovis voluptatis*, **n. sp.**, ♂ (AMNH). **G**. *Vizcaino viscainensis* (Williams, 1970), ♂ (AMNH). **H**. *Mesomexovis variegatus* (Pocock, 1898), ♀ (AMNH). **I**. *Syntropis williamsi* Lowe, Soleglad and Fet, 2007, ♂ (AMNH). Photos by E. González-Santillán, L. Prendini, W. Savary, and W.D. Sissom.

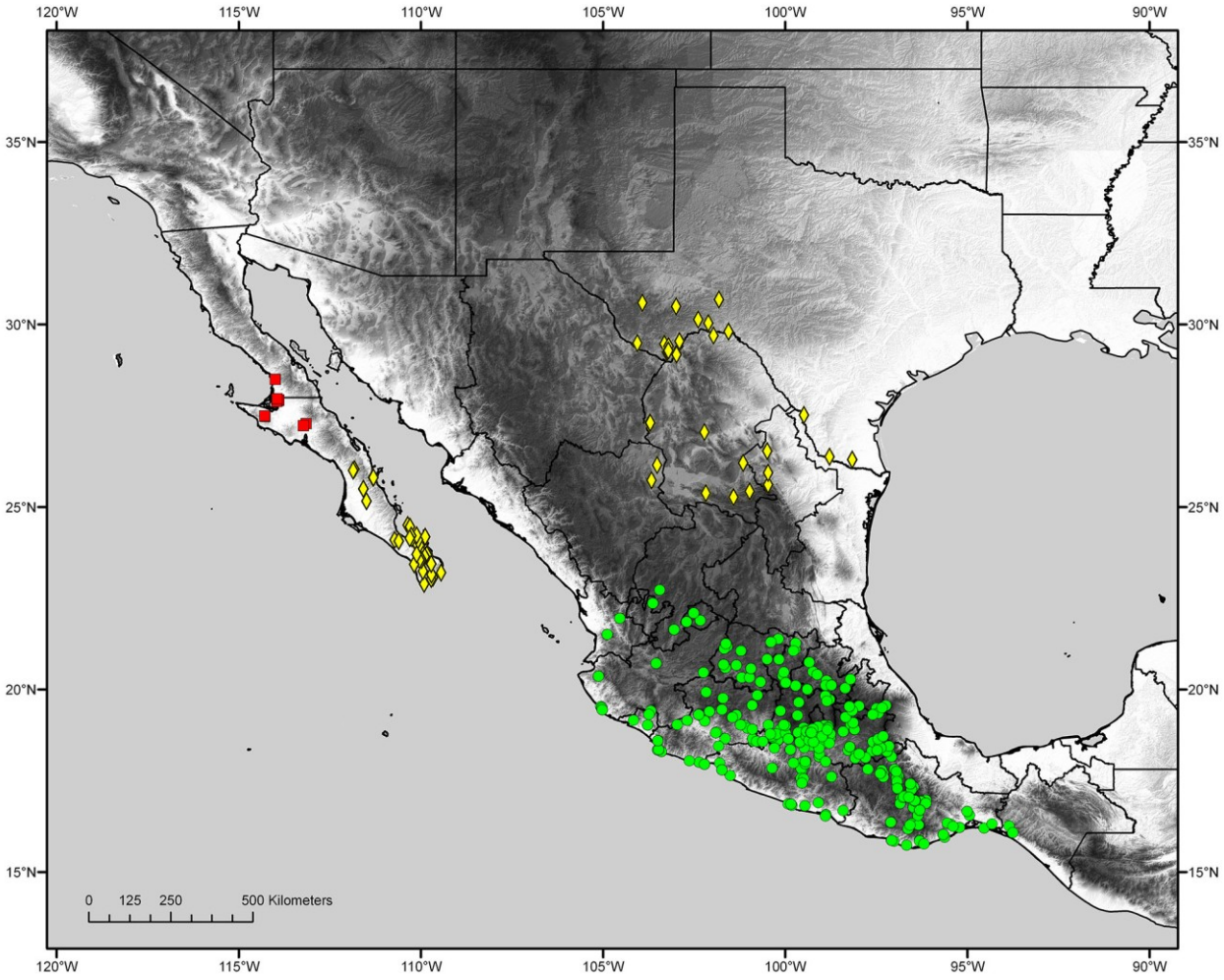


Figure 12. Map of Mexico and southern U.S.A, plotting known locality records for three genera in the vaejovid scorpion subfamily Syntropinae: *Vizcaino*, **n. gen.** (red squares); *Maaykuyak*, **n. gen.** (yellow diamonds); *Mesomexovis*, **n. gen.** (green circles).

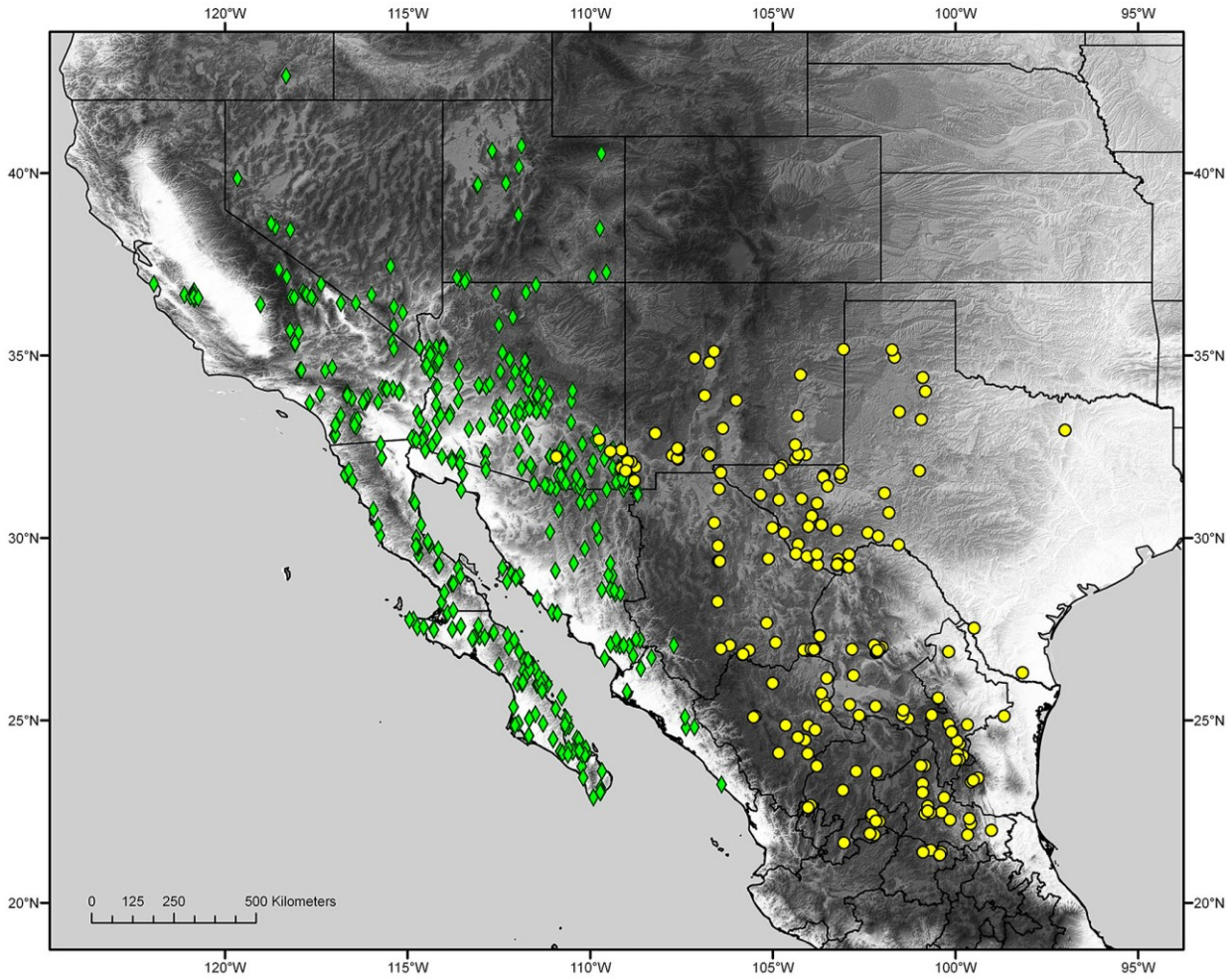


Figure 13. Map of Mexico and southern U.S.A, plotting known locality records for two genera in the vaejovid scorpion subfamily Syntropinae: *Chihuahuanus*, **n. gen.** (yellow circles); *Paravaejovis* Williams, 1980 (green diamonds).

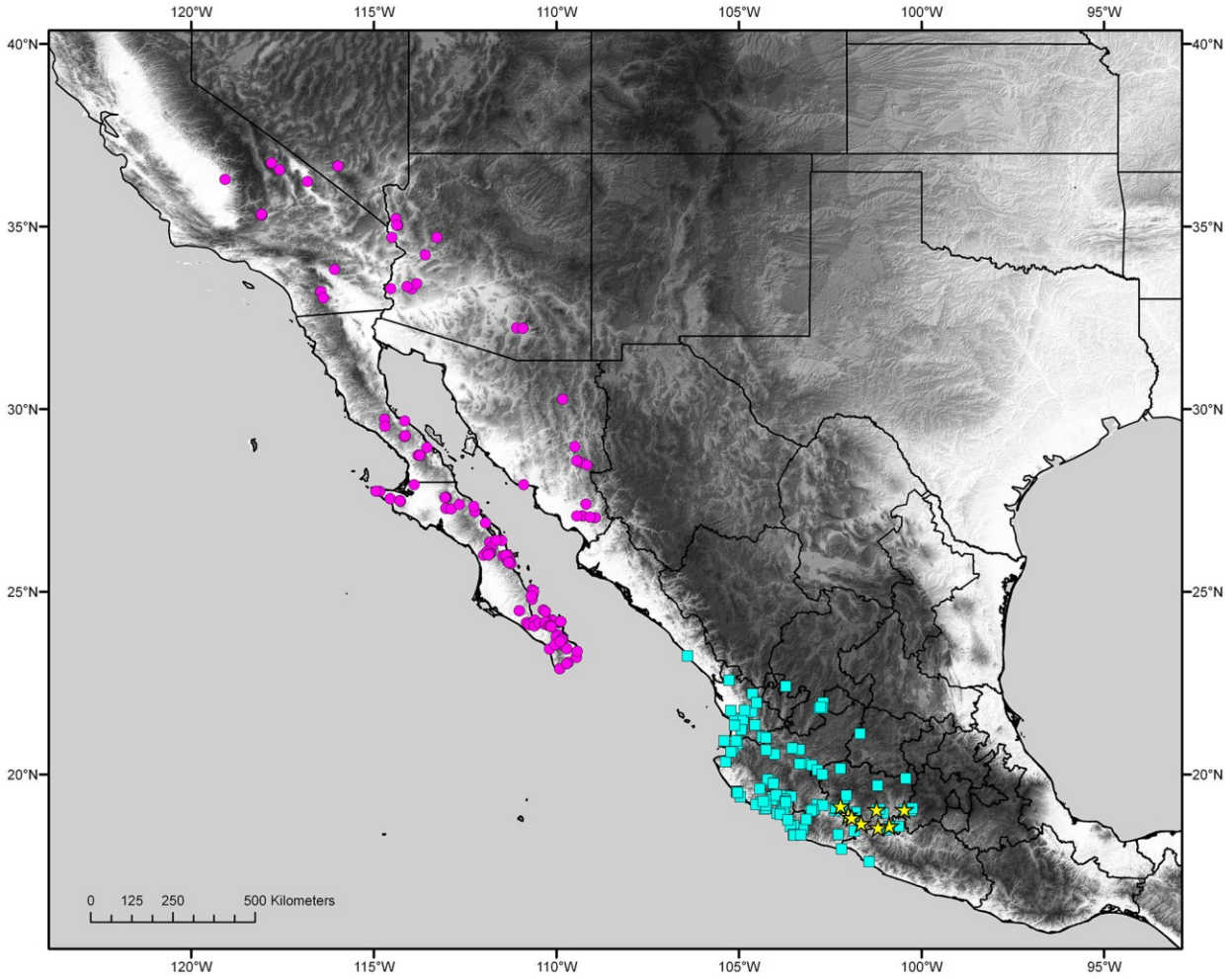


Figure 14. Map of Mexico and southern U.S.A, plotting known locality records for three genera in the vaejovid scorpion subfamily Syntropinae: *Balsateres*, **n. gen.** (yellow stars); *Kochius* Soleglad and Fet, 2008 (pink circles); *Thorellius* Soleglad and Fet, 2008 (blue squares).

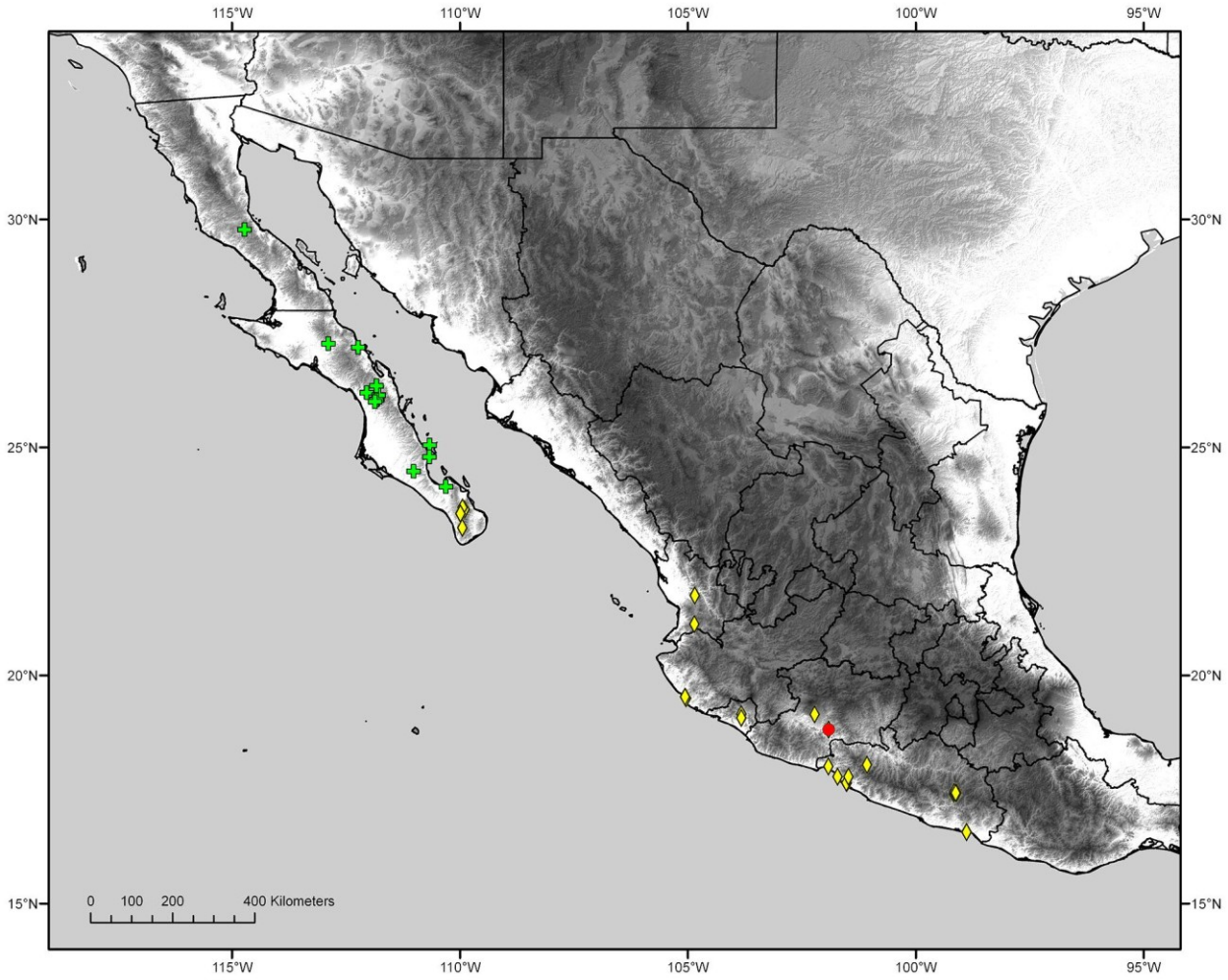


Figure 15. Map of Mexico and southern U.S.A, plotting known locality records for three genera in the vaejovid scorpion subfamily Syntropinae: *Syntropis* Kraepelin, 1900 (green crosses); *Konetontli*, **n. gen.** (yellow diamonds); *Kuarapu* Francke and Ponce-Saavedra, 2010 (red circle).

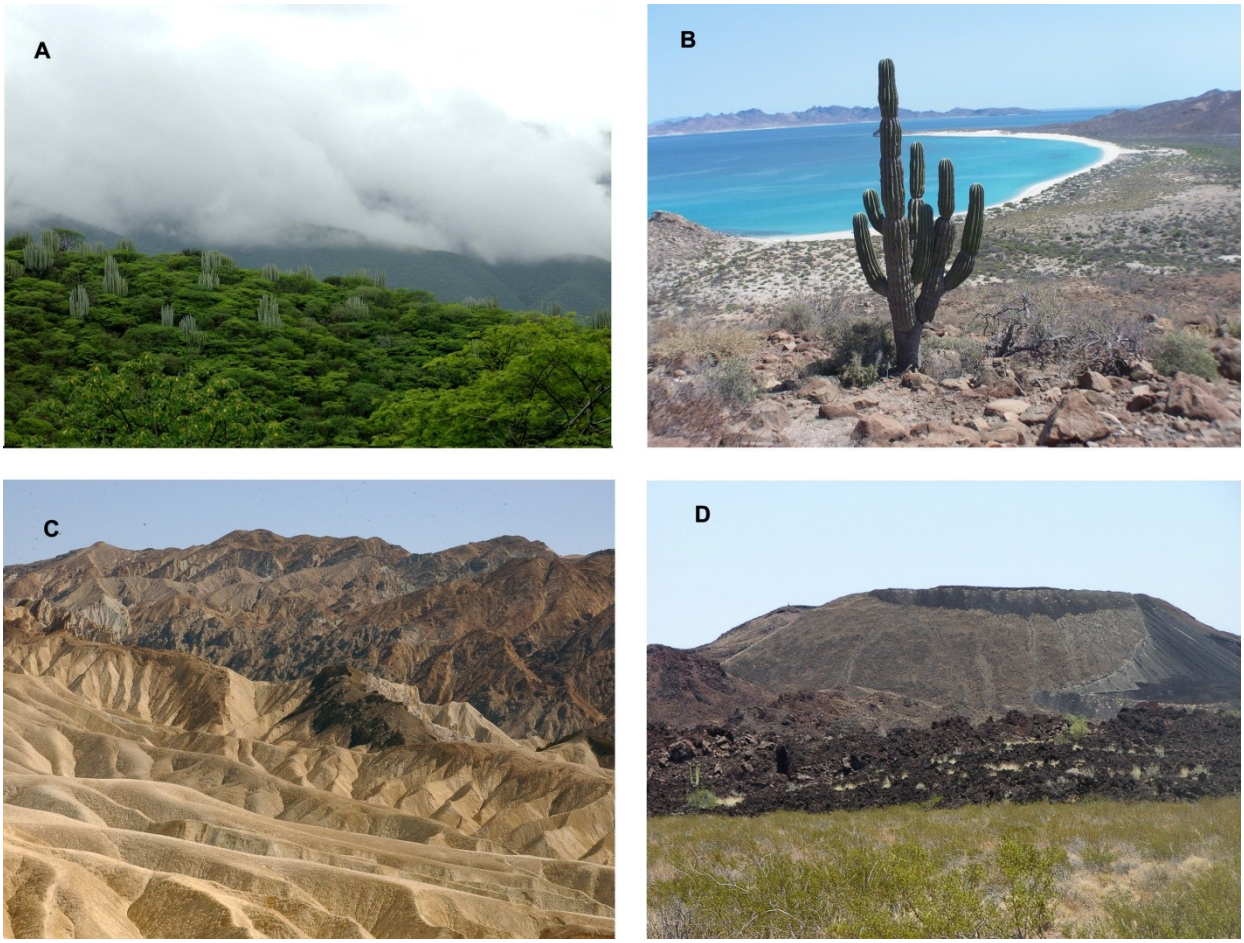


Figure 16. Syntropinae habitats. **A**. Cuicatlán, Oacaxa, habitat of *Mesomexovis subcristatus* (Pocock, 1898). **B**. Isla Espiritu Santo, La Paz, Baja California Sur, habitat of *Kochius insularis* (Williams, 1971) and *Paravaejovis gravicaudus* (Williams, 1970) and *Paravaejovis diazi* (Williams, 1970). **C**. Death Valley, California, habitat of *Kochius hirsuticauda* (Banks, 1910). **D**. Pinacate desert, Sonora, habitat of *Paravaejovis confusus* (Stahnke, 1940).

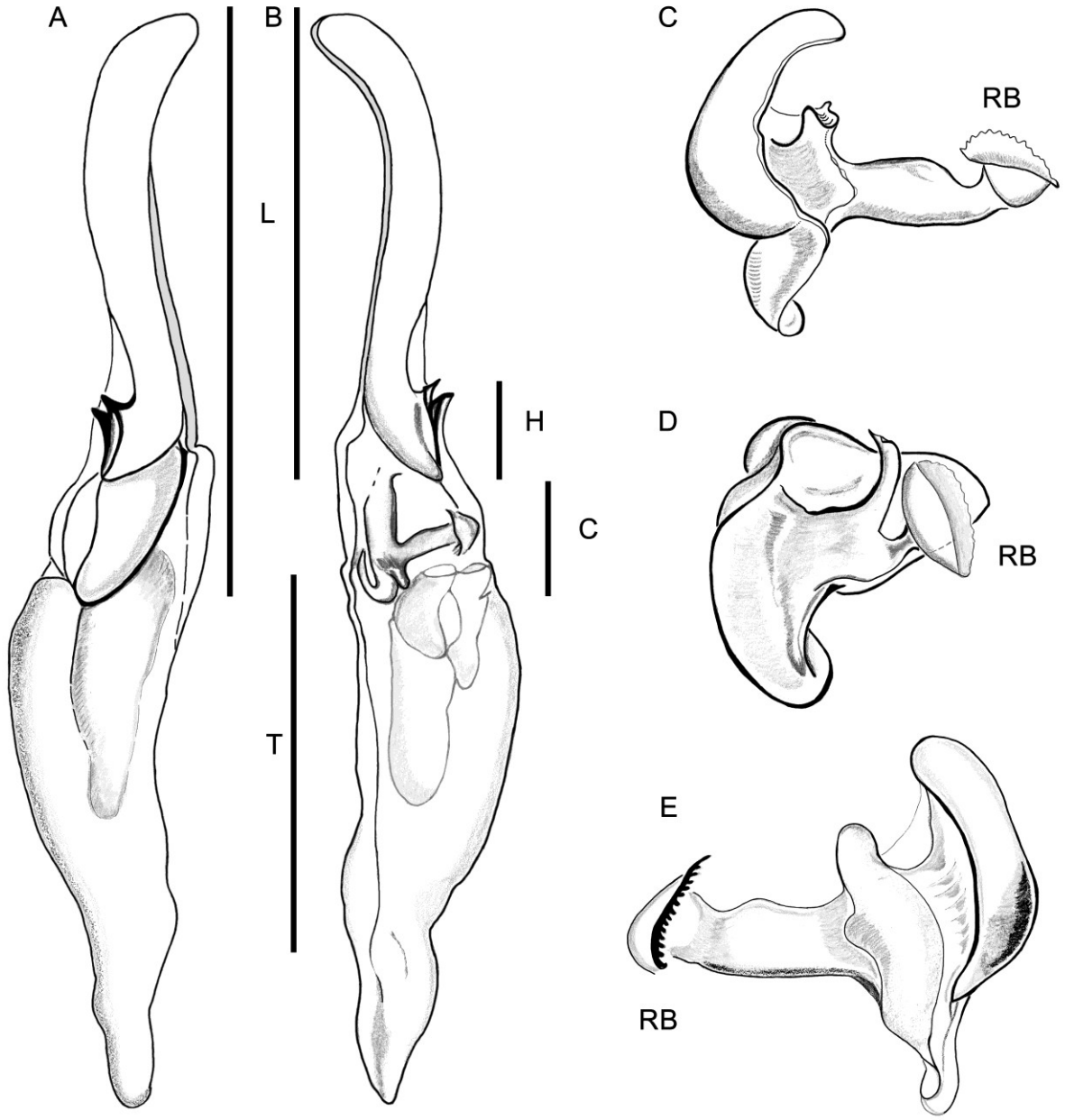


Figure 17. *Syntropis* Kraepelin, 1900, ♂ (AMNH), dextral hemispermatophore and microstructures of hemimating plug. **A**. Dorsal aspect. **B**. Ventral aspect. **C**, **D**, **E**. Hemimating plug, ventral, ental and dorsal aspect. Abbreviations: C, capsule; H, laminar hook; L, lamina; SRM, retro barbate distal endspinose retro margin; T, trunk.

The next attempt to synthesize vaejovid systematics, including syntropines, was conducted by Williams (1969, 1970a, 1970b, 1971a, 1971b, 1980). After almost 70 years Williams' (1969) fieldwork resulted in the recollection of new specimens of *Syntropis* and the discovery of another species, *S. longiunguis*. Subsequently, Stahnke (1974) created *Vejovoidus longiunguis* Stahnke, 1974 for Williams' species and placed both genera in Syntropinae, which was defined by the presence of well-developed ventral median carinae on metasomal segments I–V (Kraepelin, 1900; Stahnke, 1974). Williams formalized several species groups within Vaejovidae, among them the *eusthenura* group (Williams, 1970a) (Hoffmann's first section, in part) and the *punctipalpi* group (Williams, 1971a) (table 6). Williams distinguished the *eusthenura* group by means of the acarinate pedipalp and ventral segments of the metasoma. In contrast, granular carinae identified the *punctipalpi* group. These diverse species groups represent the core of Syntropinae. Williams also described *Paravaejovis* (Williams, 1980), distinguished primarily by the neotrichobothriotaxic pattern on the pedipalp chela. After a thorough analysis, Haradon (1983, 1984a, 1984b, 1985) suggested that *Paravaejovis* was related to the paruroctonoids (table 6), especially the *borregoensis* microgroup of *Paruroctonus*. The *borregoensis* microgroup comprises minute psammophilous scorpions in which leg II basitarsus is without mid-retrosuperior (mrs) macrosetae (part of retroventral series in the terminology used here). *Paravaejovis* and the *borregoensis* microgroup share similar morphology of the carapace, metasoma, pectines, legs, and sexual dimorphism (Haradon, 1984b). Most authors have since adopted this hypothesis (Sissom, 1990; Stockwell, 1992; Sissom, 2000; Soleglad and Fet, 2003b, 2008).

Sissom (1990) discussed the obscure taxonomic definition of the genera and the subfamilies of Vaejovidae. Sissom hypothesized that the character uniting *Syntropis* and

Vejovoidus (well-developed ventral median carinae on metasomal segments I–V) is a derivation caused by convergent evolution. He also pointed out that some species of *Vaejovis*, the largest genus of the family, was regrouped into two new genera, *Serradigitus* Stahnke, 1974 (the former *waparkiensis* group) and *Pseudouroctonus* Stahnke, 1974 (the former *minimus* group) and the remaining species were grouped into five species groups: the *eusthenura* group, the *punctipalpi* group, the *intrepidus* group (Hoffmann's second section, in part), the *nitidulus* group, and the *mexicanus* group (Hoffmann, 1931; Williams, 1970a, 1971a; Soleglad, 1973b; Sissom and Francke, 1985). The first three of these species groups are now placed within Syntropinae (table 6).

Stockwell (1992) presented a checklist of the North American scorpion fauna, and proposed taxonomic emendations based on an unpublished phylogenetic analysis (Stockwell, 1989). Stockwell suggested that the recognition of subfamilies was feasible but deferred that possibility. However, Stockwell (1992) synonymized Syntropinae with Vaejovinae, and elevated Scorpiopsinae (Fet et al., 2000, corrected the spelling to Scorpiopidae) to family. These actions left Vaejovinae as the sole subfamily, invalidating the recognition of subfamilies in Vaejovidae. Stockwell also discussed the recognition of *Pseudouroctonus*, leading him to propose that the spinose distal barb of the mating plug of the male hemispermatophore was a potential synapomorphy uniting the *eusthenura*, *punctipalpi* and *intrepidus* groups, and the genera *Syntropis* and *Paravaejovis* (Stockwell, 1992) This group of genera and species mentioned by Stockwell was partially recovered in the analyses presented in chapter 1. Although Stockwell recognized the probability of grouping these taxa, he abandoned this hypothesis and accepted Haradon's (1984b) placement of *Paravaejovis* within the paruroctonoids (table 6).

Sissom (2000) summarized the taxonomic history of the family Vaejovidae, agreed with Stockwell that all subfamilies should be rejected and validated 10 genera (table 6). After Sissom's assessment, two species of *Vaejovis* were assigned to the *eusthenura* group, two to the *punctipalpi* group (Sissom and Hendrixson, 2005b; Santibáñez-López and Sissom, 2010) and two new *Syntropis* (Soleglad et al., 2007) were described.

Soleglad and Fet revised the classification of the subfamilies of Vaejovidae (Soleglad and Fet, 2008), motivated primarily by Stockwell's (1989) unpublished work. Soleglad and Fet's assessment had several flaws, however. In particular, it failed to present phylogenetic analyses of the family and genera, simply assuming that the unpublished genera proposed by Stockwell (1989) were monophyletic, although this had never been tested in Stockwell's (1989) analysis which made use of supraspecific terminal taxa rather than exemplar species, a problem pointed out earlier by Prendini (2000) and Prendini and Wheeler (2005). A methodological problem with Soleglad and Fet's morphometric analyses is the use of odd statistics called "maximized ratios" (Fet and Soleglad, 2002) that beyond lacking theoretical basis have no objective meaning because were applied to artificially defined groups. Soleglad and Fet summarized their findings in a "phylogram" illustrating three subfamilies: (1) Smeringurinae = paruroctonoids, comprising four genera including *Paravaejovis*; (2) Vaejovinae, comprising three genera and two species groups of *Vaejovis*; and (3) Syntropinae, comprising eight genera accommodated in two tribes and two subtribes (table 6). Soleglad and Fet created three new genera to accommodate the species groups previously recognized in *Vaejovis*: *Hoffmannius* (*eusthenura* group), *Thorellius* (*intrepidus* group), and *Kochius* (*punctipalpi* group).

More recently Francke and Ponce-Saavedra, 2010 described *Kuarapu*, a new genus putatively related to the Syntropinae. The authors discussed its placement within the context of

Soleglad and Fet's (2008) classification, but noted that this classification has not been rigorously assessed and when evaluated, several of its components may not be monophyletic (Francke and Ponce-Saavedra, 2010). This genus appeared to belong to Syntropinae based on the spinose retro margin of the mating plug, and that was confirmed in the analyses presented in chapter 1.

Chapter 1 established that Syntropinae is monophyletic and comprises 11 genera (appendix 11; figure 18). The present chapter provides a new classification of Syntropinae in which the diagnosis of the subfamily is revised, the tribes and subtribes recognized by Soleglad and Fet (2008) abolished, six new genera described, the diagnoses and species composition of previously described genera revised, and distribution maps and a key to identification of all the genera provided.

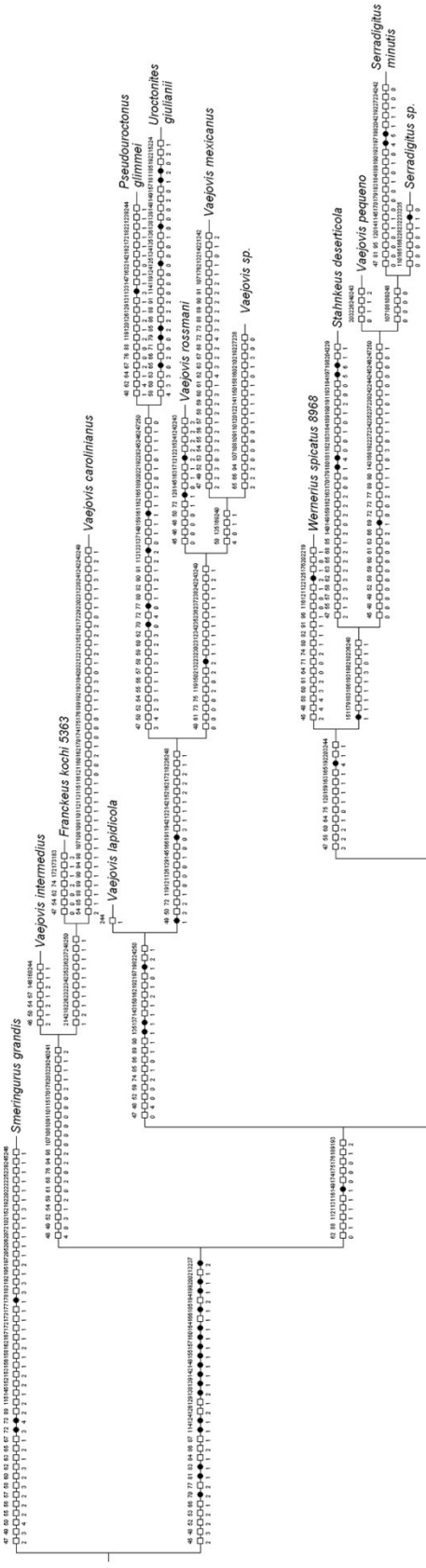

Smeringurus grandis
Vaejovis intermedius
Franckeus kochi 5363
Vaejovis carolinianus
Vaejovis lapidicola
Pseudouroctonus glimmei
Uroctonites giulianii
Vaejovis rossmani
Vaejovis mexicanus
Vaejovis sp.
Wernerius spicatus 8968
Stahnkeus deserticola
Vaejovis pequeno
Serradigitus minutis
Serradigitus sp.

Figure 18. Most parsimonious tree (length: 10884.593, CI: 0.191, RI: 0.627, fit: 289.77), obtained by cladistic analyses of 4221 aligned nucleotides and 251 continuous and discrete morphological characters (appendix 3, 4, 11) scored for 66 species of Vaejovidae Thorell, 1876 including 11 genera of Syntropinae Kraepelin, 1905 as ingroup and 8 genera of Smeringurinae Soleglad and Fet, 2008 and Vaejovinae Kraepelin, 1905 as outgroup. The analyses were conducted with implied weight (k =15) regime that maximized average support (chapter 1). Synapomorphies are optimized with accelerated transformation. Black circles indicate uniquely derived apomorphic states, white bars indicate parallel derivations of apomorphic states, numbers above branches indicate characters and numbers below branches indicate states.

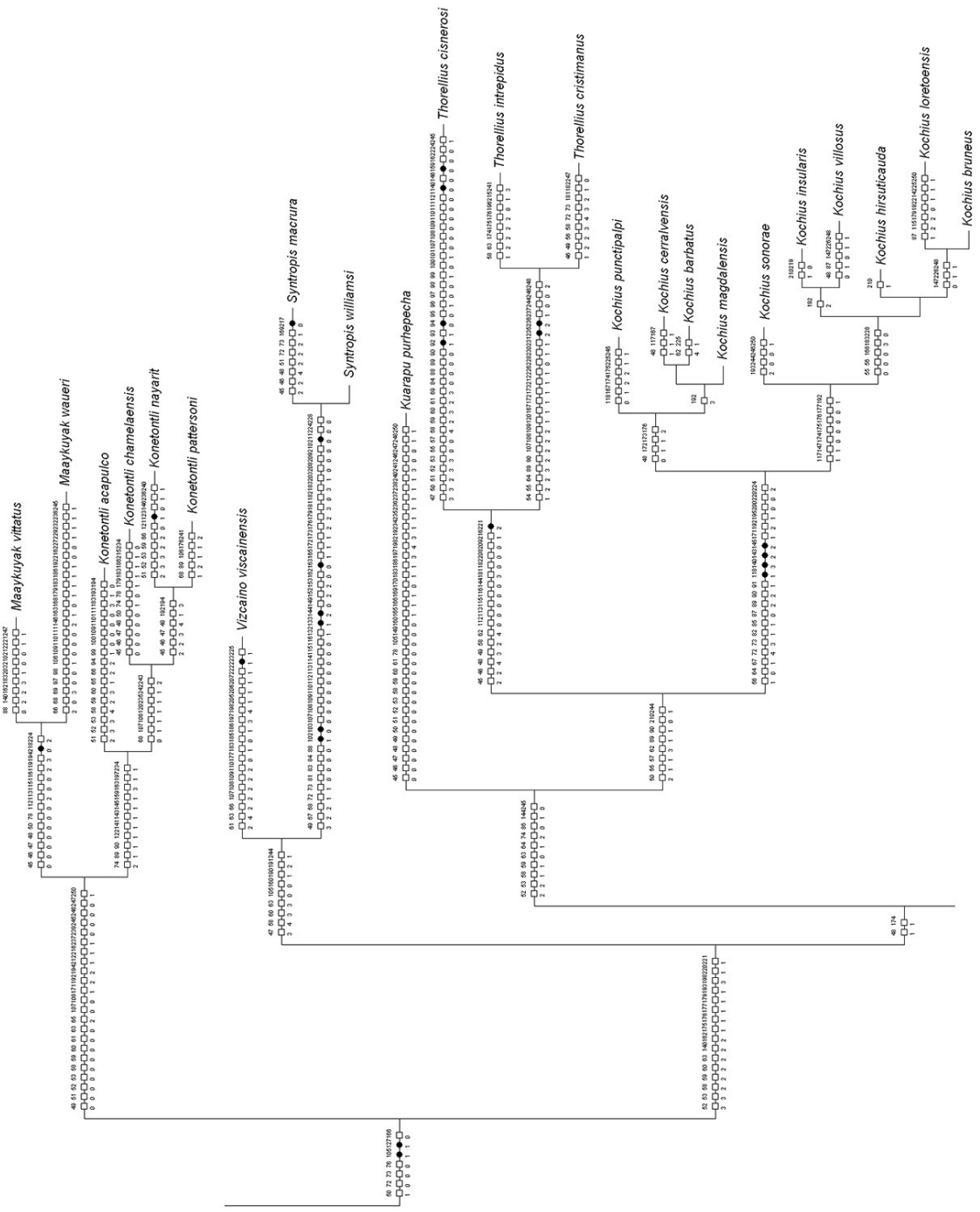


Figure 18. (continued).

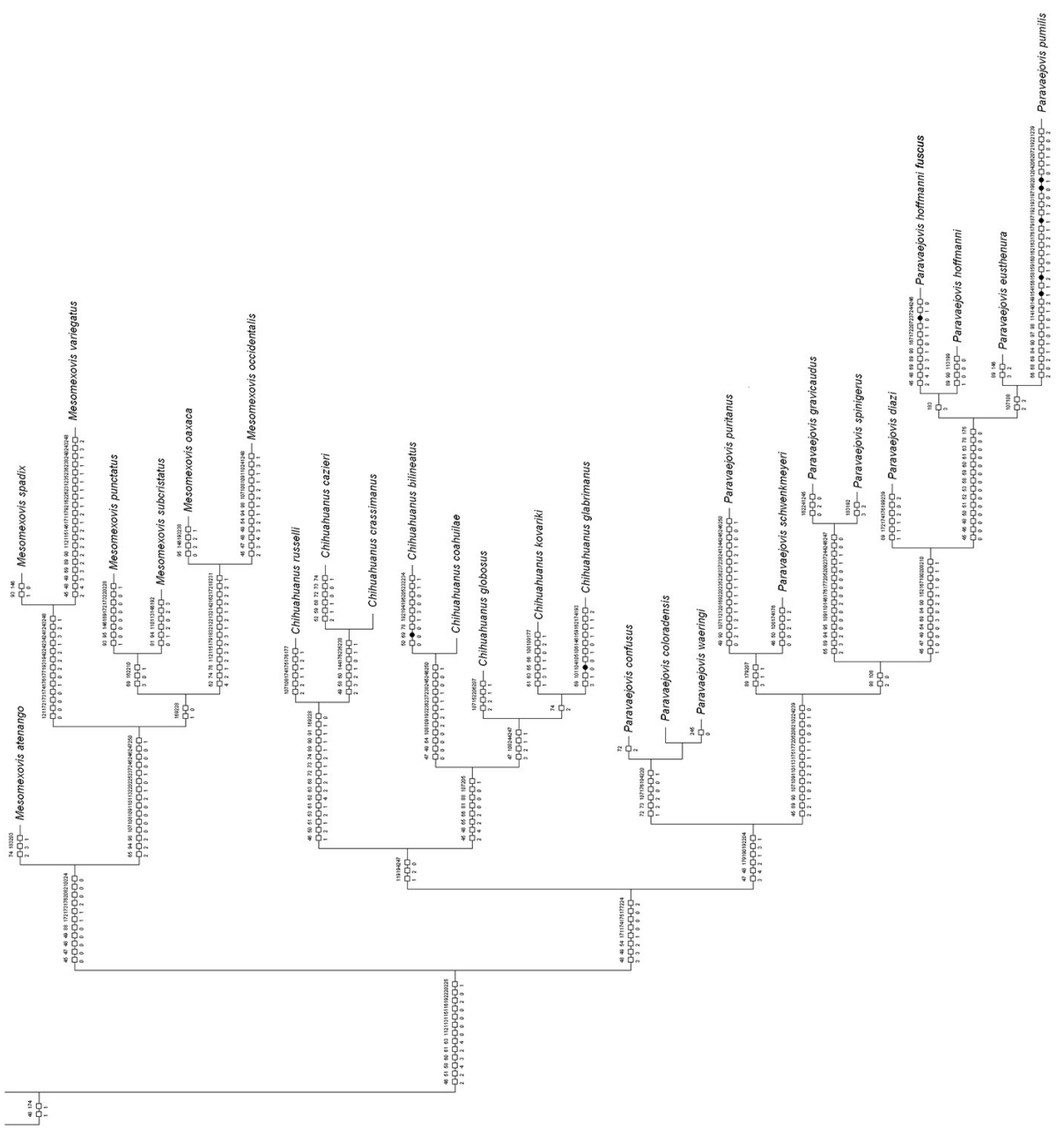


Figure 18. (continued).

Table 6. Taxonomic history of the family Vaejovidae. *Stockwell (1989) applied *Franckeus* to the former species group *punctipalpi*, whereas Soleglad and Fet (2008) applied the name to a section of the *nitidulus* group of *Vaejovis*.

Author (s)	Subfamily	Tribe	Subtribe	Genus
Stockwell, 1989	Syntropinae	Syntropini	-----	*Serradigitus*, *Syntropis*
	Vaejovinae	Uroctonini	-----	*Pseudouroctonus*, *Uroctonites*, *Uroctonus*
		Paruroctonini	-----	*Paravaejovis*, *Paruroctonus*, *Smeringurus*, *Vejovoidus*
		Sissomiini **nomen nudum**	-----	*Sissomius* **nomen nudum**
			-----	**Franckeus*, *Lissovaejovis* **nomen nudum**, *Vaejovis*
Sissom, 1990	Scorpiopsinae	-----	-----	*Dasyscorpiops*, *Parascorpiops*, *Scorpiops*
	Syntropinae	-----	-----	*Syntropis*, *Vejovoidus*
	Vaejovinae	-----	-----	*Nullibrotheas*, *Paravaejovis*, *Paruroctonus* *Pseudouroctonus*, *Serradigitus* *Uroctonus*, *Vaejovis*
Stockwell, 1992; Sissom, 2000	-----	-----	-----	*Vaejovis*, *Syntropis*, *Serradigitus*, *Uroctonus*, *Uroctonites*, *Pseudouroctonus*, *Paruroctonus*, *Smeringurus*, *Vaejovis*, *Vejovoidus*, *Paravaejovis* **Species groups of *Vaejovis*: *eusthenura*, *intrepidus*, *mexicanus*, *nitidulus*, and *punctipalpi***
Soleglad and Fet, 2003b, Fet and Soleglad, 2005	-----	-----	-----	*Paravaejovis*, *Paruroctonus*, *Pseudouroctonus*, *Serradigitus*, *Smeringurus*, *Syntropis*, *Uroctonites*, *Vaejovis*, *Vejovoidus*
Soleglad and Fet, 2005, 2006, 2008; Fet and Soleglad, 2005	Smeringurinae	Paravaejovini	-----	*Paravaejovis*
		Smeringurini	-----	*Paruroctonus*, *Smeringurus*, *Vejovoidus*
		Stahnkeini	-----	*Gertschius*, *Serradigitus*, *Stahnkeus*, *Wernerius*
	Syntropinae	Syntropini	Syntropina	*Hoffmannius = eusthenura*, *Syntropis*
			Thorellina	*Kochius = punctipalpi*, *Thorellius = intrepidus*
	Vaejovinae	-----	-----	**Franckeus*, *Pseudouroctonus Uroctonites*, *Vaejovis*

MATERIAL AND METHODS

Scorpion exemplars were collected at night by ultraviolet light detection using portable lamps or during the day by turning rocks and other objects on the ground. Material was deposited in the following collections: American Museum of Natural History (AMNH), New York, U.S.A.; California Academy of Sciences (CAS), Colección Nacional de Arácnidos, Instituto de Biología, Universidad Nacional Autónoma de México (IBUNAM), D.F., Mexico. Other material examined is deposited in the following collections: Colección de Aracnología y Entomología del Centro de Investigaciones Biológicas del Noroeste (CAECIB), Baja California Sur, Mexico; Muséum d'Histoire Naturelle de Genéve, Switzerland (MHNG), Ohio State University, Museum of Biological Diversity (OSAL), Universidad Michoacana de San Nicolás de Hidalgo (UMICH), Michoacán, Mexico.

Measurements (mm) were taken with an ocular micrometer. Photomicrographs with visible light and ultraviolet light were produced using a Microptics ML-1000 digital imaging system at the AMNH. Morphological terminology follows Prendini et al. (in prep.) for pedipalp femur, patella and chelal carination, pedipalp chela finger scalloping and metasomal carination (figures 19–22). Besides the use of topological nomenclature for carinae, internal and external are substituted with prolateral and retrolateral. Leg setation and spinules is a modified version of McWest (2009) (figure 23). Finger dentition is redefined to maintain the consistency of terminology used for the pedipalp segments (figure 24). Other nomenclature follows Stahnke (1970) and Vachon (1974) for trichobothrial patterns.

Localities were georeferenced in the field with a portable GPS (Garmin® II Plus), or retrospectively using GEOLocate (Rios and Bart, 2010) or Google Earth version 6.1.0.5001

(2011). Distribution maps were generated using ArcMap 9.3.1 (Environmental Systems Research Institute [ESRI], Redlands, California), by superimposing point locality records of genera on layers of North America depicting topography. The topographic coverage was generated from digital elevation model files with 1 arc degree of resolution, obtained from the United State Geological Survey (USGS): http://www.usgs.gov/.

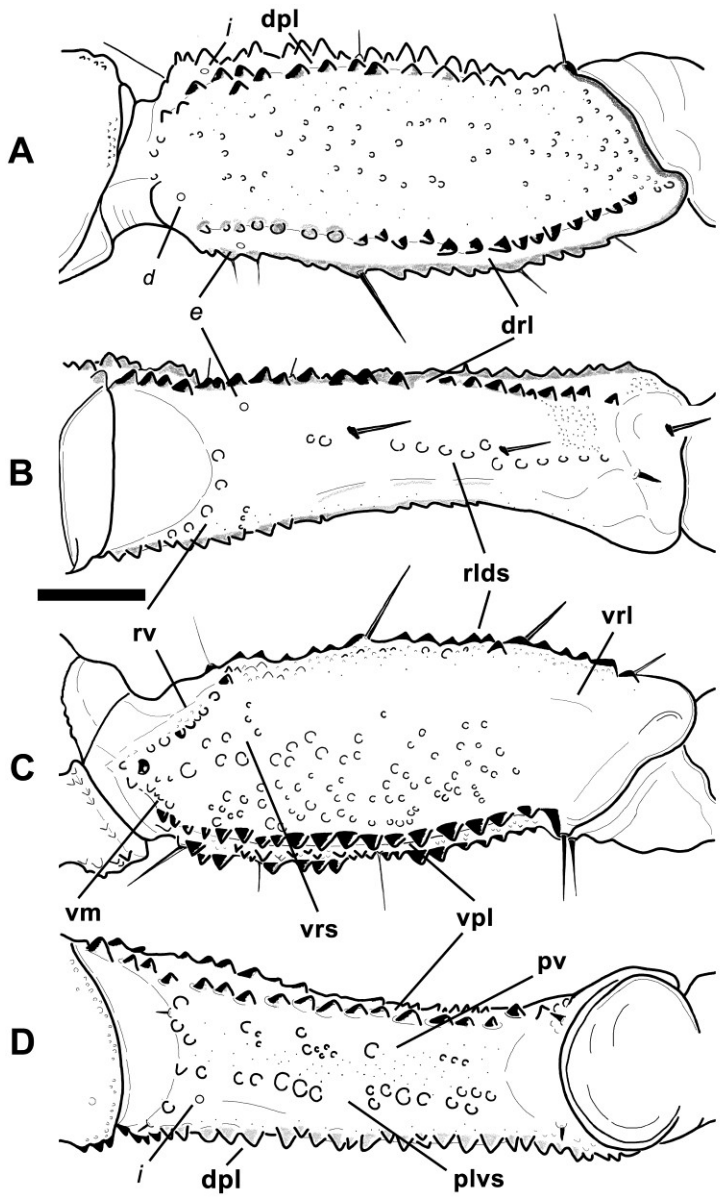


Figure 19. *Kochius* Soleglad and Fet, 2008, dextral pedipalp femur. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Bold font indicates carinae names and italic font trichobothria. Annotations: dorsal prolateral (dpl); dorsal retrolateral (drl); prolateral ventrosubmedian (plvs); prolateral ventral (pv); retrolateral dorsosubmedian (rlds); retrolateral ventral (rv); ventral median (vm); ventral retrolateral (vrl); ventral prolateral (vpl); ventral retrosubmedian (vrs); dorsal (*d*); external (*e*); internal (*i*). Scale bar = 1 mm.

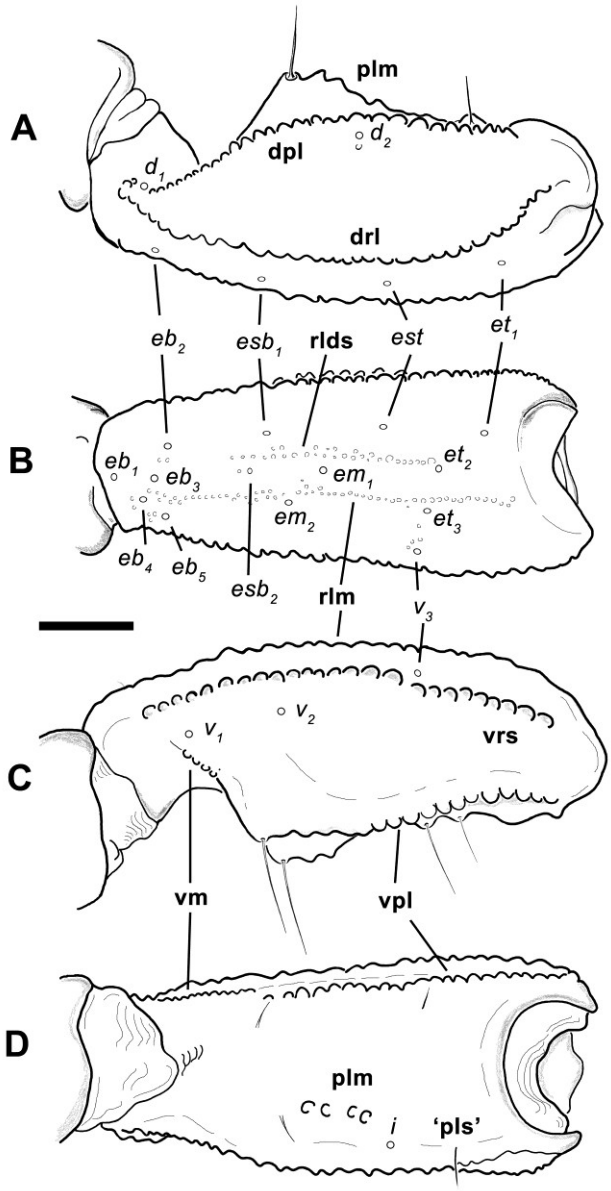
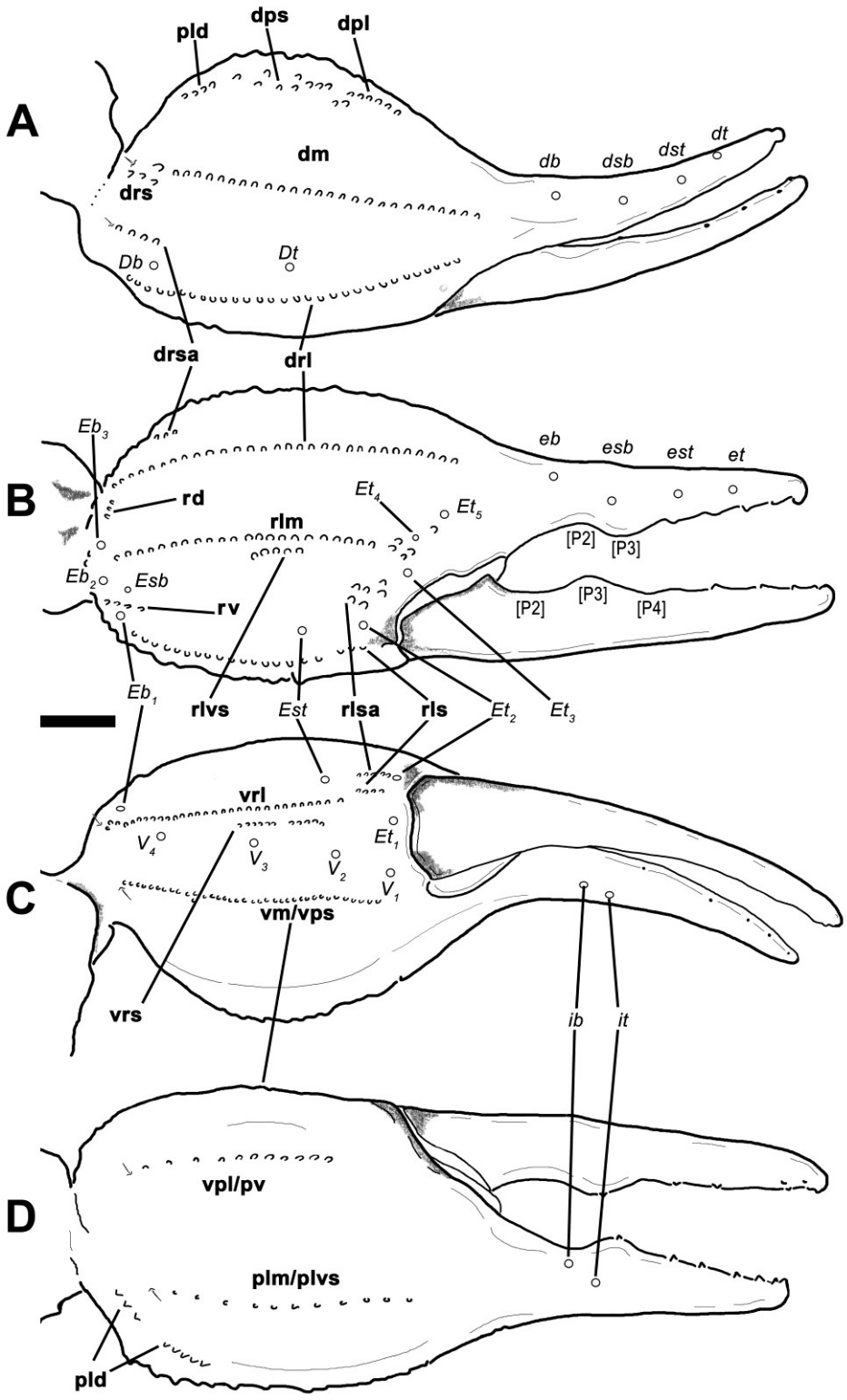


Figure 20. *Kochius* Soleglad and Fet, 2008, dextral pedipalp patella. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Bold font indicates carinae names and italic font trichobothria. Annotations: dorsal prolateral (dpl); dorsal retrolateral (drl); prolateral median (plm); prolateral subdorsal ('pls' absent in syntropines but present in vaejovids); retrolateral dorsosubmedian (rlds); ventral median (vm); ventral retrosubmedian (vrs); dorsal (*d*); external basal (*eb*); external suprabasal (*esb*); external medial (*em*); external subterminal (*est*); external terminal (*et*); internal (*i*). Scale bar = 1 mm.


A
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vm/vps
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ib
it
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plm/plvs
pld

Figure 21. *Kochius* Soleglad and Fet, 2008, dextral pedipalp chela. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Bold font indicates carinae names, italic font trichobothria and square parenthesis notches and lobes. Annotations: dorsal median (dm); dorsal prolateral (dpl); dorsal retrolateral (drl); dorsal retrosubmedian (drs); dorsal retrosubmedian accessory (drsa); prolateral dorsal (pld); prolateral median (plm); prolateral ventral (pv); prolateral ventrosubmedian (plvs); retrolateral dorsal (rd); retrolateral median (rlm); retrolateral subventral (rls); retrolateral subventral accessory (rlsa); retrolateral ventral (rv); ventral median (vm); ventral prolateral (vpl); ventral prosubmedian (vps); ventral retrolateral (vrl); ventral retrosubmedian (vrs); dorsal basal (*db*, *Db*); dorsal suprabasal (*dsb*); dorsal subterminal (*dst*); dorsal terminal (*dt*, *Dt*); external basal (*eb*, *Eb*); external suprabasal (*esb*, *Esb*); external subterminal (*est*, *Est*); external terminal (*et*, *Et*); internal basal (*ib*); internal terminal (*it*); ventral (*V*); proximal/basal notch [P2]; medial lobe [P3]; medial notch [P4]. Scale bar = 1 mm.

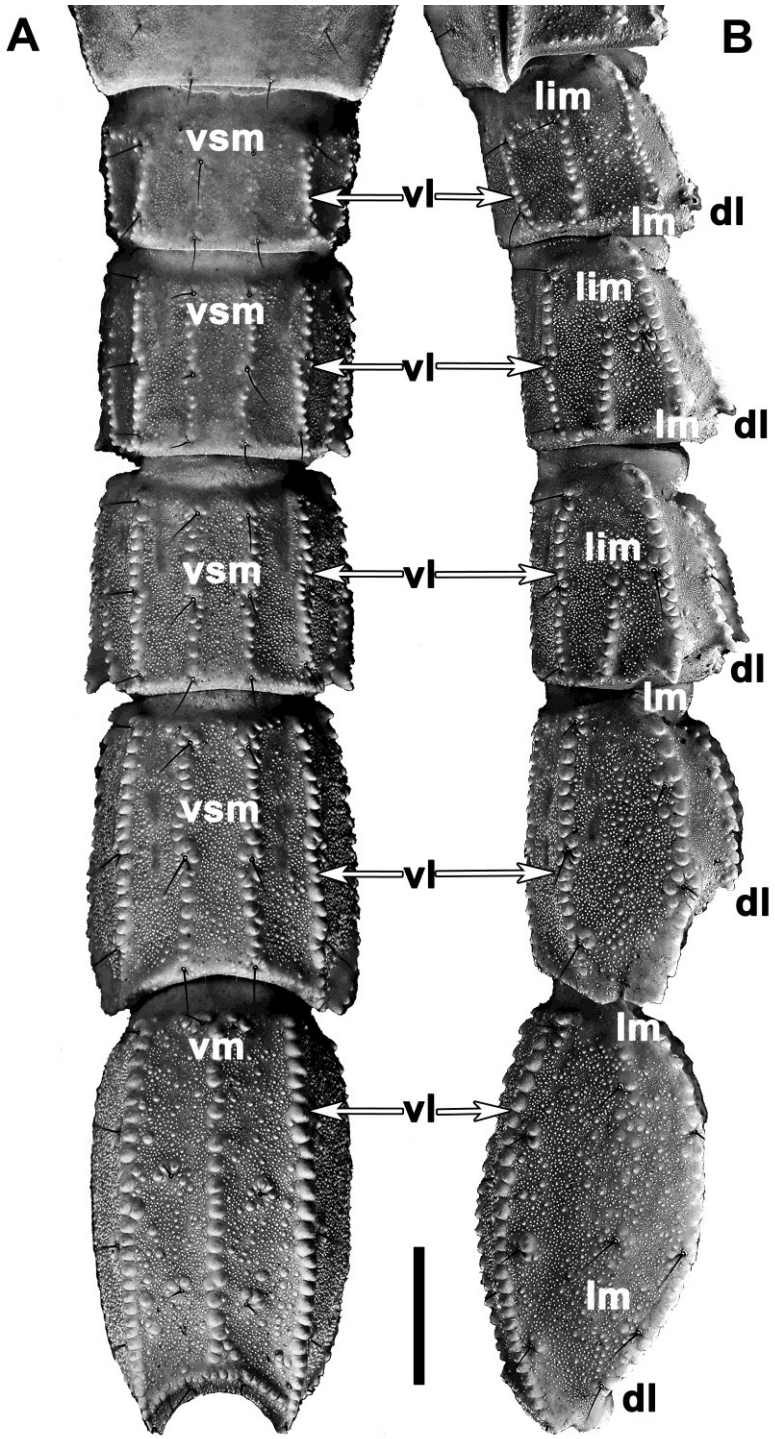


Figure 22. *Konetontli*, **n. gen. A**, **B**. Ventral and lateral aspect of metasoma. Annotations: dorsal lateral (dl); lateral median (lm); lateral inframedian (lim); ventral lateral (vl); ventral submedian (vsm). Scale bar = 1 mm.

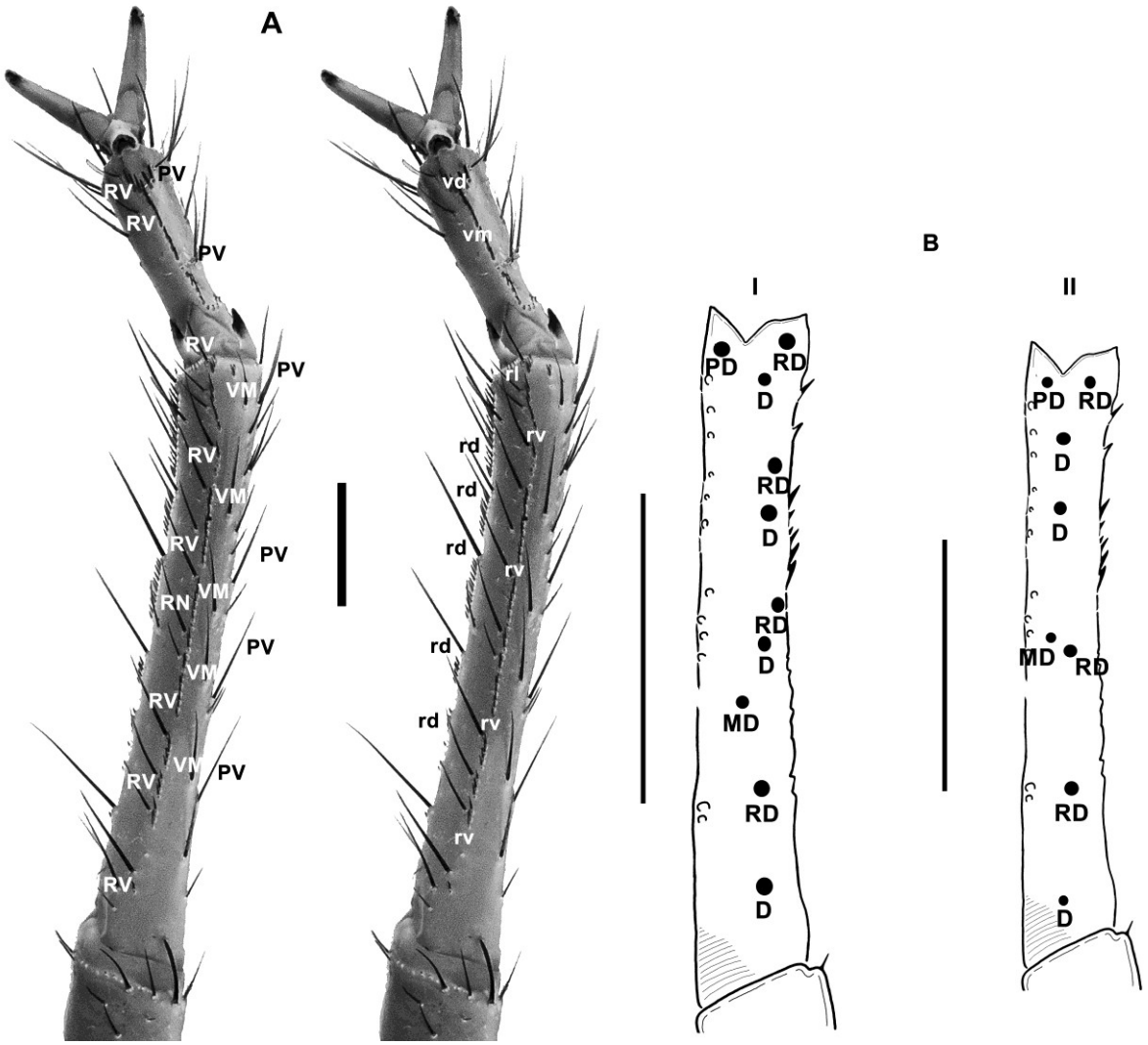


Figure 23. **A**. *Syntropis williamsi* Soleglad et al., 2007, dextral basitarsus and telotarsus III, ventral and retroventral aspect. **B**. **I**. *Vizcaino viscainensis* (Williams, 1970) and **II**. *Kochius punctipalpi* (Wood, 1863), dextral basitarsus III, dorsal aspect. Solid circles indicates setation of psammophilous species, hollow circles indicates position of setae in no-psammophilous species. Capital font indicates setae and lower font spinules. Annotations: dorsal (D); median dorsal (MD); prolateral dorsal (PD); prolateral ventral (PV); retrolateral dorsal (RD, rd); retrolateral (rl); retrolaterla ventral (RV, rv); ventral distal (vd); ventral median (VM, vm). Scale bar = 1 mm.

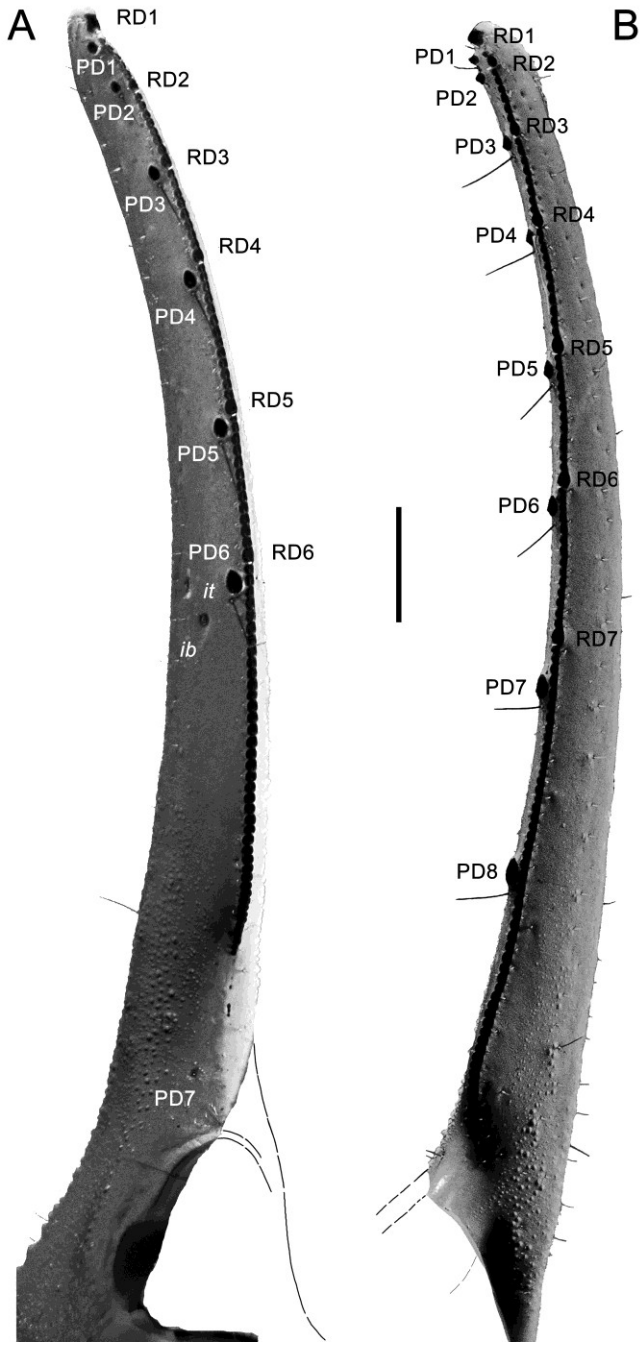


Figure 24. *Syntropis* Kraepelin, 1900, dextral pedipalp fingers. **A**. Movable finger. **B**. Fixed finger. Annotations: retrolateral denticle and/or associated macrosetae (RD); prolateral denticle and/or associated macrosetae (PD); trichobothrium internal basal (*ib*); trichobothrium internal terminal (*it*). Scale bar = 1 mm.

Table 7. Distribution of the genera of the subfamily Syntropinae Kraepelin, 1905 by Country and State.

Balsateres, **n. gen.**	**MEXICO:** Michoacán
Chihuahuanus, **n. gen.**	**MEXICO:** Aguascalientes, Chihuahua, Coahuila, Durango, Nuevo León, Tamaulipas, Zacatecas **U.S.A.**: Arizona, New Mexico, Texas
Kochius Soleglad and Fet, 2008	**MEXICO:** Baja California, Baja California Sur, Sonora **U.S.A.:** Arizona, California, Nevada
Konetontli, **n. gen.**	**MEXICO:** Baja California Sur, Colima, Guerrero, Jalisco, Michoacán, Nayarit
Kuarapu Francke and Ponce-Saavedra, 2010	**MEXICO:** Michoacán
Maaykuyak, **n. gen**.	**MEXICO:** Baja California Sur, Chihuahua, Coahuila, Durango, Nuevo León **U.S.A.:** Texas
Mesomexovis, **n. gen.**	**MEXICO:** Aguascalientes, Colima, Chiapas, Guanajuato, Guerrero, Hidalgo, Jalisco, Estado de México, Michoacán, Morelos, Nayarit, Oaxaca, Puebla, Sinaloa, Querétaro, Tlaxcala, Veracruz, Zacatecas
Paravaejovis Williams, 1980	**MEXICO:** Baja California, Baja California Sur, Chihuahua, Sonora, Sinaloa **U.S.A.:** Arizona, California, Nevada, New Mexico Utah
Syntropis Kraepelin, 1900	**MEXICO:** Baja California, Baja California Sur
Thorellius Soleglad and Fet, 2008	**MEXICO:** Aguascalientes, Colima, Estado de México, Guanajuato, Guerrero, Jalisco, Michoacán, Nayarit, Sinaloa
Vizcaino, **n. gen.**	**MEXICO:** Baja California, Baja California Sur

SYSTEMATICS

FAMILY VAEJOVIDAE THORREL, 1876

SUBFAMILY SYNTROPINAE KRAEPELIN, 1905

Figures 11–36; Table 7

Syntropinae Kraepelin, 1905: 340, type genus *Syntropis* Kraepelin, 1900; Birula, 1917a: 163, 1917b: 57; Werner, 1934: 281; Mello-Leitão, 1945: 118; Millot and Vachon, 1949: 428; Brues et al., 1954: 704; Gertsch, 1958: 14, 15; Stahnke, 1974: 112, 113; Stockwell, 1992: 408; Sissom, 2000: 107; Soleglad and Fet, 2003b: 109; 2008: 1, 2, 4–6, 13, 26–28, 33, 35–40, 45, 46, 50, 51, 53, 54, 62, 69, 72–74, 76, 77, 82, 84–86, 88–90, 93–97, 103, tab. 1–3, 8, 9, figs. 34–36, 41–43, 44–46, 47–56, 122–125, 164–167, 183, 196, 202–204.

Paravaejovini Soleglad and Fet, 2008, **n. syn.**: 1, 3, 13, 36, 46, 51, 75, 82, 84, 102, tab. 2, 8, 9, figs. 57, 126, 196, 197.

Syntropini: Soleglad and Fet, 2008: 1, 2, 4, 13, 30, 33, 34, 38, 40, 43, 45, 46, 49, 50, 51, 53, 54, 57, 69, 71–74, 76, 77, 84, 85, 89, 91, 94, 95, 103, tab. 2, 3, 8, 9, figs. 75–82, 103–110, 122–124, 170–181, 194–196, 203, 204.

Syntropina: Soleglad and Fet, 2008: 1, 32, 46, 51, 53, 74, 76, 77, 90, 91, fig. 196, 203, 103, tab. 9.

DIAGNOSIS: Hemispermatophore with sclerotized hemimating plug and distal margin armed with hooks (figure 17). Patella, retrolateral median (rlm) and retrolateral dorsosubmedian (rlds) carinae obsolete to costated, except for *Syntropis*, *Kochius*, and few *Paravaejovis*. (figure 20B) Chela, dorsal prosubmedian (dps), prolateral median (plm), prolateral dorsal (pld), and prolateral ventral submedian (plvs) carinae obsolete to costated, except *Kochius* and few species

of *Chihuahuanus*, **n. gen.** and *Thorellius* (figures 21A, D, 25–27). Superciliary carinae almost always higher than ocelli. Telotarsi I–IV with three to four retrolateral ventral and two prolateral ventral setae. Telotarsi with one to six pairs of ventral spinules (figures 23A, B, 28–29). Trichobothrium *Db* on or dorsal to dorsal retrolateral (drl) carina. Serrula with 1–30 tines. Lateral microserration on aculeus vestigial to well developed. Among vaejovids Syntropinae is more closely related to the Stahnkeini Soleglad and Fet, 2008 from which can be separated by lacking the basal pectinal teeth modified, one to three basal pectinal teeth are enlarge, ovoid and devoid of sensilla. Syntropinae has one to four pairs of ventrodistal spinule pairs on telotarsi, whereas Stahnkeini Soleglad and Fet, 2008 has one pair only. Most species of Stahnkeini Soleglad and Fet, 2008 have trichobothrium *esb* positioned between RD 3 (and/or associated macroseta) and RD 4 (and/or associated macroseta), whereas Syntropinae has *esb* between RD 4 (and/or associated macroseta) and RD 5 (and/or associated macroseta). Syntropinae has low to subserrated rows on the pedipalp chela fingers and slightly to moderate terminal RD. Most genera of Stahnkeini Soleglad and Fet, 2008 have serrated denticle rows on the pedipalp chela fingers, except *Gertschius* Graham and Soleglad, 2007 and *Wernerius* Soleglad and Fet, 2008.

INCLUDED GENERA: *Balsateres*, **n. gen.**; *Chihuahuanus*, **n. gen.**; *Kochius* Soleglad and Fet, 2008; *Konetontli*, **n. gen.**; *Kuarapu* Francke and Ponce-Saavedra, 2010; *Maaykuyak*, **n. gen.**; *Mesomexovis*, **n. gen.**; *Paravaejovis* Williams, 1980; *Syntropis* Kraepelin, 1900; *Thorellius* Soleglad and Fet, 2008; *Vizcaino*, **n. gen.**

DISTRIBUTION: **MEXICO:** Aguascalientes, Baja California, Baja California Sur, Coahuila, Colima, Chiapas, Chihuahua, Durango, Guanajuato, Guerrero, Hidalgo, Jalisco, Estado de México, Michoacán, Morelos, Nayarit, Nuevo León, Oaxaca, Puebla, Queretaro, San Luis

Potosí, Sinaloa, Sonora, Tamaulipas, Tlaxcala, Veracruz, and Zacatecas. **U.S.A.:** Arizona, California, Nevada, New Mexico, Oregon, Texas, and Utah.

REMARKS: Syntropinae and Stahnkeini Soleglad and Fet, 2008 are sister groups according to chapter 1. Although Stahnkeini Soleglad and Fet, 2008 was used as comparative group, its current status will be revised in an upcoming publication (Prendini et al., in prep.). Based on the phylogeny, the following genera are excluded from Syntropinae: *Gertschius* Graham and Soleglad, 2007; *Serradigitus* Stahnke, 1974; *Stahnkeus* Soleglad and Fet, 2006; and *Wernerius* Soleglad and Fet, 2008.

KEY TO IDENTIFICATION OF THE GENERA OF SYNTROPINAE

1. Adult with a whitish glandular area on the dorsal surface of telson (figure 30); ventral surface of metasomal segment V smooth (glabrous) to matte; pedipalp fixed finger with five MDs and five PDs…….....2

- Adult without a whitish glandular area on the dorsal surface of telson; ventral surface of metasomal segment V matte to shagreened; pedipalp fixed finger with five to six MDs and five to six PDs…….……..3

2. Adult with a small fusiform whitish glandular area at the base of the aculeus (*C. bilineatus* may have a minute gland) (figure 30A); trichobothrium *et* midway between RD3 and RD 4 (Mexico: Aguascalientes, Chihuahua, Coahuila, Durango, Nuevo León, Tamaulipas, and Zacatecas; U.S.A.: Arizona, New Mexico, and Texas)…….....*Chihuahuanus*, **n. gen.**

- Adult with an oval, moderate whitish glandular area on dorsal surface of telson, in adult females the glandular area may be reduced (figure 30B); trichobothrium *et* between RD3 and RD4 but in line or closer to RD4 (Mexico: Baja California Sur, Chihuahua, Coahuila, Durango, and Nuevo León; U.S.A.: Texas)....……...……..*Maaykuyak*, **n. gen**.

3. Adult with a whitish glandular area on medial area of sternite VII (figure 31A, B)...……..4

- Adult without a whitish glandular on medial area of sternite VII…...…….….6

4. Adult with a longitudinal whitish glandular area between the ventral submedian carinae (figure 31A), metasomal segments with ventromedian carinae costate, smooth to finely granular and ventral submedian carinae obsolete (figure 32A) (endemic to the peninsula of Baja California)……..…..……..*Syntropis*

- Adult with a truncated triangle-like elevated boss on sternite VII, metasomal segments with ventromedian carinae obsolete and ventral submedian carinae granular (figure 31B)……..5

5. Adult with pedipalp chela manus robust and strongly carinated with carinae granular and immaculate, lateral areas of sternite VII shagreened, telson of female with setae as long or longer than aculeus (figure 33A) (Mexico: Baja California, Baja California Sur, and Sonora; U.S.A.: Arizona, California, and Nevada)……...……..…….*Kochius*

- Adult with pedipalp chela manus slender and with carinae obsolete and infuscate, lateral areas of sternite VII glabrous, telson of female without setae as long or longer that aculeus (Mexico: Michoacán, endemic to the Balsas Depression).……..…….…….....*Kuarapu*

6. Telotarsi I–V with ventral spinules stout, relatively short, arranged in a single row, basitarsi with dorsal and retrolateral dorsal setae separated in independent rows, movable finger of pedipalp chelae with more than 4 MD and 4 RD……..…….7

- Telotarsi I–V with ventral spinules acuminated, elongated and thin, arranged in clusters, basitarsi with dorsal and retro dorsal setae arranged in a sublinear row and elongated (setal combs) (figure 28A), movable finger of pedipalp chelae with 4 MD and 4 RD (endemic to the peninsula of Baja California)……..….*Vizcaino*, **n. gen**.

7. Telson without a conspicuous subaculear tubercle; total body length more than 26 mm; telotarsi with two or more pairs of ventrodistal spinules (except for *P. pumilis*)……..……8

- Telson with a conspicuous subaculear tubercle, with rounded tip and slightly compressed laterally. Total body length less than 25 mm; telotarsi with one pair of ventrodistal spinules (Mexico: Baja California Sur, Colima, Guerrero, Jalisco, Michoacán, and Nayarit) (figures 33B, C, 35B)….....*Konetontli*, **n. gen.**

8. Tergites and carapace not infuscated to weakly infuscated, ventral submedian carinae weak to obsolete on I and II, weakly to strongly granular on III and IV; carinae of ventral submedian

and ventral lateral I–IV weakly to no outlined by infuscation; dorsal carinae of chela (dm, dpl, drl, drs, drsa) smooth to granular……..……..……...9

- Tergites and carapace densely infuscate, (except *M. atenango*) ventral submedian carinae on I and II and obsolete to weakly granular on III and IV; Ventral submedian and ventral lateral carinae outlined by infuscation (figure 34B); dorsal carinae of chela (dm, dpl, drl, drs, drsa) smooth (figures 27C, D) (Mexico: Aguascalientes, Guanajuato, Guerrero, Hidalgo, Jalisco, Estado de México, Michoacán, Oaxaca, Puebla, Querétaro, Veracruz, and Zacatecas) .....*Mesomexovis*, **n. gen.**

9. Robust scorpions with carinae of pedipalp chela protruding strongly above intercarinal spaces smooth to completely granular; dark brown to reddish body. Trichobothrium Et_5 positioned on manus adjacent to Et_4 (figures 25A, B)……...……..10
- Frailer scorpions with carinae of pedipalp chela obsolete to weakly protruding above intercarinal spaces and rarely granular; pale, yellow body. Trichobothrium Et_5 positioned at the base of fixed finger removed from Et_4 (figure 27B) (Mexico: Baja California, Baja California Sur, Chihuahua, Sonora, and Sinaloa; U.S.A.: Arizona, California, Nevada, New Mexico, and Utah)……...…….……*Paravaejovis*

10. Carapace, tergites, telson, pedipalp chela, pedipalp patella and metasoma with carinae and intercarinal spaces smooth (figure 35C); pale color throughout with diffuse marking on tergites (Mexico: Michoacán, endemic to the Balsas Depression)……*Balsateres*, **n. gen.**
- Carapace, tergites, telson, pedipalp chela, pedipalp patella and metasoma with carinae and intercarinal spaces crenulated to strongly granular; dark color with variable marking on tergites (Mexico: Aguascalientes, Colima, Estado de México, Guanajuato, Guerrero, Jalisco, Michoacán, Nayarit, and Sinaloa)…….……...……...*Thorellius*

Balsateres, **n. gen.**

Figures 14, 35C, 36A; Table 7

Vaejovis cisnerosi Ponce-Saavedra and Sissom, 2004 [= *Balsateres cisnerosi* (Ponce-Saavedra and Sissom, 2004) **n. comb.**] type species, by monotypy.

Thorellius: Soleglad and Fet, 2008: 1, 95, 102; Ayrey and Soleglad, 2011: 1.

Vaejovis intrepidus group: Santibáñez-López and Sissom, 2010: 52.

ETYMOLOGY: The name *Balsateres*, **n. gen.**, a compound word, masculine in gender, is derived from the Balsas Depression, to which the genus is endemic, and the Latin adjective *teres*, which means smooth or polished, and refers to the glabrous integument typical of this genus.

DIAGNOSIS: *Balsateres*, **n. gen**. is the only genus with metasomal dorsal lateral carinae smooth within the Syntropinae. The carinae and the intercarinal spaces of the metasoma (figure 35C), pedipalp chela, patella, tergites, telson, and carapace (figure 36A) are smooth. Metasomal setation highly reduced, dorsal lateral I–IV 0/0: 0/0: 0/0: 1/1; lateral median 0/0: 0/0: 0/0: 0/0; ventral lateral 1/1:1/1:1/1:1/1 and ventral submedian 1/1:1/1:1/1:1/1. Although *Thorellius* present lower setal counts on these carinae, never reaches such lower count. The aforementioned metasomal carinae usually have three or more setae in all other syntropine. *Balsateres*, **n. gen.** is also related to *Thorellius* by having metasomal and pedipalp chela carina strongly developed as a broad costa. Whereas in *Balsateres*, **n. gen**. all carinae are smooth, in *Thorellius* the carinae are moderate to densely granulate. These genera also differ by coloration and infuscation, *Balsateres*, **n. gen**. is completely yellow and virtually immaculate except for the ocular tubercle outlined by dark infuscation and *Thorellius* tend to be more obscure and if paler more reddish and various degrees of infuscation on carapace and tergites. *Balsateres*, **n. gen**. and *Thorellius*

intrepidus (Thorell, 1867) share the possession of double most basal PD on the movable finger, but the former is completely smooth and the latter strongly granular in general. In having the ventral metasomal carinae I–IV obsolete *Balsateres*, **n. gen**. is similar to *Mesomexovis*, **n. gen.** but the species of this genus are more setose and strongly infuscated.

INCLUDED SPECIES: *Balsateres cisnerosi* (Ponce-Saavedra and Sissom, 2004), **n. comb.**

DISTRIBUTION: *Balsateres*, **n. gen.** is endemic to Michoacán and Estado de México, Mexico.

NATURAL HISTORY: *Balsateres*, **n. gen.** is a monotypic genus adapted to burrow in sandy habitats. Although, it expresses poor leg armature typical of psammophilous, its extremely smooth cuticle suggests that ecomorphotype. Known specimens were collected during the night close to the entrance of their burrow, which were dug in open areas (Ponce-Saavedra and Sissom, 2004). The altitude at which *Balsateres*, **n. gen.** has been collected ranged 195–672 m in tropical deciduous forest. This monotypic genus has been collected in the same locality as the monotypic *Kuarapu*. Although, theses genera are sympatric, they are allotopic. Whereas *Balsateres*, **n. gen.** was collected in sandy areas, close to their burrow opening, *Kuarapu* was collected on road-cuts, suggesting a lithophilous ecomorphotype.

REMARKS: In the original description of this monotypic species, the authors were unable t assign it to a known species group at the time (Ponce-Saavedra and Sissom, 2004). More recently, Soleglad and Fet (2008) transferred this species to *Thorellius* where resided until now. The creation of this genus is based on the extremely smooth cuticle and the unique presence among Vaejovidae of the smooth dorsal lateral carinae on metasomal segments I–IV.

MATERIAL EXAMINED: **MEXICO: Michoacán:** *Municipio de La Huacana*: El Vado, 18°48.908'N 101°54.976'W, 198 m, 20.v.2007, O. Francke, J. Ponce, M. Villaseñor, and A. Quijano, ♂, ♀ (IBUNAM).

Chihuahuanus, **n. gen.**

Figures 11E, 13, 25C, D, 28C, 30A, 34C, 36B; Table 7

Vaejovis bilineatus Pocock, 1898 [= *Chihuahuanus bilineatus* (Pocock, 1898), **n. comb.**], type species, here designated.

Vejovis first section (part): Hoffmann, 1931: 134, 139.

Vejovis spinigerus group (part): Williams, 1968: 16; 1970d: 238.

Vejovis eusthenura group (part): Williams, 1970a: 395, 396

Vejovis punctipalpi group (part): Williams, 1971b: 44–47; fig. 1, 2; tab. 1.

Vaejovis eusthenura group (part): Williams, 1980: 55; Sissom and Francke 1985: 1; Sissom, 1991a: 26; Stockwell, 1992: 408, 409; Sissom, 1993: 68; Yahia and Sissom, 1996: 86; Lourenço and Sissom, 2000: 135; Sissom, 2000: 530, 532, 551; Armas and Martín-Frías, 2001: 8; McWest, 2009: 8, 48, 52, 56, 61, 64, 98, 101–103, 108, tab. 1; Ponce-Saavedra and Sissom, 2004: 541; González-Santillán, 2004: 29; Francke and Ponce-Saavedra, 2005: 67; Sissom and Hendrixson, 2005a: 131; 2005b: 33, 34; Graham and Fet, 2006: 8, 9; Fet et al., 2006a: 9, tab. 1; 2006b: 8; 2006c: 7; Graham and Soleglad, 2007: 9, 11, 12; Soleglad et al., 2007: 134, 135; Santibáñez-López and Sissom, 2010: 49.

Vaejovis punctipalpi group (part): Williams, 1971a: 37; 1971b: 44; 1980: 80; Sissom and Francke 1985: 1; Sissom, 1989: 180; 1991a: 26; Stockwell, 1992: 408, 409; Sissom, 1993: 68; Lourenço and Sissom, 2000: 135; Sissom, 2000: 548, 549, 551; Armas and Martín-Frías, 2001: 1; Hendrixson, 2001: 1; McWest, 2009: tab. 1, 53, 89, 91, 93, 101–105, 108, 123, figs. 322–326; Ponce-Saavedra and Sissom, 2004: 539, 541; Sissom and Hendrixson, 2005a: 131; 2005b: 35; Soleglad and Fet, 2005: 4, 6, 7; Graham and Fet, 2006: 7, 8, 10; Fet et al., 2006a: 9, tab. 1; 2006b: 8; 2006c: 7; tab. 1, 9; Soleglad and Fet, 2006: 6, 26, tab. 2, 3; Graham and Soleglad, 2007: 11, 12; Soleglad et al., 2007: 134, 135.

Hoffmannius (part): Soleglad and Fet, 2008: 1, 4, 26, 34, 38, 51, 53, 54, 57, 60, 62, 66, 67, 69, 71, 73, 74, 89–92, 96, 102; Ayrey and Soleglad, 2011: 1.

Kochius (part): Soleglad and Fet, 2008: 1, 26, 57, 60, 89, 91, 94–96, 102; Ayrey and Soleglad, 2011: 1.

ETYMOLOGY: The generic name is a noun in apposition, masculine in gender, referring to the Chihuahuan Desert to which this genus is endemic.

DIAGNOSIS: *Chihuahuanus*, **n. gen.** is distinguished from all other genera by means of a small fusiform whitish glandular area on dorsal surface of telson, at the base of the aculeus in adult male and female (figure 30A). This character is shared with *Maaykuyak*, **n. gen.**, but the gland is larger and less defined. *Chihuahuanus*, **n. gen.** possesses consistently five MDs and five PDs on prolateral cutting edge of the fixed finger. Chela, fixed finger with trichobothrium *et* positioned midway between RD 3 and RD 4 (figure 25D). The carapace of *Chihuahuanus*, **n. gen.** is shagreened in most species and tend to have a mix of large rounded granules with minute scattered granules (figure 36B). *Chihuahuanus*, **n. gen.** resembles *Paravaejovis* and *Mesomexovis*, **n. gen.** by the obsolescence of carinae on pedipalp manus and ventral submedian

and ventral lateral metasomal carinae. Whereas *Chihuahuanus*, **n. gen.** has ventral submedian carinae costate to granular at least on the distal half, on segments III and IV (figure 34C), the other genera have obsolete and smooth carinae, except few species of *Paravaejovis*, *Mesomexovis occidentalis*, and *Mesomexovis atenango*. The carinae of pedipalp manus in *Paravaejovis* and *Mesomexovis*, **n. gen.** are flat, obsolete and smooth with few exceptions in the last genus; in opposition most species of *Chihuahuanus*, **n. gen.** has some granulation on these carinae (figures 25C, D). *Chihuahuanus*, **n. gen.** is also intermediate in infuscation of the carapace, the tergites I–VII and the metasoma, half of the species have obscure markings on these areas, compared to *Paravaejovis*, only two species are infuscate and compared to *Mesomexovis*, **n. gen.** all species are heavily infuscate except *M. atenango*.

INCLUDED SPECIES: *Chihuahuanus bilineatus* (Pocock, 1898), **n. comb.**; *Chihuahuanus cazieri* (Williams, 1968), **n. comb.**; *Chihuahuanus crassimanus* (Pocock, 1898), **n. comb.**; *Chihuahuanus coahuilae* (Williams, 1968), **n. comb.**; *Chihuahuanus globosus* (Borelli, 1915), **n. comb.**; *Chihuahuanus glabrimanus* (Sissom and Hendrixson, 2005), **n. comb.**; *Chihuahuanus kovariki* (Soleglad and Fet, 2008), **n. comb.**; *Chihuahuanus russelli* (Williams, 1971), **n. comb.**

DISTRIBUTION: *Chihuahuanus*, **n. comb.** is endemic to the Chihuahuan desert from the Mexican states of Aguascalientes, Chihuahua, Coahuila, Durango, Nuevo León, Tamaulipas, Zacatecas and the U.S.A. states of Arizona, New Mexico, and Texas.

NATURAL HISTORY: *Chihuahuanus*, **n. comb.** inhabits most vegetation types from sand dunes to scrubland to pine-oak forest. Specimens have been collected under stones and at night using UV light. The localities in which specimens have been collected ranged in altitude 530–2380 m. Some species, such as *Chihuahuanus globosus* (Borelli, 1915), **n. comb.** have psammophilic adaptations, for instance the presence of setal combs (figure 28C), being more

accentuated in females. Although some species have the tendency to psammophilic ecomorphotype, most are lapidicolous, and thus are efficiently collected turning stones.

REMARKS: This genus was considered part of the first section of Hoffmann, then included within the *eusthenura* group and recently transferred to *Hoffmannius*. In chapter 1, *Hoffmannius* was consistently paraphyletic, thus it is synonymized with *Paravaejovis*. *Chihuahuanus* **n. gen.** is created to accommodate some of the species of *Paravaejovis* and *Kochius*.

MATERIAL EXAMINED: *Chihuahuanus bilineatus* (Pocock, 1898), **n. comb.**: **MEXICO: Tamaulipas:** *Municipio de Jaumave*: El Salto, between Palmillas and Jaumave, 23°21.4398'N 99°30.9408'W, 1115 m, 23.viii.2006, O. Francke, W.D. Sissom, G. Casper, T. Anton, V. Totti, H. Montaño, and C. Santibáñez, ♂, ♀ (CAS [ARA 1883]). *Chihuahuanus cazieri* (Williams, 1968), **n. comb.**: **MEXICO: Coahuila:** *Municipio de Cuatro Ciénegas*: Cuatro Ciénegas de Carranza, 0.5 km S of town, 740 m, 28.vii.1967, S.C. Williams and W.S. Brown, Holotype ♂ (CAS Type No. 10169); Cuatro Ciénegas de Carranza, 0.5 km SW, 740 m, 28.vii.1967, S.C. Williams and W.S. Brown, paratypes ♂, ♀ (AMNH). *Chihuahuanus coahuilae* (Williams, 1968), **n. comb.**: **MEXICO: Coahuila:** *Municipio de Cuatro Ciénegas*: Cuatro Ciénegas de Carranza, 0.5 km SW, 740 m, 28.vii.1967, Holotype ♂ (CAS Type No. 10170); Ojo de Agua, Ejido El Oso, 27°0.0558'N 102°0.2262'W, 1039 m, 19.vii.2006, O. Francke, W.D. Sissom, K. McWest, B. Hendrixson, S. Grant, A. Jaimes, and M. Córdova, 2 ♂, 2 ♀ (IBUNAM [ARA 0084]). *Chihuahuanus crassimanus* (Pocock, 1898), **n. comb.**: **U.S.A.: Texas:** *Hudspeth Co.*: Sierra Blanca, 9 miles W, 18.viii.1962, C.A. Triplehorn ♀ (OSAL). **MEXICO: Coahuila:** *Municipio de Cuatro Ciénegas*: Dunas de Yeso, 26°51.7650'N 102°10.47'W, 776 m, 18.vii.2006, O. Francke, W.D. Sissom, M. Córdova, A. Jaimes, and A. Ballesteros, ♂ (AMNH [ARA 1105]); Sierra San Marcos II, 26°54.7998'N 102°8.25'W, 761 m, 18.vii.2006, E. González, B.

Hendrixson, K. McWest, and S. Grant, ♀ (AMNH [ARA 1110]). **Durango**: *Municipio de Tlahualilo*: Tlahualilo de Zaragoza, ca. 15 km NW, junction Montes Claros-Tlahualilo de Zaragoza, 26°9.2418'N 103°31.28'W, 1107 m, 6.viii.2005, O. Francke, W.D. Sissom, K. McWest, C. Lee, H. Montaño, J. Ballesteros, and L. Jarvis, ♂ (AMNH [ARA 3170]). *Chihuahuanus glabrimanus* (Sissom and Hendrixson, 2005), **n. comb.**: **MEXICO: Guanajuato:** *Municipio de San Diego de la Unión*: San Diego de la Unión, 8 km S, 21°23.1444'N 100°53.4522'W, 2078 m, 28.vii.2006, E. González, M. Córdova, A. Jaimes, A. Ballesteros, and O. Francke, ♂ (AMNH). **San Luis Potosí:** *Municipio de Villa de Arista*: Villa de Arista, 10 km E, 22°30.760'N 100°45.499'W, 30.viii.2006, O. Francke, W.D. Sissom, G. Casper, T. Anton, V. Totti, H. Montaño, C. Santibáñez, and A. Ballesteros, 4 ♂, ♀ (CAS [ARA 01909]). *Chihuahuanus globosus* (Borelli, 1915), **n. comb.**: **MEXICO: Coahuila:** Gypsum dunes, 13 km SW town Cuatro Ciénegas de Carranza, 780 m, 27.vii.1967, S.C. Williams and W.S. Brown, Holotype ♂ of *V. gilvus* (CAS Type No. 10172). *Municipio de Cuatro Ciénegas*: Cuatro Ciénegas 16 mi. SW, W. point of Laguna Grande dunes, 9.viii.1968, S.C. Williams, M. Bentzien, J. Bigelow, and W.L. Minckley, ♂, ♀ (AMNH). *Municipio de Viesca*: Dunas de Bilbao, 25°25.5858'N 102°53.6538'W, 1098 m, 20.vii.2006, O. Francke, K. McWest, M. Córdova, A. Jaimes, and A. Ballesteros, 4 ♂, ♀ (CAS [ARA 1879]). *Chihuahuanus kovariki* (Soleglad and Fet, 2008), **n. comb.**: **MEXICO: Durango:** Hwy 137, marker km 4, between Once de Marzo and San Juan del Río, San Francisco de Lajas, 24°51.764'N 104°38.846'W, 1893 m, 10.viii.2005, O. Francke, W.D. Sissom, K. McWest, C. Lee, H. Montaño, J. Ballesteros, L. Jarvis, and C. Durán, ♂ (AMNH). Yerbanis, 80 mi NW Durango, 19.viii.1947, W.J. Gertsch, ♀ (AMNH). *Chihuahuanus russelli* (Williams, 1971), **n. comb.**: **U.S.A.: Arizona:** *Cochise Co.*: Portal, 4770 ft, 26.viii.1965, S.C. Williams and G. Fernald, Holotype ♂ (CAS Type No. 11471). **New**

Mexico: Rodeo, 10 mi N, 22.ix.1963, V. Roth, ♀ (AMNH). **Texas:** *Brewster Co.*: Big Ben National Park, Pine Canyon Trail, Chisos Mountains, 29.26784827°N 103.23708924°W, 1.viii.2008, W.D. Sissom, G. Casper, and T. Anton, 2 ♂ (AMNH).

Kochius Soleglad and Fet, 2008

Figures 14, 16B, C, 19, 20, 21, 26A, B, 29C, 31A, 32C, 33A, 36D; Table 7

Buthus punctipalpi Wood, 1983 = [*Kochius punctipalpi* (Wood, 1983)], type species, by original designation.

Vaejovis punctipalpi group (part): Williams, 1971a: 37; 1971b: 44; 1980: 80; Sissom and Francke 1985: 1; Sissom, 1989: 180; 1991a: 26; Stockwell, 1992: 408, 409; Sissom, 1993: 68; Lourenço and Sissom, 2000: 135; Sissom, 2000: 532, 548, 551; Armas and Martín-Frías, 2001: 1; Hendrixson, 2001: 1; Ponce-Saavedra and Sissom, 2004: 539, 541; Sissom and Hendrixson, 2005a: 131; 2005b: 35; Soleglad and Fet, 2005: 4, 6, 7; Graham and Fet, 2006: 7, 8, 10; Fet et al., 2006a: 9, tab. 1; 2006b: 8; 2006c: 7; Soleglad and Fet, 2006: 6, 26, tab. 2, 3; Graham and Soleglad, 2007: 11, 12; Francke and González-Santillán, 2007: 586, 587, 590; Soleglad et al., 2007: 134, 135; Soleglad and Fet, 2008: 1, 26, 57, 60, 94, 95, 102; McWest, 2009: tab. 1, 53, 89, 91, 93, 101–105, 108, 123, figs. 322–326.

Kochius Soleglad and Fet, 2008: 1, 3, 34, 38, 51, 53, 54, 57, 58, 60–69, 71, 73, 74, 76, 79, 91–96, 102, 104, figs. 192, 193–196, 204, tabs. 2, 4, 6, 9 (part); Ayrey and Soleglad, 2011: 1 (part).

DIAGNOSIS: *Kochius* can be differentiated from all syntropine genera by having the most noticeably elongate setae on the vesicle of the female and in some species both sexes, some setae being as long as or longer than aculeus with the terminus of setae thinner and translucent (figure 33A). *Kochius* has an elevated boss on mesosomal sternite VII, although other species of syntropine genera possess this feature, the configuration in this genus is unique, which is visibly more elevated and shaped like a truncate triangle in most species (figure 31A). Sternite V bears a second gland on the posterior medial aspect, although present in most taxa, this gland is more developed in this *Kochius* (figure 31A). The macrosetae of legs I–IV tend to be stouter and shorter than in other genera (figure 29C). The species of this genus possess strong granular carination on the pedipalp chela, especially the dorsal retrosubmedian (drs), the dorsal retrosubmedian accessory (drsa) and the retrolateral median (rlm) carinae (figures 26A, B). Unlike any genus, *Kochius* has the patellar retrolateral dorsosubmedian (rlds) and retrolateral median (rlm) carinae strongly granular. The configuration of the granulation of these carinae is also particular in that granules are arranged in a single row, whereas in other genera the granules tend to be grouped in clusters. Whereas the dorsal surface of the patella in *Kochius* is flat, in other genera is slightly lower than the dorsal prolateral (dpl) and dorsal retrolateral (drl) carinae. *Kochius* is also exceptionally shagreened notably on postergites I–VII and sternite VII (figure 31A), whereas other Syntropinae are less so. The intercarinal areas of metasomal segments I–V, pedipalp chela ventral surface and patellar retrolateral surfaces are densely matte in *Kochius* (figure 32C). *Kochius* has a typical granulation on the carapace, essentially is shagreened, however, instead or having scattered minute granules, this granulation is very dense. Additionally, the larger granules have a conic shape with tapered terminus (figure 36D). The trichobothrium *esb* is positioned at RD 6 and/or associated macroseta, the trichobothrium *Db* is

positioned on dorsal to dorsal retrolateral (drl) carina; and the trichobothrium V_4 is positioned on ventral surface. This genus possesses pedipalp manus retrolateral median (rlm) and retrolateral ventral submedian (rlvs) strong granular to costate carinae. This character is shared with *Thorellius*, *Chihuahuanus cazieri* (Williams, 1968), **n. comb.**; *Chihuahuanus crassimanus* (Pocock, 1898), **n. comb.**; *Chihuahuanus russelli* (Williams, 1971), **n. comb.**; and *Chihuahuanus kovariki* (Soleglad and Fet, 2008), **n. comb.**, but some of these taxa have lower and smoother carinae. The abovementioned four species of *Chihuahuanus*, **n. gen.** are similar to *Kochius* in the possession of an elevated boss on mesosomal sternite VII but are readily separated from *Kochius* by means of the absence of a fusiform small whitish glandular area at the base of the aculeus on dorsal surface of telson in adult male and female, which is present in all species of *Chihuahuanus*, **n. gen.** and absent in *Kochius*. Additionally, those *Chihuahuanus*, **n. gen.** species lack elongated setae on the telson vesicle in females and patellar retrolateral dorsosubmedian (rlds) and retrolateral median (rlm) carinae less developed. *Kochius* has in common with *Thorellius* the robust pedipalp manus and in general strong carination on manus and metasoma (figures 25A, B, 26A, B), but can be separated by the considerably total size in *Thorellius* and by having less granular pedipalp carinae on the chela and patella with the granulation arranged into clusters of granules instead of a single row of denticles. This last character can also be used to separate *Chihuahuanus cazieri* (Williams, 1968), **n. comb.**; *Chihuahuanus crassimanus* (Pocock, 1898), **n. comb.**; *Chihuahuanus russelli* (Williams, 1971), **n. comb.**; and *Chihuahuanus kovariki* (Soleglad and Fet, 2008), **n. comb.** from *Kochius*.

INCLUDED SPECIES: *Kochius barbatus* (Williams, 1971), **n. stat.**; *Kochius bruneus* (Williams, 1970); *Kochius cerralvensis* (Williams, 1971), **n. stat.**; *Kochius insularis* (Williams, 1971); *Kochius hirsuticauda* (Banks, 1910); *Kochius magdalensis* (Williams, 1971); *Kochius*

punctipalpi (Wood, 1863); *Kochius sonorae* (Williams, 1971); and *Kochius villosus* (Williams, 1971), **n. stat.**

DISTRIBUTION: *Kochius* **n. gen.** occurs in the Baja California peninsula, the Sonora, Colorado and Mojave deserts, in the Mexican states of Baja California, Baja California Sur, and Sonora, and U.S. states of Arizona, California, and Nevada.

REMARKS: It was found that *Kochius barbatus* (Williams, 1971), **n. stat.**; *Kochius cerralvensis* (Williams, 1971), **n. stat.**; and *Kochius villosus* (Williams, 1971), **n. stat.** possess sufficient apomorphies to be recognized as valid species (chapter 1). However, *Kochius bruneus loretoensis* (Williams, 1971) shared most apomorphic characters with *Kochius villosus* (Williams, 1971), **n. stat.** and thus the following synonym is proposed: *Kochius villosus* (Williams, 1971), **n. stat.** = *Kochius bruneus loretoensis* (Williams, 1971) **syn. n.**

NATURAL HISTORY: The altitude at which *Kochius* has been collected ranged from 0–1350 m. This genus has little evident adaptation to a specific substratum. Although, it has been suggested that the species burrow in different types of soils (Sissom, 2000), there is little morphological evidence to support this. *Kochius* has typical tarsi without elongated sclerites or setation as in psammophilous; the finger of the chelicerae are not enlarged, the absence of short and robust legs and telotarsi ungues as well as the absence of stout spiniform setae on tarsi as in pelophilous are observed. Although, it can be argued that *Kochius* species possess robust chelae, which is particular to pelophilous species, the chela never reaches the "crab-like" appearance shown in other true pelophilous genus such as *Diplocentrus* (Peters, 1861). It is more likely to assume that *Kochius* is lapidicolous, which are species characterized by shelter under rocks or other available debris on the ground.

MATERIAL EXAMINED: *Kochius barbatus* (Williams, 1971), **n. stat.**: **MEXICO: Baja California Sur:** *Municipio de La Paz*: Las Cruces, 25 ft, 29.vii.1968, S.C. Williams and M.A. Cazier, Holotype ♀ of *Vaejovis punctipalpi barbatus* (CAS Type No.10469), paratype ♀ (AMNH); Las Cruces, 4 km NW, 24°13.5108'N 110°7.41'W, 31 m, 24.vi.2008, H. Montaño and E. González, ♂ (IBUNAM [ARA 2274]); ♂ (AMNH [ARA 2884]). *Kochius bruneus* (Williams, 1971): **MEXICO: Baja California Sur:** *Municipio de Comondú*: San José de Comondú, 5 mi SW, 1000 ft, 2.vii.1968, S.C. Williams and M.A. Cazier, Holotype ♂ (CAS Type No.10410); San José de Comondú, 30 km N, between Rosarito and San Isidro, 26°21.2520'N 111°50.10'W, 258 m, 27.vi.2008, H. Montaño and E. González, 2 ♂, 2 ♀ (AMNH [ARA 2854]). *Kochius cerralvensis* (Williams, 1971), **n. stat.**: **MEXICO: Baja California Sur:** *Municipio de La Paz*: Isla Cerralvo, Bahia Limona, 31.v.1969, S.C. Williams, Holotype ♂ (CAS Type No.11470); Isla Cerralvo, Piedras Gordas, 17.v.1970, S.C. Williams and V.F. Lee, paratypes ♂, ♀ (AMNH); Isla Cerralvo, SW side, 24°10.9332'N 109°53.2332'W, 50 m, 27.v.2008, E. González and I.G. Nieto, ♂, ♀ (AMNH [ARA 2880]). *Kochius hirsuticauda* (Banks, 1910): **U.S.A.: Arizona:** *Yuma Co.*: Palm Canyon, Kofa Mountains, 12.x.1968, A. Cazier et al., ♂, ♀ (AMNH). **California:** *San Diego Co.*: Anza-Borrego Desert State Park, Pinyon Mountain Road, ca. 4.8 km towards Pinyon Mountain Valley from junction with Route S2, 33°03.043'N 116°23.270'W, 870 m, 30.viii.2005, R. Mercurio and L. Prendini, ♂, ♀ (AMNH). *Kochius insularis* (Williams, 1970): **MEXICO: Baja California Sur:** Isla Partida, Central Valley, 10.vii.1968, S.C. Williams, M. Bentzien, and B. Fox, Holotype ♂ (CAS Type No.10422). Allotype (CAS). *Municipio de La Paz*: Isla Espíritu Santo, Playa Bonanza, 24°27.3636'N 110°18.47'W, 50 m, 31.v.2008, E. González and I.G. Nieto, ♂, ♀ (AMNH [ARA 2875]); ♂, ♀ (IBUNAM [ARA 2260]). *Kochius magdalensis* (Williams, 1971): **MEXICO: Baja California Sur:** *Municipio de La Paz*: La Paz, 75 mi NW, 200 ft,

4.vii.1968, S.C. Williams and M.A. Cazier, Holotype ♂ (CAS Type No.10468); El Pilar, ca. 20 km NE of Las Pocitas, 24°28.7616'N 111°1.12'W, 92 m, 25.vi.2008, H. Montaño and E. González, ♂, ♀ (AMNH [ARA 2874]); ♂, ♀ (IBUNAM [ARA 2259]); junction Route 1, 5 km N, and road to Juan de la Costa, 24°08.500'N 110°28.566'W, 30 m, 9.vi.2005, E. González, W.E. Savary, R. Mercurio, and L. Prendini, ♂ (AMNH). *Kochius punctipalpi* (Wood, 1863): **MEXICO: Baja California Sur:** *Municipio de Los Cabos*: Santiago, 23°26.4'N 109°43.5666'W, 225 m, 9.vii.2004, O. Francke, E. González, and A. Valdez, ♂, ♀ (AMNH [ARA 1471]); San José del Cabo, ca. 10 km S off Route 1, 23°1.7622'N 109°43.49'W, 50 m, 10.vii.2005, W.E. Savary, E. González, and R. Mercurio, ♂, ♀ (AMNH [ARA 1473]). *Municipio de La Paz*: La Paz, 15 km SE, 24°3.7332'N 110°10.53'W, 476 m, 8.vii.2004, O. Francke, E. González, and A. Valdez, ♂ (AMNH [ARA 1472]). *Kochius sonorae* (Williams, 1971): **MEXICO: Sonora:** Alamos, 11.2 mi W, 23.i.1966, R. Winokur, C. Mays, and M.A. NiKerson, Holotype ♂ (CAS Type No.10472). *Municipio de Navojoa*: Microwave Cerro Prieto, 15 km E of Navojoa, 27°4.9830'N 109°17.4498'W, 375 m, 23.viii.2009, E. González and J.L. Castelo, ♂, ♀ (AMNH [ARA 3157]); Navojoa, 32 km S, 12.ix.1966, J. and W. Ivie, ♂, ♀ (AMNH). *Municipio de Soyopa*: Sierra el Encinal, 9 km from Hwy MEX 16 on dirty road to El Encinal, 28°35.4120'N 109°27.1476'W, 380 m, 24.vi.2006, E. González and P. Berea, 2 ♂ (AMNH [ARA 2539]); dirty road between El Encinal and Tonichi, 28°33.2388'N 109°21.64'W, 645 m, 1.vii.2006, E. González and P. Berea, 2 ♂ (AMNH [ARA 3015]). *Kochius villosus* (Williams, 1971), **n. stat.**: **MEXICO: Baja California Sur:** *Municipio de Comondú*: San Miguel Comondú, 5–10 mi SW, 800–1000 ft, 3.vii.1968, S.C. Williams and M.A. Cazier, Holotype ♂ of *V. bruneus villosus* (CAS Type No.10467), paratypes ♂, ♀ (AMNH). *Municipio de La Paz*: San Evaristo, 10–15 km S, dirty road, 24°47.7570'N 110°40.5018'W, 50 m, 12.vii.2008, H. Montaño and E. González, ♂

(IBUNAM [ARA 2275]). *Municipio de Loreto*: Juncalito, 25°49.8918'N 111°19.6908'W, 5 m, 20.v.2004, R. Mercurio and M. Nishiguchi, ♂, ♀ (AMNH [ARA 3132]). *Municipio de Mulegé*: San Ignacio, 152 m, 24.vi.1968, S.C. Williams and M.A. Cazier, Holotype ♂, Allotype of *V. bruneus loretoensis* (CAS Type No.10466), paratypes ♂, ♀ (AMNH).

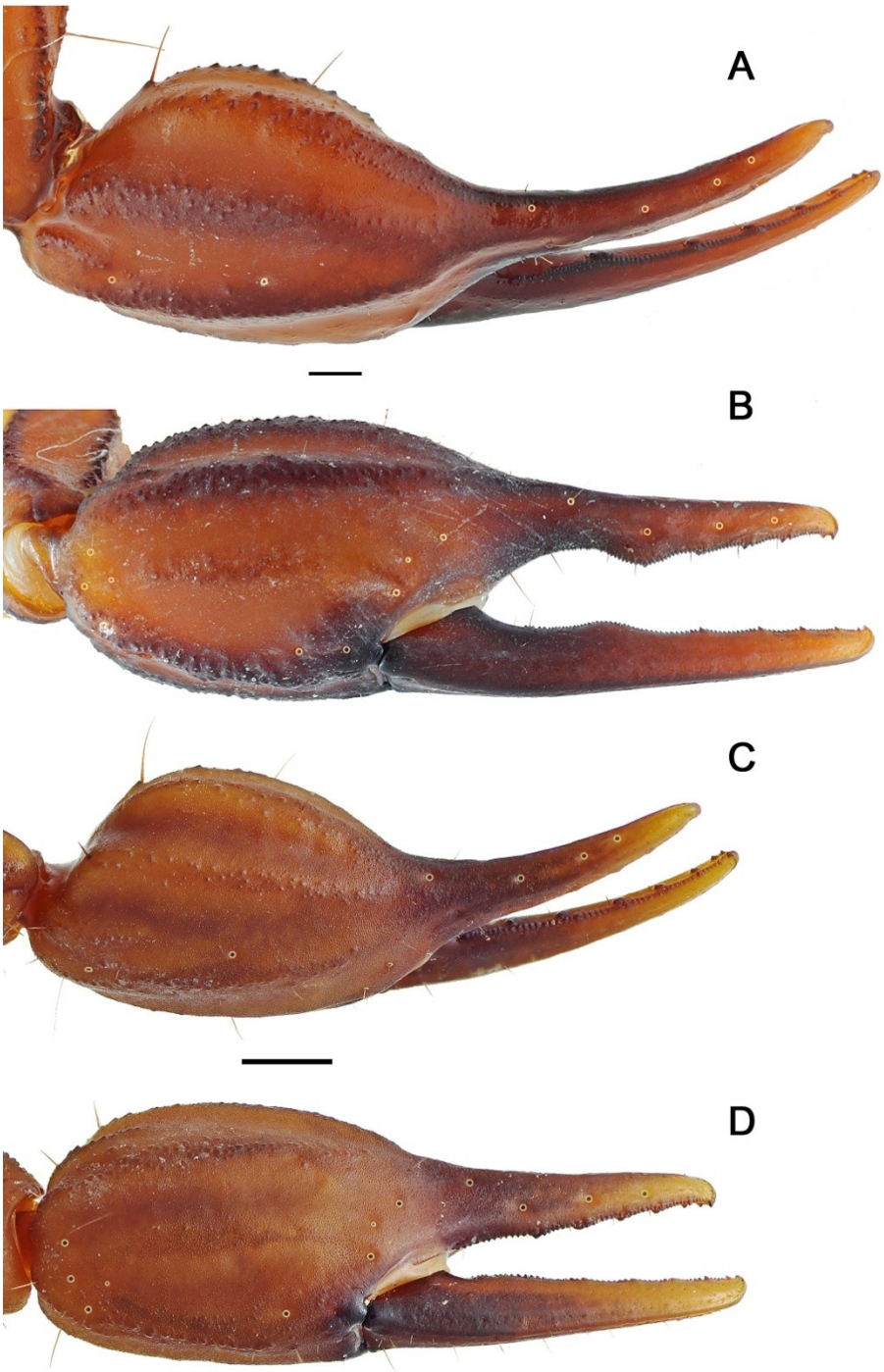


Figure 25. *Thorellius* Soleglad and Fet, 2008 and *Chihuahuanus*, **n. gen.**, dextral dorsal and retrolateral surfaces of pedipalp chelae. **A**, **B**. *Thorellius intrepidus* (Thorell, 1876), ♂ (AMNH). **C**, **D**. *Chihuahuanus crassimanus* (Pocock, 1898), ♂ (AMNH). Scale bar = 1 mm.

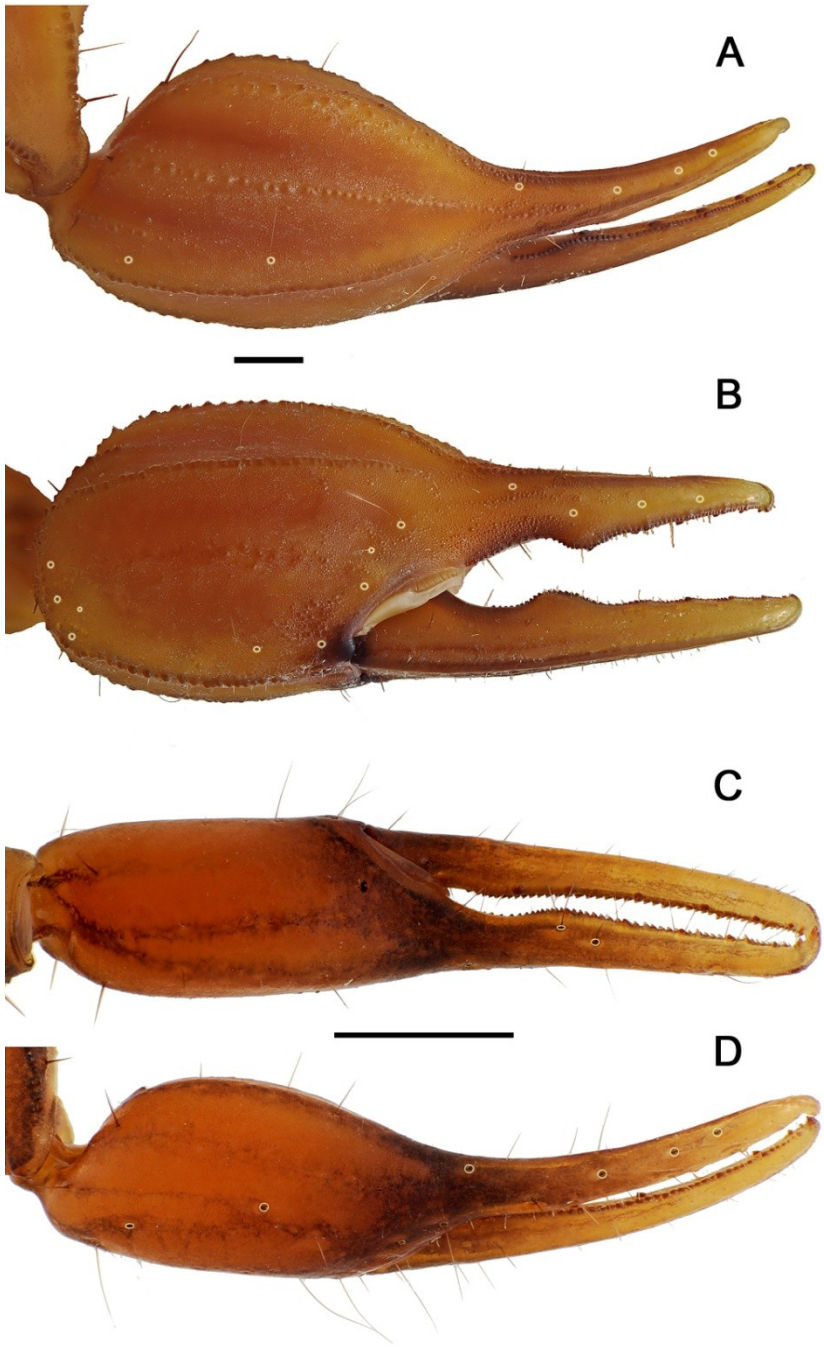


Figure 26. *Kochius* Soleglad and Fet, 2008, dextral dorsal and retrolateral surfaces of pedipalp chelae and *Kuarapu* Francke and Ponce-Saavedra, 2010, dextral prolateral and dorsal pedipalp chelae. **A**, **B**. *Kochius punctipalpi* (Wood, 1863), ♂ (AMNH). **C**, **D**. *Kuarapu purhepecha* Francke and Ponce-Saavedra, 2010, paratype ♂ (AMNH). Scale bar = 1 mm.

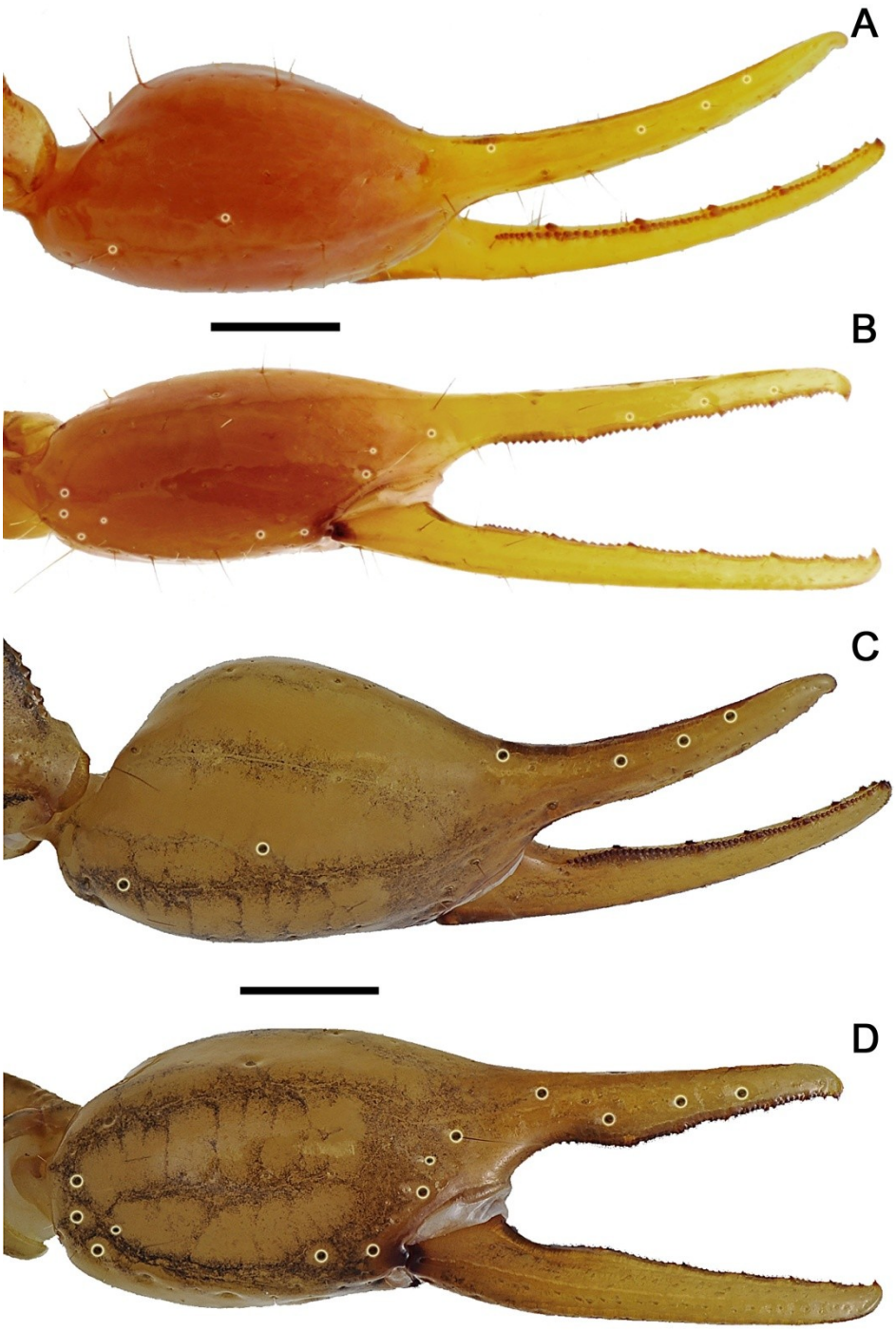


Figure 27. *Paravaejovis* Williams, 1980 and *Mesomexovis*, **n. gen.**, dextral dorsal and retrolateral surfaces of pedipalp chelae. **A**, **B**. *Paravaejovis hoffmanni* (Williams, 1970), ♂ (AMNH). **C**, **D**. *Mesomexovis punctatus* (Karsch, 1879), ♂ (AMNH). Scale bar = 1 mm.

Konetontli, **n. gen.**

Figures 15, 22, 33B, C, 35B, 36C; Table 7

Vaejovis pattersoni Williams and Haradon, in Williams, 1980 = [*Konetontli pattersoni* (Williams and Haradon, in Williams, 1980), **n. comb.**] type species, here designated.

Vaejovis eusthenura group (part): Williams, 1980: 65, fig. 56F, 69, 75, tab. 1, 2; 1986: 358; Sissom, 2000: 530, 531; Francke and Ponce-Saavedra, 2005: 67.

Vaejovis mexicanus group (part): Sissom 2000: 542; Soleglad and Fet, 2008: 1, 2, 5, 13, 26, 37, 40, 46, 71, 73, 89, 99, 100, fig. 126, 196, 207, tab. 2, 9.

ETYMOLOGY: The generic name is a noun in apposition, masculine in gender, taken from the Nahuatl language, meaning 'infant' or 'small creature', and referring to the small body size of the species in this genus.

DIAGNOSIS: *Konetontli*, **n. gen.** has a spiniform subaculear tubercle, sometimes with smaller accessory tubercles running along median carinae figures (33B, C). The tubercle tip is rounded and slightly compressed laterally. Total body length ranges from 14 to 25 mm in males and 15 to 25 mm in females. Sclerites in *Konetontli*, **n. gen.** are mostly matte. Metasomal segments I–III wider than long in most species, but at least I and II always wider than long. Tergites infuscated throughout. Chela with trichobothrium *ib* proximal to associated macroseta where RD 7 is present on other taxa and *it* between RD 6 and the associated macrosetae in RD 7 position. It is also distinctive that several species of *Konetontli*, **n. gen.** have metasomal ventral lateral V carinae obsolete (figure 35B). Typically, this genus has most of the integument matte, being more evident on the carapace (figure 36C). This genus shares with *Maaykuyak waueri* (Gertsch and Soleglad, 1972), **n. com.** and *Paravaejovis pumilis* Williams, 1980 the presence of

one pair of ventrodistal spinules on the telotarsi (figures 29A, B). From *Maaykuyak*, **n. gen.** is readily separated by the absence of subaculear tubercle and its presence in *Konetontli*, **n. gen.** From *P. pumilis* differ by being immaculate and *Konetontli*, **n. gen.** being infuscated throughout. Another character shared with *Maaykuyak*, **n. gen.** is a short smooth costa on the distal quarter on the metasomal median lateral carinae of segment V, all other Syntropinae have at least on the distal third granular carinae or absent altogether. *Konetontli*, **n. gen.** and *Mesomexovis*, **n. gen.** share the profuse infuscation of carapace and sternites I–VII and the partially to completely infuscate mesosomal sternite VII, but *Mesomexovis*, **n. gen.** has larger total size.

INCLUDED SPECIES: *Konetontli pattersoni* (Williams and Haradon, in Williams, 1980), **n. comb.**; *Konetontli chamelaensis* (Williams, 1986), **n. comb.**; *Konetontli acapulco* (Armas and Martín-Frías, 2001), **n. comb.**; *Konetontli nayarit* (Armas and Martín-Frías, 2001), **n. comb.**; and *Konetontli kuarapu* (Francke and Ponce-Saavedra, 2003), **n. comb.**

DISTRIBUTION: *Konetontli*, **n. gen.** is endemic to Mexico presenting a disjunct distributio. It is found along the Pacific coast, Sierra Madre del Sur, Balsas Depression and on the Baja California peninsula, in the states of Baja California Sur, Colima, Guerrero, Jalisco, Michoacán, and Nayarit.

NATURAL HISTORY: Most species of *Konetontli*, **n. gen.** prefer low altitudes, inhabiting tropical deciduous forest, but *Konetontli pattersoni* (Williams and Haradon, in Williams, 1980), **n. comb.** has established in the oak-pine forest of the Sierra de la Laguna, Baja California Sur. *Konetontli*, **n. gen.** has been collected in altitudes that ranged from 0–1800 m. These species are associated with sites where dense leaf litter has been accumulated (González-Santillán, 2004). However two undescribed species have been collected inside caves. The small size and cryptic coloration suggest that some species of this genus prefers humicolous habitats, although some

species have been collected under rocks and other debris in very humid substratum (Armas and Martín-Frías, 2001, Baldazo-Monsivais, 2003). These species prefer humicolous, lapidicolous or troglophilous habitats, in which the common denominator is the requirement for high relative humidity.

REMARKS: Armas and Martín-Frías (2001) described two species of vaejovid scorpions with subaculear tubercle. Although they mentioned two species described earlier (Haradon, 1974; Sissom, 1993), they failed to mention another two species described afterwards which also have a subaculear tubercle (Williams, 1980, 1986). The only other species with subaculear tubercle described recently is *K. kuarapu* (Francke and Ponce-Saavedra, 2005). Although, the subaculear tubercle seemed a good character to associate these species, Sissom (1993) noted that the species described by Haradon (1974) and Sissom (1993) appear more closely related to *Serradigitus*, but deferred assigning them to this genus. Recently, Soleglad and Fet (2006) created *Wernerius* to accommodate these species and transferred the remaining five to the *mexicanus* group (Soleglad and Fet, 2008). These species are here transferred to *Konetontli*, **n. gen.** The phylogenetic analyses in chapter 1 indicate that the subaculear tubercle is not a reliable character, and evolved at least twice in Vaejovidae, once in Syntropinae with *Konetontli*, **n. gen.** and once in Stahnkeini with *Wernerius.*

MATERIAL EXAMINED: *Konetontli acapulco* (Armas and Martín-Frías, 2001): **MEXICO: Guerrero:** Colonia Francisco Villa, Acapulco, 25.v.1999, E. Martín and A. Losoya, Holotype ♂ (IBUNAM). *Municipio de José Azueta*: Colonia Agua de Correa, 17°38.6982'N 101°31.0932'W, 72 m, 1.viii.2008, O. Francke, H. Montaño, J. Ponce, and A. Quijano, ♀ (IBUNAM). *Konetontli chamelaensis* (Williams, 1986): **MEXICO: Jalisco:** *Municipio de La Huerta*: Estación de Biología de Chamela, UNAM 10–13.vii.1985, S.C. Williams, Holotype ♂, Allotype (CAS Type

No. 15744); 1.vi.1994, N. Martigera, ♀ (IBUNAM); 31.v.1990, N. Martínez, (IBUNAM); 19°29.875'N 105°02.608'W, 97 m, 30.viii.2007, O. Francke et al., ♀ (AMNH [LP 7675]); 19°29.8752'N 105°2.6082'W, 24.x.2005, E. González and J.L. Castelo, 2 ♂ (IBUNAM); Rincón de Ixtlán, Chamela, 19°32'N 105°4'W, 25.x.2005, E. González, ♀ (IBUNAM). *Konetontli kuarapu* (Francke and Ponce-Saavedra, 2005): **MEXICO: Michoacán:** *Municipio de Parácuaro*: La Batea, 19°07'54"N 102°07'48"W, 361 m, 21.x.2000, J. Ponce et al., Holotype ♂ (IBUNAM); ♂ (AMNH); El Valle, 19°8.84883'N 102°13.222833'W, 21.x.2000, J. Ponce et al., ♂, ♀ (IBUNAM). *Konetontli nayarit* (Armas and Martín-Frías, 2001): **MEXICO: Nayarit:** *Municipio de Compostela*: Felipe Carrillo Puerto, 4 km NE, 16.vii.1999, J.A. Fernández, Holotype ♂ (IBUNAM). *Municipio de El Nayar*: Río Santiago, 16.v.1996, E. Barrera, ♀ (AMNH). *Konetontli pattersoni* (Williams and Haradon, 1980): **MEXICO: Baja California Sur:** *Municipio de Los Cabos*: Sierra de la Laguna, 23°14.2848'N 109°57.1314'W, 782 m, 10.vii.2004, A. Valdez, E. González, O. Francke, and W.E. Savary, ♀ (AMNH [ARA 3082]); 23°41.1666'N 109°56.6832'W, 850 m, 9.vii.2004, A. Valdez and E. González, ♀ (AMNH [ARA 3083]); Sierra de la Laguna, nucleus zone, 23°33.0162'N 109°59.4498'W, 1800 m, 20.vii.2006, A. Valdez, E. González, O. Francke, and W.E. Savary, 2 ♂ (AMNH [ARA 3064]); La Laguna, Sierra de la Laguna, 1–3.viii.1974, R.M. Haradon, V.F. Lee, and W.E. Savary, Holotype ♂, Allotype (CAS Type No. 12250).

Kuarapu Francke and Ponce-Saavedra, 2010

Figures 15, 26C, D, 32B; Table 7

Kuarapu purhepecha Francke and Ponce-Saavedra, 2010, type species, by monotypy.

Kuarapu purhepecha: Francke and Ponce-Saavedra, 2010; Ayrey, 2011: 1.

DIAGNOSIS: *Kuarapu* has a heavily infuscated integument with the cheliceral manus dorsal surface, the dorsal median (dm) carina of tergites I–VII, the metasomal segments I–V dorsal and ventral surfaces, the ventral surface and dorsal median (dm) carinae of the telson infuscated. *Kuarapu* possess all surfaces of the metasomal segments I–V covered in matte granulation (figure 32B). This genus has the anterior margin of the carapace straight. The carapace median ocular tubercle is shallow, protruding slightly and the superciliary carinae are lower than ocelli. The chela movable finger dentition has five subrows of median denticles (MD) and five retrolateral denticles (RD). Although the chela fixed and movable fingers have a terminal denticle larger than preceding denticles (figures 26C, D), they are not comparable to those of *Serradigitus*. The chelal has obsolete carinae. The pedipalp fingers are elongate with trichobothrium *ib* positioned at RD 6 and associated macroseta and trichobothrium *it* positioned between RD 5 and RD 6, and associated macrosetae (figure 26C). This character is only shared with *Vizcaino*, **n. gen.** from which is readily distinguished by having basitarsi I–III dorsal and retrolateral dorsal setae in two separate rows, not arranged in a sublinear row and by having a heavily infuscated integument not being essentially immaculate. *Kuarapu* has metasomal ventral submedian (vsm) and ventral lateral (vl) carinae I–IV finely granular, and a glandular elevated boss on sternite VII; resembling *Kochius*, from which differ by having slender and elongated pedipalp chela manus, not robust and strongly carinated pedipalp chela manus. *Kuarapu* also shares with *Kochius* and *Thorellius* the position of the trichobothrium *Dt* at midpoint on the manus. Both *Kochius* and *Thorellius* differ markedly from *Kuarapu* in possessing of very robust pedipalp manus and in general a robust habitus as opposed to slim and elongated manus and attenuated habitus.

INCLUDED SPECIES: *Kuarapu purhepecha* Francke and Ponce-Saavedra, 2010.

DISTRIBUTION: *Kuarapu* is endemic to the Balsas Depression in the state of Michoacán, Mexico.

NATURAL HISTORY: The ecomorphotype of *Kuarapu* appears to have converged with *Serradigitus*, *Franckeus* + *nigrescens* (the former *nitidulus* group of *Vaejovis*) and *Syntropis*. These taxa have attenuated pedipalps, well-developed superciliary carinae of the medial ocular tubercle and dorsoventral compression of the body. Characteristically, these scorpions move rapidly when on the surface disappearing inside the cracks or rocky crevices. The only locality were *Kuarapu* has been collected is an altitude of 248 m. The authors reported that *Kuarapu* was collected at night using UV light detection on the surfaces of road-cuts (Francke and Ponce-Saavedra, 2010).

MATERIAL EXAMINED: *Kuarapu purhepecha* Francke and Ponce-Saavedra, 2010: **MEXICO: Michoacán:** *Municipio de La Huacana*: El Vado, km 17 road Zicuaran-Churumuco, 18°48.8520'N 101°54.9558'W, 248 m, 30.vi.2008, O. Francke, H. Montaño, J. Ponce, and A. Quijano, paratypes ♂, ♀ (AMNH).

Maaykuyak, **n. gen.**

Figures 12, 29B, 30B; Table 7

Vaejovis vittatus Williams, 1970 = [*Maaykuyak vittatus* (Williams, 1970), **n. comb.**] type species, here designated.

Vejovis spinigerus group (part): Gertsch and Soleglad, 1972: 605.

Vaejovis eusthenura group (part): Williams, 1980: 55; Sissom and Francke 1985: 1; Sissom, 1991a: 26; Stockwell, 1992: 408, 409; Sissom, 1993: 68; Lourenço and Sissom, 2000: 135; Sissom, 2000: 530, 532, 551; Armas and Martín-Frías, 2001: 8; McWest, 2009: 8, 48, 52, 56, 61, 64, 98, 101–103, 108, tab. 1; Ponce-Saavedra and Sissom, 2004: 541; González-Santillán, 2004: 29; Francke and Ponce-Saavedra, 2005: 67; Sissom and Hendrixson, 2005a: 131; 2005b: 33, 34; Graham and Fet, 2006: 8, 9; Fet et al., 2006a: fig., 17 tab. 1, 3; 2006b: 8; 2006c: 7; Graham and Soleglad, 2007: 9, 11, 12; Soleglad et al., 2007: 134, 135; Santibáñez-López and Sissom, 2010: 49.

Hoffmannius: Soleglad and Fet, 2008: 1, 26, 57, 60, 89, 91, 96, 102 (in part); Ayrey and Soleglad, 2011: 1.

ETYMOLOGY: *Maaykuyak*, **n. gen.** is a noun in apposition, masculine in gender, meaning 'god of the warriors' in the language of the Kiliwa people from northern Baja California.

DIAGNOSIS: Adult males with oval, moderate whitish glandular area on dorsal surface of telson, in adult females the glandular area is reduced (figure 30B). Chela, dorsal median (dm), dorsal prolateral (dpl), dorsal retrolateral (drl), dorsal retrosubmedian (drs) and prolateral dorsal (pld) carinae obsolete, without ornamentation from adjacent intercarinal surfaces. Dorsal intercarinal spaces of the chela rounded lacking depressions. Metasomal segment V with dorsal median (dm) carina partially infuscated, pigmentation not extending full length of segment. Lateral surfaces of metasomal segment I–V glabrous. Trichobothrium *et*, positioned between RD 3 and RD 4, closer to RD 4. Telotarsus IV with two retrolateral ventral macrosetae. This genus shares with *Konetontli* the basitarsus III with five fully developed retrolateral ventral setae, while other genera bear a minimum of six fully developed retrolateral ventral macrosetae (figure 29B). The total size in *M. waueri* is also similar to that of *Konetontli*, **n. gen.**, being one of the smallest

scorpions within the subfamily. The two genera can be easily recognized by the presence of a well-developed subaculear tubercle in *Konetontli*, **n. gen.** and the absence in *Maaykuyak*, **n. gen.** General body infuscation with pattern of markings similar to most species of *Mesomexovis*, **n. gen.**, but can readily be distinguished from them by de presence of the glandular area on the dorsal surface of the telson and smaller total length.

INCLUDED SPECIES: *Maaykuyak vittatus* (Williams, 1970), **n. comb.** and *Maaykuyak waueri* (Gertsch and Soleglad, 1972), **n. comb.**

DISTRIBUTION: *Maaykuyak*, **n. gen.** presents a disjunct distribution. *Maaykuyak vittatus*, **n. comb.** is distributed in the subtropical arid regions of Baja California Sur whereas *Maaykuyak waueri*, **n. comb.** occupies the northern ranges of the Chihuahuan desert. It appears that this genus is a relict that underwent vicariance promoted by the uplifting of the Sierra Madre Occidental and posteriorly the separation of the Baja California peninsula. In Mexico, the genus is found in the states of Baja California Sur, Chihuahua, Coahuila, Durango, and Nuevo León, and in the U.S.A., only in Texas.

NATURAL HISTORY: The two species adapted to different environments during their evolution. *Maaykuyak vittatus*, **n. comb.** has been collected in altitudes ranging 0–850 m. In contrast, *Maaykuyak waueri*, **n. comb.** is adapted to altitudes of 620–1922 m. Although these syntropines inhabit deserts, they prefer mesic areas close to vegetated spots or oases and because no adaptation to substrate is evident, they could be lapidicolous species. Although they are frequently collected using UV light at night, they can be found during the day turning rock or disturbing leaf litter.

REMARKS: These two species were assigned to the *eusthenura* group (Williams, 1980; Sissom, 2000) and recently transferred to *Hoffmannius* by Soleglad and Fet (2008). The new

genus created here accommodates these two species that are distinguished by the presence of a glandular patch on the dorsal surface of the vesicle of the telson, unique to the genus.

MATERIAL EXAMINED: *Maaykuyak vittatus* (Williams, 1970): **MEXICO: Baja California Sur:** *Municipio de Comondú*: San Miguel Comondú, 5 mi SW, 1000 ft, 2.vii.1968, S.C. Williams and M.A. Cazier, Holotype ♂ (CAS Type No. 10430); San Miguel Comondú, 8–16 km SW, 304 m, 3.vii.1968, S.C. Williams and M.A. Cazier, paratypes ♂, ♀ (AMNH). *Maaykuyak waueri* (Gertsch and Soleglad, 1972): **U.S.A.: Texas:** *Brewster Co.*: Big Ben National Park, The Basin, Chisos Mountains, 28.ix.1950, Holotype ♀ (AMNH). **MEXICO: Durango:** *Municipio de Tlahualilo*: Hwy 49, at deviation Montes Claros-Tlahualilo de Zaragoza, 26°9.242'N 103°31.284'W, 1107 m, 6.viii.2005, O. Francke, W.D. Sissom, K. McWest, C. Lee, H. Montaño, J. Ballesteros, L. Jarvis, and C. Durán, ♂, ♀ (AMNH).

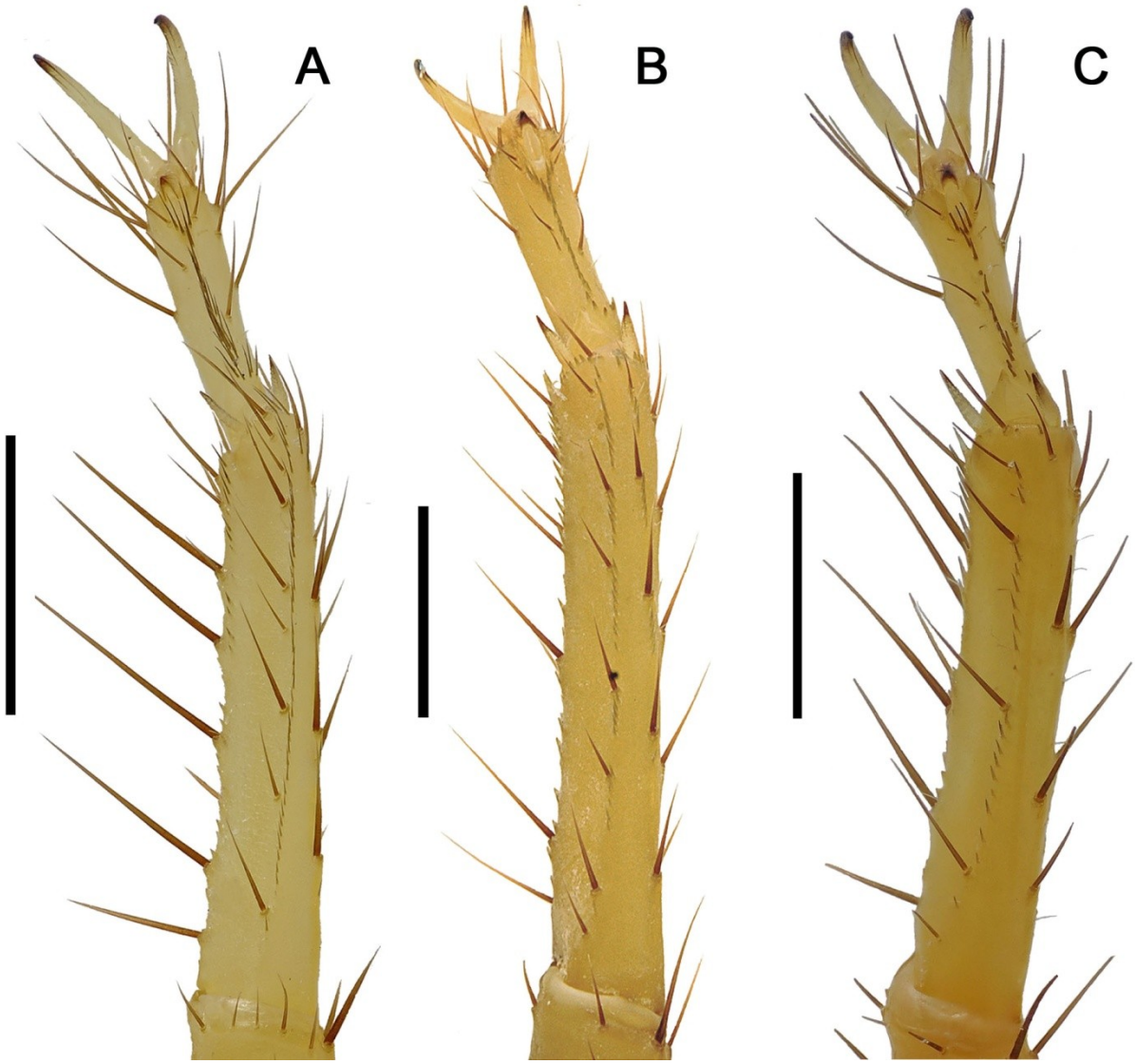


Figure 28. *Vizcaino*, **n. gen.**, *Thorellius* Soleglad and Fet, 2008, and *Chihuahuanus*, **n. gen.**, ventral and retrolateral ventral aspect of basitarsus and ventral aspect of telotarsus III. **A**. *Vizcaino viscainensis* (Williams, 1970), ♂ (AMNH). **B**. *Thorellius intrepidus* (Thorell, 1876), ♂ (AMNH). **C**. *Chihuahuanus globosus* (Borelli, 1915), ♂ (AMNH). Scale bar = 1 mm.

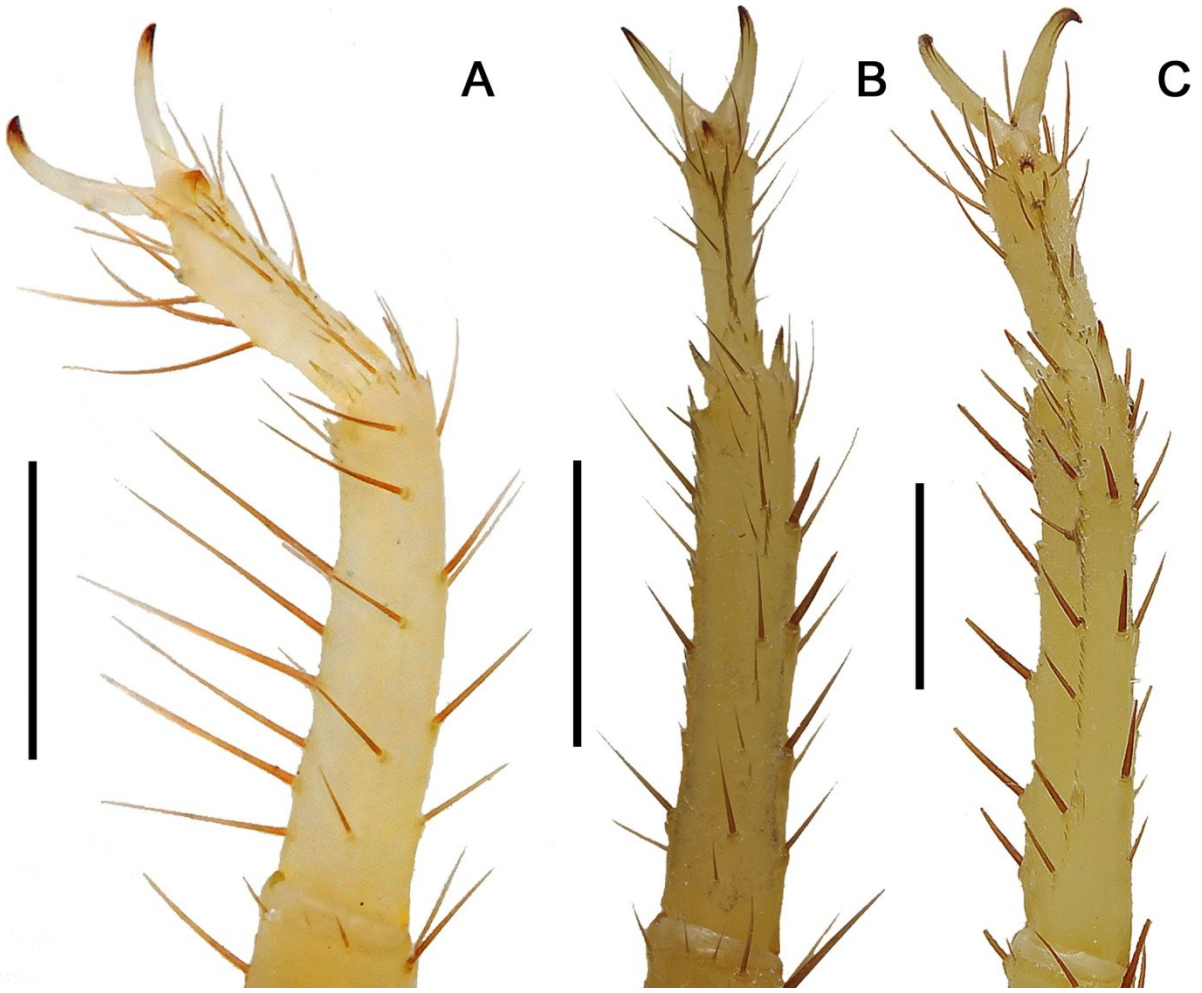


Figure 29. *Paravaejovis* (Williams, 1980), *Maaykuyak*, **n. gen.**, ventral and retrolateral ventral aspect of basitarsus and ventral aspect of telotarsus III. **A**. *Paravaejovis pumilis* (Williams, 1980), ♂ (AMNH). **B**. *Maaykuyak waueri* (Gertsch and Soleglad, 1972), ♂ (AMNH). **C**. *Kochius punctipalpi* (Wood, 1863), ♂ (AMNH). Scale bar = 1 mm.

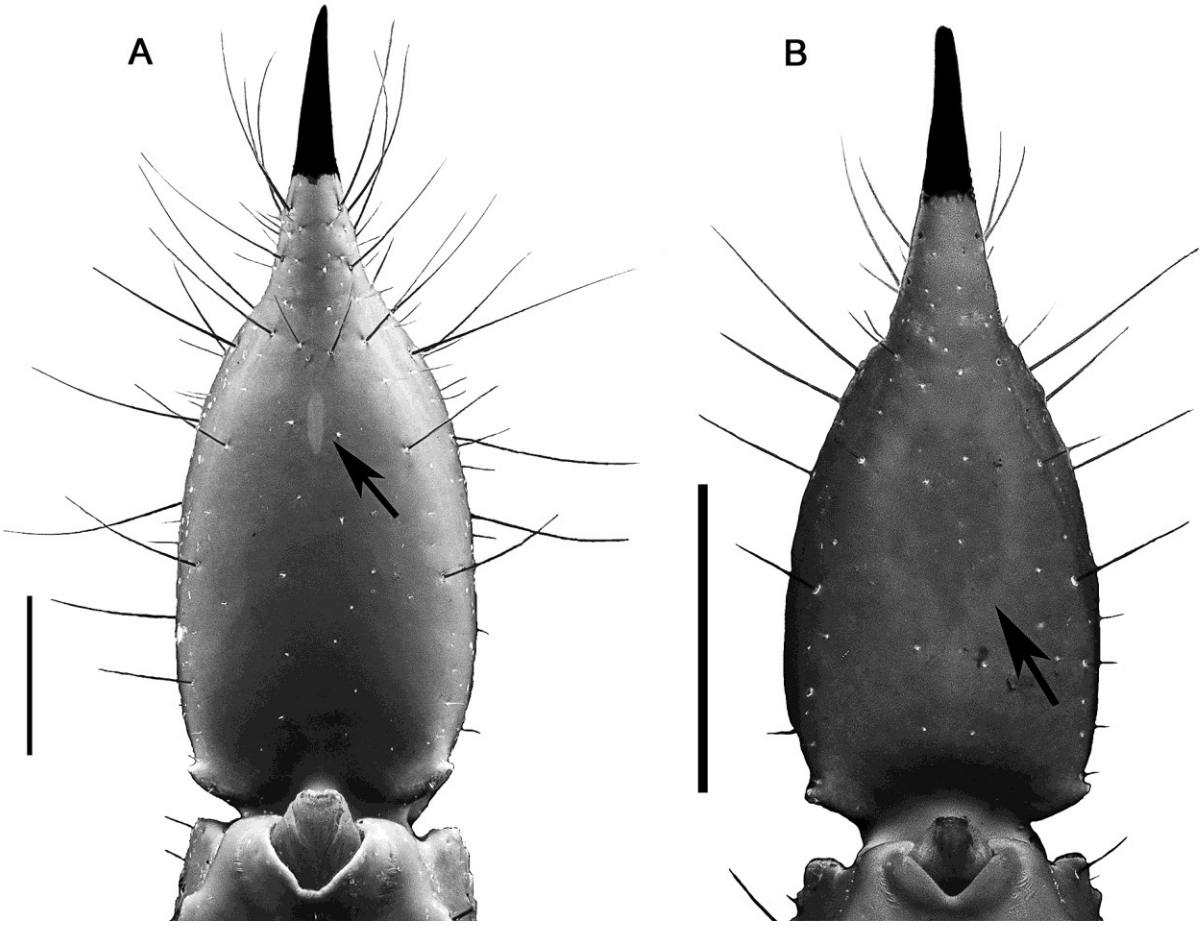


Figure 30. **A**. *Chihuahuanus coahuilae* (Williams, 1968), ♂ (AMNH), dorsal surface of telson. Arrow indicates fusiform dorsal gland. **B**. *Maaykuyak waueri* (Gertsch and Soleglad, 1972), ♂ (AMNH), dorsal surface of telson. Arrow indicates dorsal gland. Scale bar = 1 mm.

Mesomexovis, **n. gen.**

Figures 11H, 12, 16A, 27C, D, 34B; Table 7

Vejovis punctatus Karsch, 1879 = [*Mesomexovis punctatus* (Karsch, 1879), **n. comb.**] type species, here designated.

Vejovis first section: Hoffmann, 1931: 134, 139 (in part).

Vejovis eusthenura group: Williams, 1970a: 395, 396 (in part).

Vaejovis eusthenura group: Williams, 1980 (in part): 55; Sissom, 1991b: 26; Stockwell, 1992: 408, 409; Sissom, 1993: 68; Lourenço and Sissom, 2000: 135; Sissom, 2000: 530, 532, 551; Armas and Martín-Frías, 2001: 8; González-Santillán, 2004: 29; Ponce-Saavedra and Sissom, 2004: 541; Francke and Ponce-Saavedra, 2005: 67; Sissom and Hendrixson, 2005b: 33, 34; Graham and Fet, 2006: 8, 9; Fet et al., 2006a: 9, tab. 1; 2006b: 8; 2006c: 7; Graham and Soleglad, 2007: 9, 11, 12; Soleglad et al., 2007: 134, 135; McWest, 2009: 8, 48, 52, 56, 61, 64, 98, 101–103, 108, tab. 1; Santibáñez-López and Sissom, 2010: 49.

Vaejovis intrepidus group: Sissom, 1989b: 180; 1991a: 24, 26; 1991b: 24, 25; Stockwell, 1992: 409; Sissom, 1993: 68; Lourenço and Sissom, 2000: 135; Sissom, 2000: 537, 538, 551; Armas and Martín-Frías, 2001: 8; Hendrixson 2001: 47; González-Santillán, 2004: 30, 31; Ponce-Saavedra and Sissom, 2004: 539, 541; Graham and Fet, 2006: 7; McWest, 2009: 66, 69, 70, 100–102, tab. 1; Santibáñez-López and Sissom, 2010: 52 (in part).

Vaejovis punctipalpi group: Francke and González-Santillán, 2007: 586, 587, 590; Graham and Soleglad, 2007: 11, 12; Soleglad et al., 2007: 134, 135 (in part).

Hoffmannius: Soleglad and Fet, 2008: 1, 26, 57, 60, 89, 91, 96, 102 (in part); Ayrey and Soleglad, 2011: 1.

Kochius: Soleglad and Fet, 2008: 1, 26, 30, 35, 57, 60, 66, 73, 92–95, 102, tabs. 4, 9; Ayrey and Soleglad, 2011: 1 (in part).

Thorellius: Soleglad and Fet, 2008: 1, 5, 30, 35, 53, 67, 73, 94, 95, 102, figs. 26, tabs. 1, 4, 9; Ayrey and Soleglad, 2011: 1 (in part).

ETYMOLOGY: The generic name is a noun in apposition that combine three words, the Greek prefix 'meso', meaning middle, the abbreviation of the country name Mexico 'mex', and the termination of the genus *Vaejovis* 'vis', and is masculine in gender. The name refers to the distribution of the genus, which is endemic to the central states of Mexico, and to the original placement of its component species within the genus *Vaejovis*.

DIAGNOSIS: *Mesomexovis*, **n. gen.** has chela dorsal prolateral (dpl), prolateral median (plm), ventral retrolateral (vrl) and ventral retrosubmedian (vrs) carinae complete, extending the length of the manus and obsolete, without difference in ornamentation from adjacent intercarinal surfaces (figures 27C, D). *Mesomexovis*, **n. gen.** possesses pedipalp chela, patella and femur with infuscate carinae. The ventral surface of the metasomal segment V is matte to shagreened (figure 34B). *Mesomexovis*, **n. gen.** has not only similar infuscation patterns of the dorsal aspect of the body similar to *Maaykuyak*, **n. gen.**, but also has metasomal segment I–V lateral surfaces glabrous. These genera can be easily separated by the presence of a glandular spot on dorsal surface of the telson in *Maaykuyak*, **n. gen.**, being absent in *Mesomexovis*, **n. gen.** The pedipalp patella dorsosubmedian (rlds) and retrolateral median (rlm) carinae are completely infuscated, a unique character shared with *Kuarapu*, but *Mesomexovis*, **n. gen.** is distinguished from *Kuarapu* by having shorter pedipalp fingers and corresponding proximal trichobothria (figures 27C, D) and weak development of metasomal ventral submedian (vsm) carinae on I–IV (figure 34B). Most species of *Mesomexovis*, **n. gen.** have patellar ventral retrolateral (vrl) and femoral

retrolateral dorsosubmedian (rlds) carinae expressed as smooth costa as well as the ventral lateral (vl) carina of sternite VII. Except *M. atenango*, **n. comb.**, most species of *Mesomexovis*, **n. gen.**, have ventral lateral carinae flat to costated on segments I–IV. Most species of *Mesomexovis*, **n. gen.**, except *M. atenango*, **n. comb.**, have strong infuscation that underlines metasomal ventral submedian (vsm) and ventral lateral (vl) carinae. This feature is observed also in some *Chihuahuanus*, **n. gen.** and *Paravaejovis* though tend to be more diffuse.

INCLUDED SPECIES: *Mesomexovis atenango* (Francke and González-Santillán, 2007), **n. comb.**; *Mesomexovis punctatus* (Karsch, 1879), **n. comb.**; *Mesomexovis spadix* (Hoffmann, 1931), **n. comb.**, **n. stat**; *Mesomexovis subcristatus* (Pocock, 1898), **n. comb.**; *Mesomexovis oaxaca* (Santibáñez-López and Sissom, 2010), **n. comb.**; *Mesomexovis occidentalis* (Hoffmann, 1931), **n. comb.**; and *Mesomexovis variegatus* (Pocock, 1898), **n. comb.**, **n. stat.**

DISTRIBUTION: *Mesomexovis*, **n. gen.** is endemic to the central states of Mexico, within the mountain ranges of the Trans Mexican Volcanic Belt, the valleys along the Pacific coast extending from the southern limits of the Sierra Madre Occidental to the Isthmus of Tehuantepec and the Balsas Depression. This genus has been recorded from Aguascalientes, Colima, Chiapas, Guanajuato, Guerrero, Hidalgo, Jalisco, Estado de México, Michoacán, Morelos, Nayarit, Oaxaca, Puebla, Sinaloa, Querétaro, Tlaxcala, Veracruz, and Zacatecas.

NATURAL HISTORY: *Mesomexovis*, **n. gen.** is the genus of Syntropinae adapted to the greatest range of altitudes (0–2600 m) and found at the highest elevation. This genus has been able to adapt to temperate and tropical forest within these altitudes. This genus seems to be maladapted to xeric conditions and has been replaced by *Chihuahuanus*, **n. gen.** and *Paravaejovis* species in the northern ranges of the Syntropinae distribution. Unlike *Chihuahuanus*, **n. gen.** and *Paravaejovis*, *Mesomexovis*, **n. gen.** has a very strong seasonal

activity. Although no ecological data are available for this genus, personal observations in the field suggest that most of the species aestivate during the dry season and are very active during the rainy season, becoming numerically dominant species at certain localities. In contrast, during the dry season they are inactive and may be very uncommon at the same locality. Due to this phenology, this species are collected efficiently during rainy seasons during the day turning rocks and at night with UV light detection. This genus is weakly armed with digging structures and frequently found under rocks, which indicates a lapidicolous ecomorphotype.

REMARKS: The results of the phylogenetic analyses in chapter 1 showed that there are sufficient apomorphies to recognize *Mesomexovis spadix* (Hoffmann, 1931), **n. comb. et n. stat.**; and *Mesomexovis variegatus* (Pocock, 1898), **n. comb. et n. stat.**, which have long been subspecies of *Mesomexovis punctatus* (Karsch, 1879), **n. comb.**, as valid species. Another result of the analyses indicated that *Mesomexovis atenango* (Francke and González-Santillán, 2007), **n. comb.**, described within the species group *punctipalpi* of *Vaejovis* (Francke and González-Santillán, 2007) and later transferred to *Kochius* (Soleglad and Fet, 2008), is a species that belongs in this genus. Similarly, *Mesomexovis subcristatus* (Pocock, 1898), **n. comb.** and *Mesomexovis occidentalis* (Hoffmann, 1931), **n. comb.**, assigned to the *intrepidus* group of *Vaejovis* and later moved to *Thorellius* (Soleglad and Fet, 2008), were consistently recovered within *Mesomexovis*, **n. gen.**

MATERIAL EXAMINED: *Mesomexovis atenango* (Francke and González-Santillán, 2007): **MEXICO: Guerrero:** *Municipio de Tepecoacuilco de Trujano*: Cerro de la Coronilla, 3.4 km NE Ahuehuepan, 18°0'57"N 99°31'32"W, 857 m, A. Valdez, T. López, and C. Quijano, ♂, ♀ (AMNH); Cerro de la Coronilla, 18°0.9756'N 99°31.7256'W, 844 m, 27.vi.2008, O. Francke, A. Quijano, and C. Santibáñez, ♂, ♀ (AMNH). *Municipio de Copalillo*: Totonimitla, Papalutla,

18°1.4700'N 98°53.8092'W, 650 m, 28.i.2011, U. Lonjino and J. Mendez, ♂, ♀ (IBUNAM). *Mesomexovis spadix* (Hoffmann, 1931): **MEXICO: Guanajuato:** *Municipio de León*: León, iv.2004, P. Berea, ♂, ♀ (IBUNAM). *Mesomexovis oaxaca* (Santibáñez-López and Sissom, 2010): **MEXICO: Oaxaca:** *Municipio de Ocotlán*: Chichicapan, 4.8 km E, 1645 m, 23.viii.1966, C.M. Bogert, ♂, ♀ (AMNH). *Municipio de San Pablo Villa Mitla*: Mitla, 8 km NE, on ridge ca. 6800–7200, near ruins called El crucero, 27.viii.1963, C.M. Bogert, G. Sluder, and N. Bucknall, ♂, ♀ (AMNH). *Municipio de Tlacolula de Matamoros*: Tlacolula, 16.vii.1955, C. and P. Wauer, paratypes ♂, ♀ (AMNH). *Mesomexovis occidentalis* (Hoffmann, 1931): **MEXICO: Guerrero:** *Municipio de Acapulco*: Acapulco, Holotype ♀ of *V. subcristatus occidentalis* (AMNH); same locality, H. Hoffmann, paratypes ♂, ♀ (AMNH). Cumbres of Llano Largo, 16°49.505'N 99°49.999'W, 371 m, 19.vi.2007, O. Francke, H. Montaño, and A. Ballesteros, ♂ (CAS [ARA 1975]). *Municipio de Copala*: Microwaves Fogos, E of Copala, 16°33.9918'N 98°53.30'W, 103 m, 22.vi.2007, O. Francke, H. Montaño, L. Escalante, and A. Ballesteros, ♂, ♀ (IBUNAM). *Mesomexovis punctatus* (Karsch, 1879): **MEXICO: Hidalgo:** *Municipio de Zimapán*: Microwave antenna at Zimapán, 20°44.7828'N 99°20.8998'W, 1900 m, 3.viii.2002, L. Prendini, O. Francke, E. González, and J. Ponce, 2 ♂, 2 ♀ (AMNH [ARA 1170]). *Mesomexovis subcristatus* (Pocock, 1898): **MEXICO: Oaxaca:** *Municipio de Cuicatlán*: Tomellin, 17°45.180'N 96°57.237'W, 605 m, 23.vii.2002, L. Prendini, O. Francke, E. González, and J. Ponce, ♂, ♀ (AMNH [LP 2086]). **Puebla:** *Municipio de Tehuacán*: Tehuacán, 2 km E, 18°24.002'N 97°22.867'W, 1435 m, 25.vii.2002, L. Prendini, O. Francke, E. González, and J. Ponce, ♂, ♀ (AMNH [LP 2048]). *Mesomexovis variegatus* (Pocock, 1898): **MEXICO: Guerrero:** *Municipio de Buenavista de Cuellar*: El Comal, 18°27.086'N 99°17.139'W, 1749 m, 13.vi.2007, O. Francke et al., ♂, ♀ (AMNH [ARA 2623]).

Paravaejovis Williams, 1980

Figures 11B, F, 13, 16B, D, 27A, B, 29A, 34A, 35A; Table 7

Vejovis pumilis Williams, 1970 [= *Paravaejovis pumilis* (Williams, 1980)], type species, by monotypy.

Vejovis first section: Hoffmann, 1931: 134, 139 (in part).

Vejovis eusthenura group: Williams, 1970a: 395, 396 (in part).

Vejovis pumilis group: Williams, 1970b: 297, fig. 13, 14.

Vaejovis eusthenura group: Williams, 1980: 55; Sissom and Francke 1985: 1; Sissom, 1991a: 26; Stockwell, 1992: 408, 409; Sissom, 1993: 68; Lourenço and Sissom, 2000: 135; Sissom, 2000: 530, 532, 551; Armas and Martín-Frías, 2001: 8; McWest, 2009: 8, 48, 52, 56, 61, 64, 98, 101–103, 108, tab. 1; González-Santillán, 2004: 29; Ponce-Saavedra and Sissom, 2004: 541; Francke and Ponce-Saavedra, 2005: 67; Sissom and Hendrixson, 2005a: 131; 2005b: 33, 34; Graham and Fet, 2006: 8, 9; Fet et al., 2006a: 7; 2006b: tab. 1. 9; 2006c: 7; Graham and Soleglad, 2007: 9, 11, 12; Soleglad et al., 2007: 134, 135; Santibáñez-López and Sissom, 2010: 49.

Paravaejovis: Williams, 1980: 29, 30, fig. 32A–D; Haradon, 1984b: 319; Francke, 1985: 11, 18, 21; Sissom, 1990: 107, 110, 114, 106, fig. 3.19A; Nenilin and Fet, 1992: 9; Stockwell, 1992: 409, 416, figs. 62, 63; Fet et al., 1998: 617; Kovařík, 1998: 143; Beutelspacher, 2000: 56, 63, 151; Sissom, 2000: 504, 505; Soleglad and Fet, 2003b: 88; 2005: 5, 6; Prendini and Wheeler, 2005: 482, tab. 10; Fet et al., 2006a: 4, 7, 9, 13, tab. 1, 2, fig. 6; 2006b: 1, 2, 4, 5, 7, 8, figs. 5, 6, tab.1, 2; 2006d: 1, 2, 4, 5, 8, figs. 5, 6, tab. 1; Soleglad and Fet, 2006: 5, 6, 10, 12, 13, 26, tab. 2, 3; 2008: 1, 3, 5, 6, 12, 13, 24, 25, 28, 30, 34,

35, 37, 38, 40, 43, 51, 54, 55, 60, 62, 63, 70, 71, 73, 76–78, fig. 7, 18, 19, 57, 97, 163, 189, 191, 196, 197, 201, tab. 1, 2, 7, 9, fig. 82, 83, 84, 102;

Lissovaejovis Ponce-Saavedra and Beutelspacher, 2001, **n. syn.**: 88 [nomen nudum].

Hoffmannius Soleglad and Fet, 2008, **n. syn.**: 1, 4, 26, 57, 60, 89, 91, 96, 102; *Buthus eusthenura* Wood, 1863 [= *Paravaejovis eusthenura* (Wood, 1863), **n. comb.**], type species, by original designation.

Hoffmannius: Ayrey and Soleglad, 2011: 1.

DIAGNOSIS: Most species of *Paravaejovis* have the chelal dorsal retrolateral (drl) and patellar retrolateral dorsosubmedian (rlds) and retrolateral median (rlm) carinae obsolete, complete but as a smooth costa (figures 27A, B). Except for *Paravaejovis pumilis*, *Paravaejovis puritanus* (Gertsch, 1958), **n. comb.** and *Paravaejovis schwenkmeyeri* (Williams, 1970), **n. comb.**, the fixed finger has six primary subrows of median denticle (MD), divided by six retrolateral denticles (RD) (figure 27B). Trichobothrium *esb* is positioned between RD 5 and RD 6, and/or associated macrosetae and trichobothrium Et_5 positioned at base of fixed finger, distal to the condyle and removed from Et_4, (figure 27B) in both cases the exception is *Paravaejovis pumilis*. *Paravaejovis* is related to *Chihuahuanus*, **n. gen.** and *Mesomexovis*, **n. gen.**, but is primarily differentiated from *Mesomexovis*, **n. gen.** by having poor infuscation or immaculate cuticle on carapace and mesosomal tergites, whereas the former has strong infuscation on those areas. In general, *Paravaejovis* exhibits slender pedipalp manus and long fingers, opposite to more robust and shorter fingers in the other two genera, the exceptions being *Paravaejovis pumilis*, *Paravaejovis spinigerus* (Wood, 1863), **n. comb.**, and *Paravaejovis gravicaudus* (Williams, 1970), **n. comb.**, which have robust pedipalp manus. This genus presents psammophilous adaptations; most of the species are pale, exhibiting abundant long setae on all

segments of the legs and tent to have basitarsi I–III dorsal and retrolateral dorsal setae closely arranged in a row (setal combs) (figure 29A). *Chihuahuanus globosus*, **n. comb.** share these adaptations but is distinguished from the species of *Paravaejovis* because lack the glandular fusiform spot on the dorsal surface of the telson. While *Chihuahuanus*, **n. gen.** display more frequently granular mesosomal ventral lateral carinae I–IV, the carinae are smooth in at least half the species of *Paravaejovis* (figure 34A), the exception being some species related to *Paravaejovis confusus* (Stahnke, 1940), **n. comb.** and *Paravaejovis pumilis* (figure 35A).

INCLUDED SPECIES: *Paravaejovis confusus* (Stahnke, 1940), **n. comb.**; *Paravaejovis coloradensis* (Williams, 1970), **n. comb.**; *Paravaejovis diazi* (Williams, 1970), **n. comb.**; *Paravaejovis eusthenura* (Wood, 1863), **n. comb.**; *Paravaejovis galbus* (Williams, 1970), **n. comb.**; *Paravaejovis gravicaudus* (Williams, 1970), **n. comb.**; *Paravaejovis flavus* Banks, 1900, **dubious species**; *Paravaejovis hoffmanni* (Williams, 1970), **n. comb.**; *Paravaejovis pumilis* (Williams, 1970); *Paravaejovis puritanus* (Gertsch, 1958), **n. comb.**; *Paravaejovis schwenkmeyeri* (Williams, 1970), **n. comb.**; *Paravaejovis spinigerus* (Wood, 1863), **n. comb.**; and *Paravaejovis waeringi* (Williams, 1970), **n. comb.**

DISTRIBUTION: *Paravaejovis* has only four species distributed beyond the Baja California peninsula, in the southwestern deserts of U.S.A. The genus is recorded in the Mexican states of Baja California and Baja California Sur, Chihuahua, Sonora, and Sinaloa and the U.S. states of Arizona, California, Nevada, New Mexico, and Utah.

NATURAL HISTORY: *Paravaejovis* encompasses ultrasammophilous (i.e. *Paravaejovis pumilis*), psammophilous (i.e. *Paravaejovis eusthenura* (Wood, 1863), **n. comb.**) and semipsammophilous species (i.e. *Paravaejovis spinigerus* (Wood, 1863), **n. comb.**) (Fet et al., 1998; Prendini, 2001). It seems that sandy substrate had an important role in the diversification

of this genus in Baja California along with the isolation caused by the opening of the Gulf of California. Most species found in the peninsula have developed long setae on the telotarsi and basitarsi, are pale and barely infuscate and live in burrows constructed in sand. The continental species tend to be less specialized and are common in a greater range of substrata, from sand dunes to rocky areas and also are found in most vegetation zones, from xeric to pine-oak forests. Whereas the species of this genus in the peninsula have been collected from 0–1180 m of altitude, the continental species have been collected in altitudes above 2000 m. The most efficient technique to collect this genus is by using UV light detection at night because these scorpions rest during the day inside burrows or hide in inaccessible crevices and only occasionally can be found under rocks or other debris on the ground. Although the continental species have no visible adaptation to substrate, they have been collected at night with UV in sand dunes and slopes of rocky walls or road-cuts. *Paravaejovis* have not been collected in oak-pine forest on the Baja California peninsula.

REMARKS: After comparative study of hundreds of specimens of the subspecies recognized by Williams (1970a, 1970b), now assigned to *Paravaejovis*, they do not differ sufficiently to be recognized as separate species. The features used by Williams to propose creation of these subspecies were color and infuscation, which have been found to be a very homoplastic and depend of the substratum where the scorpions live (chapter 1) instead of common ancestry. Therefore the following synonyms are proposed: *Paravaejovis hoffmanni* (Williams, 1970) = *Vaejovis hoffmanni fuscus* Williams, 1970, **syn. n.** and *Paravaejovis diazi* (Williams, 1970) = *Vaejovis diazi transmontanus* Williams, 1970, **syn. n.**

The species *Vaejovis flavus* Banks, 1900, has been problematic since its description. The species was never described properly. Banks (1900) mentioned it in an identification key.

Soleglad (1973a) redescribed the species on the basis of a specimen from the MCZ which turned out not to be the type (Sissom, 2000 in a pers. comm. of J. Bigelow). According to Bigelow the type specimen was deposited in the USNM, the MCZ specimens belonged to an undescribed species of the former *punctipalpi* group = *Kochius* (Sissom, 2000), and the specimen from USNM belonged to the *eusthenura* group = *Hoffmannius*. The type locality of this species is Albuquerque, New Mexico. Sissom's attempt to recollect the specimen at the type locality and in New Mexico was unsuccessful. The type specimen was not located in USNM and in light of the uncertainty of the existence of the type specimen and the rather complicated identity, *Vaejovis flavus* Banks, 1900 is deemed **nomen dubium**.

Paravaejovis pumilis (Williams, 1980) was consistently placed in the former *eusthenura* group = *Hoffmannius* (in part), even when morphology was analyzed alone (chapter 1). As result, several species of *Hoffmannius*, formerly *eusthenura* group, are here transferred to this genus. It seems that *Paravaejovis pumilis* (Williams, 1980) underwent an extreme adaptation to live in sand. The most notable apomorphy of this species is the neotrichobothriotaxic pattern which as pointed out by Haradon (1984b), and contrary to Soleglad and Fet (2008), is not uncommon (i.e. *Stahnkeus* Soleglad and Fet, 2006; *Paruroctonus ammonastes* Haradon, 1984, *Pseudouroctonus bogerti* (Gertsch and Soleglad, 1972). Hence, *Paravaejovis* is not different from these examples just because several accessory trichobothria are present and should not have "more evolutionary or taxonomic significance" according to Soleglad and Fet (2008). A simple explanation of this phenomenon is the differential expression of chromosomes and homeotic genes, where the effect of a mutation (duplication in this case) in one gene can reflect the same change in homologous structures such as trichobothria (Scott and Weiner, 1984). Beyond the neotrichobothriotaxic pattern, most characters observed in *Paravaejovis* are related to psammophilous adaptations.

This is turn is a different origin of adaptations compared to the subfamily Smeringurinae Soleglad and Fet, 2008, which is supported by the same analyses (chapter 1) that never recover *Paravaejovis pumilis* (Williams, 1980) close to *Smeringurus grandis* (Williams, 1970).

MATERIAL EXAMINED: *Paravaejovis coloradensis* (Williams, 1970): **U.S.A.: California:** *Imperial Co.*: 2 mi W Andrade, 6.vii.1969, S.C. Williams and V.F. Lee, Holotype ♂ (CAS Type No.10411). *San Diego Co.*: Anza-Borrego Desert State Park, Culp Valley Camp, 33°13.4118'N 116°27.26'W, 1033 m, 30.viii.2005, R. Mercurio and L. Prendini, ♂, ♀ (AMNH [ARA 1497]). *Paravaejovis confusus* (Stahnke, 1940): **U.S.A.: Arizona:** Wickenburg, 20.iv.1938, A.L. Corbin, Syntypes 2 ♀ (CAS Type No.105170). *Mohave Co.*: Warm Springs Wash, 4.7 km N Topock, 34°44.8662'N 114°28.8996'W, 147 m, 9.ix.2007, L. Prendini and J. Huff, 5 ♂, 2 ♀ (AMNH [ARA 3117]). *Paravaejovis diazi* (Williams, 1970): **MEXICO: Baja California Sur:** Punta San Telmo on Gulf coast, 25 ft, 26.v.1969, S.C. Williams, Holotype ♂ of *V. diazi transmontanus* (CAS Type No.10414). 34.4 km W Ciudad Constitución (=El Crucero, 21.4 mi W, Magdalena Plain), 75 ft, 26.vii.1968, S.C. Williams and M.A. Cazier, Holotype ♂ (CAS Type No.10413). *Municipio de La Paz*: Las Cruces, 8 km SW, 30.vii.1968, S.C. Williams and M.A. Cazier, paratypes ♂, ♀ (AMNH). *Paravaejovis eusthenura* (Wood, 1863): **MEXICO: Baja California Sur:** *Municipio de Los Cabos*: San José del Cabo, ca. 10 km S off Route 1, 23°1.7622'N 109°43.49'W, 50 m, 10.vii.2005, W.E. Savary, E. González, and R. Mercurio, ♂, ♀ (AMNH [ARA 3177]). *Municipio de La Paz*: La Paz, 18 km SE, 24°2.7498'N 110°8.85'W, 626 m, 8.vii.2004, O. Francke, E. González, and A. Valdez, ♂, ♀ (AMNH [ARA 1192]). *Paravaejovis galvus* (Williams, 1970): **MEXICO: Baja California Sur:** *Municipio de Loreto*: Loreto, 8 km S, 16.v.1969, S.C. Williams, Holotype ♂ (CAS Type No.10415), paratypes ♂, ♀ (CAS), allotype (CAS). *Paravaejovis gravicaudus* (Williams, 1970): **MEXICO: Baja California Sur:** Los

Aripes, 21.4 mi W, 900 ft, 25.vii.1968, S.C. Williams, J. Bigelow, and M. Bentzien, Holotype ♂ (CAS Type No.10418). *Municipio de Comondú*: San Miguel de Comondú, 2 km SW, 3.vii.1968, M.A. Cazier et al., paratypes ♂, ♀ (AMNH). *Paravaejovis hoffmanni* (Williams, 1970): **MEXICO: Baja California Sur:** *Municipio de Comondú*: San Jose de Comondú, 24 mi NE, 900 ft, 15.v.1969, S.C. Williams, Holotype ♂ of *V. hoffmanni fuscus* (CAS Type No.10421). **Baja California:** *Municipio de Ensenada*: Laguna Manuela, 4.8 km N, 152 m, 22.vi.1968, S.C. Williams and M.A. Cazier, paratypes ♂, ♀ (AMNH); Manuela 3 mi N, 500 ft, 22.vi.1968 S.C. Williams and M.A. Cazier, Holotype ♂ (CAS Type No.10420). *Paravaejovis pumilis* (Williams, 1970): **MEXICO: Baja California Sur:** Ciudad Constitución (= El Crucero), 26.8 mi W, Magdalena Plain, 50 m, 26.vii.1968, S.C. Williams and M.A. Cazier, Holotype ♂ (CAS Type No.10425). *Municipio de Comondú*: El Cayuco Fish camp, sand dunes, 24°34.6656'N 111°40.6326'W, 6 m, 11.vii.2005, W.E. Savary, E. González, L. Prendini, and R. Mercurio, 2 ♀ (AMNH [ARA 3173]). *Paravaejovis puritanus* (Gertsch, 1958): **MEXICO: Baja California Sur:** Rancho Canipolé, 1 mi SW, 800 ft, 15.v.1969, S.C. Williams, Holotype ♂ of *V. terradomus* (CAS Type No.10428). **Baja California:** *Municipio de Ensenada*: Santo Tomas, 8.vii.1953, W.J. and J.W. Gertsch, Holotype ♂ (AMNH). *Paravaejovis schwenkmeyeri* (Williams, 1970): **MEXICO: Baja California:** Bahia de Los Angeles, 25 ft, 19.vi.1968, S.C. Williams and M.A. Cazier, Holotype ♂ (CAS Type No.10426). **Baja California Sur**: San Raymundo, 12.9 km NW, 152 m, 30.vi.1968, M.A. Cazier et al., Topotypes ♂, ♀ (AMNH). *Paravaejovis spinigerus* (Wood, 1863): **U.S.A.: Arizona:** *Maricopa Co.*: Sunflower, turnoff to Bushnell Tanks, 33°52'08.8"N 111°27'54.4"W, 1057 m, 6.iv.2007, J. Huff and L. Prendini, ♂, ♀ (AMNH). *Paravaejovis waeringi* (Williams, 1970): **MEXICO: Baja California:** *Municipio de Ensenada*: Oakies Landing, 27 mi S of Puertocitos, 12.vi.1968, S.C. Williams and M.A. Cazier, Holotype ♂

(CAS Type No.10431); Puertocitos, 44 km S, Oakies Landing, 12.vi.1968, S.C. Williams and M.A. Cazier, paratype ♂ (AMNH); Puertocitos, 11.vi.1968, S.C. Williams and M.A. Cazier, 2 ♂, ♀ (CAS); Oakies Landing, 27 mi S of Puertocitos, 12.vi.1968, S.C. Williams and M.A. Cazier, Allotype (CAS). **U.S.A.: California:** *Imperial Co.*: Algodones Dunes, along Grays Wells Road, S of Interstate Hwy 8, W of Imperial Sand Dunes Recreation Area, 32°44.1756'N 114°53.43'W, 50 m, 31.viii.2005, R. Mercurio and L. Prendini, ♀ (AMNH [ARA 1499]).

Syntropis Kraepelin, 1900

Figures 11A, I, 15, 17A–E, 23A, 24A, B, 31B, 32A; Table 7

Syntropis macrura Kraepelin, 1900, type species, by original designation.

Syntropis Kraepelin, 1900: 16, 17; Birula, 1917a: 163; Werner, 1934: 281; Kästner, 1941: 272; Mello Leitão, 1945: 118; Williams, 1969: 285; 1974: 15 (in part); Stahnke, 1974: 113–120; Vachon, 1974: 914, 916; Díaz-Nájera, 1975: 3, 6; Stahnke, 1975: 257, 258; Williams, 1980: 47; Sissom, 1990: 110, 114; 1991b: 26; Nenilin and Fet, 1992: 9; Stockwell, 1992: 408; Kovařík, 1998: 146; Beutelspacher, 2000: 55, 70, 152, lam. IId; Sissom, 2000: 526; Ponce-Saavedra and Beutelspacher, 2001: 20; Soleglad and Fet, 2003b: 15, 36, 67, 144, 163, figs. 66, 79, 80, D-4, tabs. 3, 4, 9; Fet and Soleglad, 2005: 4, 6, 7; Prendini and Wheeler, 2005: 482, tab. 10; Soleglad and Fet, 2005: 4, 7; Soleglad et al., 2007: 119–136, figs. 1–37; tabs. I, II; Soleglad and Fet, 2008: 1, 4, 13, 27, 30, 32, 38, 46, 51, 69, 71–74, 82, 84, 85, 89–92, 95, 104, figs. 10, 27, 53, 82, 106, 110, 139, 151, 180, 203, tabs. 1–3, 9.

DIAGNOSIS: This genus differs from all other in the Syntropinae by having the metasomal segments I–V with ventromedian carinae protruding as a costa, smooth to finely granular, not pigmented and I–IV with ventral submedian carinae obsolete, smooth, not pigmented indicated only by pairs of macrosetae (figure 32A). Adult male exhibit elongated metasoma and appendices, females are less elongated. *Syntropis* is the only scorpion in the subfamily that has consistently eight PD on the movable finger (figures 24A, B); although some species of *Thorellius* occasionally exhibit the same number, the position of the basal PD in *Thorellius* is adjacent to the subsequent PD, where is common to find up to three adjacent PDs, whereas in *Syntropis* these PDs are completely separated. Adult males have the mesosomal sternite VII with a longitudinal whitish glandular area extended between the ventral submedian carinae, in females the gland is reduced but still evident (figure 31B). Dorsal and dorsal lateral carinae on segment I–IV are rounded do not project outwards distally and the distal denticle is not enlarged compared to preceding denticles unlike most genera in the subfamily. The number of setae on basitarsus and telotarsus are numerically higher than in any other syntropine genus (figures 23A, B). *Syntropis* has in common with *Vizcaino*, **n. gen.**, *Kuarapu*, and the *confusus* group of *Paravaejovis* elongated pedipalp fingers that in consequence displaced distally the trichobothria on the fixed finger, but position varies in reference to the PDs on the fixed finger. *Syntropis* does not share any of the abovementioned characters with these three genera.

INCLUDED SPECIES: *Syntropis aalbui* Lowe, Soleglad and Fet, 2007; *Syntropis macrura* Kraepelin, 1900; and *Syntropis williamsi* Soleglad, Lowe and Fet, 2007.

DISTRIBUTION: *Syntropis* is endemic to the Baja California peninsula, and has been recorded from the states of Baja California and Baja California Sur, Mexico.

NATURAL HISTORY: *Syntropis* is a lithophilous genus inhabiting the cracks of cliffs, rocky walls and crevices, piles of loose rocks or between flakes of eroded rocks. This genus has been collected at altitudes that ranged 0–556 m with *Syntropis aalbui* Lowe, Soleglad and Fet, 2007 collected at highest elevation. *Syntropis macrura* has been reported as synanthropic in the Comondús area (Williams, 1980; Jiménez-Jiménez and Palacios-Cardiel, 2010). The ecology of this genus is poorly known: only one paper on parturition and post-parturition behavior has been published (Hjelle, 1974). Field observations (E.G.-S.) suggest that the populations are larger in oases. Although, *Syntropis* is lithophilous, Jiménez-Jiménez and Palacios-Cardiel (2010) reported capturing species using pitfall traps, which indicates that this genus may move across softer substrates.

MATERIAL EXAMINED: *Syntropis aalbui* (Soleglad, Lowe and Fet, 2007): **MEXICO: Baja California:** Blue Palm Canyon (intermittent river La Bocana), 5 km N Cataviña, 13.vii.1979, R. Aalbu, Holotype ♀ (MNHG). *Syntropis macrura* Kraepelin, 1900: **MEXICO: Baja California Sur:** *Municipio de Comondú*: San José Comondú, 27.viii.2006, C. Palacios, ♂, ♀ (CAECIB). *Syntropis williamsi* Soleglad, Lowe and Fet, 2007: **MEXICO: Baja California Sur:** N Los Aripes, 25.vi.1985, W.R. Lourenço and G.A. Polis, Holotype ♀ (NHNG). *Municipio de La Paz*: El Pilar, ca. 20 km NE of Las Pocitas, 24°28.7616'N 111°1.12'W, 92 m, 25.vi.2008, H. Montaño and E. González, ♂, ♀ (AMNH [ARA 2825]).

Thorellius Soleglad and Fet, 2008

Figures 11C, D, 14, 25A, B, 28B; Table 7

Vejovis intrepidus Thorell, 1876 [= *Thorellius intrepidus* (Thorell, 1876)] type species, by original designation.

Vejovis second section: Hoffmann, 1931: 134, 139 (in part).

Vaejovis second section: Francke and González-Santillán, 2007: 590 (in part).

Vaejovis intrepidus group: Sissom, 1989b: 180 (in part); 1991a: 24, 26; 1991b: 24, 25; Stockwell, 1992: 409; Sissom, 1993: 68; Lourenço and Sissom, 2000: 135; Sissom, 2000: 537, 551; Armas and Martín-Frías, 2001: 8; Hendrixson, 2001: 47; González-Santillán, 2004: 30, 31; Ponce-Saavedra and Sissom, 2004: 539, 541; Graham and Fet, 2006: 7; McWest, 2009: 66, 69, 70, 100–102, tab. 1;Santibáñez-López and Sissom, 2010: 52.

Vaejovis punctipalpi group: Fet et al., 2006a: tab. 1 (in part). Soleglad and Fet, 2006: 6.

Thorellius: Soleglad and Fet, 2008: 1, 95, 102 (in part); Ayrey and Soleglad, 2011: 1.

DIAGNOSIS: *Thorellius* is separated from other genera by having a maximum of nine fully developed retrolateral ventral setae on basitarsus III, while most of the genera bear between six and seven, being the rest smaller or minor (McWest, 2009) (figure 28B) and *Syntropis* has more than 10. This genus encompasses the largest and most robust scorpions in the Syntropinae, the only genus that is similar in total length is *Syntropis*, but is rather slender. The patellar retrolateral dorsosubmedian (rlds) and retrolateral median (rlm) carinae are weakly developed and smooth. All species of *Thorellius*, except for *T. cisnerosi* have the ventral aspect of the telson vesicle shagreened and the dorsal surface of the pedipalp femur with fine scattered granulation. Both sex, especially female have chela fingers with a distinct gap that is evident

when fingers closed, *T. cisnerosi* being the exception. Very distinctive in *Thorellius* is also the broad carinae expressed in all pedipalp carinae, compared to *Kochius* is lower and in most cases comprises only one row of granules, whereas in *Thorellius* the carina is covered with clusters of granules along its extension (figures 25A, B). These two genera also differ by having metasomal segments I–III ventral submedian (vsm) carina costate to weakly denticulate in *Thorellius* compared with strongly granular in *Kochius*.

INCLUDED SPECIES: *Thorellius intrepidus* (Thorell, 1876); *Thorellius cristimanus* (Pocock, 1898); and *Thorellius atrox* (Hoffmann, 1931).

DISTRIBUTION: *Thorellius* is endemic to Mexico, and has been recorded from the states of Aguascalientes, Colima, Estado de México, Guanajuato, Guerrero, Jalisco, Michoacán, Nayarit, and Sinaloa.

NATURAL HISTORY: *Thorellius* is probably the least known genus ecologically. The only attempt to characterize the ecomorphotype of *Thorellius intrepidus* was González-Santillán (2004). He concluded that the species is pelophilous, based on the presence of enlarged chelicerae, robust chela and the carapace with protuberances indicating insertion of large muscles for chelicerae used to dig. However, the species of this genus lack the typical leg armature characteristic of pelophilous scorpions and the chelicerae and robust pedipalp are similar to those observed in *Kochius*. This morphology suggests rather that *Thorellius* is lapidicolous. *Thorellius* prefer altitude that ranges from 0–1760 m and inhabit mostly tropical deciduous forest. Like *Mesomexovis*, **n. gen.** the species of this genus aestivate and are only active during rainy the season. The most efficient way of collecting these scorpions is during the night using UV light.

REMARKS: Hoffmann (1931) created the second section of *Vaejovis = intrepidus* group, in part, and included two subspecies that were elevated to species by Sissom (1989b) and subsequently assigned to a new genus, *Thorellius*, by Soleglad and Fet, 2008). The analyses in chapter 1 showed that these two species are part of *Mesomexovis*, **n. gen.**, hence *Thorellius subcristatus* (Pocock, 1898) and *Thorellius occidentalis* (Hoffmann, 1931) are transferred to *Mesomexovis*, **n. gen.**

Although it has been accepted that this genus occurs in Catemaco, Veracruz, based on Hoffmann's specimens, more material has not been recollected. It is likely that Hoffmann's specimens were mislabeled.

MATERIAL EXAMINED: *Thorellius cristimanus* (Pocock, 1898): **MEXICO: Colima:** *Municipio de Colima*: Colima, in house, Holotype ♂ of *V. intrepidus atrox* (AMNH); same locality, ♂, ♀ (AMNH). *Municipio de Tonila*: Tonila, 3.2 km S, 28.viii.1965, W.J. Gertsch and R. Hastings, ♂, ♀ (AMNH). *Thorellius intrepidus* (Thorell, 1876): **MEXICO: Colima:** *Municipio de Armería*: Mine La Salada NW Ixtlahuacan, 19°01.680'N 103°47.036'W, 275 m, Mine staff, ♂, ♀ (AMNH). *Municipio de Tecomán*: Tecomán, 18°54'30"N 103°52'28"W, ♂, ♀ (AMNH).

Vizcaino, **n. gen.**

Figures 11G, 12, 23B, 28A; Table 7

Vaejovis viscainensis Williams, 1970 [= *Vizcaino viscainensis* (Williams, 1970), **n. com.**] type species, by monotypy.

Vaejovis eusthenura group (in part) Williams, 1980: 55; Sissom, 1991a: 26; Stockwell, 1992: 408, 409; Sissom, 1993: 68; Lourenço and Sissom, 2000: 135; Sissom, 2000: 530, 532, 551; Armas and Martín-Frías, 2001: 8; McWest, 2009: 8, 48, 52, 56, 61, 64, 98, 101–103, 108, tab. 1; Ponce-Saavedra and Sissom, 2004: 541; González-Santillán, 2004: 29; Francke and Ponce-Saavedra, 2005: 67; Sissom and Hendrixson, 2005b: 33, 34; Graham and Fet, 2006: 8, 9; Fet et al., 2006a: 7; 2006b: tab. 1, 9; 2006c: 7; Graham and Soleglad, 2007: 9, 11, 12; Soleglad et al., 2007: 134, 135; McWest, 2009: 8, 48, 52, 56, 61, 64, 98, 101–103, 108, tab. 1; Santibáñez-López and Sissom, 2010: 49.

Hoffmannius: Soleglad and Fet, 2008: 1, 26, 57, 60, 89, 91, 96, 102 (in part); Ayrey and Soleglad, 2011: 1.

ETYMOLOGY: The generic name is a noun in apposition, masculine in gender, taken from the Vizcaino Desert in the Baja California Peninsula, to which this monotypic genus is endemic.

DIAGNOSIS: *Vizcaino*, **n. gen.** is unique among the Syntropinae genera in having the pedipalp movable finger cutting edge with four subrows of MDs divided by four PDs; the distal subrow, typically with one denticle on the distal subrow in other genera, is absent in *Vizcaino*, **n. gen.**. Basitarsi I–III of male and female with setal combs (figure 28A). Telotarsi I–IV with basal, ventromedian and distal series of spinules acuminated, elongated and thin arranged in clusters (figure 28A). Femur with retrolateral ventral (rlv) carina developed as smooth costa. Metasomal

segment I–IV, ventral submedian (vsm) carina protruding noticeably above adjacent intercarinal surfaces and finely denticulate. It seems superficially allied to *Paravaejovis* and *Chihuahuanus*, **n. gen.**, but it can be distinguished from most of the species of these genera by possessing a basitarsi I–III laterally compressed medially having dorsal and retrolateral dorsal setae in a sublinear row creating setal comb (figure 28A). This character is shared with *C. globosus*, *P. pumilis* and in a lesser degree with *P. eusthenura*. It differs from these genera by having noticeably elongated pedipalp fingers such that trichobothrium *ib* is positioned on the fixed finger, at or close to RD 6 and/or associated macroseta; trichobothrium *it* is positioned on the fixed finger between RD 5 and RD 6, and/or associated macrosetae; trichobothrium *db* is positioned in the proximal third of fixed finger, distal of articulation between fixed and movable fingers; and trichobothrium *eb* is positioned on medial to distal third of fixed finger whereas in *Chihuahuanus*, **n. gen.** the trichobothria are more basal to the finger and basal to the most basal PD*;* although most *Paravaejovis* do not share this feature, the *confusus* group has similar configuration as *Vizcaino*, **n. gen.**, but lacks all previous characters.

INCLUDED SPECIES: *Vizcaino viscainensis* (Williams, 1970), **n. comb.**

DISTRIBUTION: *Vizcaino*, **n. gen.** is endemic to the Vizcaino desert in the Baja California peninsula, Mexico and has been recorded from the states of Baja California and Baja California Sur.

NATURAL HISTORY: *Vizcaino*, **n. gen.** is psammophilous. Williams (1970b) reported that the species is rare and perhaps has limited activity on the surface, spending most of its life inside burrows. The presence of setal combs, as well as the elongated spinules and pale, immaculate cuticle indicates that is psammophilous. *Vizcaino*, **n. gen.** has been collected at low altitudes

from 0–262 m using UV light at night. The genus prefers semi-stabilized dunes with sparse vegetation and it appears to be more abundant in places where sea fog is frequent.

MATERIAL EXAMINED: *Vizcaino viscainensis* (Williams, 1970): **MEXICO: Baja California Sur:** *Municipio de Mulegé*: Las Bombas, 3.2 km E, 30 m, 16.iv.1969, S.C. Williams, 2 ♀ (AMNH); Sierra del Placer, 21 km to junction Bahía Tortugas and Bahía Asunción, 98 km E of Vizcaino towards Bahía Tortugas, 27°28.9278'N 114°17.0928'W, 262 m, 28.vi.2008, H. Montaño and E. González, 8 ♂, 6 ♀ (IBUNAM [ARA 2245]). **Baja California:** Miler's Landing, 2 mi NW, 25 ft, 21.vi.1968, S.C. Williams and M.A. Cazier, Holotype ♂ of *V. viscainensis* (CAS Type No. 10429).

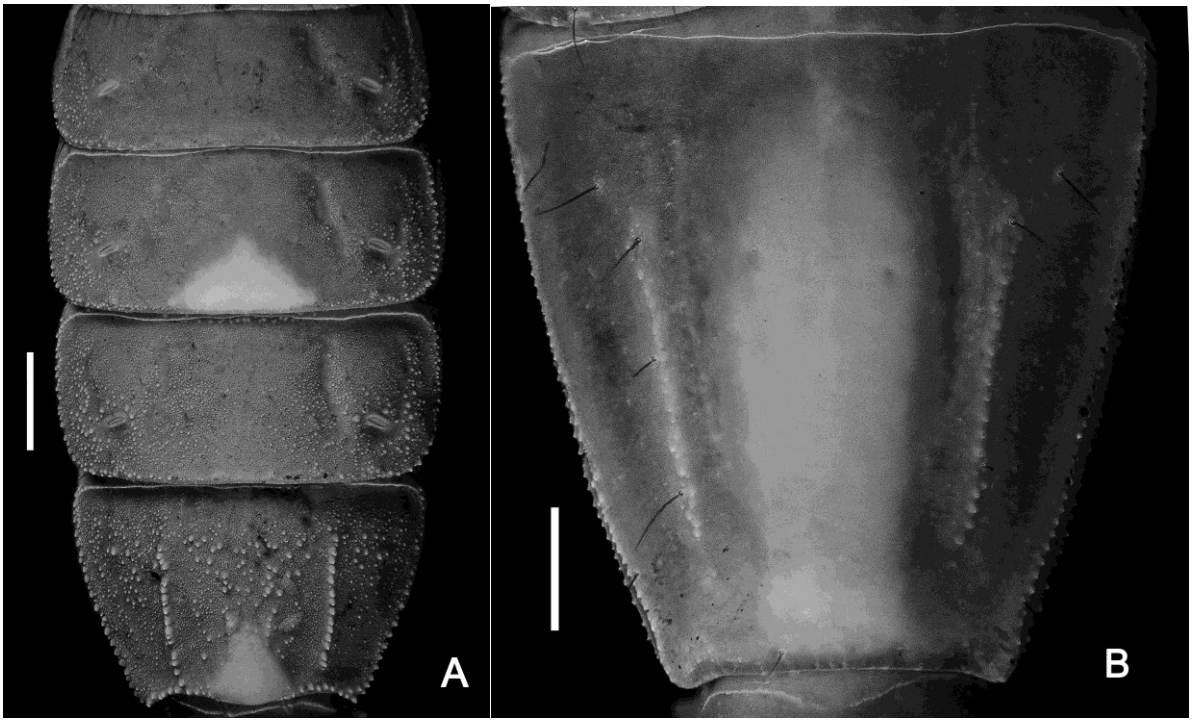


Figure 31. **A**. *Kochius bruneus* (Williams, 1970), ♂ (AMNH), ventral surface of sternites IV–VII. **B**. *Syntropis macrura* Kraepelin, 1900, ♂ (AMNH), ventral aspect of sternite VII. Scale bar = 1 mm.

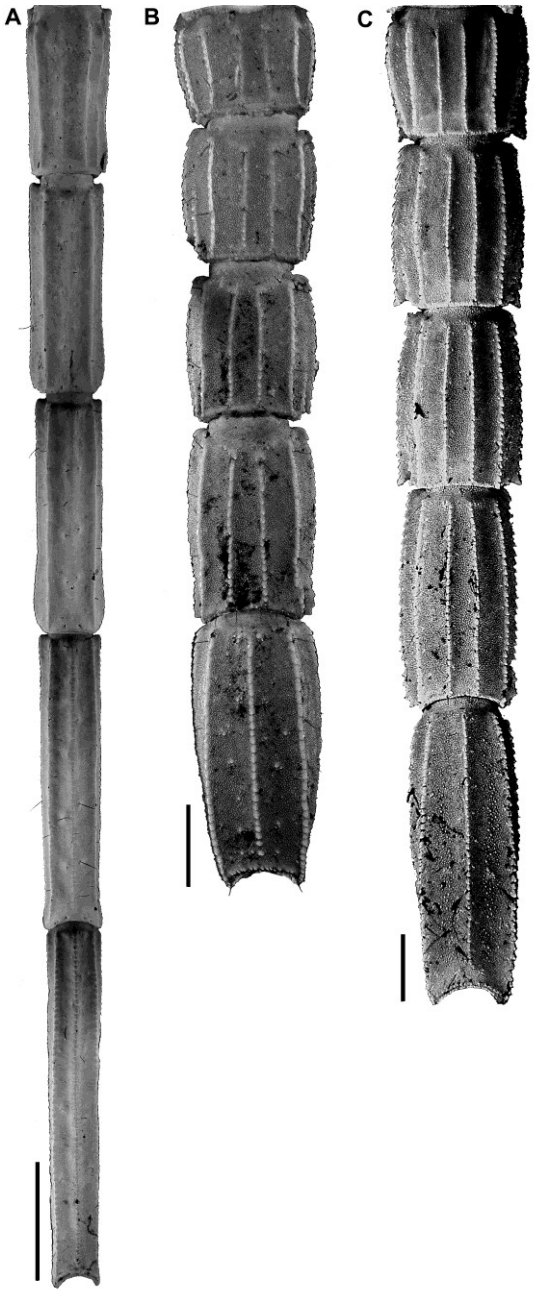


Figure 32. *Syntropis* Kraepelin, 1900; *Kuarapu* Francke and Ponce-Saavedra, 2010 and *Kochius* Soleglad and Fet, 2008, ventral aspect of metasoma I–V. **A**. *Syntropis macrura* Kraepelin, 1900, ♂ (AMNH). Scale bar = 5 mm. **B**. *Kuarapu purhepecha* Francke and Ponce-Saavedra, 2010, paratype ♂ (AMNH). **C**. *Kochius bruneus* (Williams, 1971). Scale bar = 1 mm.

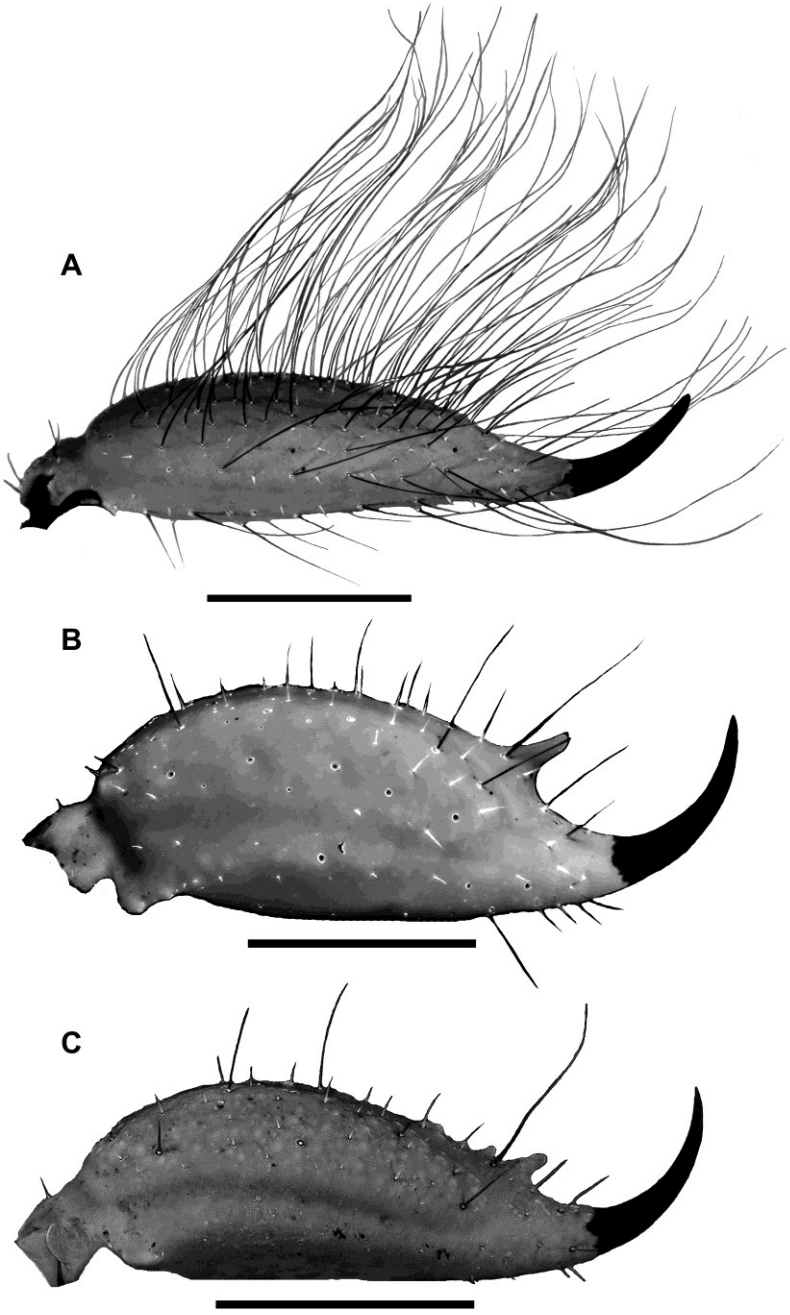


Figure 33. *Kochius* Soleglad and Fet, 2008 and *Konetontli*, **n. gen.**, lateral aspect of telson. **A**. *Kochius hirsuticauda* (Banks, 1910), ♂ (AMNH). **B**. *Konetontli acapulco* (Armas and Martín-Frías, 2004), holotype ♂ (IBUNAM). **C**. *Konetontli nayarit* (Armas and Martín-Frías, 2004), holotype ♂ (IBUNAM). Scale bar = 1 mm.

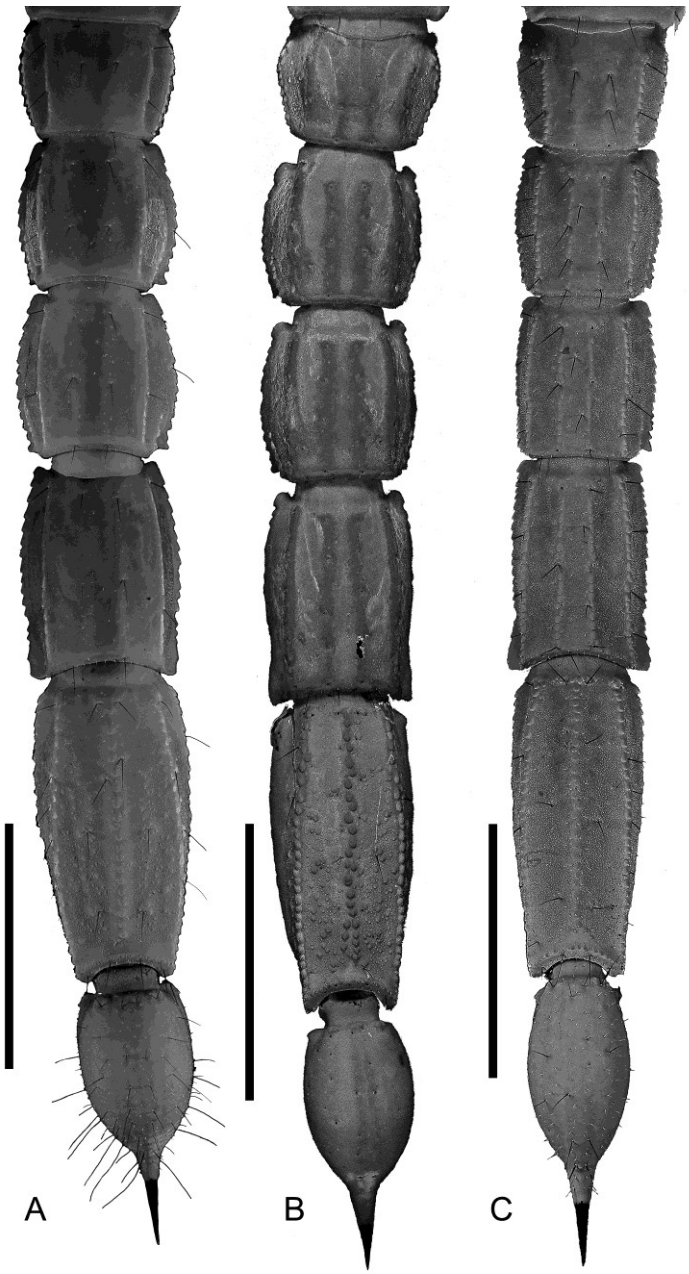


Figure 34. *Paravaejovis* Williams, 1980, *Mesomexovis*, **n. gen.**, and *Chihuahuanus*, **n. gen.**, ventral aspect of metasoma I–V and telson. **A**. *Paravaejovis diazi* (Williams, 1970), ♂ (AMNH). **B**. *Mesomexovis punctatus* (Karsch, 1879), ♂ (AMNH). **C**. *Chihuahuanus coahuilae* (Williams, 1968), ♂ (AMNH). Scale bar = 5 mm.

Figure 35. *Paravaejovis* Williams, 1980, *Konetontli*, **n. gen.**, and *Balsateres*, **n. gen.**, lateral aspect of metasoma I–V and telson. **A**. *Paravaejovis pumilis* (Williams, 1980), ♂ (AMNH). **B**. *Konetontli acapulco* (Armas and Martín-Frías, 2004), ♂ holotype (IBUNAM). Scale bar = 1. **C**. *Balsateres cisnerosi* (Ponce-Saavedra and Sissom, 2004), ♂ (IBUNAM). Scale bar = 5 mm.

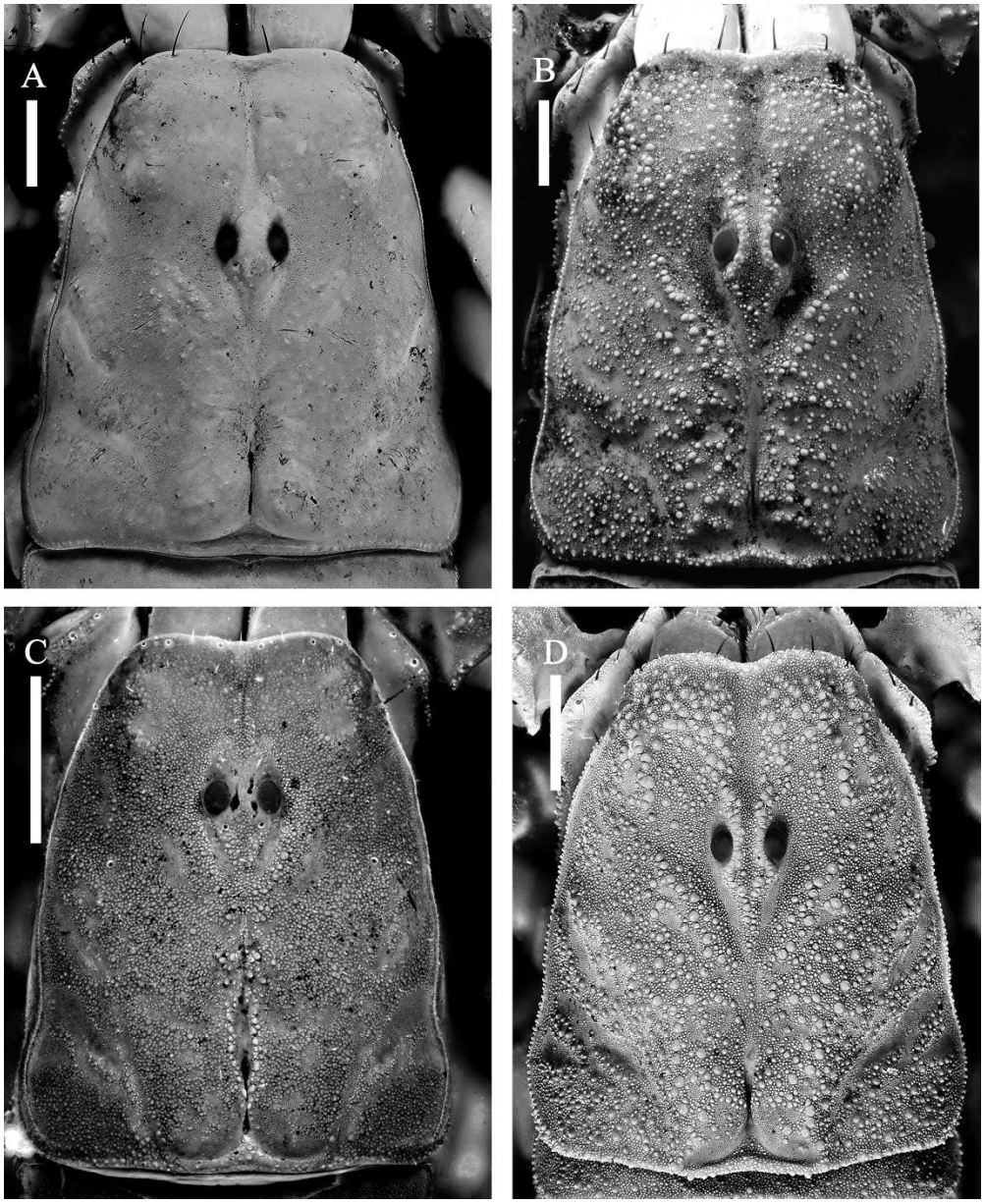


Figure 36. *Balsateres* **n. gen.**, *Chihuahuanus*, **n. gen.**, *Konetontli*, **n. gen.**, and *Kochius* Soleglad and Fet, 2008, dorsal aspect of carapace. **A**. *Balsateres cisnerosi* (Ponce-Saavedra and Sissom, 2004), **n. comb.**, ♂ (IBUNAM). **B**. *Chihuahuanus crassimanus* (Pocock, 1898), **n. comb.**, ♂ (AMNH). **C**. *Konetontli acapulco* (Armas and Martín-Frías, 2001), **n. comb.**, holotype ♂ (IBUNAM). **D**. *Kochius bruneus* (Williams, 1971), ♂ (AMNH). Scale bar = 1 mm.

CHAPTER 3

MONOGRAPHIC REVISION OF THE NORTH AMERICAN SCORPION SUBFAMILY SYNTROPINAE KRAEPELIN, 1905 (VAEJOVIDAE)

ABSTRACT

The species of the scorpion subfamily Syntropinae are revised. Eighty valid species are recognized, 26 of which are newly described here. Four new species of *Konetontli* González-Santillán and Prendini, in prep. are described: *Konetontli ignis*, **n. sp.**; *Konetontli ilitchi*, **n. sp.**; *Konetontli juxtlahuaca*, **n. sp.**; and *Konetontli migrus*, **n. sp.** *Konetontli zihuatanejensis* (Baldazo-Monsivais, 2003) is revalidated. Three new species of *Thorellius* Soleglad and Fet, 2008 are described: *Thorellius tekuani*, **n. sp.**; *Thorellius wixarika*, **n. sp.**; and *Thorellius yuyuawi*, **n. sp.** *Thorellius atrox* (Hoffmann, 1931) is synonymized with *Thorellius cristimanus* (Pocock, 1898). Six new species of *Kochius* Soleglad and Fet, 2008 are described: *Kochius catavina*, **n. sp.**; *Kochius danzante*, **n. sp.**; *Kochius jatay*, **n. sp.**; *Kochius kiliwa*, **n. sp.**; *Kochius maroma*, **n. sp.**; and *Kochius moosni*, **n. sp.** Six new species of *Mesomexovis* González-Santillán and Prendini, in prep. are described: *Mesomexovis caxcan*, **n. sp.**; *Mesomexovis izazagai*, **n. sp.**; *Mesomexovis ofeliae*, **n. sp.**; *Mesomexovis tinctus*, **n. sp.**; *Mesomexovis tlayoli*, **n. sp.**; and *Mesomexovis zaragozai*, **n. sp.** *Mesomexovis nigropictus* (Pocock, 1898) is revalidated and *M. spadix* (Hoffmann, 1931) is synonymized with it. A new species of *Chihuahuanus* González-Santillán and Prendini, in prep. is described: *Chihuahuanus panchovillai* **n. sp.** *Chihuahuanus cazieri* (Williams, 1968) is synonymized with *C. crassimanus* (Pocock, 1898). Six new species of *Paravaejovis* Williams, 1980 are described: *Paravaejovis cochimi*, **n. sp.**, *Paravaejovis*

elucidatus, **n. sp.**, *Paravaejovis exploratus*, **n. sp.**, *Paravaejovis kino*, **n. sp.**, *Paravaejovis nigroguerreroensis*, **n. sp.**, *Paravaejovis voluptatis* **n. sp.** All previously described species are redescribed, and new diagnoses presented. All descriptions are illustrated with habitus, diagnostic characters and comprehensive distribution maps based on all known and available locality records. Keys to the species of each genus are provided.

INTRODUCTION

The diversity of Syntropinae had not been assessed since the monographs of Hoffmann (1931) and Williams (1980). Although Sissom (1989b, 1991b; Sissom and Hendrixon, 2005a, 2005b, Yahia and Sissom, 1996) and others (Francke and Gonzalez-Santillán, 2007; Francke and Ponce-Saavedra, 2010, Ponce-Saavedra and Sissom, 2004; Santibañez-López 2010) published short revisionary analyses or redescription of species, Soleglad and Fet (2008) made the last comprehensive revision. Several flaws in Soleglad and Fet's revision were detected in previous chapters and in this chapter several changes to that revision are implemented based on extensive study of fresh and museum specimens and supported by the phylogenetic analyses presented in chapter 4.

The phylogenetic analyses presented in chapter 1 produced a novel hypothesis of relationships for the vaejovid subfamily Syntropinae, which permitted the redefinition of the subfamily and its component genera in chapter 2. The revised classification of the subfamily comprises eleven genera. A revision of the species in each genus is presented in this chapter. Eighty valid species are recognized, 26 of which are newly described: four new species of *Konetontli* González-Santillán and Prendini, in prep., three new species of *Thorellius* Soleglad and Fet, 2008; six new species of *Kochius* Soleglad and Fet, 2008; six new species of

Mesomexovis González-Santillán and Prendini, in prep.; one new species of *Chihuahuanus* González-Santillán and Prendini, in prep.; and six new species of *Paravaejovis* Williams, 1980. *Konetontli zihuatanejensis* (Baldazo-Monsivais, 2003) and *Mesomexovis nigropictus* (Pocock, 1898) are revalidated. *Thorellius atrox* (Hoffmann, 1931) is synonymized with *Thorellius cristimanus* (Pocock, 1898); *Mesomexovis spadix* (Hoffmann, 1931) synonymized with *M. nigropictus*; and *Chihuahuanus cazieri* (Williams, 1968) synonymized with *Chihuahuanus crassimanus* (Pocock, 1898). All previously described species are redescribed, with new diagnoses presented based. Standardized descriptions are presented with sexual dimorphism noted as appropriate. All descriptions are illustrated with habitus, diagnostic characters and comprehensive distribution maps based on all known and available locality records. Keys to the species of each genus are provided.

MATERIAL AND METHODS

Scorpion specimens are deposited in the following collections: Academia de Ciencias de Cuba, Instituto de Ecología y Sistemática, Havana Cuba (IES); American Museum of Natural History, New York, U.S.A. (AMNH); Colección de Aracnología y Entomología del Centro de Investigaciones Biológicas del Noroeste, Baja California Sur, Mexico (CAECIB); California Academy of Sciences, San Francisco, California (CAS); Colección Nacional de Aráchnidos, Instituto de Biología, Universidad Nacional Autónoma de México, Mexico City (IBUNAM); Muséum d'Histoire Naturelle, Geneva, Switzerland (MHNG); Florida State Collection of Arthropods, Gainesville, FL, U.S.A. (FSCA); Michael Soleglad Private Collection, Borrego Springs, CA, U.S.A. (MES); Museo ed Instituto di Zoologia Sistematica della Università, Turin, Italy (MIZT); Museum of Comparative Zoology, Cambridge, MA, U.S.A. (MCZ); Museum

National d'Histoire Naturelle, Paris, France (MNHN); Natural History Museum, London, UK (BMNH); Ohio State University, Museum of Biological Diversity, Columbus, OH, U.S.A. (OSAL); Naturhistoriska Riksmuseet, Stockholm, Sweden (NRS); Universidad Autónoma de Guerrero, Guerrero, Mexico (UAGRO); Universidad Michoacana de San Nicolas de Hidalgo, Michoacán, Mexico (UMSNH). United States National Museum of Natural History, Smithsonian Institution, Washington, DC, U.S.A. (USNM); W. David Sissom Private Collection, Canyon, TX, U.S.A. (WDS); Museum für Naturkunde, Berlin, Germany (ZMB). Material at the AMNH, CAS and IBUNAM bearing the acronym ARA were collected during a U.S. National Science Foundation-funded 'Revisionary Syntheses in Systematics' grant number 0413453.

Provenance data were copied from the labels associated with each specimen or lot and complemented with georeference, municipality, county or a complementary reference, such an identifiable city close to the locality in question. Localities were georeferenced in the field with a portable GPS (Garmin® II Plus) or retroactively using GEOLocate (Rios and Bart, 2010) and Google Earth version 6.1.0.5001 (2011). Distribution maps were generated using ArcMap 9.3.1 (Environmental Systems Research Institute [ESRI], Redlands, California), by superimposing point locality records on layers depicting the topography of North America, generated from digital elevation model files with 1 arc degree of resolution, obtained from the United State Geological Survey (USGS) http://www.usgs.gov/.

Measurements (mm) were taken with an ocular micrometer. Illustrations of external morphology were produced using a Nikon SMZ 1500 stereomicroscope with a camera lucida. Photomicrographs where taken under visible and UV light using a Microptics ML-1000 digital imaging system.

Morphological terminology follows Vachon (1974) for trichobothria, Sissom (1991a) for a modified and extended terminology of hemispermatophores, and Stahnke (1970) for other characters, except as noted. The terms ‘internal’ and ‘external’ are substituted for ‘prolateral’ and ‘retrolateral’, following Acosta et al. (2008). Pedipalp and mesosomal carination follows the system developed by Prendini et al. (in prep.). The pedipalp chela finger dentition of Soleglad and Sissom (2001) is redefined to maintain consistency with the terminology for pedipalp segments (figure 24). Terminology for leg setation and spinules (figures 23) is modified from McWest (2009). Metasomal carination (figure 22) is a modification of Ochoa et al. (2010) by Prendini et al. (in prep.).

Cheliceral denticles are not described in detail in each description, because there is no variation in position and number. The ‘typical’ dentition of Syntropinae, applying the nomenclature of Vachon (1956, 1963), is as follows. The fixed finger has four denticles: distal, subdistal, median and basal. The median and basal denticles are fused to form a bicuspid denticle. The movable finger has five denticles on the prolateral (or dorsal) margin, one distal, two subdistal, one median and one basal denticle, the median and distal being the largest in the row. The retrolateral margin (or ventral) of the movable finger is smooth, without denticles or other ornamentation expect for a large distal denticle that is opposable with the distal prolateral denticles. This configuration is not unique to Syntropinae. It is also observed in the monophyletic sister group Stahkeini, comprising *Gertschius* Graham and Soleglad, 2007, *Serradigitus*, *Stahnkeus* Soleglad and Fet, 2006, and *Wernerius* Soleglad and Fet, 2008, as well as other taxa in the family Vaejovidae.

Pedipalp finger dentition is reported in the descriptions as prolateral denticles (PD), median denticles (MD) and retrolateral denticles (RD). Finger scalloping was developed by

Prendini et al. (in prep.) but only the proximal notch and median lobe of the fixed and movable fingers, present in Syntropinae, are described here.

Two types of macrosetae are described, following McWest (2009): major and minor. The former are fairly long hairs, tapering, usually dark, and situated in a socket, whereas the latter are morphologically similar but are a half or a third shorter and often pale or translucent. Macrosetae are reported as formulae, i.e. the number of macrosetae observed on each carina on a segment. For example, the prolateral ventral carinae of leg basitarsi I:II:III:IV in *S. macrura* have setal counts of 9:9:9:9, and the dorsal lateral carinae of metasomal segments I:II:III:IV:V have setal counts of 0:1:2:3:11. The ventral sublateral and ventral median carinae are expressed as setae on V segment only, except in *Syntropis* where the ventral median carina is expressed on all segments, thus setal counts for these carinae only apply to these segments.

Telson carinae follow the system developed for the carinal system developed for the metasoma by Prendini et al. (in prep.). Whereas earlier works (e.g., Williams, 1980) provided qualitative descriptions of the hirsuteness of the telson, macrosetal counts of each carina are more accurate and convenient for taxa with dense rows of macrosetae on the telson (e.g. *Kochius*). The presence of macrosetae on the ventral surface of the telson is a source of confusion in *Kochius*. The presence of macrosetae depends on the age and state of preservation of material. Macrosetae often become detached in old or poorly preserved specimens, creating the false appearance of a bald telson when compared with fresh material with a full setal complement. Counting the sockets of macrosetae on each carina is a more accurate method.

Several glands, used in chapter 1, diagnostic for genera and species, are included in the descriptions. For example, the distomedian glandular spots of sternite VII are diagnostic for

Kochius and the minute fusiform to rounded glandular spot on the dorsal surface of the telson is diagnostic for *Chihuahuanus*.

SYSTEMATICS

FAMILY VAEJOVIDAE THORELL, 1876

SUBFAMILY SYNTROPINAE KRAEPELIN, 1905

KONETONTLI González-Santillán and Prendini, in prep.

KEY TO IDENTIFICATION OF THE SPECIES OF *Konetontli*

1. Ventral submedian carinae of metasomal segments II and III and ventral median carinae of metasomal segment V obsolete……2

- Ventral submedian carinae of metasomal segments II and III and ventral median carinae of metasomal segment V granular……..……..6

2. Ventral lateral carinae of metasomal segment V obsolete……...3

- Ventral lateral carinae of metasomal segment V moderately granular…….5

3. Pedipalp chela movable finger with seven retrolateral denticles and seven rows of median denticles, pedipalp manus relatively incrassate, prolateral dorsal carina with scattered granules along its extension and dorsal prolateral with scattered granules on distal pedipalp manus……..*K. acapulco*

- Pedipalp chela movable finger with six or five retrolateral denticles and six or five rows of median denticles, pedipalp manus relatively slender, prolateral dorsal carina and dorsal prolateral carinae of pedipalp manus smooth and obsolete……..…...4

4. Pedipalp chela movable finger with six retrolateral denticles and six rows of median denticles, pedipalp manus essentially immaculate with traces of infuscation on distal manus……..……*K. juxtlahuaca*, **n. sp.**

- Pedipalp chela movable finger with five retrolateral denticles and five rows of median denticles, pedipalp manus entirely infuscated with all carinae outlined with darker infuscation……..…*K. ignis*, **n. sp.**

5. Pedipalp chela movable finger with six retrolateral denticles and six rows of median denticles, distal margin of carapace sublinear with shallow median notch, patella dorsal and retrolateral surfaces weakly infuscate...…….*K. kuarapu*

- Pedipalp chela movable finger with seven retrolateral denticles and seven rows of median denticles, distal margin of carapace straight, lacking median notch, patella dorsal and retrolateral surfaces with diffuse infuscation outlining carinae……..*K. zihuatanejensis*

6. Pedipalp chelae relatively slender, chela fixed finger with five retrolateral denticles and five rows of median denticles……..……7

- Pedipalp chelae relatively incrassate, chela fixed finger with six retrolateral denticles and six rows of median denticles…….....……8

7. Pedipalp manus immaculate, chela movable finger with five retrolateral denticles and five rows of median denticle, ventral submedian carinae of metasomal segment I obsolete…...……

…….*K. chamelanesis*

- Pedipalp manus with all carinae strongly infuscate, intercarinal surfaces diffusely infuscate, chela movable finger with six retrolateral denticles and six rows of median denticle, ventral submedian carinae of metasomal segment I moderately granular….…….…….*K. ilitchi*, **n. sp.**

8. Carinae of pedipalp manus immaculate, ventral submendian carinae of metasomal segments II–IV weakly granular with scattered minute granules, distal median hyaline glandular spot on ventral sternite VII present, protruding slightly from adjacent surfaces, pectinal count in males 10–11……..……*K. migrus*, **n. sp.**

- Carinae of pedipalp manus infuscated, ventral submedian carinae of metasomal segment II–IV strongly granular with large granules, distal median hyaline glandular spot on ventral sternite VII absent, pectinal count in males 12–14……..……...9

9. Pedipalp fixed finger straight lacking proximal notch, fingers fitting together evenly at the base, a small gap evident when closed, ventral median carinae of telson with compound subaculear tubercle, primary tubercle relatively elongated, with two or more proximal secondary tubercles along ventral median carinae, telson relatively globose……*K. nayarit*

- Pedipalp fixed finger with proximal notch, fingers fitting together unevenly at the base, distinct gap evident when closed, ventral median carinae of telson with simple subaculear tubercle, primary tubercle solitary, relatively small, sometimes with a secondary minute tubercle, telson relatively elongated…….……..…*K. pattersoni*

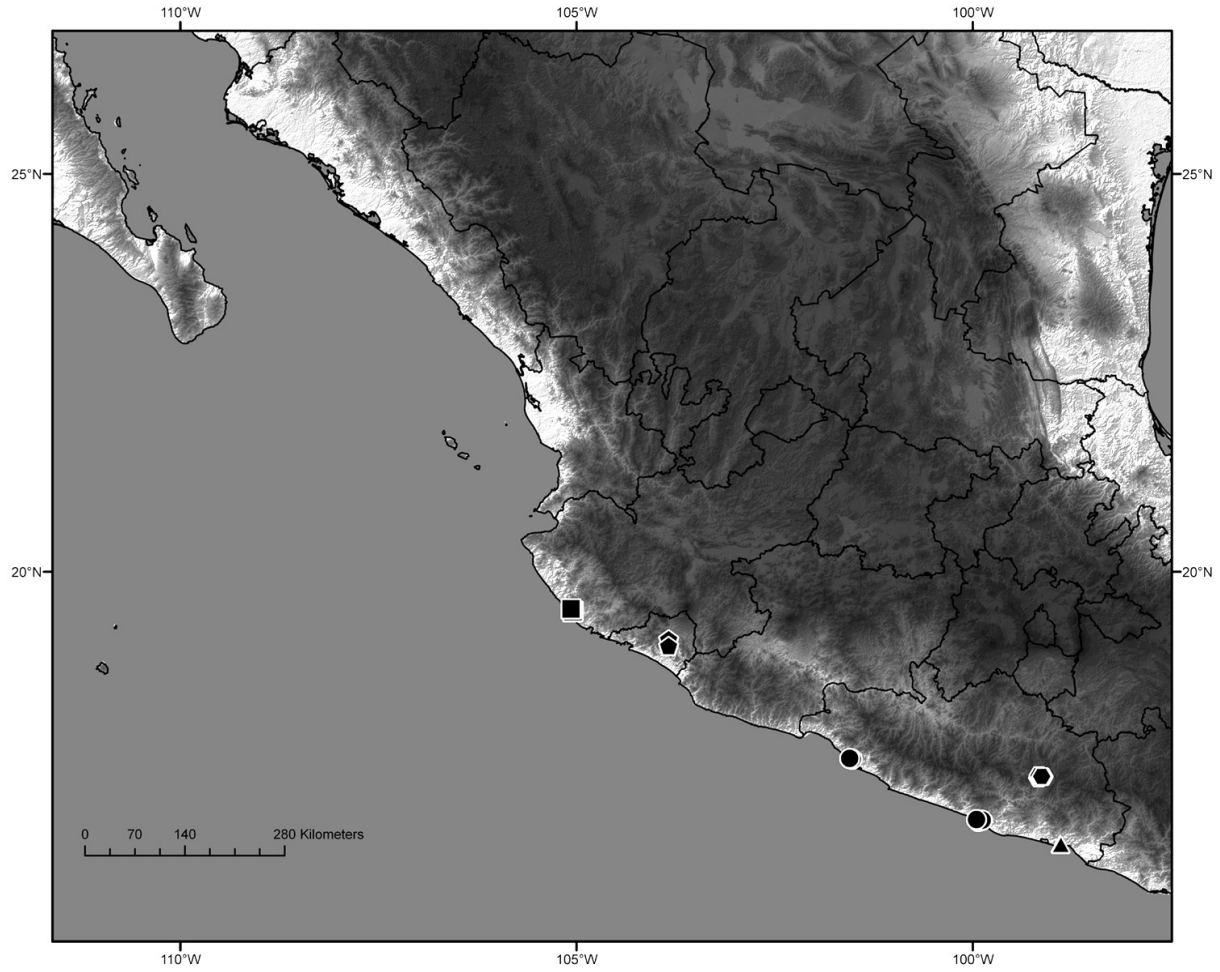


Figure 37. Map of Mexico, plotting known locality records for five species in the vaejovid scorpion genus *Konetontli* González-Santillán and Prendini, in litt., based on data collected in the present study: *Konetontli acapulco* (Armas and Martín-Frías, 2001) (circles), *Konetontli chamelaensis* (Williams, 1986) (squares), *Konetontli ignis*, **n. sp.** (triangles), *Konetontli ilitchi*, **n. sp.** (pentagons), and *Konetontli juxtlahuaca*, **n. sp.** (hexagons), darker contour indicates increase of altitudinal gradient.

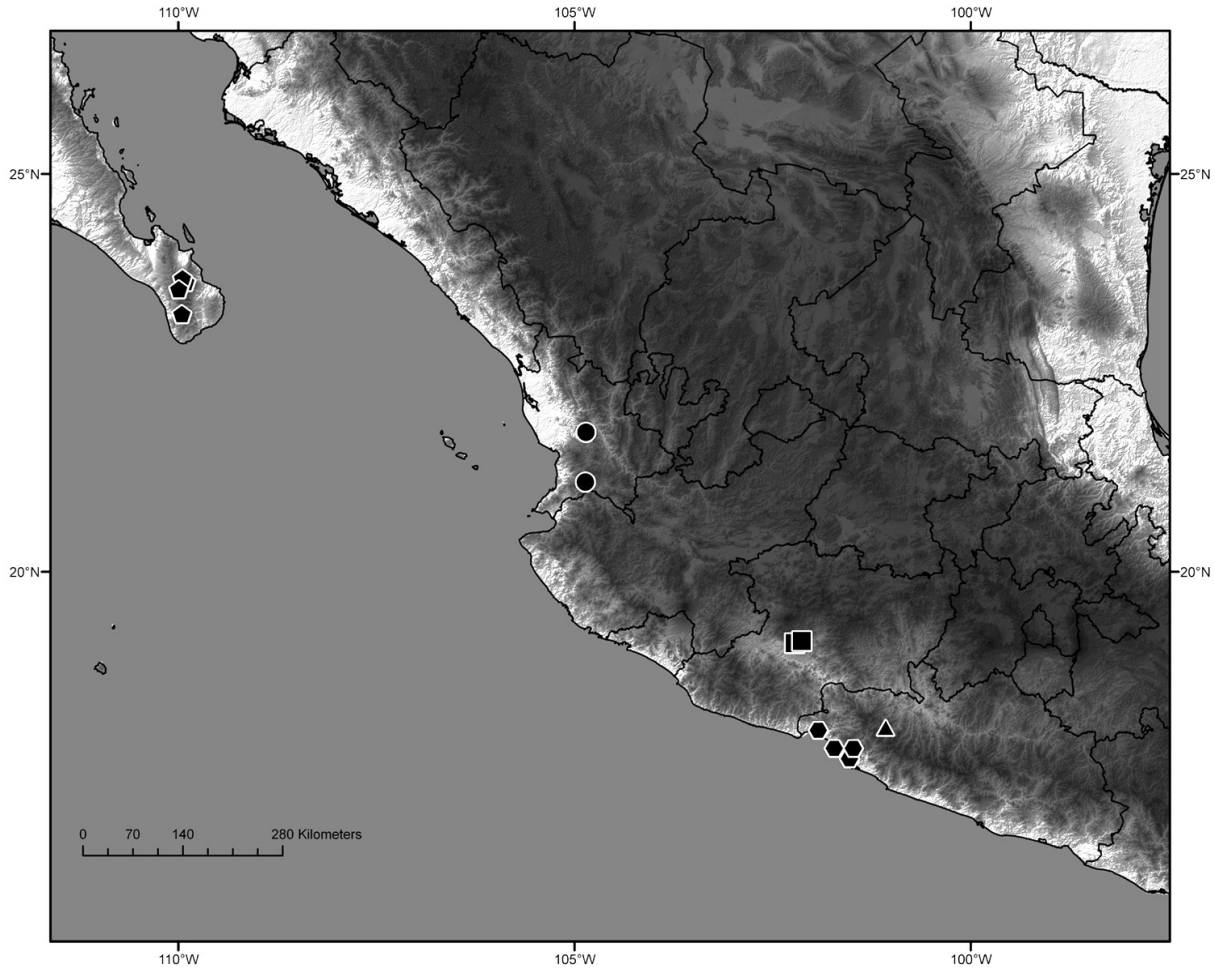


Figure 38. Map of Mexico, plotting known locality records for five species in the vaejovid scorpion genus *Konetontli* González-Santillán and Prendini, in litt., based on data collected in the present study: *Konetontli kuarapu* (Francke and Ponce-Saavedra, 2004) (squares), *Konetontli migrus*, **n. sp.** (triangles), *Konetontli nayarit* (Armas and Martín-Frías, 2001) (circles), *Konetontli pattersoni* (Williams and Haradon, in Williams, 1980) (pentagons), and *Konetontli zihuatanejensis* (Baldazo-Monsivais, 2003) (hexagons), darker contour indicates increase of altitudinal gradient.

Konetontli acapulco (Armas and Martín-Frías, 2001)
Figures 37, 39–41, 69A, 82A, 85A, 86A, 89A, 91A, 93A

Vaejovis acapulco Armas and Martín-Frías, 2001: 9–13, figs. 1, A–F, tabs. 1–3; Armas, 2003: 240; González-Santillán, 2004: 29; Francke and Ponce-Saavedra, 2005: 63, 64, 66, fig. 11, 67, figs. 18, 19; Soleglad and Fet, 2008: 89, 99.

TYPE MATERIAL: **MEXICO: Guerrero:** [*Municipio de Acapulco de Juárez*]: Holotype ♂ (IBUNAM), Acapulco, Colonia Francisco Villa, 25.v.1999, E. Martín and A. Losoya. Paratypes: 1 ♀, 1 subad. ♂, 1 subad. ♀ (IBUNAM), same data as holotype; 3 ♀, 1 juv. ♀ (IES), 2 ♀ (ENCB), Acapulco, Fraccionamiento Mozimba; 1 ♀, 1 juv. ♀, 1 ♂ (ENCB), Acapulco, Colonia Alta Progreso; 2 ♀, 2 juv. (IBUNAM), 2 ♀, 1 ♂ (IES), Acapulco, Colonia el PRI; 1 ♀, 1 juv. (ENCB), Acapulco, Colonia Jardín Mangos. [*Municipio de Zihuatanejo de Azueta*]: 1 ♂, 1 juv. ♀ (IES), Ixtapa Zihuatanejo.

DIAGNOSIS: *Konetontli acapulco* is closely related to *K. zihuatanejensis*, *K. kuarapu*, *K. ignis*, **n. sp.**, and *K. juxtlahuaca*, **n. sp.**, with which it forms a monophyletic group (see *K. kuarapu* for details). These species are related by the unique derived apomorphic character: ventral submedian carinae obsolete to vestigial in metasomal segment I–IV. *K. acapulco* and *K. zihuatanejensis* are the closely related species and they differ in that the former has prolateral dorsal, dorsal prosubmedian, dorsal prolateral, prolateral median, and prolateral submedian carinae finely granular with scattered moderated granules and the latter has these carinae smooth. *K. acapulco* has ventral lateral carinae of metasomal segment V vestigial, expressed as a short row of denticles on distal fourth and ventral submedian in IV obsolete but *K. zihuatanejensis* has ventral lateral carinae finely serrated and ventral submedian vestigial, expressed as a short row of denticles on distal fourth. *K. acapulco* has ventral median carinae of telson with a solitary

subaculear tubercle and ventral surface smooth, *K. zihuatanejensis* has an additional secondary tubercle and the ventral surface with enlarged scattered granules. From *K. kuarapu* differs by having pedipalp chelae movable finger with seven retrolateral denticles and seven rows of median denticles, instead of six each. From *K. ignis*, **n. sp.** and *K. juxtlahuaca*, **n. sp.** *K. acapulco* differs by having pedipalp manus immaculate, instead of having intercarinal surfaces heavily infuscated and carinae outlined with infuscation.

DESCRIPTION: The following redescription supplements Armas and Martín-Frías' (2001) original description. It is based on the holotype and the material mentioned below.

Color and infuscation: Base color mesosoma, metasoma brownish-yellow, pedipalps yellow-orange and legs yellow straw. Carapace, tergites, ventral metasoma infuscated with dusky markings. Pedipalp carinae, fingers diffusely infuscated with dusky markings. Tergites with ventral median carinae weakly infuscated, ventral median, dorsal submedian intercarinal surface immaculate. Sternite I–VI immaculate. Metasomal carinae infuscated partially in all segments, dorsal intercarinal surfaces diffusely infuscate. Telson paler than metasomal segment V base of coloration yellowish-orange. Aculeus brown reddish. Coxal region immaculate.

Carapace: Carapace length 1.2 times longer than posterior width. Anterior margin sublinear, with shallow median notch. Carapace matte, cover with fine granules throughout, except posterolateral furrow. Median ocular tubercle raised, positioned on anterior half of carapace. Three lateral eyes, two frontal pairs same size, posterior reduced approximately by half. Median eyes approximately double size of lateral frontal pair. Anteromedian sulcus moderate; posteromedian deep, narrow outlined by slightly larger granules, posterolateral and posterior transverse obsolete.

Sternum and coxal region: Sternum pentagonal subequilateral 1.5 times wider than longer, surface matte, with four pairs of macroseta, median sulcus deep. Coxal region with scatter matte spots in ♂, in ♀ smooth. Anterior margin of coxa II entirely cover with minute granules, subbasally three oblique slit-like structures, adjacent to low, smooth protuberance; proximal margin of coxal endite II with deep depression each, median edge smooth. Coxa IV 2.1 times longer than coxa II.

Chelicerae: Dorsal surface smooth and immaculate, movable finger infuscate. Distal manus with three macrosetae, reducing in size from median to prolateral side. Serrula present on ventral distal half of movable finger, tines numbering 27/27.

Pedipalps: Trichobothrial pattern Type C, orthobothriotaxic. Chela 1.6 times longer than patella, 1.9 times longer than femur. Femur: All intercarinal surface matte. Carinae: dorsal prolateral, dorsal retrolateral carinae complete, granular; retrolateral dorsosubmedian obsolete, expressed only by proximal enlarged tubercle, two or three granules each with macroseta positioned on medial aspect of femur; retrolateral ventral, ventral median, ventral retrosubmedian vestigial, expressed only on proximal extreme by few granules; ventral prolateral complete, granular; prolateral ventral partial, expressed by three tubercles each one with macroseta, three intersperse granules, extending two-thirds of femur; prolateral ventrosubmedian partial, expressed by four spiniform enlarged, blunt tubercles, proximal tubercles adjacent to trichobothrium *I,* and distal two with one macroseta each.

Patella: All intercarinal species matte. Carinae: Dorsal prolateral, dorsal retrolateral, ventral prolateral, ventral retrosubmedian with moderate granules, weakly costate. Dorsal retrolateral, ventral retrolateral incomplete, proximal and distal granulation weaker to obsolete. Ventral median granular, extending mid segment progressively weaker distally. All retrolateral

carinae obsolete. Prolateral ventral obsolete, two macrosetae demarcating longitudinal partial expression on ventral aspect of patella. Prolateral median on vaulted projection protruding strongly medially, moderately granular, distal extreme with a ridge angling dorsally reaching dorsal prolateral carinae on distal fifth of patella, delimited by two macrosetae.

Chela: Proximal surface of manus smooth, distal surface finely, scattered granular; manus relatively incrassate. Carinae: Prolateral dorsal, dorsal prosubmedian, dorsal prolateral, prolateral median, prolateral submedian finely granular with scattered moderated granules, more evident in distal half. All other carinae obsolete. Trichobotrium *ib* and *it* positioned subbasal on fixed finger, between PD6 and PD7. *Dt* positioned close to mid manus. Pedipalp

Fingers: Fingers dentate margin straight, lacking notch or lobe. Fixed finger, PD = 6, RD = 6, MD rows = 6, all PD subpaired with corresponding RD and RD dislocated from medial rows; movable finger, PD = 7, RD = 7, MD rows = 7, distal row bearing one reduced granule. PD subpaired with corresponding RD and RD dislocated from medial rows.

Legs: Spinules: Basitarsi I–III prolateral ventral, retrolateral ventral carinae complete expressed as scattered row of spinules, in IV absent; retrolateral median, retrolateral dorsal rows absent on I–IV. Telotarsi I–IV with two pair of ventral distal spinules. Setae: Prolateral ventral 4:4:4:4, basal three spiniform, stout on IV; retrolateral ventral 3:4:4:5; retrolateral dorsal: 3:3:3:3; dorsal 3:3:3:3. Retrolateral dorsal, dorsal series arranged in two independent rows.

Tergites: Tergites matte. Dorsal median carinae of tergites I–VI complete costate; submedian weak with few proximal granules. Dorsal median carina of tergite VII moderately costate, expressed on proximal half of segment with fields of granules; dorsal lateral, lateral submedian incomplete expressed on distal two-thirds of segment, strongly granular, intercarinal surfaces shagreened.

Genital operculum: Male genital operculum: wider than long, with two pairs of macrosetae. Sclerites free on longitudinal edge moving independently but unable to open more than 45°. Genital papillae protruding posteriorly. Female genital operculum wider than long, with three macrosetae. Sclerites fuse longitudinally.

Sternites I–VI smooth. Sternite V with distal median hyaline glandular spot reduced but visible. Sternite VII with all carinae obsolete except ventral submedian moderately crenular and costate. Ventral submedian, ventral lateral carinae with two pairs of macrosetae, lateral ventral with one pair of macrosetae. Sternite VII posteromedian whitish glandular spot absent. Spiracles minute slit-like, approximately three times longer than wide.

Pectines: Basal piece of pectines with three pairs of macrosetae. Marginal lamella consist of three sclerites, medial lamella basal two or three sclerites fused, others arrange in nine beads. Fulcra with 14/14 beads. Pectinal tooth numbering 13–16 ♂, 12–14 ♀. Pectines relatively short, mid distal sclerite of marginal lamella at level of distal edge of coxa IV in ♂, in ♀ sclerite at the level of distal edge of coxa IV.

Hemispermatophore: Lamina 2.05 longer than trunk. Median lobe ental terminus moderate, rounded. Dorsal through margin long, narrow, curving proximally, removed from ventral trough. Primary, secondary hooks elongate, positioned on apex of lateral margin extension of lamina (flange), forming deep notch. Primary hook finely bifurcate. Hemi-mating plug developed from inner lobe, distal barb margin with approximately 13 long spinules. Basal plate of inner lobe distal to ventral trough. Neck of inner lobe shorter than basal plate (0.5 times longer than basal plate). Measurements, lamina, 2.79; trunk, 1.36; dorsal trough/laminar hooks, 1.12; ventral trough/laminar hook, 0.68; neck, 0.17; basal plate, 0.34.

Metasoma: All intercarinal surfaces matte. Metasoma 1.5 times longer than mesosoma. Metasomal segments I–III wider than longer. Carinae: Dorsal lateral, lateral median segments I–IV crenatoserrated terminating in moderated enlarged spiniform granules pointing backwards; segment V dorsal lateral granulate to serrate, lateral median vestigial with two or three proximal, weakly costate, distal absent. Lateral inframedian carinae in segment I complete, granular, moniliform; in II incomplete, present on distal half, granular proximally with clustered granules, becoming moniliform distally; in III incomplete, present on distal two thirds, granular proximally with clustered granules, becoming moniliform distally; in IV absent; ventral lateral in I–III moderately granular, in IV moderated with cluster of granules with few scattered distal granules; ventral submedian I–V obsolete expressed by infuscation and macrosetae; ventral submedian in segment V obsolete; ventral lateral vestigial with row of fine granules on distal third to fourth. Ventral, lateral intercarinal surfaces of IV and V with fields of moderate granules. Setae: Dorsal lateral carinae, 1:1:1:2:8; lateral median, 1:2:2:3; lateral inframedian, 2:2:2:2:5; ventral lateral, 3:3:3:3:6; ventral submedian, 3:3:3:3:4; ventral sublateral, 2. All setae major.

Telson: Telson relatively globose, 2.0 times longer than wide. Metasomal segment V 1.4 times wider than telson. Vesicle 1.9 times longer than aculeus. Dorsal surface smooth. Ventral median carinae with subaculear tubercle simple, solitary, conical, blunt. Other carinae smooth, obsolete. Carinae with five to six pairs of macrosetae each. Microserration on laterobasal aculeus numbering 3/3.

DISTRIBUTION: *Konetontli acapulco* is endemic to the coast of Guerrero, Mexico. It extends from Ixtapa-Zihuatanejo to Acapulco, Mexico.

ECOLOGY: According to Armas and Martín-Frías (2001), the paratypes of *K. acapulco*, collected at Mozimba an urban location in Acapulco, were found in shaded vacant lots with

abundant leaf litter and tall grass, where it was sympatric with *Mesomexovis occidentalis*. In Zihuatanejo, *K. acapulco* was collected close to an urban location as well, ca. 100 m from the beach, under rocks and litter. The dominant vegetation in this location was tropical deciduous forest. *K. acapulco* was collected from 72 to 912 m altitude.

REMARKS: *Konetontli acapulco* was described as a species of *Vaejovis* (Armas and Martín-Frías, 2001). These authors proposed that the subaculear tubercle was a putative apomorphy uniting: *K. acapulco*, *K. nayarit* from Mexico and *Wernerius spicatus* (Sissom, 1993) and *W. mumai* (Haradon, 1974) from the southwest U.S.A. However, Sissom concluded earlier (1993) that these last two species are more closely related to the genus *Serradigitus* and allied genera, because they share a basal modified pectinal teeth and distal barb of the mating plug smooth. Subsequently, Soleglad and Fet (2008) transferred *K. acapulco* along with other species with a subaculear tubercle: *K. chamelaensis*, *K. kuarapu K. nayarit*, and *K. pattersoni* to the *mexicanus* group of *Vaejovis* and created *Wernerius* to accommodate the two species from the U.S.A. The phylogenetic analyses conducted in chapter 1, confirmed Sissom (1993) observations, placing *Wernerius* in a monophyletic group including *Stahnkeus* and *Serradigitus* along with other putative new genera, and falsified Soleglad and Fet's (2008) relative placement of the Mexican species with subaculear tubercle in to the *mexicanus* group, instead retrieveing as a monophyletic group these species within the Syntropinae subfamily.

MATERIAL EXAMINED: **MEXICO: Guerrero:** *Municipio de José Azueta*: Colonia Agua de Correa, 17°38.6982'N 101°31.0932'W, 72 m, 1.viii.2008, O. Francke, H. Montaño, J. Ponce, and A. Quijano, tropical dry forest, 1 ♀ (AMNH [LP 9520]).

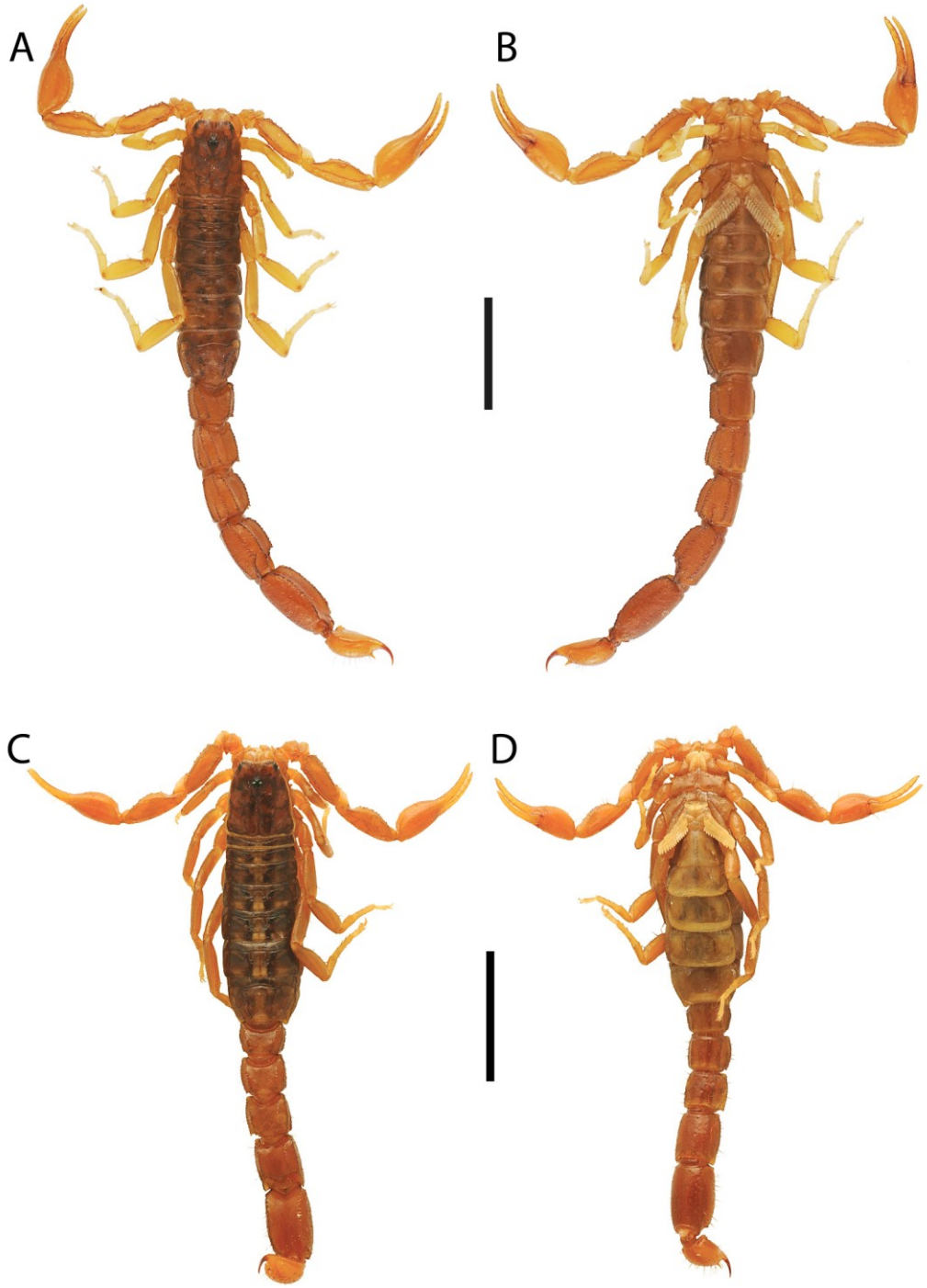


Figure 39. *Konetontli acapulco* (Armas and Martín-Frías, 2001), habitus. **A**, **B**. Holotype ♂ (IBUNAM). **C**, **D**. ♀ (IBUNAM). **A**, **C**. Dorsal aspect. **B**, **D**. Ventral aspect. Scale bars = 5 mm.

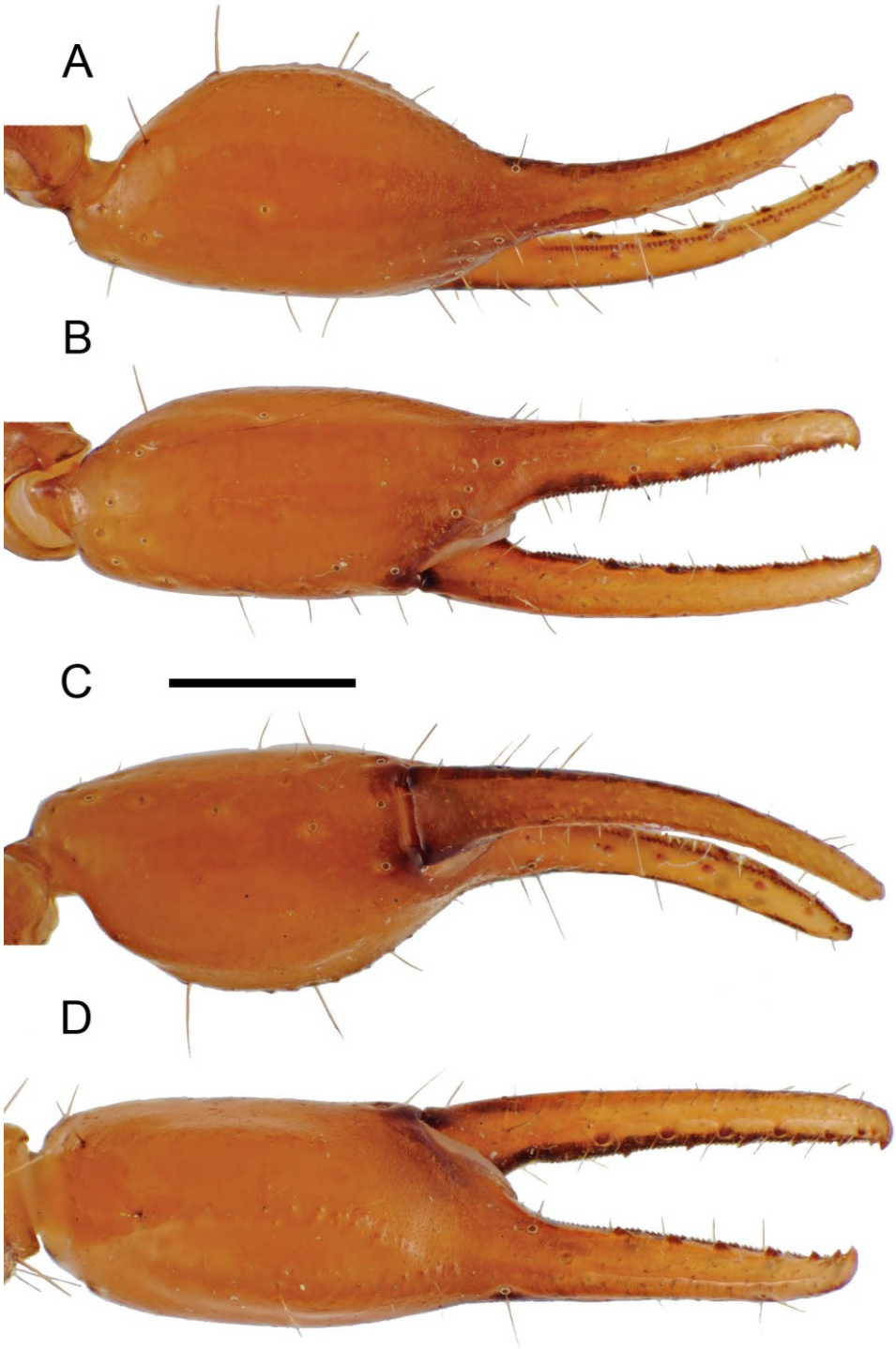


Figure 40. *Konetontli acapulco* (Armas and Martín-Frías, 2001), holotype ♂ (IBUNAM), dextral pedipalp chela. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

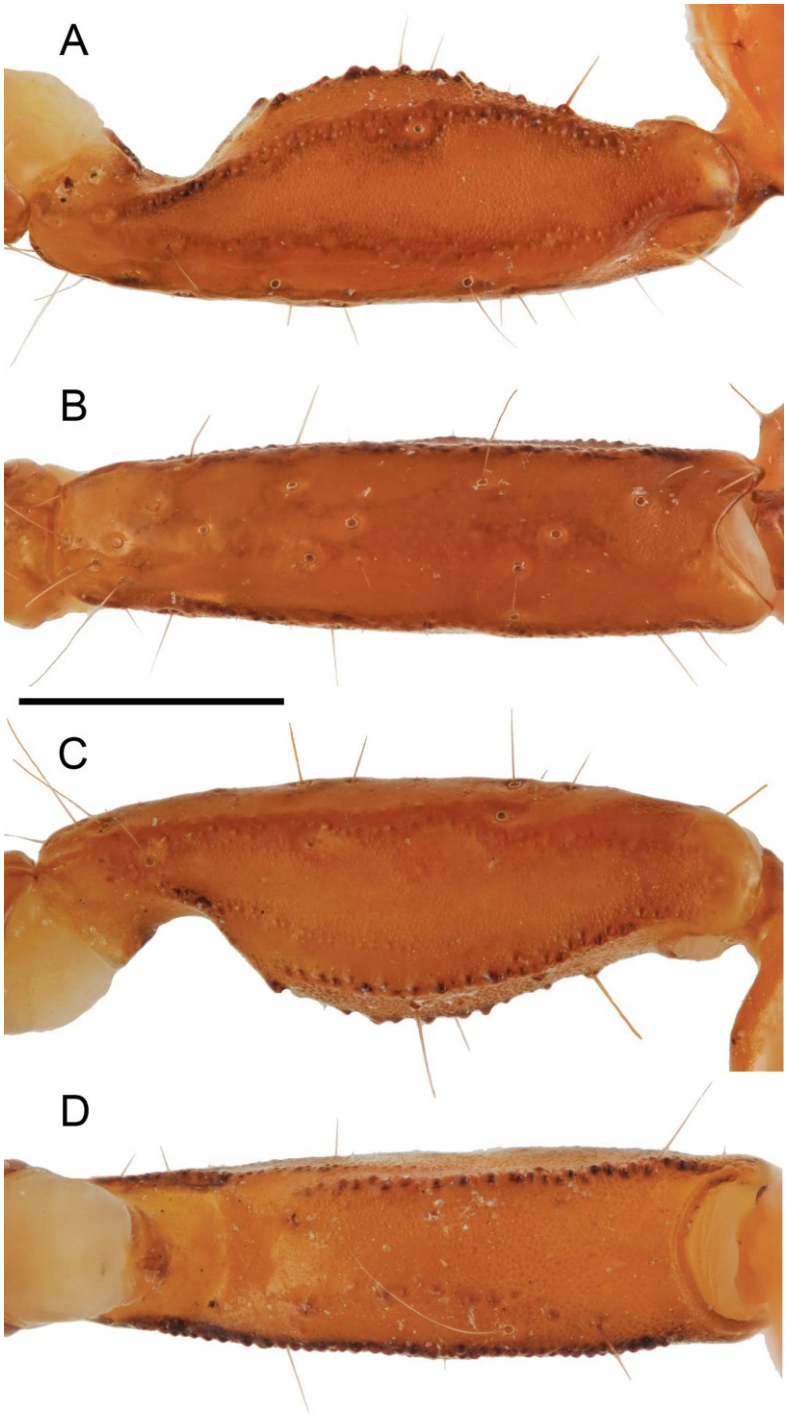


Figure 41. *Konetontli acapulco* (Armas and Martín-Frías, 2001), holotype ♂ (IBUNAM), dextral pedipalp patella. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

Konetontli chamelaensis (Williams, 1986) **new combination**

Figures 37, 42–44, 69B, 74A, 75B, 76B, 79B, 81B, 83B

Vaejovis chamelaensis Williams, 1986: 355–358, fig. 1; Kovařík, 1998: 146; Beutelspacher, 2000: 76, 141, 152, map 50; Sissom, 2000: 530, 531; González-Santillán, 2004: 25, 26, tab. 1, 27, 31 (key), 34, fig. 3; Francke and Ponce-Saavedra, 2005: 63, 66, fig. 10, 67, figs. 12, 13; Soleglad and Fet, 2008: 89, 99; Ponce-Saavedra and Francke, 2011: 466, tab. 1.

TYPE MATERIAL: **MEXICO: Jalisco:** Holotype: ♂ (CAS, Type No. 15744), Estación de Biología, Chamela, 10–13.vii.1985, S.C. Williams. Paratypes: 7 ♂ (CAS, Type No. 15744), same locality as holotype.

DIAGNOSIS: *Konetontli chamelanesis* is closely related to *K. ilitchi*, **n. sp.**, *K. nayarit*, *K. pattersoni*, and *K. migrus*, **n. sp.**, with which it forms a monophyletic group. These species are related by the unique derived apomorphic character: ventral submedian carinae granular in metasomal segments I–IV (see *K. nayarit* for details). *K. chamelanesis* may be separated from all the above mentioned species by having five rows of median denticles and five retrolateral denticles on pedipalp movable finger, instead of six. From the closest relative *K. ilitchi*, **n. sp.**, *K. chamelanesis* differs by the absence of infuscation and lighter base color of pedipalp chela. Whereas *K. chamelanesis* has the ventral surface of the telson with scattered minute crenulations, *K. ilitchi*, **n. sp.** exhibits a uniformly coarse granular surface. *K. chamelanesis* has dorsal retrolateral carinae of pedipalp femur partially infuscated but *K. ilitchi*, **n. sp.** has it completely infuscated. From *K. nayarit* and *K. pattersoni* differs by total size more than 20 mm (♂ and ♀) and *K. chamelanesis* at less than 15 mm (♂) and less than 17 mm (♀).

DESCRIPTION: The following redescription supplements Williams' (1986) original description. It is based on the holotype and the material studied.

Color and infuscation: Base coloration mesosoma, carapace yellow-orange, pedipalps yellow, legs yellow straw. Carapace, tergites, metasoma, infuscated with dusky markings. Pedipalps carinae immaculate. Base of pedipalp fingers weakly infuscated, slightly darkened. Tergites with ventral median carinae immaculate, ventral median and dorsal submedian intercarinal surface immaculate. Sternite I–VI immaculate. Metasomal carinae infuscated partially in all segments. Metasomal segments basal to distal becoming darker from yellowish to red-brownish. Telson, orange-brownish, paler than metasomal segment V. Aculeus brown reddish. Pectinal teeth, genital operculum, coxal segments immaculate.

Carapace: Carapace length 1.2 times longer than posterior width. Anterior margin sublinear, lacking median notch. Carapace matte. Median ocular tubercle rise, positioned on anterior half. Tree lateral eyes, two frontal pairs same size, posterior reduced approximately in half. Median eyes approximately three times the size of lateral frontal pair. Anteromedian sulcus obsolete, posteromedian shallow, narrow; posterolateral, posterior transverse obsolete.

Sternum and coxal region: Sternum pentagonal subequilateral, 1.5 times wider than longer, matte, with three pairs of macroseta, median sulcus deep. Coxal region with scatter matte spots in ♂, in ♀ smooth. Anterior margin of coxa II entirely cover with scatter moderate and minute granules, subbasally three oblique slit-like structures, adjacent to low and smooth protuberance; proximal margin of coxal endite II with a moderate depression each, median margin smooth. Coxa IV 1.25 times longer than coxa II.

Chelicerae: Dorsal surface and movable finger smooth, immaculate. Distal manus with three setae, reducing in size from median to lateral sides. Serrula present on ventral distal half of movable finger, tines numbering 11–12.

Pedipalps: Trichobothrial pattern Type C, orthobothriotaxic. Femur: All intercarinal surfaces matte. Dorsal retrolateral, dorsal prolateral, ventral prolateral carinae weakly granular; retrolateral dorsosubmedian obsolete, expressed by two macrosetae positioned medially; retrolateral ventral, ventral median carinae obsolete; prolateral ventral obsolete, expressed by three macrosetae; prolateral ventrosubmedian finely granular with one median macroseta.

Patella: All intercarinal surfaces matte. Dorsal prolateral weakly granular, dorsal retrolateral obsolete; all retrolateral carinae obsolete; ventral retrosubmedian, ventral median obsolete; ventral prolateral finely granular; prolateral ventral finely granular with two macrosetae demarcating longitudinal partial expression on the medial aspect of the patella; prolateral median on vaulted projection, protruding moderately medially, finely crenulated, distal extreme angling dorsally almost reaching distal end of dorsal prolateral carinae with two macrosetae on proximal and distal extremes. All other carinae absent.

Chela: Proximal surface of manus smooth, distal surface finely, scattered granular. Manus relatively slender. Carinae: All carinae obsolete. Trichobotrium *ib* and *it* positioned subbasal on fixed finger, between PD6 and PD7. *Dt* positioned close to mid manus. Pedipalp

Fingers: Fingers dentate margin straight, lacking notch or lobe. Fixed finger, PD = 5, RD = 5, MD rows = 5, all PD subpaired with corresponding RD and proximal two retrolateral denticles dislocated from row of median denticles; movable finger, PD = 7, RD = 5, MD rows = 5, distal row bearing two reduce granule. Prolateral deticles subpaired with corresponding

retrolateral denticles, proximal two retrolateral denticles dislocated from median row of median denticles.

Legs: Spinules: Basitarsi I–II with prolateral ventral and retrolateral ventral carinae with row of spinules each on distal half, on III retrolateral ventral row of spinules on distal end, prolateral ventral absent, in IV absent; retrolateral median and retrolateral dorsal rows absent in I–IV. Telotarsi I–IV with one pair of ventral distal spinules. Setae: Basitarsi setal counts: Prolateral ventral, 3:3:4:4, median two spiniform and stout on III–IV; retrolateral ventral, 3:3:3:3; retrolateral dorsal, 3:3:3:3; dorsal, 2:2:2:2. Retrolateral dorsal and dorsal series arranged in two independent rows.

Tergites: Tergites matte. Tergites I–VI median carinae obsolete, submedian weak with few proximal granules. Tergite VII with dorsal median carina moderately costate, expressed on proximal half of the segment; dorsal lateral, lateral submedian incomplete expressed on distal two thirds of the segment.

Genital operculum: Male genital operculum wider than long, with three macrosetae. Sclerites free on longitudinal margin moving independently, unable to open more than 45°. Genital papillae protruding posteriorly. Female genital operculum wider than long, with three macrosetae. Sclerites fuse longitudinally.

Sternites: Sternites I–VI smooth throughout. Sternite V lacking distal median hyaline glandular spot. Sternite VII with all carinae obsolete. Ventral submedian, ventral lateral carinae with two pairs of macrosetae, lateral ventral with one pair of macrosetae, setae infuscated at base. Sternite VII lacking posteromedian whitish glandular spot. Spiracles minute slit-like, approximately three times longer than wide.

Pectines: Basal piece of pectines with three pairs of macrosetae. Marginal lamella consist of three sclerites, medial lamella basal two or three sclerites fuse, others arrange in eight beads. Fulcra with 10–10 beads. Pectinal tooth numbering 10–11 ♂, 10 ♀. Pectines relatively short, mid distal sclerite of marginal lamella at the level of distal edge of coxa IV in ♂, in ♀ sclerite at the level of distal edge of coxa IV.

Hemispermatophore: Lamina 2.50 longer than trunk. Median lobe ental terminus moderate and rounded. Dorsal through margin long, narrow, curving proximally, and removed from the ventral trough. Primary and secondary hooks elongated, positioned on the apex of the lateral margin extension of the lamina (flange), forming deep notch. Hemi-mating plug developed from the inner lobe, distal barb margin with approximately 12 short spinules. Basal plate of inner lobe distal to ventral trough. Neck of inner lobe shorter than basal plate (0.43 times longer than basal plate). Measurements, lamina, 1.70; trunk, 0.68; dorsal trough/laminar hooks, 0.51; ventral trough/laminar hook, 0.71; neck, 0.10; basal plate, 0.24.

Metasoma: All intercarinal surfaces matte. Metasomal segments I–III wider than longer. Carinae: Dorsal lateral and lateral median segments I–IV crenatoserrated terminating in moderated enlarged spiniform granules pointing backwards; segment V dorsal lateral granulate, lateral median crenatoserrated expressed on proximal half. Lateral inframedian carinae in segment I complete, granular, and moniliform, in II incomplete, present on distal half, moniliform, and curving upwards reaching median aspect of lateral median carinae, in III incomplete, present on distal two thirds, with scattered granules, in IV absent; ventral lateral in I–V absent; ventral lateral in I–V moderate, granular, and complete; ventral submedian in I weakly granular and costate, in I–IV moderate, granular, and complete, ventral median in V moderate, granular, and complete. All intercarinal surfaces matte. Setae: Dorsal lateral carinae,

1:1:1:1:4; lateral median, 1:1:1:2; lateral inframedian, 0:0:0:0; ventral lateral, 2:2:2:3:5; ventral submedian, 2:3:3:3; segment V ventral sublateral, 2. All setae major.

Telson: Telson relatively elongate, 2.9 times longer than wide. Metasomal segment V 1.8 times wider than telson. Vesicle 2.2 times longer than aculeus. Dorsal surface matte. Ventral median carinae with subaculear simple, solitary, conical, and slightly sharp. Other carinae obsolete. Ventral carinae with three to four pairs of macrosetae. Microserration on laterobasal aculeus numbering 4–4.

DISTRIBUTION: *Konetontli chamelaensis* is endemic to the Coast of Jalisco and has been recorded only from the Estación de Biología Chamela (Biological Station Chamela).

ECOLOGY: The topology of the Biological Station Chamela is quite flat, with elevations ranging from 10 to 580 m. The only record of altitude for this species is 97 m. The dominant vegetation in the station is tropical deciduous forest. The climate in the Station presents strong seasonality, the drought season is from November to July, the rainy season produces moderate rain during December and January; the rest of the season the rain is diminished. Cyclones rarely pass by, usually run parallel to the coast, producing little rain. The Station has basalt, rhyolite, and loose conglomerate as dominant soils. These soils are of variable depth, predominately sandy.

Williams (1986) collected all his specimens on July 10 and 11, 1985 during the night using ultraviolet light. He collected eight males and one female, which may have coincided with the reproductive cycle of this species, due to the season and the sex ratio observed. The habitat described by Williams included moderately well drained, flat sedimentary, fine texture, and well packed soil; the habitat had dense, deciduous tropical forest with stands of cacti in high, more exposed areas. This species was sympatric with *Centruroides elegans* (Thorell, 1876),

Centruroides chamelaensis Ponce-Saavedra y Francke, 2010, *Mesomexovis caxcan* González-Santillán and Prendini, in prep., and *Thorellius intrepidus* (Thorell, 1876). Williams proposed that *K. chamelaensis* is an obligate burrower. However, González-Santillán (2004) reported that the species inhabits leaf litter and decaying vegetation, based on the observation that *K. chamelaensis* has weak tarsal armature and lack other features found in pelophilous or psammophylous species (i.e. crab-like chelae, stout spiniform setae on tarsi, in pelophilous ecomorphotype, and setal combs and pale and immaculate color for psammophylous species). González-Santillán (2004) collected two specimens of *K. chamelaensis* during the day inside decaying logs, in shaded and relatively humid places. He noted that in both cases the logs were populated by termites. This type of habitat agrees more with humiculous species, which characteristically inhabit dense leaf litter and similar habitats.

REMARKS: Williams (1986) described this species as part of the *eusthenura* group, and it remained there until Soleglad and Fet transferred it to the *mexicanus* group of *Vaejovis.* The present position within *Konetontli* is justified by the results of phylogenetic analysis presented in chapter 1 and 4.

MATERIAL EXAMINED: **MEXICO: Jalisco:** *Municipio de La Huerta*: Estación de Biología UNAM, Chamela, S.H. Bullok, 23.iv.1980, 1 ♀ (IBUNAM), 24.iv.1993, 2 ♀ (IBUNAM), N. Martínez, 31.v.1990, 1 ♀ (IBUNAM), N. Martigera, 1.vi.1994, 2 ♀ (IBUNAM), E. González and J.L. Castelo, 23.x.2001, 1 ♂ (IBUNAM), 24.x.2005, 1 ♂, 1 ♀ (IBUNAM), 19°29.875'N 105°02.608'W, 97 m, 30.viii.2007, O. Francke et al., 2 juv. (AMNH [LP 7675]); Rincón de Ixtlán, [19°32'N 105°4'W], 25.x.2005, 1 ♀ (IBUNAM), E. González, 24.x.2001, 1 ♀ (IBUNAM).

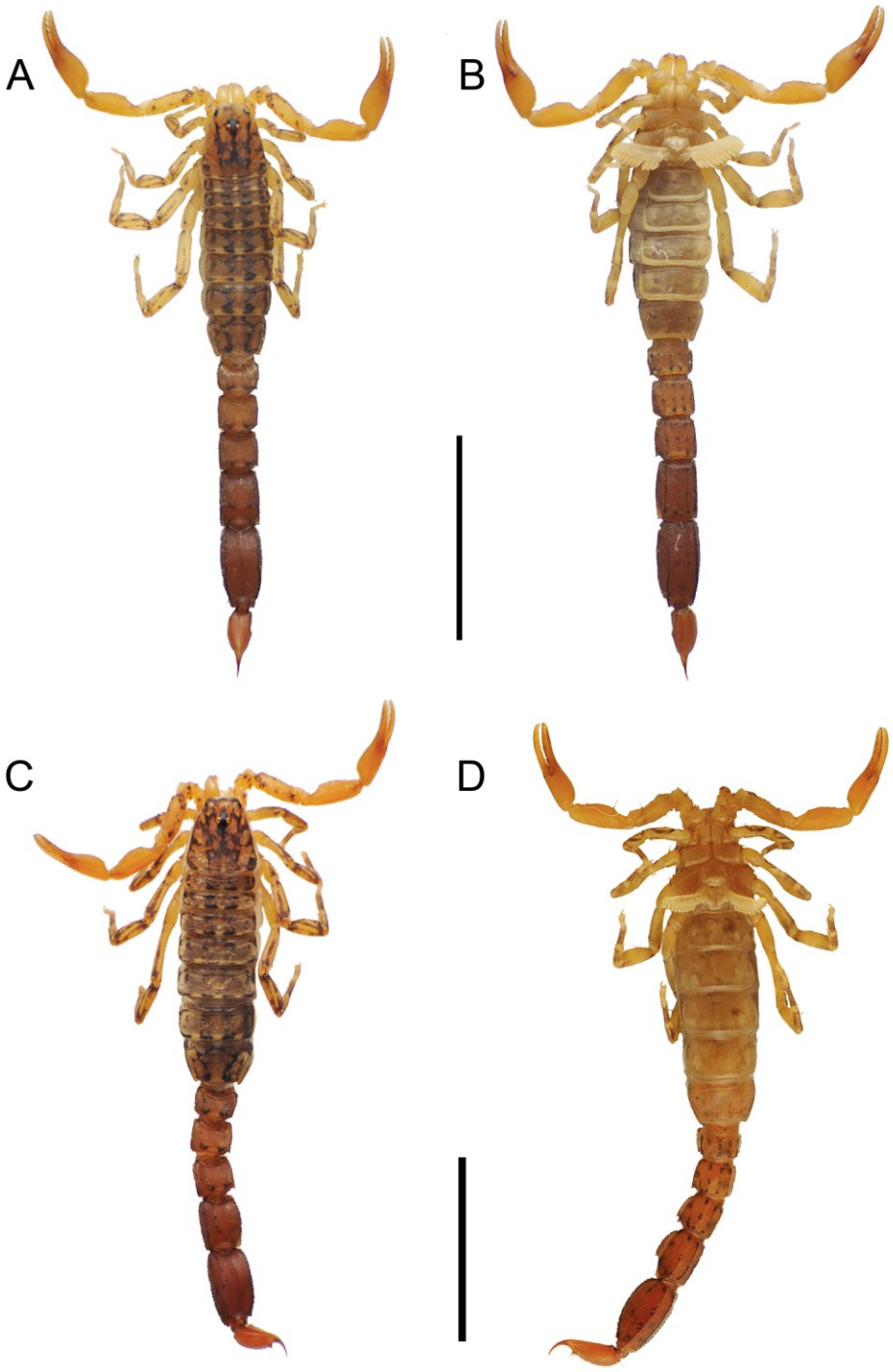


Figure 42. *Konetontli chamelaensis* (Williams, 1986), habitus. **A**, **B**. Holotype ♂ (CAS). **C**, **D**. Topotype ♀ (IBUNAM). **A**, **C**. Dorsal aspect. **B**, **D**. Ventral aspect. Scale bars = 5 mm.

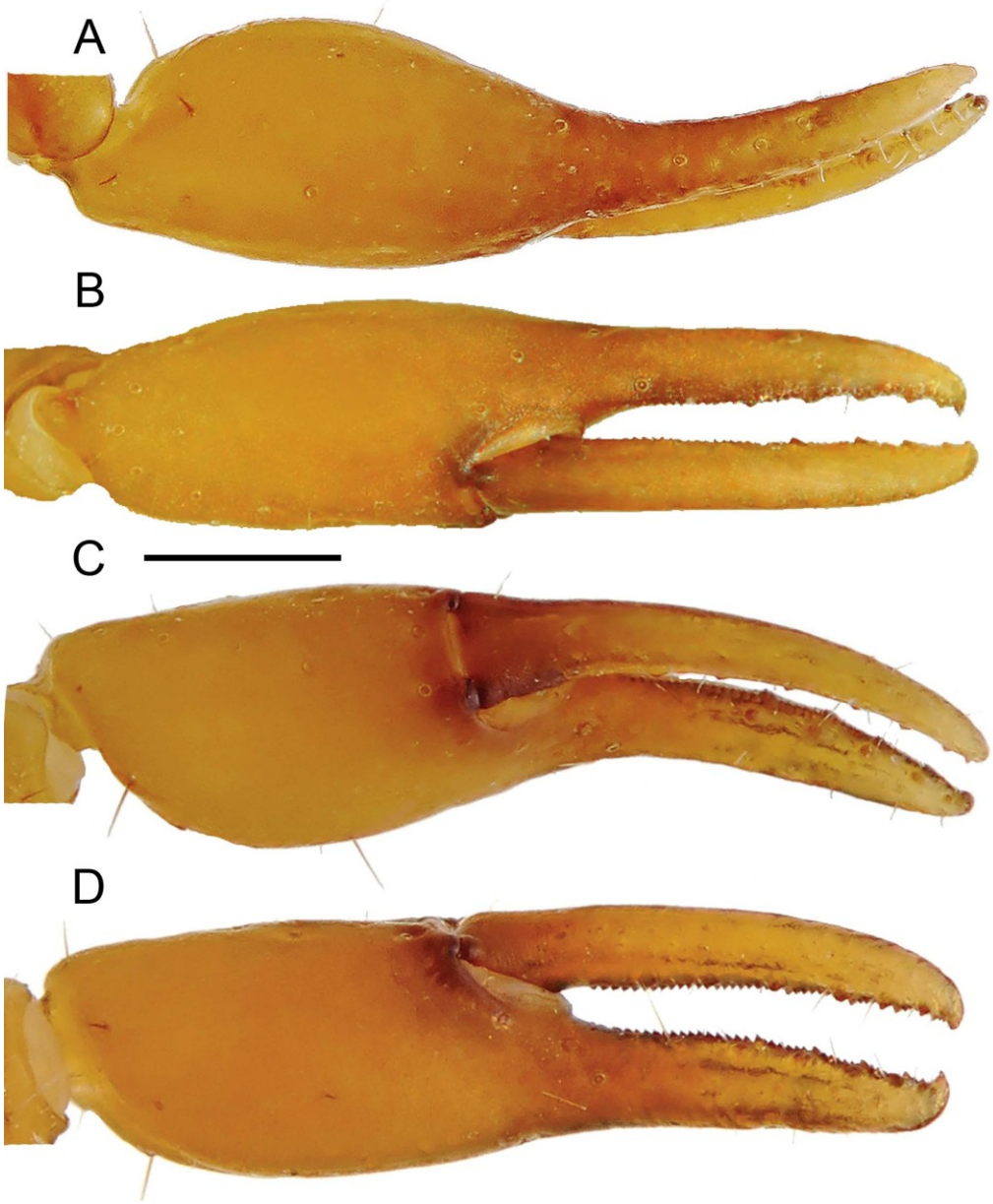


Figure 43. *Konetontli chamelaensis* (Williams, 1986), holotype ♂ (CAS), dextral pedipalp chela. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 0.5 mm.

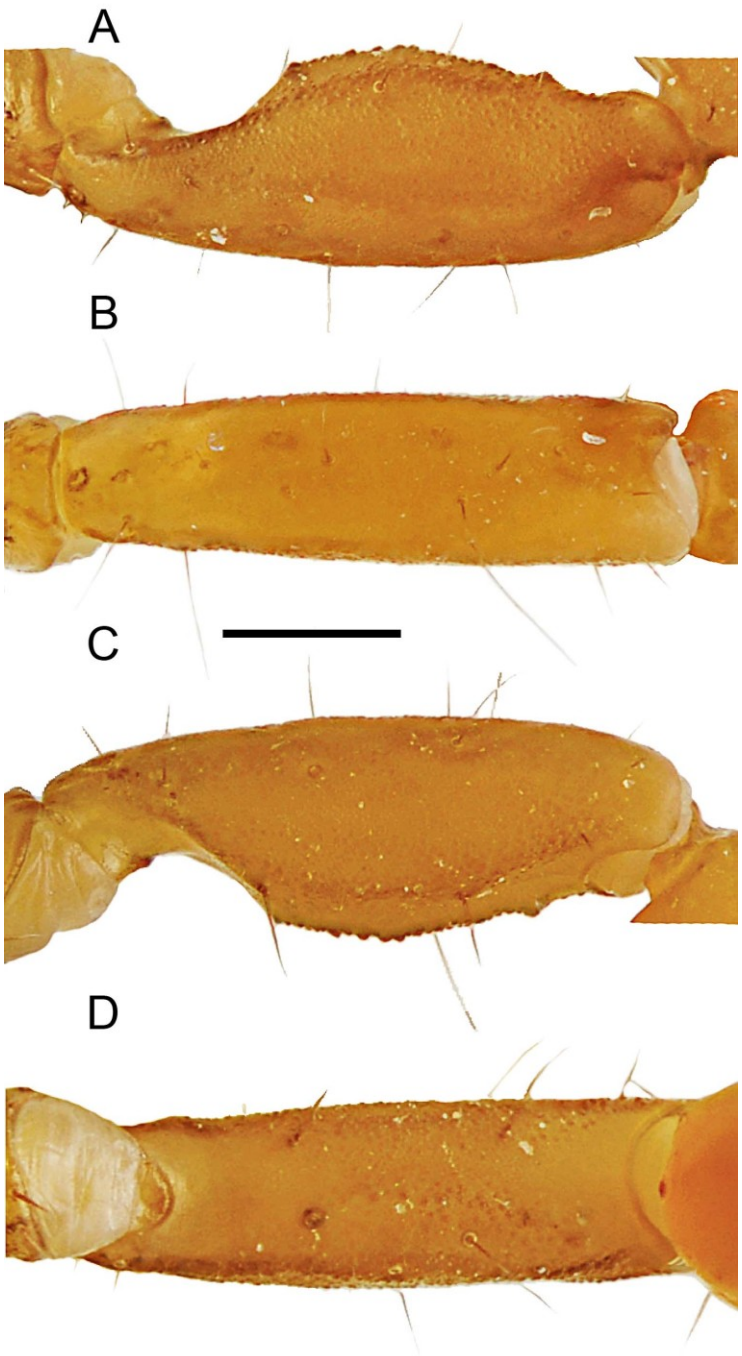


Figure 44. *Konetontli chamelaensis* (Williams, 1986), holotype ♂ (CAS), dextral pedipalp patella. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 0.5 mm.

Konetontli ignis, **n. sp.**

Figures 37, 45–47, 69C, 73A, 75C, 76C, 79C, 81C, 83C, 94A, B; Table 8

TYPE MATERIAL: **MEXICO: Guerrero:** [*Municipio de Copala*]: Holotype ♀ (IBUNAM), Microwave Tower Fogos [ca. 10 km southeast Copala, 1 km from Route Mexico 200, between Copala and Marquelia], 16°34.0524'N 98°53.2524'W, 139 m, 31.viii.2008, O. Francke, H. Montaño, C. Santibáñez, and A. Valdez. Paratypes: 1 ♀ (AMNH), same data as holotype; 3 ♀ (IBUNAM), Microwave Tower Fogos, 16°33.992'N 98°53.301'W, 103 m, 22.vi.2007, O. Francke, H. Montaño, Escalante, and A. Ballesteros.

ETYMOLOGY: The species name *ignis* is derived from the name of type locality. The Portuguese noun fogos is translated to the Latin *ignis* that means fires. The name is used as a noun in apposition.

DIAGNOSIS: *Konetontli ignis*, **n. sp.** is closely related to *K. juxtlahuaca*, **n. sp.**, *K. kuarapu*, *K. zihuatanejensis*, and *K. acapulco*, with which it forms a monophyletic group (see *K. kuarapu* for details). These species are related by the unique derived apomorphic character: ventral submedian carinae obsolete to vestigial in metasomal segment I–IV. *K. ignis*, **n. sp.** and *K. juxtlahuaca*, **n. sp.** are closely related species, they differ by being less than 13 mm in total length ♀ in the former and more than 16 mm the latter ♀. *K. ignis* has pedipalp chela completely infuscated and carinae underlined by darker infuscation, *K. juxtlahuaca* has only base of pedipalp fingers infuscated and carinae immaculate. *K. ignis*, **n. sp.** differs from its related species by having pedipalp movable finger with five rows of median denticles, five retrolateral denticles, five prolateral denticles. The other species have six or seven denticles and rows of denticles, and by having pedipalp fixed finger with five rows of median denticles, five retrolateral denticles instead of six in the other aforementioned species.

DESCRIPTION: The following description is based on the adult ♀ holotype and paratypes.

Color and infuscation: Body color base yellow-brownish. Carapace, mesosomal tergites, metasomal segments and retrolateral side of legs heavily infuscated with dusky markings. Femur infuscated only on dorsal and retrolateral surfaces. Patella infuscated only surrounding trichobothria series eb_1–eb_5. Chela with carinae strongly infuscate. Fingers strongly infuscated from base to mid finger. Coxal segments immaculate. Tergites with ventromedian carinae immaculate. Sternite I–VI immaculate. Sternite VII with a pair of diffuse blotches running oblique from proximal sublateral to distal submedian areas. Metasomal carinae infuscated in all segments with most intercarinal surfaces also infuscate. Metasomal segments same color. Telson orange-reddish, paler than metasomal segment V. Aculeus brown reddish.

Carapace: Carapace length 1.18 times longer than posterior width; anterior margin straight lacking medial notch, with three pairs of macrosetae. Carapace matte, cover with fine granules throughout. Median ocular tubercle rised, positioned on anterior half of carapace. Tree lateral eyes, two frontal pairs same size and posterior reduced approximately in half. Median eyes approximately double size of lateral frontal pair. Anteromedian and posteromedian sulci shallow, narrow; posterolateral weak, shallow; posterior transverse obsolete.

Sternum and coxal region: Sternum pentagonal subequilateral, 1.55 times wider than longer, smooth, with three pairs of macroseta, median sulcus deep. Coxa IV = 1.88 times longer than coxa II. Anterior margin of coxal endite II entirely cover with scatter moderate, minute granules; subbasally three oblique slit-like structures, adjacent to vestigial smooth protuberance.

Chelicerae: Dorsal surface smooth, manus distal margin infuscate, movable finger infuscate. Distal manus with three setae, reducing in size from median to lateral. Serrula present on ventral surface of movable finger, tines count 16.

Pedipalps: Trichobothrial pattern Type C, orthobothriotaxic. Chela, patella and femur with same width. Femur: All intercarinal surfaces matte. Carinae: Dorsal prolateral, dorsal retrolateral, ventral prolateral obsolete; dorsal retrolateral strongly infuscate, retrolateral dorsosubmedian obsolete expressed by three macrosetae on median aspect of the femur, retrolateral ventral, ventral median obsolete, prolateral ventral vestigial, expressed by a proximal spiniform moderate tubercle and two minor macrosetae, prolateral ventrosubmedian obsolete expressed by two median minor macrosetae.

Patella: Carinae: Dorsal prolateral, dorsal retrolateral, ventral prolateral and ventral retrosubmedian obsolete, smooth, and weakly costate, ventral median absent, retrolateral surface lacking carinae, prolateral ventral obsolete, two macrosetae demarcating longitudinal partial expression, prolateral median on vaulted projection protruding medially, weakly crenulated, distal extreme with a ridge curving dorsally almost reaching dorsal prolateral carinae on distal fifth of the patella. Prolateral median and dorsal prolateral intercarinal surface matte, other intercarinal surfaces smooth.

Chela: Manus smooth, slender. Carinae: All carinae obsolete, strongly infuscated. All intercarinal surfaces infuscate, less intensely than carinae. Trichobotrium *ib* and *it* positioned subbasal on fixed finger between PD6 and PD7. *Dt* positioned near to mid manus.

Fingers: Dentate margin straight, lacking notch, lobe. Fixed finger, PD = 4, proximal PD positioned by distal half of the finger, RD = 5, proximal RD positioned by mid finger, MD rows = 5, all PD subpaired with corresponding RD; movable finger, PD = 5, RD = 5, MD rows = 5, distal row bearing one reduce granule. RD subpaired with corresponding PD.

Legs: Basitarsi I–II prolateral ventral, retrolateral ventral and retrolateral dorsal carinae with complete rows of spinules; prolateral ventral in III vestigial, expressed by row of spinules

on distal third, in IV absent; retrolateral dorsal carinae in III partial, expressed as row of spinules on distal two thirds, in IV absent; retrolateral median rows in I–IV vestigial expressed as few terminal spinules. Telotarsi I–IV with two pairs of ventrodistal spinules in I–IV. Setae: Prolateral ventral 3:3:4:5; subdistal two in III slightly stout and in IV stout; retrolateral ventral 3:4:4:4; retrolateral dorsal 2:2:2:2; dorsal 2:2:2:2; retrolateral dorsal and dorsal series arranged in two independent rows.

Tergites: Pretergites and posttergites I–VII matte. Dorsal median carina complete costate, submedian obsolete, strongly infuscate. Posttergites I–VII dorsal submedian, dorsal lateral intercarinal surface immaculate. Tergite VII with dorsal median carina costate reaching one half of segment, dorsal sublateral, dorsal lateral incomplete expressed on proximal half of the segment, intercarinal surfaces matte. Sternites I–VI smooth. Sternite V lacking distal median hyaline glandular spot. Sternite VII with all carinae obsolete; ventral submedian, ventral lateral with two pairs of macrosetae; lateral ventral with one pair of macrosetae, all setae infuscated at base. Sternite VII posteromedian whitish glandular spot, weak, slightly protruding from adjacent surfaces. Spiracles minute slit-like, approximately two times longer than wide. Male genital operculum: Wider than long, with three macrosetae. Sclerites free on longitudinal margin moving independently, unable to open more than 45°. Genital papillae protruding posteriorly. Female genital operculum: Wider than long, with three macrosetae. Sclerites fuse longitudinally. Pectines longer than distal margin of coxa V. Basal piece with five pairs of macrosetae. Marginal lamella consist of three sclerites, medial lamella proximally fuse distally progressively forming conspicuous five beads. Fulcra with 8/8 beads. Pectinal tooth numbering 9/9 in ♀.

Hemispermatophore: Lamina 1.60 longer than trunk. Median lobe ental terminus strong and rounded. Dorsal through margin long, moderate, curving proximally, and removed from the

ventral trough. Primary and secondary hooks elongated, positioned on the apex of the lateral margin extension of the lamina (flange), forming deep notch. Hemi-mating plug developed from the inner lobe, distal barb margin with approximately 12 short spinules. Basal plate of inner lobe distal to ventral trough. Neck of inner lobe shorter than basal plate (0.29 times longer than basal plate). Measurements, lamina, 1.36; trunk, 0.85; dorsal trough/laminar hooks, 0.51; ventral trough/laminar hook, 0.34; neck, 0.07; basal plate, 0.24.

Metasoma: All intercarinal surfaces matte. Metasoma 1.3 times longer than mesosoma. Metasomal segments I–III wider than longer. Carinae: Dorsal lateral and lateral median segments I–IV carinae crenular to serrated terminating in moderated enlarged spiniform granules pointing backwards; segment V dorsal lateral granulate to serrate, lateral median vestigial with few proximal granulation; lateral inframedian carinae in segment I complete and granular, in II incomplete, present on distal half, granular; in III incomplete, present on distal two thirds, granular; in IV and V absent; ventral lateral and ventral submedian in I–III obsolete, in IV vestigial with few scattered distal granules; segments V ventral median and ventral lateral carinae incomplete, present on distal half as fields of granules. Setae: Dorsal lateral carinae, 0:0:0:1:4; lateral median, 0:1:1:2; lateral inframedian, 2:2:2:2:5; ventral lateral, 2:3:3:3:5; ventral submedian; 2:3:3:3; ventral sublateral, 2. All setae major.

Telson: Telson relatively elongated, 2.1 times longer than wide. Metasomal segment V 1.2 times wider than telson. Vesicle 2.2 times longer than aculeus. Dorsal surface smooth. Ventromedian carinae with subaculear simple, solitary, conical, and blunt. Other carinae smooth and obsolete. Ventral carinae with three pairs of setae. Microserration on laterobasal aculeus numbering 3–3.

DISTRIBUTION: *Konetontli ignis*, **n. sp.** is endemic to the coast of Guerrero. It is known only from the type locality.

ECOLOGY: The specimens were collected in a tropical deciduous forest from 14 to 139 m altitude, using ultraviolet light at night and directly disturbing leaf litter and under rocks.

MATERIAL EXAMINED: **MEXICO: Guerrero:** Microwave Tower Fogos, 16°34.0524'N 98°53.2524'W, 139 m, 31.viii.2008, O. Francke, H. Montaño, C. Santibáñez, and A. Valdez, 1 juv. (AMNH [LP 9527]); Microwave Tower Fogos, 16°33.992'N 98°53.301'W, 103 m, 26.vi.2007, 1 juv. (AMNH [LP 6993]), 16°34.360'N 98°53.423'W, 14 m, 2.xi.2007, 1 ♂ (AMNH [LP 8584]), O. Francke, H. Montaño, Escalante, and A. Ballesteros.

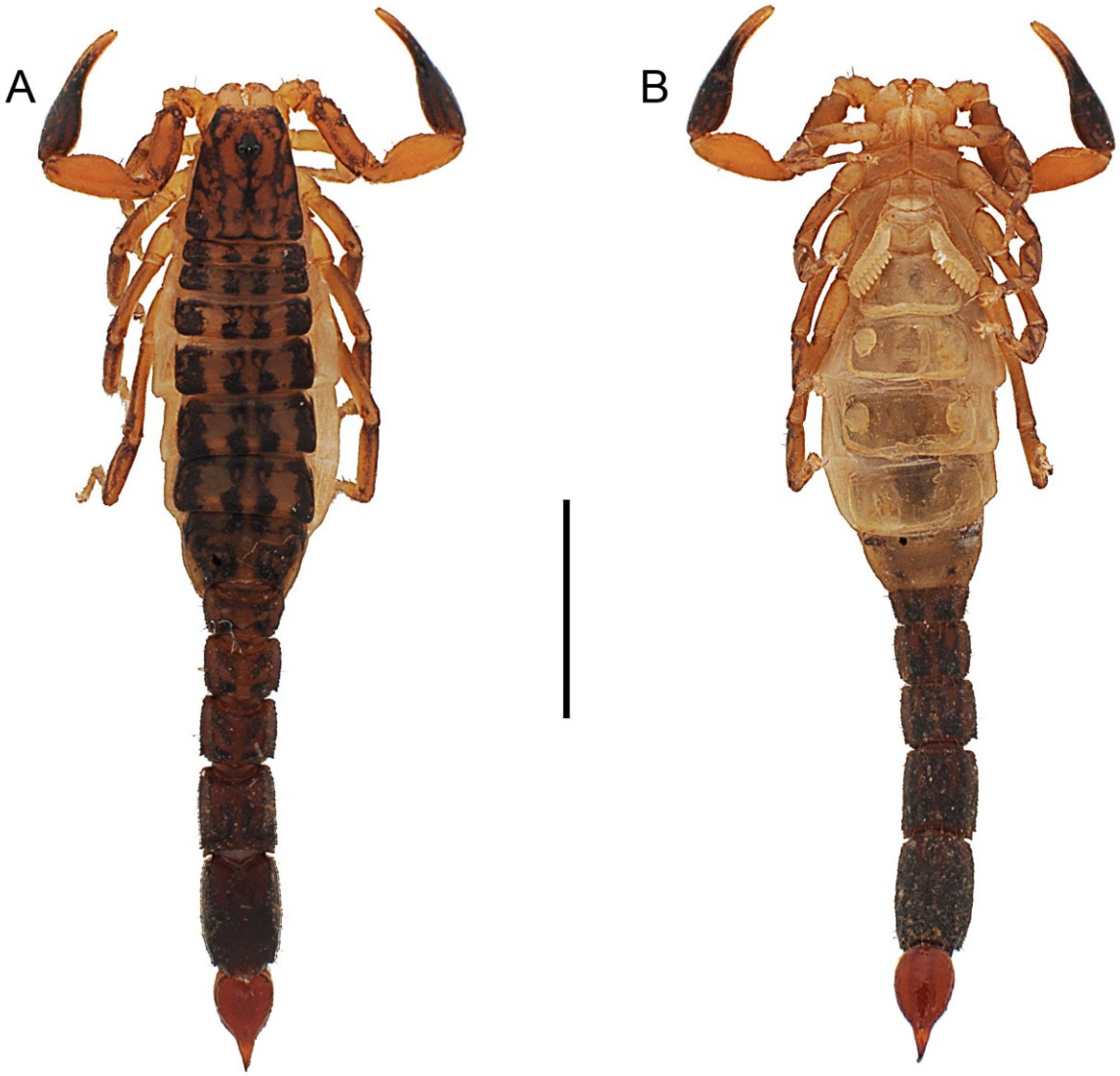


Figure 45. **A**, **B**. *Konetontli ignis*, **n. sp.**, paratype ♀ (IBUNAM), habitus. **A**. Dorsal aspect. **B**. Ventral aspect. Scale bar = 5 mm.

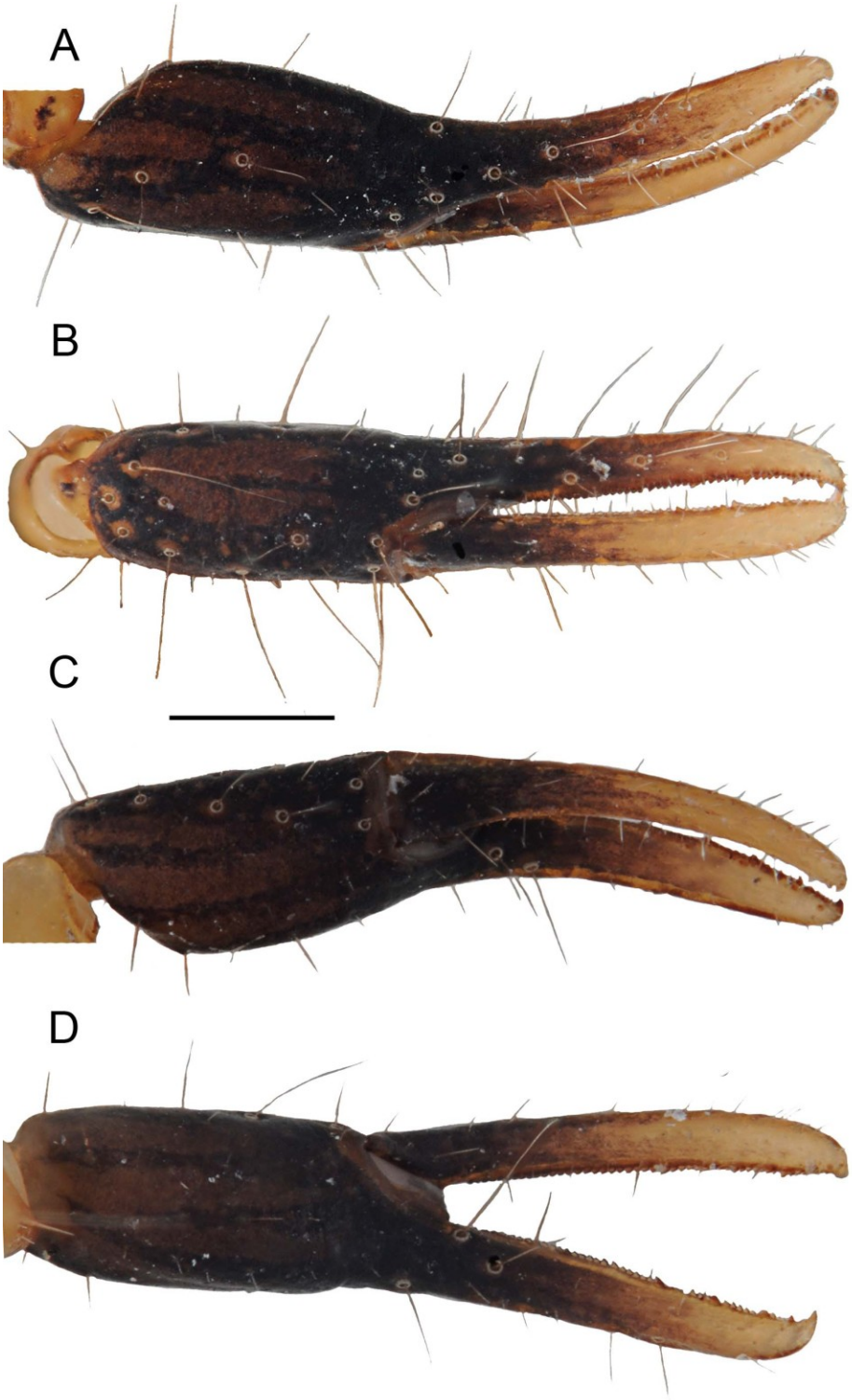


Figure 46. *Konetontli ignis*, **n. sp.**, paratype ♀ (IBUNAM), dextral pedipalp chela. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 0.5 mm.

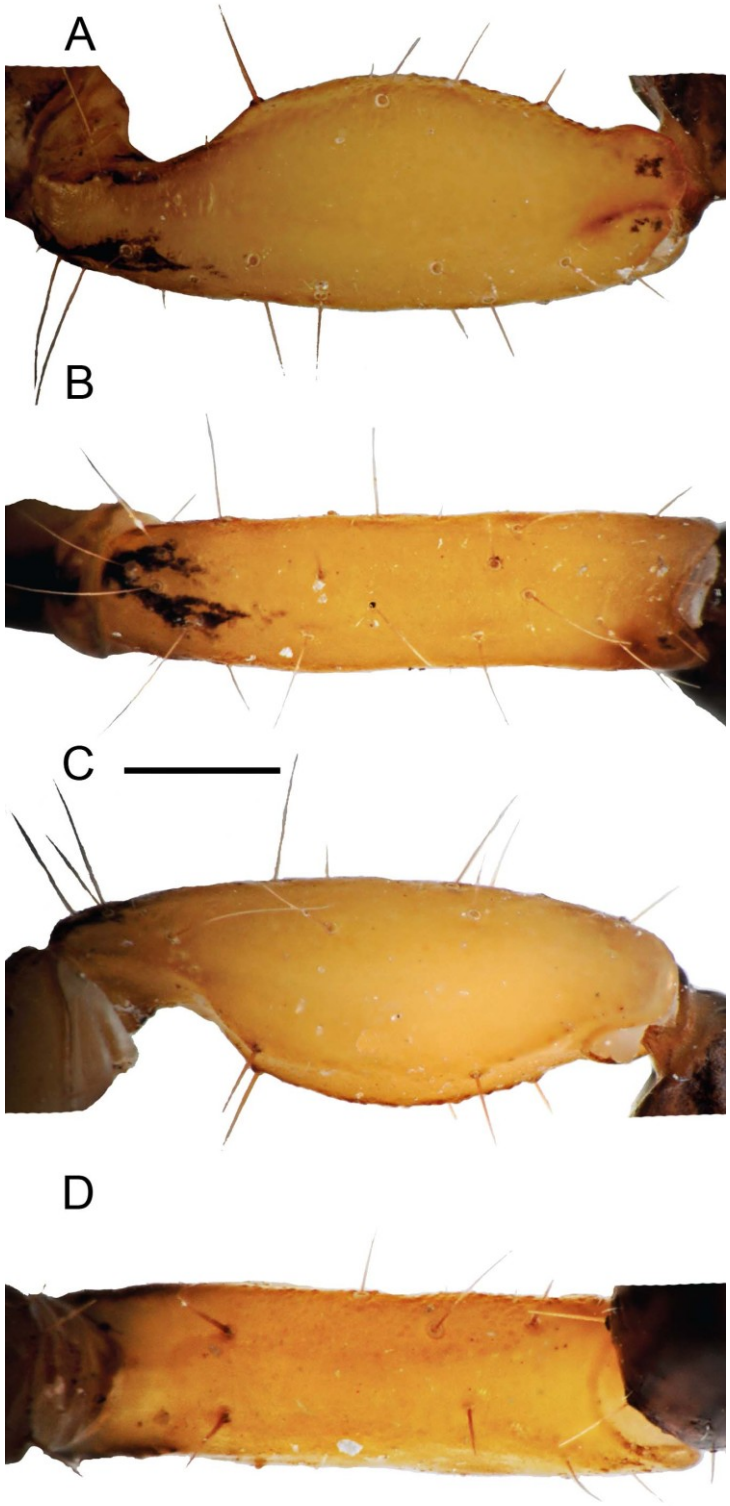


Figure 47. *Konetontli ignis*, **n. sp.**, paratype ♀ (IBUNAM), dextral pedipalp patella. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 0.5 mm.

Konetontli ilitchi, **n. sp.**

Figures 37, 48–50, 69D, 72D, 75D, 76D, 79D, 81D, 83D; Table 8

TYPE MATERIAL: **MEXICO: Colima:** *Municipio de Coquimatlán*: Holotype ♀ (IBUNAM), 8 km S, Coquimatlán, 19°09.061'N 103°50.080'W, 277 m, 2007, H. Montaño, A. Valdez, O. Francke, and N. Perez. Paratypes: 1 ♀ (AMNH), same data as holotype.

ETYMOLOGY: The species name *ilitchi* is an adjective in Yaqui language that means small, referring to the small body size of this species.

DIAGNOSIS: *Konetontli ilitchi*, **n. sp.** is closely related to *K. chamelanesis*, *K. migrus*, **n. sp.**, *K. nayarit*, and *K. pattersoni*, with which it forms a monophyletic group (see *Konetontli nayarit* for details). *K. ilitchi*, **n. sp.** is closely related to *K. chamelaensis* by having ventral submedian and ventral lateral carinae complete and granular in metasomal segment I–IV, similar size 16.3 mm female allotype (Williams, 1986), at 16 mm in female holotype. *K. chamelaensis* and *K. ilitchi*, **n. sp.** also share a simple subaculear tubercle. The following characters can separate these species: pedipalp movable finger with five rows of median denticles in *K. chamelaensis* and six rows of median denticles in *K. ilitchi*, **n. sp.** Manus almost immaculate in the former, and heavily infuscated in the later. In *K. chamelaensis* ventral lateral and ventral submedian metasomal carinae segments I–V are infuscated only on the base of macrosetae whereas in *K. ilitchi*, **n. sp.** are completely infuscated. Additional diagnostic characters include: Metasomal segment V ventral median carinae immaculate. Metasomal segment I–III wider than long. Telson vesicle almost 1.8 times longer than wide. Chela 3.9 times longer than wide. Pectinal count in females 11/11.

DESCRIPTION: The following description is based on the adult ♀ holotype and paratypes.

Color and infuscation: Base color of body yellow orange. Carapace, mesosomal tergites, prolateral side of legs heavily infuscated with dusky markings. Pedipalp femur, base of trichobothria *i*, *e*, and *d* infuscated. Patella, base of trichobothria series eb_1–eb_5 infuscated. Chelae with present carinae strongly infuscated. Fingers infuscated at proximal half, manus color base orange-brown with all carinae outlined with darker infuscation, intercarinal surfaces finely infuscated. Tergites with ventral median carinae immaculate. Sternite immaculate except for fine infuscation on lateral edges. Sternite VII with macrosetae infuscated at base on ventral sublateral, ventral lateral, lateral ventral carinae. Pectines and lamella faintly infuscated. Metasomal segments III–V orange yellowish, darker than I–II yellow pale. Metasomal ventral carinae ventral submedian and ventral lateral I–IV infuscated. Metasomal segment V ventral median carina immaculate, but lateral macrosetae base infuscated. Metasomal segment I–V with dorsal sublateral area infuscated. Dorsal lateral, lateral inframedian intercarinal surface of metasomal segments I–IV completely infuscated. Metasomal segment V with ventral sublateral carinae with infuscated setae base on distal half of the segment. Telson paler than metasomal segment V. Telson uniformly orange. Aculeus dark reddish.

Carapace: Carapace length 1.1 times longer than posterior width. Frontal margin sublinear lacking medial notch. Carapace shagreened, dominantly with fine granules by scattered moderate granules. Median ocular tubercle rised, positioned on anterior half of carapace. Three lateral eyes, two frontal pairs same size and posterior reduced approximately in half. Median eyes approximately double size of lateral frontal pair. Anteromedian sulcus moderate with anterior depression; posteromedian shallow, anterolateral and posterior transverse obsolete, posterolateral shallow.

Sternum and coxal region: Sternum pentagonal subequilateral 1.75 times wider than longer, smooth, with four pairs of macroseta, median sulcus deep. Anterior margin of coxa II entirely smooth, subbasally three oblique slit-like structures, adjacent to low smooth protuberance; proximal margin of coxal endite II with a shallow depression each, median margin smooth. Coxa IV 2.3 times longer than coxa II.

Chelicerae: Dorsal surface smooth, manus with reticulated infuscation, base of movable finger infuscated. Distal manus with three setae, reducing in size medially to laterally. Serrula present on ventral distal half of movable finger, tines numbering 12–15.

Pedipalps: Trichobothrial pattern Type C, orthobothriotaxic. Chelae and patella same width both wider than femur. Femur: All intercarinal surfaces matted. Dorsal prolateral and dorsal retrolateral complete with minute granulation; retrolateral dorsal submedian obsolete, expressed only by three macrosetae on medial aspect of the femur; retrolateral ventral absent; ventral median vestigial, expressed only on proximal extreme by few granules; ventral prolateral complete with minute granulation; prolateral ventral vestigial, expressed by one subdistal granule and three macrosetae; prolateral ventrosubmedian vestigial, one basal tubercle, one distal tubercle, and one medial macrosetae demarcating partial longitudinal expression ending by distal forth of the femur.

Patella: All intercarinal surfaces smooth. Carinae: Dorsal prolateral and ventral retrosubmedian complete and weakly granular; retrolateral surface lacking carinae; ventral retrolateral obsolete, weakly protruding from adjacent surfaces; ventral prolateral complete, weakly granular; ventral median vestigial, weakly costate, incomplete reaching proximal third of the segment; prolateral ventral obsolete, two macrosetae demarcating longitudinal partial expression on medial aspect of patella, never reaching proximal extremes; prolateral median on

vaulted projection with coarse sparse granules, protruding strongly medially; distal extreme with crenulated ridge angling dorsally almost reaching dorsal prolateral carinae on distal fifth of segment. All other carinae absent.

Chela: Manus smooth and relatively slender. Carinae: Prolateral dorsal, dorsal median, dorsal retrolateral, retrolateral median, ventral submedian, ventral prosubmedian, prolateral ventral, and prolateral median obsolete, express by infuscation. Trichobothria *ib* and *it* positioned subbasal on fixed finger; *Dt* positioned close to mid manus.

Fingers: Dentate margin straight without notch or lobe. Fixed finger, PD = 6, proximal PD positioned by proximal fourth of the finger, MD rows = 5, RD = 5, proximal RD positioned by mid finger. All RD subpaired with corresponding PD. Movable finger, PD = 7, MD rows = 6, distal row bearing one minute granule, RD = 6. All RD subpaired with corresponding PD.

Legs: Spinules: Basitarsi prolateral ventral, retrolateral ventral and retrolateral dorsal carinae with spinules rows on distal half in I–II, vestigial to absent in III–IV. Telotarsi I–III with 10 ventral median spinules, IV with 14, ventral distal I–IV with one pair of spinules. Setae: Basitarsi I–IV steal counts. Prolateral ventral, 3:3:4:4; retrolateral ventral, 4:5:5:5; retrolateral dorsal, 3:3:3:3; prolateral dorsal, 2:2:2:2. Retrolateral dorsal, prolateral dorsal series arranged in two independent rows.

Tergites: Pretergites matte, posttergites matte medially, shagreened laterally. Mesosomal tergites I–VI median carinae complete weakly costate with few granules distally and submedially obsolete. Intercarinal surfaces of submedian carinae in posttergites I–VII immaculate, other surfaces heavily infuscated. Tergite VII with dorsal median carina granular reaching one half of the segment moderately costate; dorsal sublateral, dorsal lateral incomplete expressed on distal

three fourths of the segment, strongly granular, running parallel, intercarinal surfaces shagreened.

Genital operculum: Male genital operculum: Wider than long, with three macrosetae. Sclerites free on longitudinal margin moving independently but unable to open more than 45°. Genital papillae protruding posteriorly. Female genital operculum: Wider than long, with three macrosetae. Sclerites fuse longitudinal.

Sternites: Sternites I–VII smooth, immaculate except lateral margin infuscated. Sternite V lacking distal median hyaline glandular area. Sternite VII with ventral sublateral carinae incomplete on medial distal aspect of the segment, weakly granular with one distal and one proximal macrosetae; all other carinae obsolete. One pair of macroseta with infuscated base delineating the obsolete ventral submedian and ventral lateral carinae. Sternite VII distal median hyaline glandular area vestigial. Spiracles minute, slit-like, approximately two times longer than wide.

Pectines: Basal piece with three pairs of macrosetae, one median distal macroseta. Marginal lamella consist of three sclerites, medial lamella proximally fuse distally progressively forming conspicuous five beads. Fulcra with 10 beads. Pectinal tooth numbering 11. Pectines relatively short, distal sclerite at the level of distal edge of coxa IV.

Hemispermatophore: Unknown.

Metasoma: All intercarinal surfaces matted. Metasoma 1.4 times longer than mesosoma. Metasomal segments I–III wider than long. Metasomal segments I–IV dorsal lateral, lateral median carinae crenatoserrated terminating in moderated enlarge granules pointing backwards, in V incomplete, absent on the distal half, proximal half strongly granular but granules turning minute, scattered. Metasomal segment I lateral inframedian carinae complete, granular, in II

incomplete present on distal fourth, granular, in III incomplete, present in distal half, granular, in VI absent. Metasomal segments I–V ventral lateral, ventral submedian complete, strongly granular. Metasomal segments V ventral median, ventral lateral carinae complete, strongly granular. Setae: Dorsal lateral carinae, 0:0:0:1:4; lateral median; 0:1:1:2; lateral inframedian, 0:0:0:0:2; ventral lateral, 2:3:3:3:5; ventral submedian, 2:3:3:3:1; ventral sublateral 2. All setae major.

Telson: Telson 2.5 times longer than wide. Metasomal segment V 1.3 times wider than telson. Vesicle 2.3 times longer than aculeus. Dorsal surface smooth. Ventral median carinae with subaculear simple, solitary spiniform tubercle, proximally with scattered low granulation and two pairs of macrosetae. Ventral sublateral and Ventral lateral intercarinal surfaces cover with scattered low granules; each carinae with three pairs of macrosetae. Microserration on laterobasal aculeus numbering 3–4.

DISTRIBUTION: *Konetontli ilitchi*, **n. sp.** is endemic to the state of Colima, Mexico.

ECOLOGY: Although the only specimens known were collected inside a cave, they lack evidence of troglomorphic adaptation, such as reduction of infuscation, attenuation of appendices, and reduction or loss of eyes. They exhibit instead epigean adaptations, such as abundant infuscation of the cuticle, relatively short appendices, and normal eyes. It is most likely that the presence of these specimens inside caves was incidental. The area surrounding the cave is dominated by the subtype tropical subdeciduous forest (Rzedowski, 1978), characterized by trees of 20–25 m height, of which 50–75% of the species are perennial.

MATERIAL EXAMINED: **MEXICO: Colima:** *Municipio de Coquimatlán*: 8 km S, Coquimatlán, 19°09.061'N 103°50.080'W, 277 m, 2007, H. Montaño, A. Valdez, O. Francke, and N. Perez, 1 ♀ (AMNH [LP 8583]).

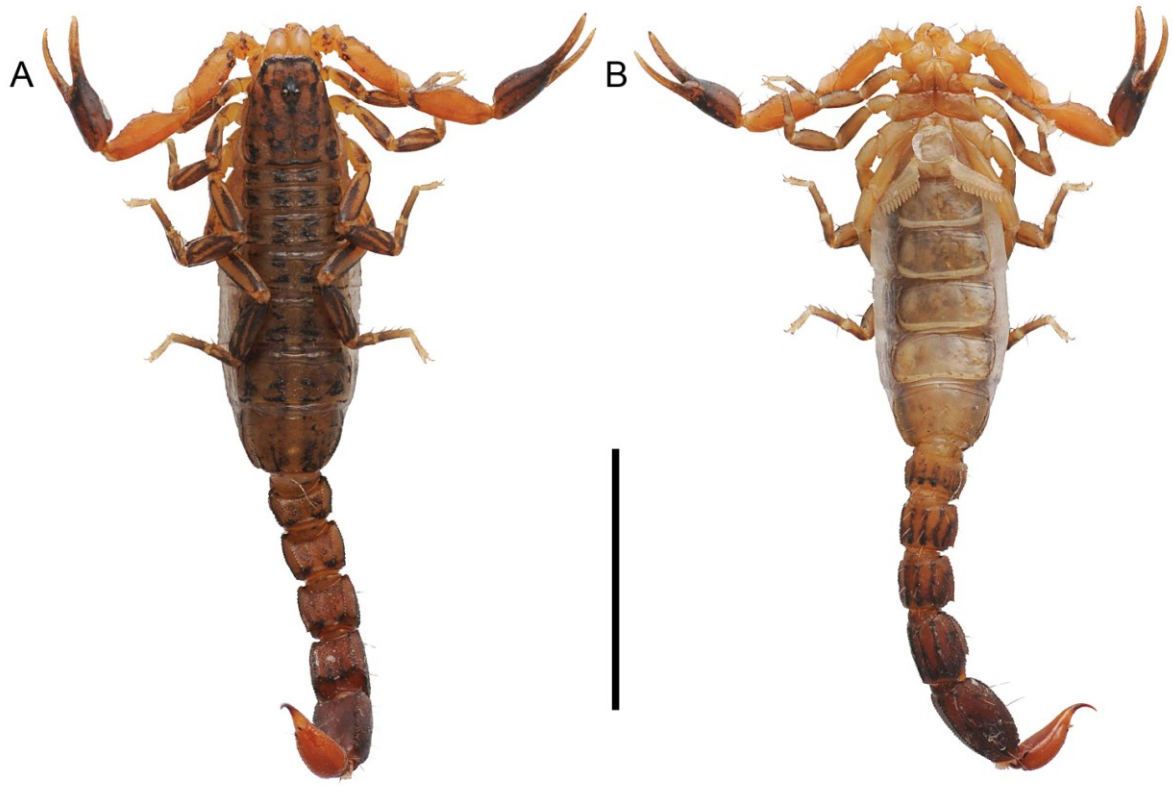


Figure 48. **A**, **B**. *Konetontli ilitchi*, **n. sp.**, holotype ♀ (IBUNAM), habitus. **A**. Dorsal aspect. **B**. Ventral aspect. Scale bar = 5 mm.

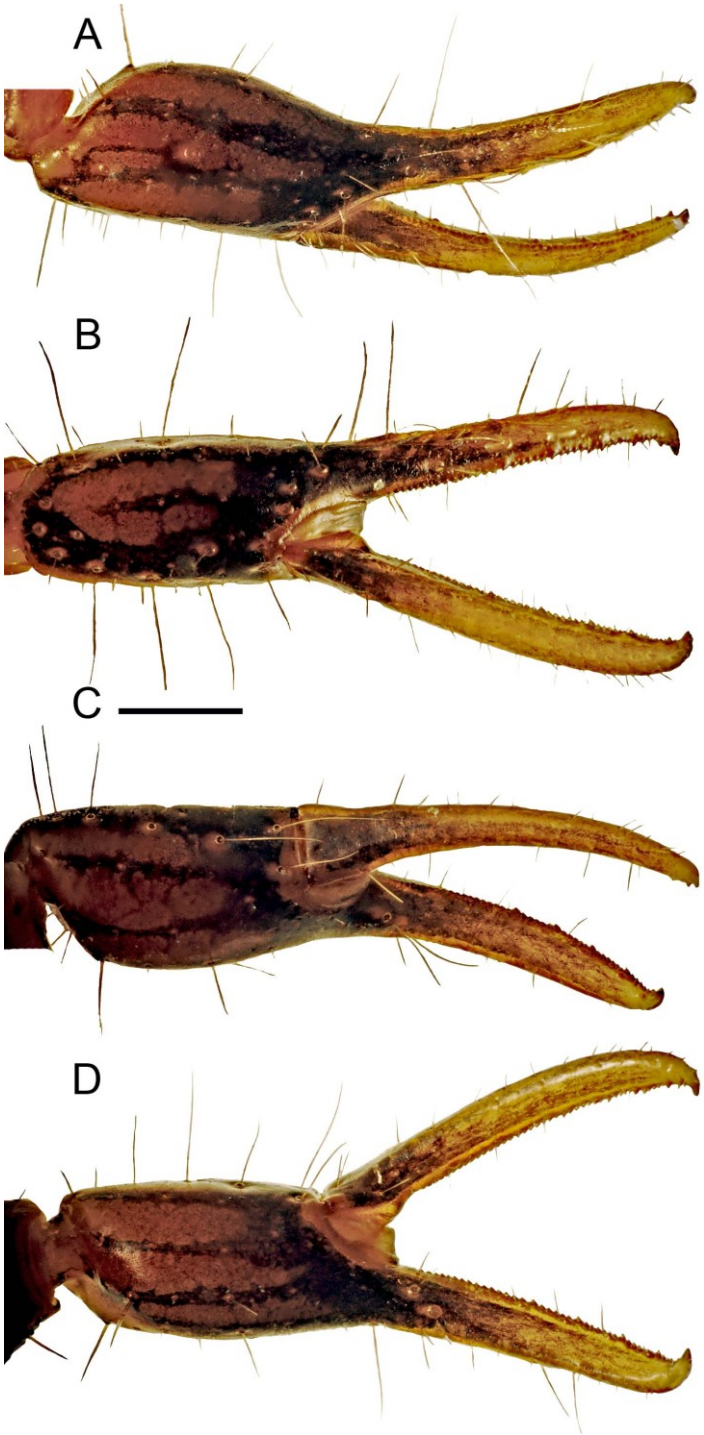


Figure 49. *Konetontli ilitchi*, **n. sp.**, holotype ♀ (IBUNAM), dextral pedipalp chela. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 0.5 mm.

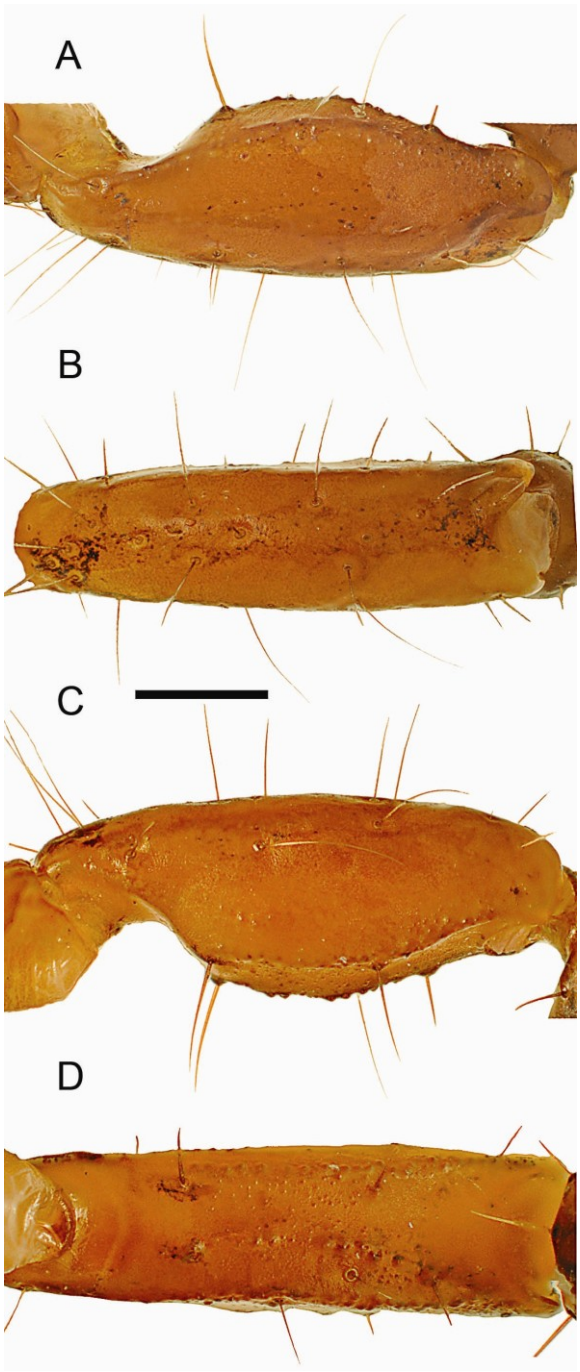


Figure 50. *Konetontli ilitchi*, **n. sp.**, holotype ♀ (IBUNAM), dextral pedipalp patella. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 0.5 mm.

Konetontli juxtlahuaca, **n. sp.**

Figures 37, 51–53, 70A, 72B, 75E, 76E, 79E, 81E, 83E, 85C, D; Table 8

TYPE MATERIAL: **MEXICO: Guerrero:** *Municipio de Quechultenango*: Holotype ♂ (IBUNAM), entrance of Gruta de Juxtlahuaca, [17°25'30.77"N 99°6'36.02"W], 2.v.2009, A. Valdez and H. Montaño, tropical dry forest. Paratypes: 1 ♂, 4 juv. (AMNH), Colotlipa, 5 km NW, [17°24.52683'N 99°9.971666'W], 19.vii.2005, A. Valdez and H. Montaño, tropical dry forest; 9 ♀, 1 juv. (AMNH), Colotlipa, near Grutas de Juxtlahuaca, 14.ix.2005, A. Valdez and H. Montaño, tropical dry forest; 2 ♂, 3 ♀ (AMNH), Grutas de Juxtlahuaca, 17°26.350'N 99°09.567'W, 936 m, 3.xi.2007, O. Francke, H. Montaño, A. Ballesteros, A. Valdez, and H. Montaño, tropical dry forest.

ETYMOLOGY: The species name *juxtlahuaca* is the name that the original Nahuatl people gave to the cave where some specimens were collected, Juxtlahuaca in Nahuatl means 'there is no dry soil'. The name is used as a noun in apposition.

DIAGNOSIS: *Konetontli juxtlahuaca*, **n. sp.** is closely related to *K. ignis*, **n. sp.**, *K. acapulco*, *K. kuarapu*, and *K. zihuatanejensis*, with which it form a monophyletic. These species are related by the unique derived apomorphic character: ventral submedian carinae obsolete to vestigial in metasomal segment I–IV (see details in *K. kuarapu*). *K. juxtlahuaca*, **n. sp.** is closely related to *K. ignis*, **n. sp.** from which differ by total length, adult male at 17 mm and female ca. 37 mm, *K. ignis*, **n. sp.** at 13 mm in females; pedipalp manus almost immaculate, *K. ignis*, **n. sp.** has pedipalp manus completely infuscated and all carinae outlined by darker infuscation; the subaculear tubercle in females of *K. juxtlahuaca*, **n. sp.** is variable, with one to two tubercles, instead of consistently simple with only one tubercle; dorsal prolateral carinae of femur is

heavily infuscated and granular, in *K. ignis*, **n. sp.** is infuscated on distal extreme and obsolete, weakly costate. Pedipalp fixed finger with five prolateral denticles instead of four and movable finger with six prolateral denticles instead of five.

DESCRIPTION: The following description is based on the adult ♂ holotype, paratypes and the specimens listed in material examined.

Color and infuscation: Body color base yellow-orange. Pedipalps and legs yellowish slightly paler than rest of the body. Carapace, mesosomal tergites, metasomal segments, prolateral side of legs heavily infuscated with dusky markings. Femur with dorsal surface infuscated except subproximal spot pale; retrolateral surface immaculate; dorsal, prolateral slightly and diffusely infuscated. Patella with dorsal, retrolateral surfaces with marbled infuscation; ventral, prolateral surfaces weakly, diffusely infuscated. Chela completely immaculate. Pedipalp fixed finger entirely infuscated, movable finger infuscated on proximal half. Metasomal segments progressively darker from yellowish-orange in I to brown-reddish in V. Telson paler than metasomal segment V. Telson vesicle orange-yellowish. Aculeus dark reddish brown. Pedipalp fingers infuscated except for the tips. Metasomal ventral carinae ventral submedian, ventral lateral I–IV outlined with blotches of infuscation. Metasomal segment V ventral median carina infuscated only in proximal fourth.

Carapace: Carapace length 1.11 times longer than posterior width; frontal margin sublinear lacking medial notch, with three pairs of macrosetae. Carapace matte, cover with fine granules throughout. Median ocular tubercle raised, positioned on anterior half. Superciliary carina weak finely granular. Three lateral eyes, frontal pair same size, posterior reduced approximately in half. Median eyes approximately double size of lateral frontal pair.

Anteromedian sulcus moderate; posteromedian proximally shallow, distally deep; anterolateral, posterior transverse obsolete; posterolateral moderate.

Sternum and coxal region: Sternum pentagonal subequilateral 1.71 wider than long, finely granulated with four pairs of macroseta, median sulcus deep. Anterior margin of coxa II entirely cover with minute granules, subbasally three oblique slit-like structures, adjacent to low, smooth protuberance; proximal margin of coxal endite II with deep depression each, median edge smooth. Coxa IV 1.93 times longer than coxa II.

Chelicerae: Dorsal surface smooth, manus distal area with reticulated infuscation, movable finger infuscated. Distal manus with three setae, reducing in size from median to lateral sides. Serrula present on ventral distal half of movable finger, tines numbering 12.

Pedipalps: Trichobothrial pattern Type C, orthobothriotaxic. Femur: All intercarinal surfaces matted. Carinae: Prolateral dorsal, dorsal retrolateral granular; dorsal retrolateral granular immaculate; retrolateral dorsosubmedian obsolete strongly infuscate, expressed only by three macrosetae on median aspect of the femur; retrolateral ventral, ventral median obsolete, weakly costate; ventral prolateral complete, granulated; prolateral ventral obsolete, expressed by three macrosetae; prolateral ventrosubmedian vestigial with a distal granule, on slightly vaulted projection expressed from proximal to distal forth of the femur with one subbasal macrosetae.

Patella: All intercarinal surfaces smooth. Carinae: Dorsal prolateral, dorsal retrolateral, ventral prolateral, ventral retrosubmedian weak with scattered minute granules; ventral median obsolete, weakly costate; retrolateral dorsal, retrolateral median, retro ventral obsolete, strongly infuscated; prolateral ventral obsolete weakly infuscated, two macrosetae demarcating longitudinal partial expression on the medial aspect of the patella; prolateral median on vaulted projection protruding strongly medially, weakly granulated, distal extreme with a ridge angling

dorsally almost reaching dorsal prolateral carinae on distal fifth of patella; proximal half weakly infuscated, distal half strongly infuscated.

Chela: Hand slender, smooth, almost immaculate. Chela as wide as patella, both wider than femur. Carinae: Prolateral dorsal, dorsal median, dorsal retrolateral, retrolateral median, ventral submedian, ventral prosubmedian, prolateral ventral, prolateral median obsolete, weakly costate. Trichobothria *ib* and *it* positioned subbasal on fixed finger. *Dt* positioned close to mid manus.

Fingers: Fixed finger, PD = 5, proximal PD positioned at distal half of the finger, MD rows = 6, RD = 6, proximal RD positioned at proximal fourth, all RD subpaired with corresponding PD; movable finger, PD = 6, MD rows = 6, RD = 6, all PD subpaired with corresponding RD. Fingers without scallop, gap created when fingers closed absent.

Legs: Basitarsus I–II prolateral ventral, retrolateral ventral, retrolateral dorsal carinae with partial rows of spinules expressed on distal half, absent in III–IV; retrolateral median absent in I–IV. Setae: Prolateral ventral, 4:4:4:4; retrolateral ventral, 3:4:5:5; retrolateral dorsal, 2:2:2:2; dorsal, 2:2:2:2; Telotarsi I–III with 10 ventral median spinules, IV with 14. Telotarsi I–IV with one pair of ventrodistal spinules.

Tergites: Pretergites and posttergites matte. Mesosomal tergites I–VII median carinae complete costate; submedian obsolete, strongly infuscated. Dorsal submedian, dorsal lateral intercarinal surface of posttergites I–VII partially immaculate with tin line of infuscation connecting these infuscated carinae, other intercarinal surfaces diffusely infuscated. Tergite VII with dorsal median carina granular reaching one half of the segment moderately costate; dorsal sublateral incomplete expressed on distal half of the segment; dorsal lateral incomplete expressed

on distal third of the segment, both carinae strongly granular. All intercarinal surfaces shagreened.

Genital operculum: Male genital operculum: wider than long. Sclerites free on longitudinal edge moving independently, unable to open more than 45°. Genital papillae protruding posteriorly. Female genital operculum: Wider than long, with three macrosetae. Sclerites fuse longitudinal.

Sternites: Sternites I–VII medial areas smooth, lateral areas matte. Sternite V lacking distal median hyaline glandular area. Sternite VII with all carinae obsolete; ventral submedian with one pair of macrosetae, ventral lateral with two pairs of macrosetae, lateral ventral with one pair of macrosetae. Sternite VII distal median hyaline glandular area evident moderate, slightly protruding from adjacent surfaces. Spiracles minute slit-like, approximately three times longer than wide.

Pectines: Pectines longer than distal edge of coxa V. Basal piece with three pairs of macrosetae. Marginal lamella consist of three sclerites, medial lamella proximally fuse distally progressively forming eight conspicuous beads. Fulcra with 10–11 in ♂, in ♀ 9–10 beads. Pectinal tooth count 11–12 in ♂, in ♀ 10–11. Pectines relatively short, mid distal sclerite of marginal lamella at the level of distal edge of coxa IV in ♂, in ♀ sclerite at the level of distal edge of coxa IV.

Hemispermatophore: Lamina 1.83 longer than trunk. Median lobe ental terminus moderate, rounded. Dorsal through margin long, narrow, curving proximally, removed from ventral trough. Primary, secondary hooks moderate, positioned on the apex of lateral margin extension of lamina (flange), forming deep notch. Hemi-mating plug developed from inner lobe, distal barb margin with approximately 12 elongated spinules. Basal plate of inner lobe distal to

ventral trough. Neck of inner lobe almost shorter than basal plate (0.43 times longer than basal plate). Measurements, lamina, 1.87; trunk, 1.02; dorsal trough/laminar hooks, 0.44; ventral trough/laminar hook, 0.78; neck, 0.10; basal plate, 0.24.

Metasoma: All intercarinal surfaces matte. Metasoma 1.4 times longer than mesosoma. Metasomal segments I–III wider than long. Metasomal segments I–IV dorsal lateral, I–III lateral median carinae crenatoserrated terminating in moderated enlarged granules pointing backwards; metasomal segments IV lateral median carinae with scattered minute granules, metasomal segments V dorsal lateral proximally with few enlarge serrated granules, the rest with scattered sparse minute granules, lateral median carina vestigial with one proximal granule; metasomal segment I lateral inframedian carinae complete, granular, in II vestigial, present on distal third, minutely granular at distal end, in III incomplete, present on the distal fifth, minutely granular on distal end, in VI absent; metasomal segments I–IV ventral lateral and ventral submedian obsolete; metasomal segment V ventral median, ventral sublateral, ventral lateral carinae obsolete. Setae: Dorsal lateral, 0:0:1:1:5; lateral median, 1:1:1:2; lateral inframedian, 2:2:2:2:5; ventral lateral, 2:3:3:3:5; ventral submedian, 2:3:3:3:3; ventral sublateral 3.

Telson: Telson 2.1 times longer than wide. Metasomal segment V 1.7 times wider than telson. Vesicle 2.0 times longer than aculeus. Dorsal surface smooth. Ventral median carinae with subaculear simple, solitary, conical tubercle. Other carinae smooth, obsolete, ventral carinae with five pairs of setae. Microserration on laterobasal aculeus numbering 3.

DISTRIBUTION: *Konetontli juxtlahuaca*, **n. sp.** is endemic to the west face of the southern extreme of Sierra Madre del Sur, in the state of Guerrero, Mexico.

ECOLOGY: *Konetontli juxtlahuaca*, **n. sp.** was collected inside a cave, as it was *K. ilitchi*. These two species lack troglomorphic adaptations and additionally *K. juxtlahuaca* was collected

outside the cave. This suggest that these species were incidentally collected inside the caves and that represent epigean species. The sites were this species were collected are dominated by tropical deciduous forest.

MATERIAL EXAMINED: **MEXICO: Guerrero:** *Municipio de Quechultenango*: Grutas de Juxtlahuaca, 17°26.350'N 99°09.567'W, 936 m, 3.xi.2007, O. Francke, H. Montaño, A. Ballesteros, A. Valdez, and H. Montaño, 1 ♀ (AMNH [LP 8585]), tropical dry forest.

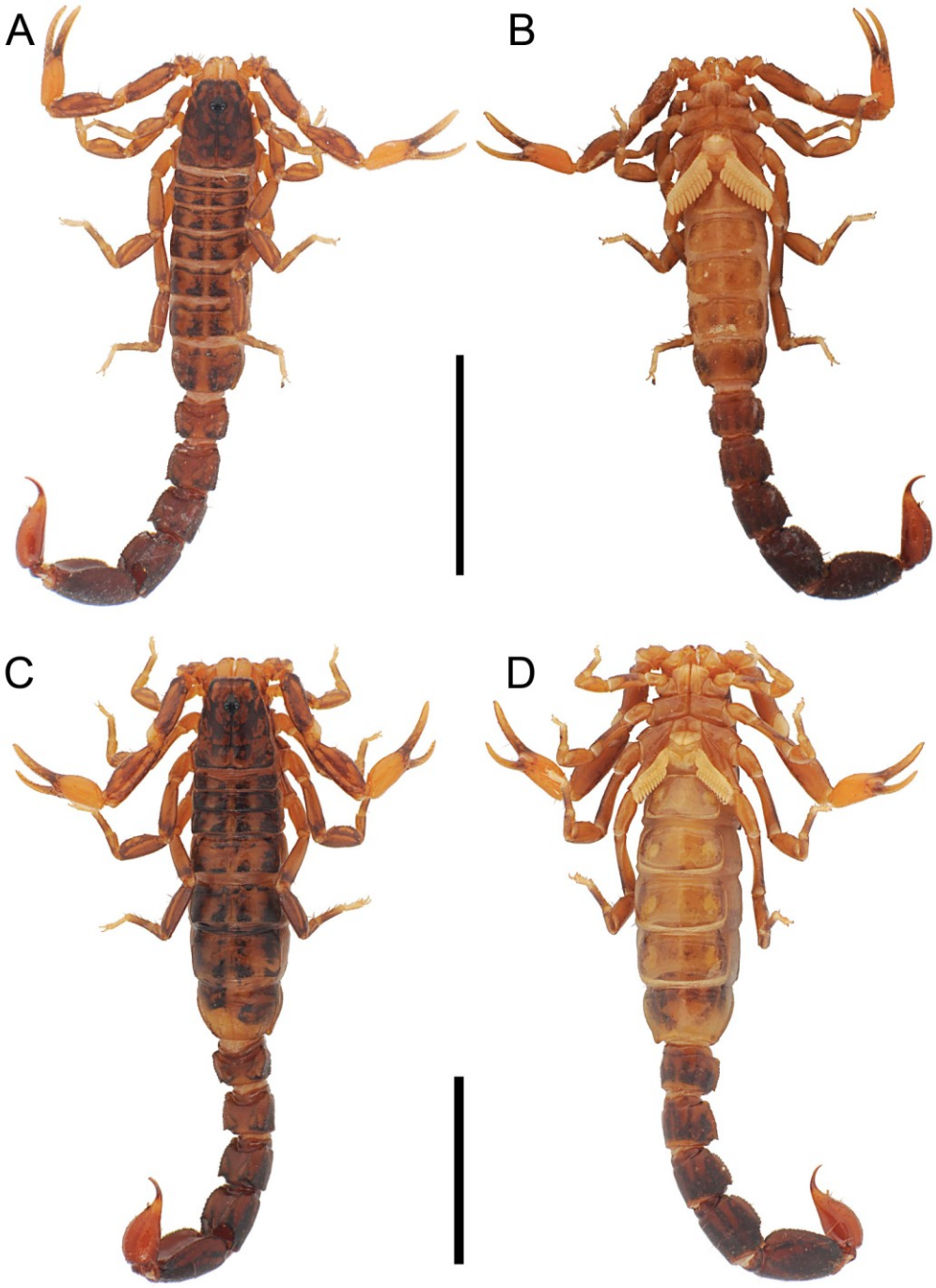


Figure 51. *Konetontli juxtlahuaca*, **n. sp.**, habitus. **A**, **B**. Paratype ♂ (IBUNAM). **C**, **D**. Paratype ♀ (AMNH). **A**, **C**. Dorsal aspect. **B**, **D**. Ventral aspect. Scale bars = 5 mm.

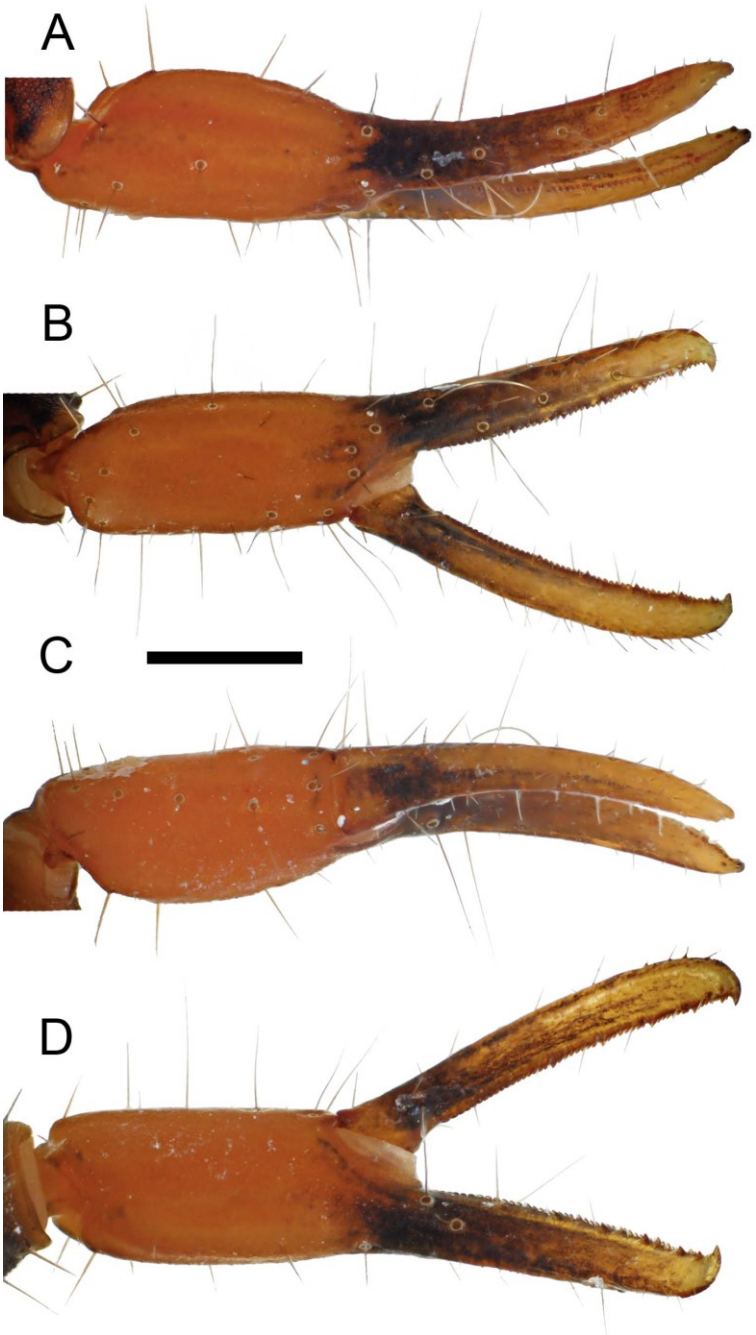


Figure 52. *Konetontli juxtlahuaca*, **n. sp.**, paratype ♂ (IBUNAM), dextral pedipalp chela. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 0.5 mm.

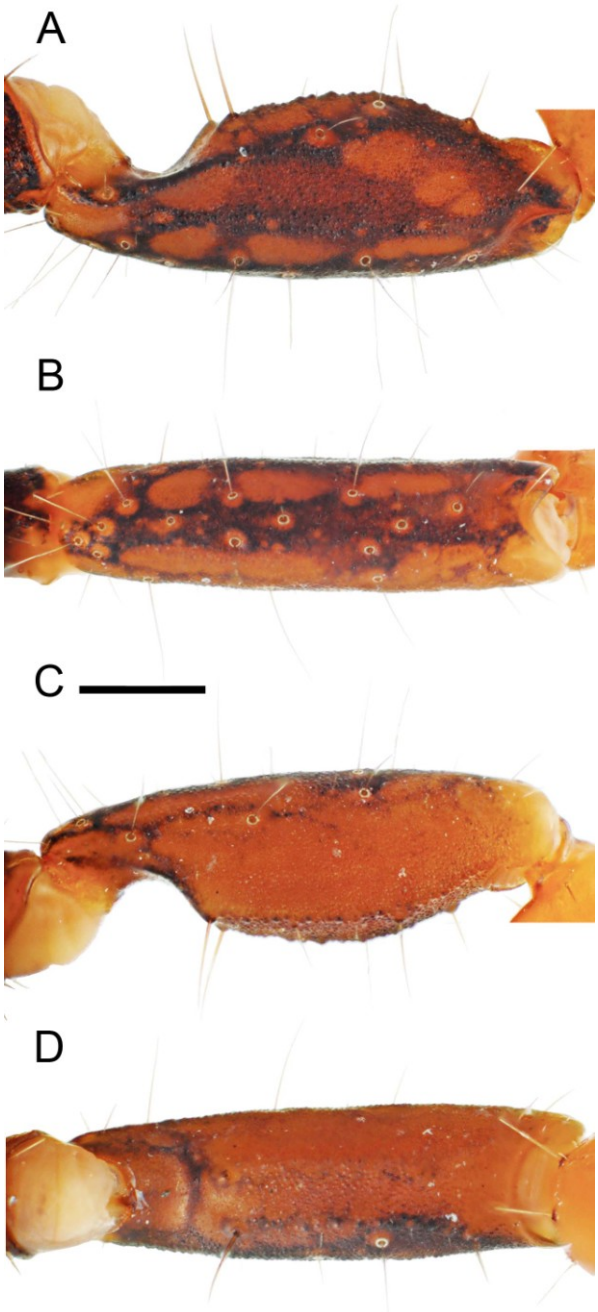


Figure 53. *Konetontli juxtlahuaca*, **n. sp.**, paratype ♂ (IBUNAM), dextral pedipalp patella. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 0.5 mm.

Table 8. Measurements (mm) of adult *Konetontli ignis*, **n. sp.**; *Konetontli ilitchi*, **n. sp.**; *Konetontli juxtlahuaca*, **n. sp.**; *Konetontli migrus*, **n. sp.**; and *Konetontli zihuatanejensis* (Baldazo-Monsivais, 2003). Abbreviation: H, holotype.

	K. ignis ♀, H, IBUNAM	*K. ilitchi* ♀, H, IBUNAM	*K. juxtlahuaca* ♂, H, IBUNAM	*K. migrus* ♂, H IBUNAM	*K. zihuatanejensis* ♂, H, IBUNAM
Length					
Carapace	1.80	2.20	2.00	2.00	2.90
Pedipalp: femur	1.60	1.55	1.50	1.50	2.30
Pedipalp: patella	1.70	1.95	1.90	1.80	2.80
Pedipalp: chela	2.30	2.75	2.50	2.75	4.30
Fixed finger	1.20	1.35	1.30	1.25	1.90
Movable finger	1.50	1.75	1.60	1.60	2.40
Mesosoma	4.10	4.90	4.30	4.20	6.40
Metasoma	5.30	6.65	6.20	6.60	9.60
Metasomal segment I	0.60	0.80	0.70	0.80	1.20
Metasomal segment II	0.70	0.95	0.90	1.00	1.50
Metasomal segment III	0.80	1.00	1.00	1.10	1.60
Metasomal segment IV	1.30	1.60	1.60	1.60	2.30
Metasomal segment V	1.90	2.30	2.00	2.10	3.00
Telson	1.90	2.15	2.10	2.00	3.00
Telson: vesicle	1.30	1.50	1.40	1.25	1.90
Telson: aculeus	0.60	0.65	0.70	0.75	1.10
Total	13.10	15.90	14.60	14.80	21.90
Width					
Pedipalp: femur	0.50	0.55	0.60	0.55	0.90
Pedipalp: patella	0.50	0.70	0.60	0.60	1.90
Pedipalp: chela	0.50	0.70	0.50	0.85	1.40
Metasomal segment I	1.20	1.25	1.30	1.25	2.00
Metasomal segment II	1.10	1.25	1.20	1.25	1.80
Metasomal segment III	1.10	1.25	1.20	1.20	1.80
Metasomal segment IV	1.10	1.20	1.20	1.15	1.80
Metasomal segment V	1.10	1.15	1.20	1.20	1.90
Telson: vesicle	0.90	0.85	1.00	0.95	1.30
Height					
Pedipalp: chela	0.50	0.60	0.50	0.80	1.10
Metasomal segment I	1.00	1.05	1.00	1.1	1.50
Metasomal segment II	0.90	1.05	1.00	1.0	1.50
Metasomal segment III	0.90	1.05	1.00	1.0	1.50
Metasomal segment IV	1.00	1.05	1.00	1.0	1.50
Metasomal segment V	1.00	1.05	1.00	1.1	1.50
Telson: vesicle	0.70	0.60	0.70	0.65	1.10

Konetontli kuarapu (Francke and Ponce-Saavedra, 2005)

Figures 38, 54−56, 70B, 73C, 77A, 78A, 79F, 81F, 84A

Konetontli kuarapu Francke and Ponce-Saavedra, 2005: 64–68, figs. 1–7, 9, 14, 15; Graham and Fet, 2006: 9; Soleglad and Fet, 2008: 31, 73, 74, 89, 100.

TYPE MATERIAL: **MEXICO: Michoacán:** *Municipio de Parácuaro*: Holotype ♂ (IBUNAM), La Batea, [ca. 10 km E of Parácuaro], 19°07'54"N 102°07'48"W, 360 m, 21.x.2000, J. Ponce et al., under rocks. Paratypes: 1 ♂ (AMNH), 2 ♀ (UMSNH), same locality as holotype.

DIAGNOSIS: *Konetontli kuarapu* is closely related to *K. acapulco*, *K. ignis*, **n. sp.**, *K. juxtlahuaca*, **n. sp.**, and *K. zihuatanejensis*, with which it forms a monophyletic group sister to the other five species of *Konetontli*. The following scheme of relationship was retrieved among the species: (*K. kuarapu* (*K. acapulco* + *K. zihuatanejensis*) (*K. juxtlahuaca* + *K. ignis*)). These species are related by the unique derived apomorphic character: ventral submedian carinae obsolete to vestigial in metasomal segment I–IV. *K. kuarapu* differs from *K. acapulco* and *K. zihuatanejensis* by having pedipalp chela movable finger with six retrolateral denticles and six rows of median denticles, instead of seven. From *K. ignis* differs by having pedipalp manus intercarinal surfaces heavily infuscated and carinae outlined by darker infuscation instead of being immaculate. *K. ignis*, **n. sp.** and *K. juxtlahuaca*, **n. sp.** have slender pedipalp manus, contrasting with the incrassate manus of *K. kuarapu*. From *K. juxtlahuaca*, **n. sp.** differs by having finger base intensely infuscated, instead of immaculate. From *K. acapulco* and *K. ignis*, **n. sp.** differs by having ventral median carinae of telson with subaculear tubercle complex, instead of solitary. Although *K. juxtlahuaca*, **n. sp.** has in some specimens compound subaculear

tubercle and *K. zihuatanejensis* it compound, the configuration differs, *K. kuarapu* has a major subaculear tubercle that comes after four secondary spiniform tubercles, first two bicuspid, these followed by a row of enlarge granules along the telson. *K. juxtlahuaca*, **n. sp.** and *K. zihuatanejensis* have only one secondary tubercle.

DESCRIPTION: The following redescription supplements Francke and Ponce-Saavedra's (2005) original description. It is based on the adult ♂ holotype and ♀paratype.

Color and infuscation (in alcohol): Base color base yellow straw. Carapace, tergites, prolateral surface of legs heavily infuscate with dusky markings. Tergites with ventral median carinae immaculate except distal end of V, VI with diffuse infuscation. Sternites I−VI immaculate except fine infuscation on lateral margins. Ventral sublateral, ventral lateral, lateral ventral carinae of sternite VII with macrosetae infuscate at base. Metasomal segments turning darker distally from orange to darker brown, metasomal segments VI, V orange and reddish respectively, darker than I−III. Telson lighter than metasomal segment V, yellow-orange. Aculeus dark reddish to brownish. Pedipalp fingers infuscate at base. Ventral lateral, ventral sublateral carinae of metasomal segments I−IV outlined with broad infuscation; ventral median carina of metasomal segment V immaculate, ventral submedian infuscate, distal half of ventral submedian and ventral lateral intercarinal surface infuscated.

Carapace: Carapace 1.17 times longer than posterior width. Frontal sublinear, moderately bilobed with vestigial medial notch. Carapace cover with fine granules and few scattered coarse granules. Median ocular tubercle slightly raised, positioned on anterior third of carapace. Tree lateral eyes, two anterior pair same size, posterior reduced approximately in half. Median eyes approximately double size of lateral anterior pair. Anteromedian sulcus moderate;

posteromedian moderate on proximal half and deep distally; anterolateral, posterior transverse obsolete; posterolateral moderate.

Sternum and coxal region: Sternum pentagonal subequilateral, 1.21 times wider than long, matte, three pairs of macroseta, median sulcus deep. Coxa IV 1.88 times longer than coxa II. Proximal margin of coxal endite II with shallow depression each, median margin finely granular. Anterior margin of coxa IV with three oblique slit-like structures, adjacent to protuberance of the frontal margin.

Chelicerae: Dorsal surface smooth, prolateral and distal margin of manus, movable finger base, diffusely infuscate. Subdistal margin with one macroseta. Serrula present on ventral distal half of movable finger, tines numbering 19.

Pedipalps: Trichobothrial pattern Type C, orthobothriotaxic. Femur: All intercarinal surfaces matted. Dorsal retrolateral, dorsal prolateral, ventral prolateral carinae moderately granular. Retrolateral dorsosubmedian obsolete, expressed by two macrosetae positioned medially. Retrolateral ventral, ventral median vestigial, expressed on proximal extreme by few granules. Prolateral ventral partial, expressed by one proximal spiniform macrosetae, three median enlarged tubercles with two macroseta on extreme distal, proximal tubercles. Prolateral ventrosubmedian partial, expressed by one proximal enlarged spiniform tubercle adjacent to trichobothrium *i*, with three to four comparatively smaller and blunt tubercles with two median.

Patella: All intercarinal surfaces matted. Carinae: Dorsal prolateral weakly granular; dorsal retrolateral obsolete; retrolateral carinae obsolete, expressed by infuscation; ventral retrosubmedian partial, weakly granular proximally becoming smooth distally; ventral prolateral complete moderately granular; ventral median vestigial moderately granular expressed on proximal third; prolateral ventral obsolete, two spiniform macrosetae demarcating longitudinal

partial expression on medial aspect of patella; prolateral median on vaulted projection, protruding strongly medially, coarse sparse tubercles, distal extreme angling dorsally almost reaching dorsal prolateral carinae on distal third with two macrosetae on proximal, distal extremes, one or two intersperse minor macrosetae. All other carinae absent.

Chela: Manus rounded, smooth, incrassate, acarinated. Chela wider than patella, femur. All carinae and intercarinal surface immaculate. Trichobotrium *ib* and *it* positioned subbasal on fixed finger, between RD6 and RD7, RD7 lacking granule. *Dt* positioned close to mid manus.

Fingers: Fixed finger dentition: PD = 6, RD = 6, MD rows = 6; movable finger PD = 7, RD = 6, MD rows = 6, proximal retrolateral denticle positioned by mid finger. Fingers lacking scalloped and proximal, gap created when fingers closed moderate.

Legs: Spinules: Basitarsi I–II with retrolateral ventral, retrolateral dorsal carinae with row of spinules each on distal third, on III retrolateral ventral row of spinules on distal fourth, retrolateral dorsal absent, in IV absent; retrolateral, prolateral ventral rows absent in I–IV. Telotarsi I–IV with one pair of ventral distal spinules. Setae: Basitarsi setal counts: Prolateral ventral, 4:4:4:4, basal three spiniform and stout on II–IV; retrolateral ventral, 3:4:5:6 retrolateral dorsal, 3:3:3:3; dorsal 2:2:2:2. Retrolateral dorsal, dorsal series arranged in two independent rows.

Tergites: Mesosomal tergites matte. Ventral median carinae absent in I and II, in III−VII partial on distal half, costate and finely granular; ventral submedian obsolete. Tergite VII with dorsal median carina costae, smooth reaching on proximal half of the segment; dorsal sublateral, dorsal lateral strong, granular.

Genital operculum: Male genital operculum: wider than long, with two pairs of macrosetae. Sclerites free on longitudinal edge moving independently but unable to open more

than 45°. Genital papillae protruding posteriorly. Female genital operculum: Wider than long, with three macrosetae. Sclerites fuse longitudinally.

Sternites: Sternites I−VII matte. Sternite V with moderate distal median hyaline glandular area. Sternite VII with all carinae obsolete, ventral submedian with three pairs of macrosetae, ventral lateral carinae with two pair of macrosetae. Sternite VII lacking distal median hyaline glandular area. Spiracles minute sub ovoid shaped.

Pectines: Basal piece with three pairs of macrosetae. Marginal lamella consist of three sclerites, medial lamella proximally fuse distally progressively forming seven conspicuous beads. Fulcra with 11–12 in ♂, in ♀ 11 beads. Pectinal tooth count 12–13 in ♂, in ♀ 12. Pectines relatively long, second sclerite of marginal lamella at level of distal edge of coxa IV in ♂, in ♀ mid distal sclerite at level of distal edge of coxa IV.

Hemispermatophore: Lamina 2.17 longer than trunk. Median lobe ental terminus moderate, rounded. Dorsal through margin long, narrow, curving proximally, removed from ventral trough. Primary, secondary hooks moderate, positioned on apex of lateral margin extension of lamina (flange), forming a deep notch. Hemi-mating plug developed from inner lobe, distal barb margin with approximately 12 short spinules. Basal plate of inner lobe distal to ventral trough. Neck of inner lobe shorter than basal plate (0.3 times longer than basal plate). Measurements, lamina, 2.21; trunk, 1.02; dorsal trough/laminar hooks, 1.05; ventral trough/laminar hook, 0.68; neck, 0.10; basal plate, 0.34.

Metasoma: All intercarinal surfaces matted. Metasoma 1.5 times longer than mesosoma. Metasomal segments I−III wider than longer. Dorsal lateral carinae of metasomal segments I−V serrated and lateral median of metasomal segments I−IV terminating in moderated enlarge granules pointing backwards. Lateral median carinae in V vestigial with a proximal tubercle and

most of length broadly costate, smooth. Lateral inframedian carinae in I complete, granular; in II and III incomplete, granular present in distal third, in IV absent. Ventral lateral carinae in I−IV complete, finely crenatoserrated. Ventral submedian in I−IV obsolete only expressed by setal pairs. Ventral median carinae in V obsolete. Setae: Dorsal lateral, 1:1:1:1:3; lateral median, 0:2:2:3; lateral inframedian, 1:1:1:2:1; ventral lateral, 2:3:3:3:4; ventral submedian, 2:3:3:3:2; ventral sublateral, 2.

Telson: Telson 2.2 times longer than wide. Metasomal segment V 1.6 times wider than vesicle. Dorsal surface smooth, ventral median with subaculear tubercle complex, major tubercle enlarged triangular isosceles type with two or three serrations at base, followed by smaller spiniform tubercle, both blunt. Ventral submedian carinae with scattered broad, low crenulations with three pairs of macrosetae, four to five pairs of minor setae. Ventral sublateral, ventral lateral surfaces cover with comparative less speckled low crenulations; each carinae with three pairs of macrosetae. Laterobasal microserration of aculeus 4–5.

DISTRIBUTION: *Konetontli kuarapu* is endemic to the Balsas Depression in the state of Michoacán, Mexico.

ECOLOGY: *Konetontli kuarapu* is known for four specimens collected in the type locality and a second locality ca. 10 km west of the type locality. According to the authors, the specimens were collected by turning rocks at 360 m altitude. The area exhibits secondary thorn forest, and deciduous tropical forest.

REMARKS: The locality label of the paratype specimen deposited at the AMNH and one paratype deposited at IBUNAM differ from the locality stated in the original description. The authors omitted the locality El Valle and instead reported only the type locality La Batea.

MATERIAL EXAMINED: **MEXICO: Michoacán:** *Municipio de Parácuaro*: El Valle [ca. 5 km S, Parácuaro] [19°6'12.41"N 102°13'9.73"], 21.x.2000, J. Ponce et al., 1 ♂, (AMNH), 1 ♀ (IBUNAM).

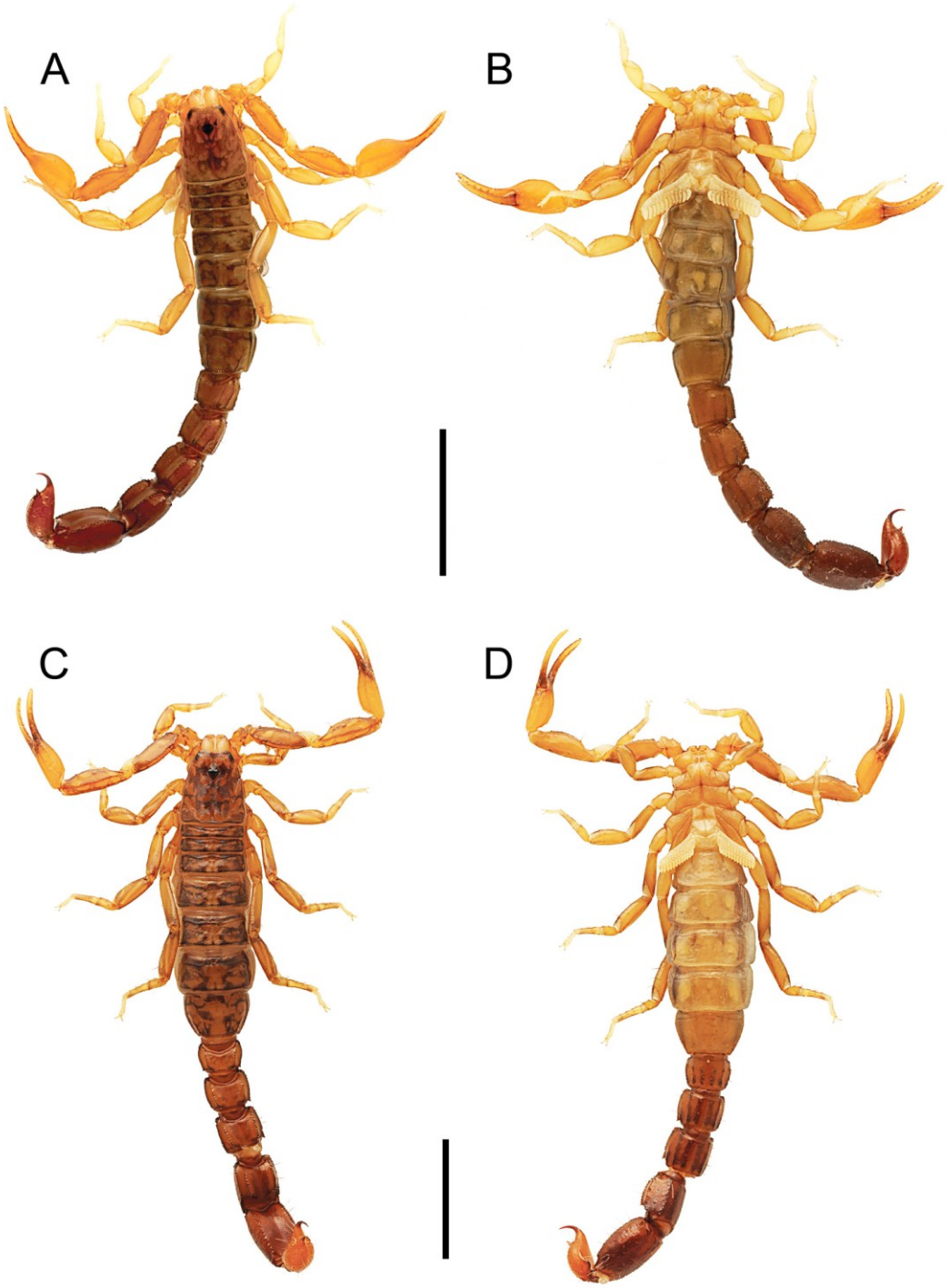


Figure 54. *Konetontli kuarapu* (Francke and Ponce-Saavedra, 2005), habitus. **A**, **B**. Paratype ♂ (AMNH). **C**, **D**. ♀ (AMNH). **A**, **C**. Dorsal aspect. **B**, **D**. Ventral aspect. Scale bars = 5 mm.

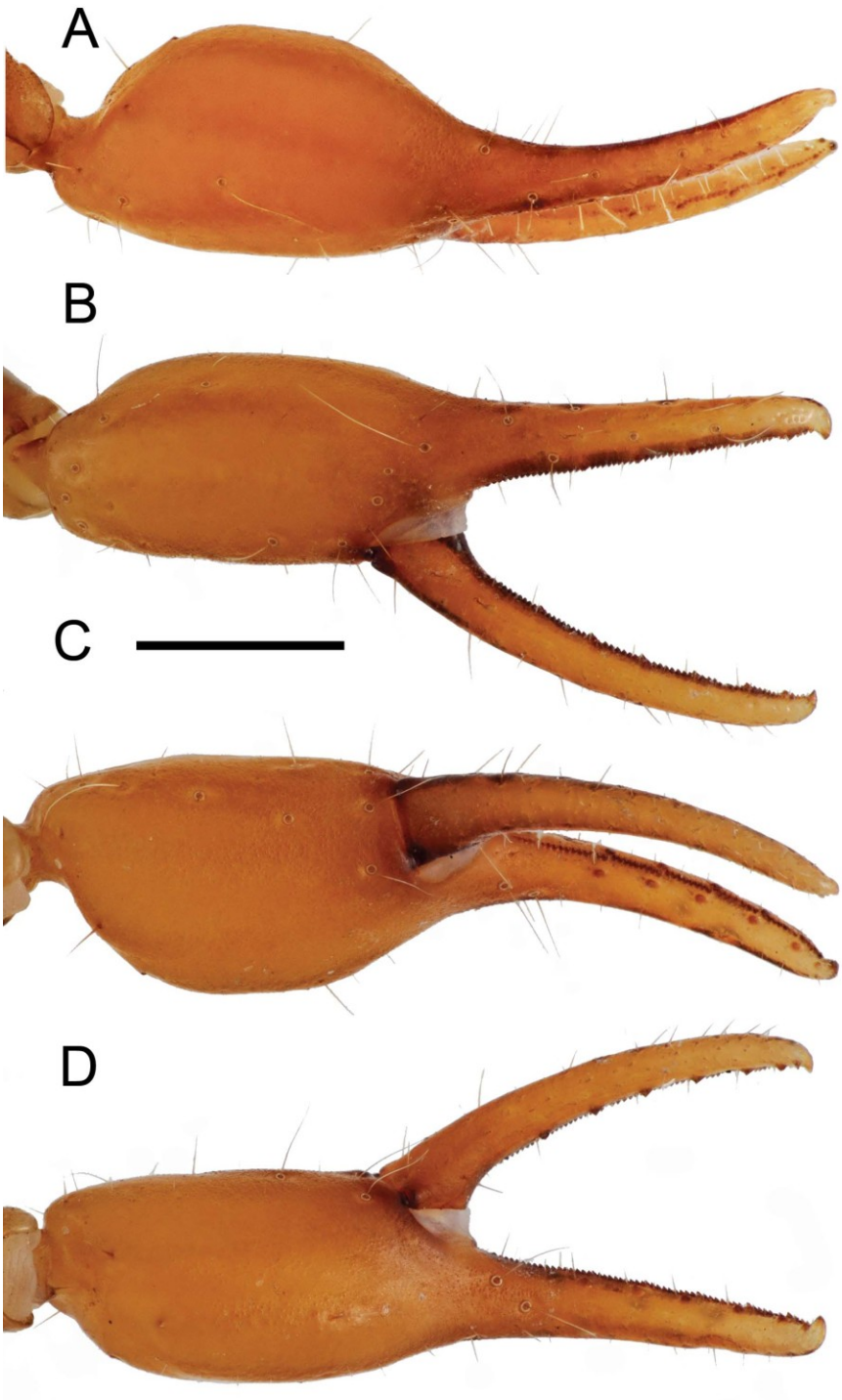


Figure 55. *Konetontli kuarapu* (Francke and Ponce-Saavedra, 2005), paratype ♂ (AMNH), dextral pedipalp chela. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

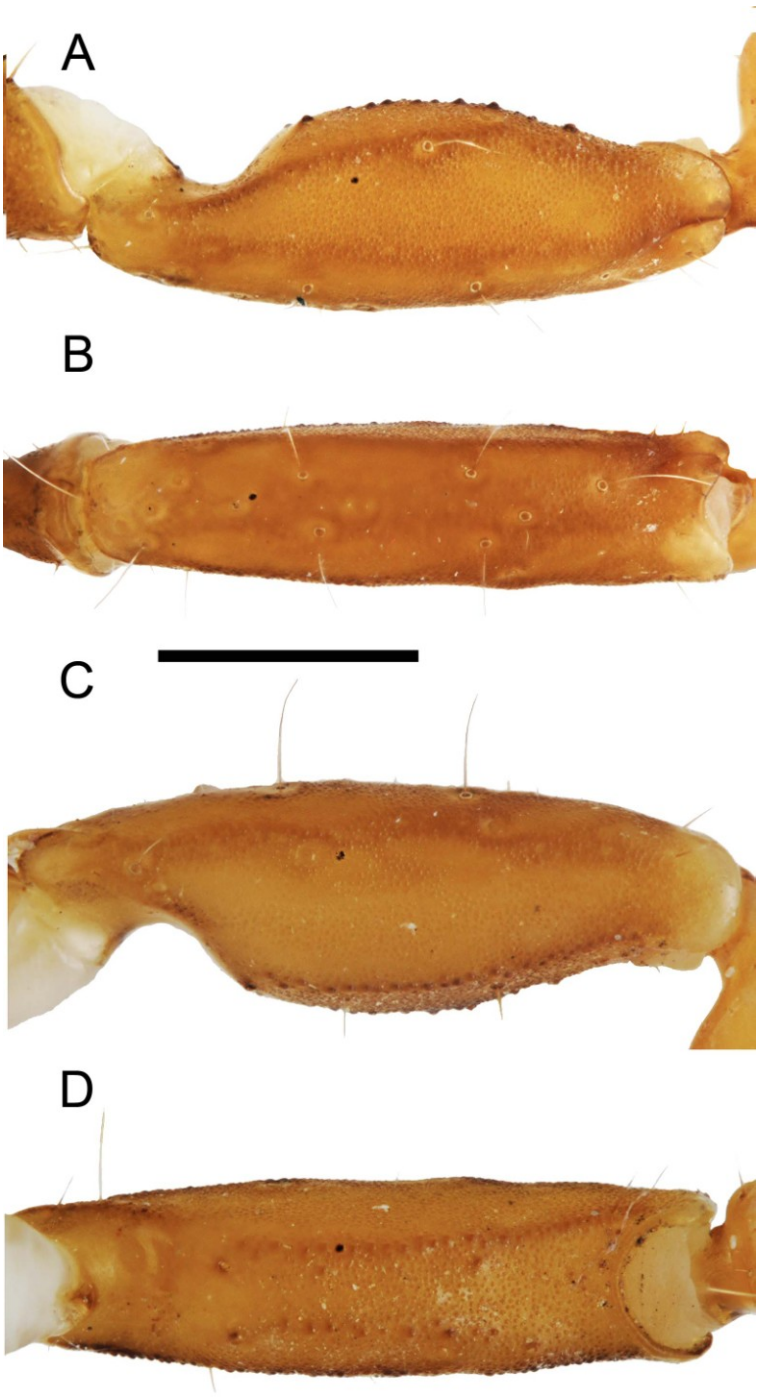


Figure 56. *Konetontli kuarapu* (Francke and Ponce-Saavedra, 2005), paratype ♂ (AMNH), dextral pedipalp patella. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

Konetontli migrus, **n. sp.**

Figures 38, 56–59, 70C, 73B, 77B, 78B, 80A, 82A, 84B, 85E–F; Table 8

TYPE MATERIAL: **MEXICO: Guerrero:** *Municipio de Coyuca de Catalan*: Holotype ♂ (IBUNAM [ARA 2077]), Puente El Cedral, [on Road Mexico 134, ca. 68 km NE of Zihuatanejo], 796 m, 2.iv.2008, 18°2.4048'N 101°4.3818'W, O. Francke, H. Montaño, J. Ponce, and A. Quijano. Paratype: 1 ♂ (AMNH [ARA 3814]), same data as holotype.

ETYMOLOGY: The species name *migrus* is a Latin word that means small, referring to the small body size of this species.

DIAGNOSIS: *Konetontli migrus*, **n. sp.** is closely related to *K. nayarit*, *K. pattersoni*, *K. chamelanesis* and *K. ilitchi*, **n. sp.**, with which it forms a monophyletic group. These species are related by the unique derived apomorphic character: ventral submedian carinae granular in metasomal segments I–IV. From *K. nayarit* differs by being smaller, adult male at 15 mm, in *K. nayarit* 21.50 mm, ventral submedian carinae in II and III obsolete instead of granular and from the aforementioned species differs by having metasomal dorsal ventral carinae with a crest of tubercles running from proximal surface to the subaculear tubercle. From *K. pattersoni* differs by having pedipalp manus and fingers finely and diffusely infuscate, instead of having distal manus and base of the fingers heavily infuscated, the dorsal surface of the telson is smooth and elongated in *K. pattersoni* but granular and more robust in *K. migrus*, **n. sp.** From *K. chamelaensis* differs by having incrassate pedipalp manus instead of slender and by having prolateral dorsal and dorsal retrolateral carinae of femur granular instead of obsolete. From *K. ilitchi*, **n. sp.** differs by having finely and diffusely infuscate, in *K. ilitchi*, **n. sp.** manus and

fingers are heavily infuscated, with all carinae outlined and intercarinal surfaces more darker, also the manus are slender not as incrassate as *K. migrus*, **n. sp.**

DESCRIPTION: The following description is based on the adult ♂ holotype and paratype.

Color and infuscation: Body color base yellow straw. Carapace, tergites, prolateral side of legs heavily infuscate with dusky markings. Pedipalp femur with only dorsal carinae infuscate. Tergites with ventral median carinae immaculate, slightly infuscate in V, VI. Sternites immaculate except for fine infuscation on lateral margins. Sternite VII with macrosetae on ventral sublateral, ventral lateral and lateral ventral carinae infuscate at base. Metasomal segments VI, V orange and reddish respectively, darker than I–III. Telson paler than metasomal segment V, vesicle turning from orange-yellowish to golden yellow by distal portion. Aculeus dark reddish. Base of pedipalp fingers finely, diffusely infuscate. Metasomal ventral carinae ventral submedian, ventral lateral I–IV outlined with blotches of infuscation surrounding macrosetae base. Metasomal segment V ventral median carina immaculate, lateral macrosetae base infuscate. Metasomal segment I–III with dorsal lateral intercarinal surface infuscate. Dorsal lateral and lateral inframedian intercarinal surface of metasomal segments I–IV completely infuscate. Metasomal segment V with ventral sublateral carinae with infuscate setae base on distal half of the segment.

Carapace: Carapace 1.05 longer than posterior width. Frontal margin sublinear lacking medial notch. Carapace matte, cover with fine granules throughout. Median ocular tubercle raised, positioned on anterior half of carapace. Three lateral eyes, two frontal pair same size, posterior reduced approximately in half. Median eyes approximately double size of lateral frontal pair. Anteromedian, posteromedian, and posterolateral sulci shallow; anterolateral obsolete; posterior transverse vestigial.

Sternum and coxal region: Sternum pentagonal subequilateral, 1.7 times wider than longer, finely granulate, three pairs of macroseta, median sulcus well developed. Anterior margin of coxa II cover with minute granules, subbasally three oblique slit-like structures, adjacent to low smooth protuberance. Proximal margin of coxal endite II with deep depression each, median edge finely granular. Coxa IV less than 1.9 times longer than coxa II.

Chelicerae: Dorsal surface smooth, distal manus and movable finger base slightly infuscate. Distal manus with three setae, reducing in size from median to lateral sides. Serrula present on ventral distal half of movable finger, tines numbering 15.

Pedipalps: Trichobothrial pattern Type C, orthobothriotaxic. Femur: All intercarinal surfaces matted. Carinae: Prolateral dorsal, dorsal retrolateral carinae complete and granular; retrolateral dorsosubmedian obsolete, expressed only by three macrosetae on medial aspect of the femur; retrolateral ventral and ventral median vestigial, expressed only on proximal extreme by few granules; ventral prolateral complete and granular; prolateral ventral partial granular, expressed by one proximal, one medial, one distal granule connected by minute granulation positioned at distal forth of the femur, protruding strongly from adjacent surfaces, with three macrosetae; prolateral ventrosubmedian vestigial, one basal tubercle, connected by scattered granules and one medial macrosetae demarcating partial longitudinal expression ending by distal forth of the femur.

Patella: Only dorsal and retrolateral carinae infuscate. All intercarinal surfaces matted. Carinae: Dorsal prolateral and dorsal retrolateral complete and granular; retrolateral dorsal obsolete expressed by confluent blotches of infuscation around trichobothria eb_2, esb_1, *est*, and *et* merging with infuscation at dorsal retrolateral carina; retrolateral dorsosubmedian obsolete, expressed by confluent blotches of infuscation around trichobothria eb_2, esb_1, and *est*; ventral

retrolateral obsolete, weakly protruding from adjacent surfaces; ventral prolateral complete, granular, granules minute compare to those on prolateral dorsal carinae; ventral median vestigial weakly costate, reaching proximal third of patella length; prolateral ventral obsolete, two macrosetae demarcating longitudinal partial expression on medial aspect of patella, restricted to mid segment; prolateral median on vaulted projection, protruding strongly medially with coarse sparse granules, distal extreme angling dorsally almost reaching dorsal prolateral carinae on distal fifth of the patella with minute sparse granules; all other carinae absent.

Chelae: Manus rounded, incrassate, smooth. Chela wider than patella and patella wider than femur. All carinae immaculate, only distal retrolateral aspect of manus finely and diffusely infuscate. Carinae: prolateral dorsal, dorsal median, dorsal retrolateral, retrolateral median, ventral submedian, ventral prosubmedian, prolateral ventral and prolateral median carinae obsolete, almost imperceptibly protruding from adjacent surfaces. Trichobothrium *Db* positioned on dorsal retrolateral carina, subbasal on chelae; *Dt* positioned close to mid manus, but on proximal half.

Fingers: Fixed finger, PD = 6, proximal PD positioned by proximal fourth of finger, MD rows = 6, RD = 6, proximal RD positioned by proximal fourth of finger. All PD, RD subpaired. Movable finger, PD = 7, MD rows = 6, distal row bearing one minute granule, RD = 6. All PD, RD paired. Fingers lacking scallop, gap created when fingers closed vestigial. Trichobotrium *ib* and *it* positioned subbasal on fixed finger

Legs: Basitarsi I–II prolateral ventral, retrolateral ventral and retrolateral dorsal carinae with complete rows of spinules; prolateral ventral in III partial expressed by distal row of spinules on distal third, in IV absent; retrolateral dorsal carinae in III partial, expressed as row of spinules on distal two thirds, in IV absent; retrolateral median in I–IV vestigial expressed as few

terminal spinules; retrolateral dorsal in I, II partial, expressed as row of spinules on distal two thirds, in III and IV absent. Telotarsi I–IV with two pairs of ventrodistal spinules in I–IV. Setae: Prolateral ventral 2:3:4:4; subdistal two in III, in IV stout; retrolateral ventral 3:3:5:5; retrolateral dorsal 2:2:2:2; dorsal 2:2:2:2; retrolateral dorsal, dorsal series arranged in two independent rows.

Tergites: Tergites matte throughout, shagreened laterally. Median carinae complete, strongly costate, granular distally in all segments; submedian obsolete on I–IV, granular on V–VI. Pretergites I–VII with median carinae infuscate, dorsal submedian intercarinal surface of posttergites immaculate, other surfaces heavily infuscate. Tergite VII with dorsal median carina granular reaching one half of the segment strongly costate; dorsal sublateral, dorsal lateral with enlarged granules curving inwards almost merging forming two semi rings in each side, internal surfaces of these semi rings shagreened.

Genital operculum: Male genital operculum: Wider than long, with three macrosetae. Sclerites free on longitudinal margin moving independently but unable to open more than 45°. Genital papillae protruding posteriorly. Female genital operculum: sclerites fuse longitudinally.

Sternites: Sternites I–VII medial surfaces smooth immaculate, lateral surfaces matte lateral edge slightly infuscate. Sternite V with moderated distal median hyaline glandular area. Sternite VII with ventral sublateral carinae incomplete occupying medial distal aspect of the segment, granular; all other carinae obsolete. Ventral submedian, ventral lateral carinae with one pair of macrosetae infuscated at base. Sternite VII distal median hyaline glandular area slightly protruding from adjacent surfaces. Spiracles minute sub ovoid.

Pectines: Basal piece with three pairs of macrosetae. Marginal lamella consist of three sclerites, medial lamella proximally fuse distally progressively forming seven conspicuous

beads. Fulcra with 9–10 beads. Pectinal tooth count 10–11. Pectines relatively long, second sclerite of marginal lamella at level of distal edge of coxa IV.

Hemispermatophore: Lamina 2.00 longer than trunk. Median lobe ental terminus moderate and rounded. Dorsal through margin long, narrow, curving proximally, removed from ventral trough. Primary, secondary hooks moderate, positioned on apex of lateral margin extension of lamina (flange), forming deep notch. Hemi-mating plug developed from the inner lobe, distal barb margin rimmed with weakly sclerotized indentation, spinules weakly developed. Basal plate of inner lobe distal to ventral trough. Neck of inner lobe shorter than basal plate (0.3 times longer than basal plate). Measurements, lamina, 1.70; trunk, 0.85; dorsal trough/laminar hooks, 0.75; ventral trough/laminar hook, 0.51; neck, 0.07; basal plate, 0.20.

Metasoma: All intercarinal surfaces matted. Metasoma less than 1.6 times longer than mesosoma. Metasomal segments I–III wider than longer. Metasomal segments I–IV dorsal lateral, lateral median carinae crenular to serrated terminating in moderated enlarge granules pointing backwards, in V incomplete, absent on distal half basally strong granular, granules turning minute towards distal end. Metasomal segment IV lateral median carinae with moderated enlarged granule by inflexion point where edge of flared terminal ends start. Metasomal segment I lateral inframedian carinae complete, granular; in II incomplete, absent on third proximal aspect, and granular; in III incomplete, absent on proximal half, granular; in VI absent. Metasomal segments I–V ventral lateral complete, strongly granular. Metasomal segment I−IV ventral submedian obsolete only expressed by presence of setal pairs. Metasomal segments V ventral median carinae vestigial, outlined by fields of scattered minute granules. Setae: Dorsal lateral carinae, 0:1:1:1:4; lateral median, 0:2:2:3; lateral inframedian, 1:1:1:0:3; ventral lateral, 2:3:3:3:5; ventral submedian, 2:3:3:3:1; ventral sublateral, 2.

Telson: Telson 2.1 times longer than wider. Metasomal segment V 1.3 times wider than vesicle. Vesicle 1.6 longer than aculeus. Dorsal surface smooth. Subaculear tubercle complex, major tubercle followed of four smaller spiniform tubercles, first two bicuspid, these followed by row of enlarge granules along ventral median carinae, decreasing in size proximally. Ventral submedian carina obsolete with three pairs of macrosetae, four to five pairs of minor setae. Ventral sublateral, ventral lateral intercarinal surfaces cover with scattered flat granules; each carinae with three pairs of macrosetae. Microserration on laterobasal aculeus numbering 5−6.

DISTRIBUTION: *Konetontli migrus*, **n. sp.** is endemic to the west face of the northern extreme of the Sierra Madre del Sur, in the state of Guerrero, Mexico.

ECOLOGY: *Konetontli migrus*, **n. sp.** was collected in the foothills of Sierra Madre del Sur, at 796 m altitude. This area is a transition zone between tropical deciduous forest and oak-pine forest.

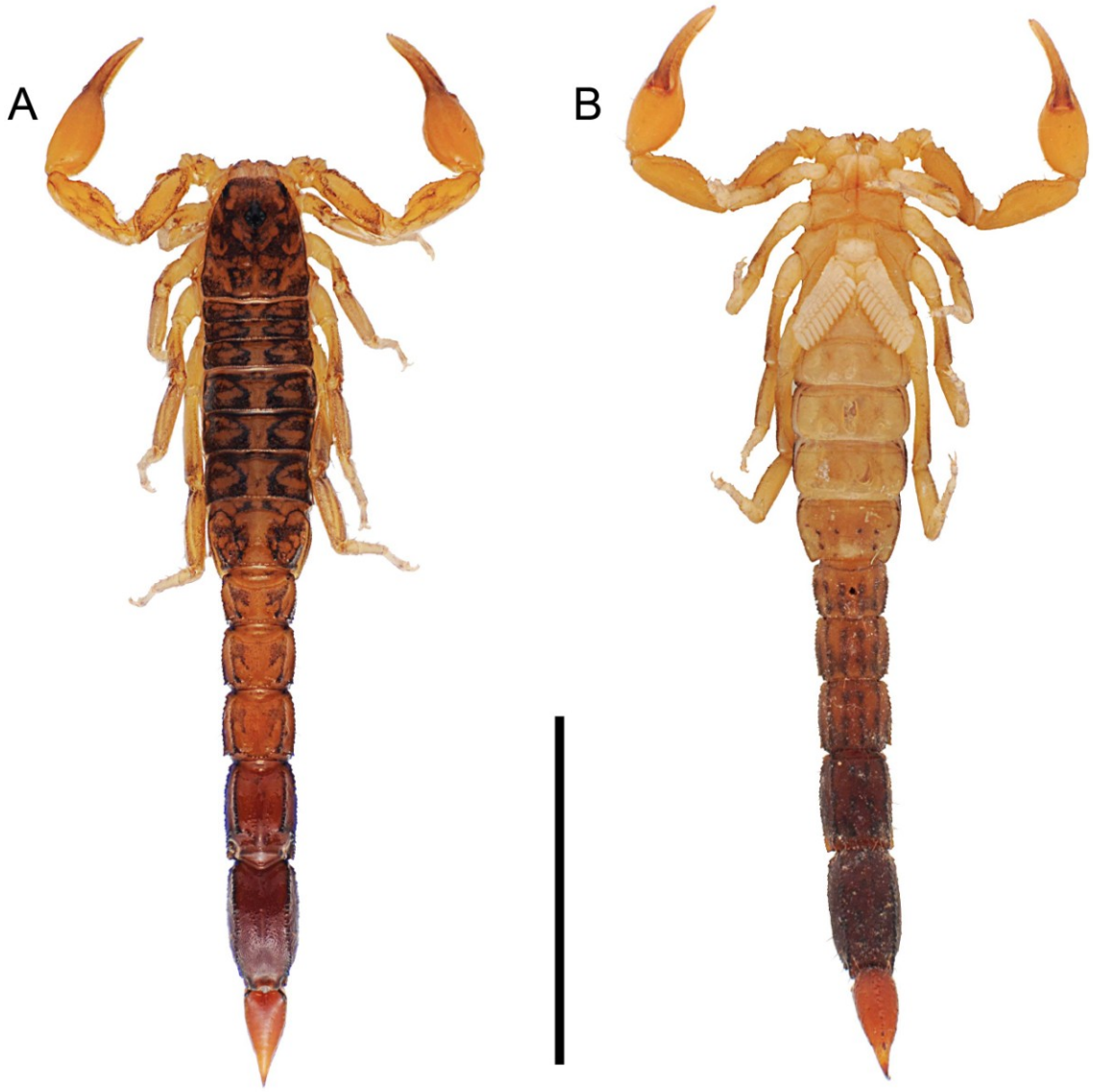


Figure 57. *Konetontli migrus*, **n. sp.**, habitus, holotype ♂ (IBUNAM). **A**. Dorsal aspect. **B**. Ventral aspect. Scale bars = 5 mm.

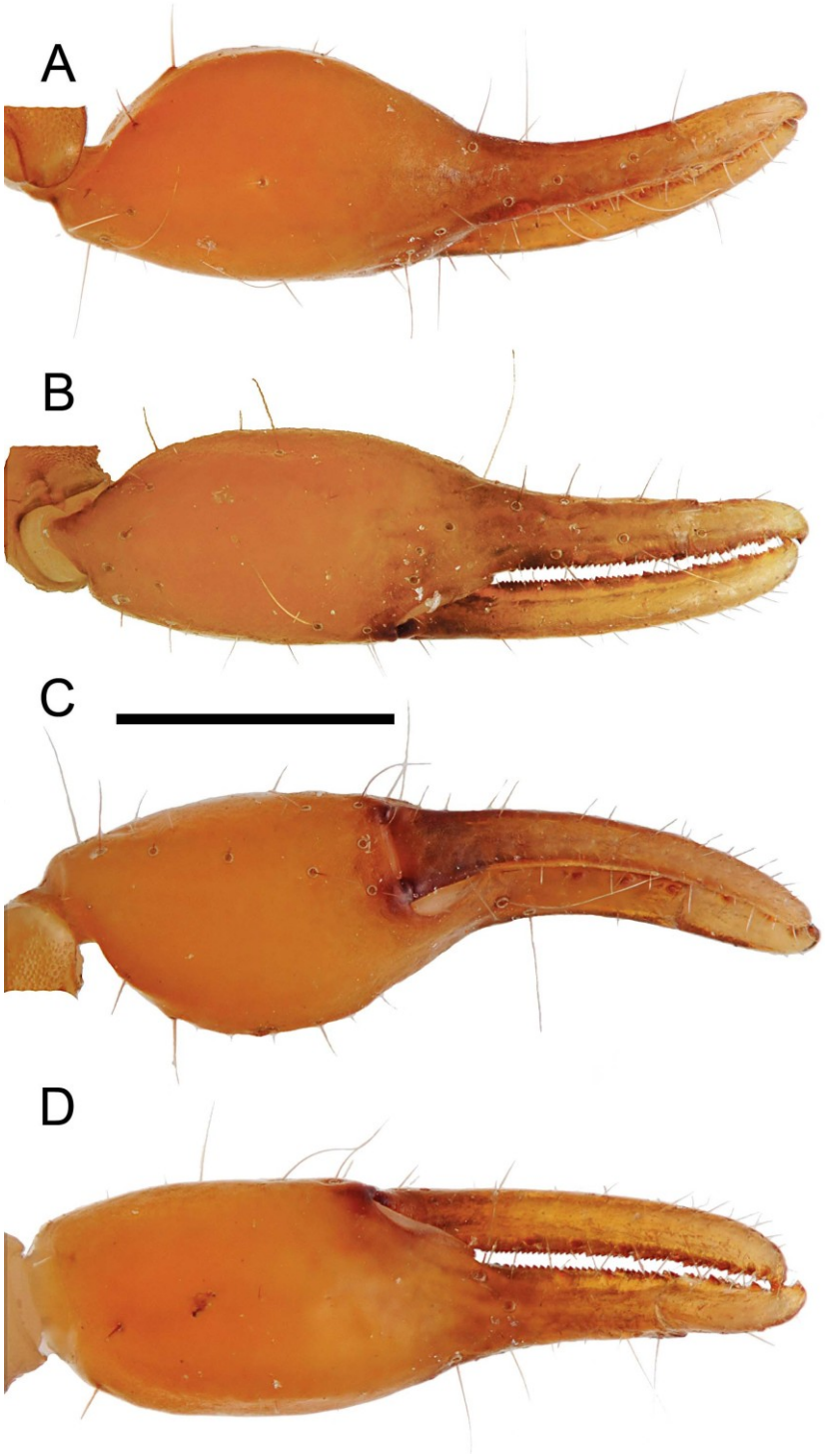


Figure 58. *Konetontli migrus*, **n. sp.**, holotype ♂ (IBUNAM), dextral pedipalp chela. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

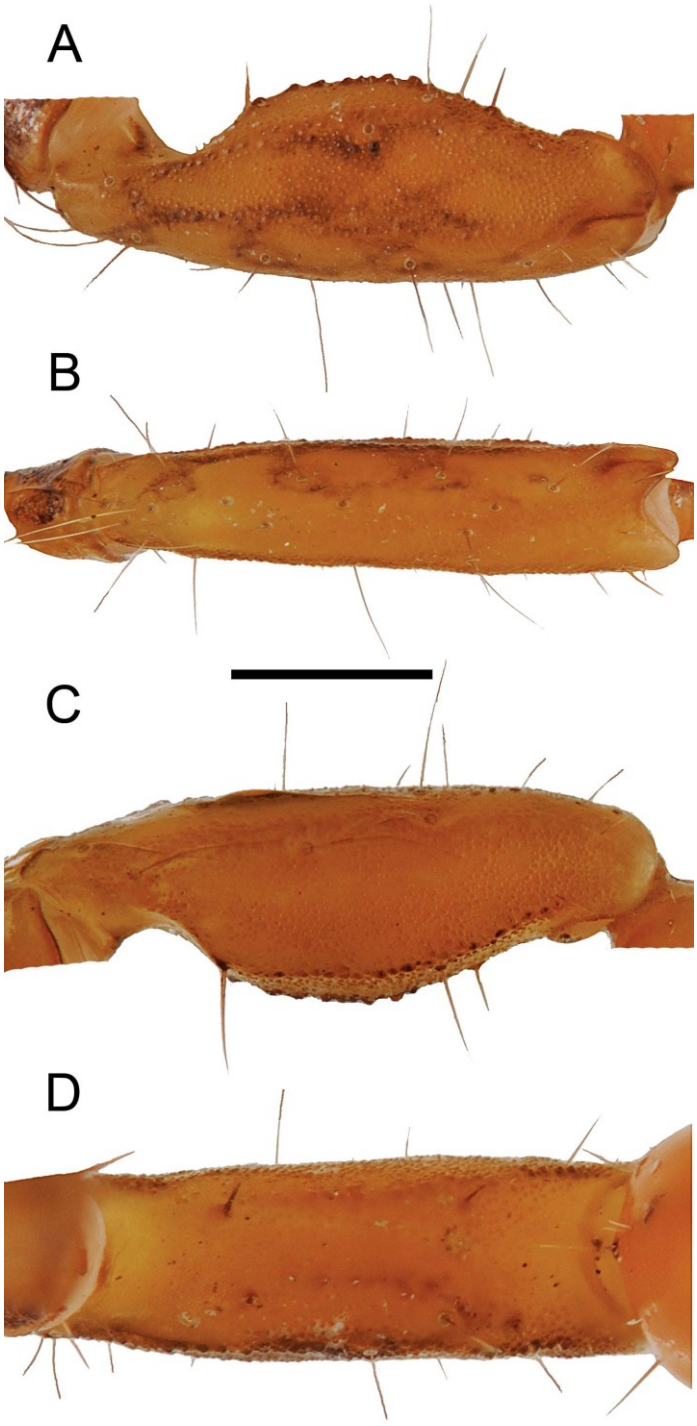


Figure 59. *Konetontli migrus*, **n. sp.**, holotype ♂ (IBUNAM), dextral pedipalp patella. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

Konetontli nayarit (Armas and Martín-Frías, 2001)

Figures 38, 60−62, 70D, 72C, 77C, 78C, 80B, 82B, 84C

Vaejovis nayarit Armas and Martín-Frías, 2001: 13–16, fig. 2, A−E, tab. 1; González-Santillán, 2004: 29; Francke and Ponce-Saavedra, 2005: 63, 66, fig. 8, 67, figs. 16, 17; Soleglad and Fet, 2008: 73, 89, 100.

TYPE MATERIAL: **MEXICO: Nayarit: [***Municipio de Compostela*]: Holotype ♂ (IBUNAM), 4 km NE Felipe Carrillo Puerto, [ca. 13 km NW of Compostela], [21°7.60433'N 104°51.6245'W], [ca. 870 m], 16.vii.1999, J.A. Fernández Ibarra.

DIAGNOSIS: *K. nayarit* is closely related to *K. chamelanesis*, *K. ilitchi*, **n. sp.**, *K. migrus*, **n. sp.**, and *K. pattersoni*, with which it forms a monophyletic group sister to the other five species of *Konetontli*. The following scheme of relationship was retrieved among the species: ((*K. nayarit* + *K. pattersoni*) (*K. migrus* (*K. ilitchi* + *K. chamelaensis*))). These species are related by the unique derived apomorphic character: ventral submedian carinae granular in metasomal segment I–IV. *K. nayarit* is closely related to *K. pattersoni* from which can be distinguished by having an infuscation pattern, in which the markings are more extended and connected on the cuticle surface creating a marbled appearance, especially on the metasomal surface, where carinae is outlined by intense infuscation *K. pattersoni* has more scattered and smaller markings on the cuticle surface creating a mottled appearance, especially on the metasomal surface, where carinae is sparkled with blotches of infuscation that never connect each other. *K. nayarit* has metasomal segment IV longer than wide, *K. pattersoni* has that segment as wide as long as or slightly wider than long. Additionally, *K. nayarit* has internal cutting margin of fingers straight, lacking lobes or notches and in consequence, fingers closure is

even, no gap evident, *K. pattersoni* has proximal notch of fixed finger moderated and weak median lobe in consequence fingers closure is uneven, exhibiting a strong gap. Furthermore *K. nayarit* has compound subaculear tubercle with four or more secondary tubercles and primary tubercle is moderately enlarged and blunt, whereas *K. pattersoni* has simple subaculear tubercle and is relatively smaller and sharper.

DESCRIPTION: The following redescription supplements Armas and Martín-Frías' (2001) original description. It is based on the ♂ holotype and the material mentioned below.

Color and infuscation: Color base medium yellow. Carapace, tergites, setal base of sternites, prolateral side of legs, metasoma heavily infuscate with dusky markings. Pedipalp femur, patella moderately infuscate, distal manus, proximal fingers heavily infuscate. Pedipalp chelae carinae diffusely infuscate distally, Tergites with ventral median carinae immaculate. Sternite III–VII immaculate except for fine infuscation on lateral margins, base of macrosetae along the sclerites. Metasomal segments VI and V orange, reddish respectively, darker than I–III. Telson paler than metasomal segment V, similar tone as in segment IV, vesicle orange-yellowish. Aculeus dark brown to reddish. All metasomal carinae outlined with infuscation, lateral intercarinal surfaces infuscate on distal half in segments I–V, ventral submedian intercarinal surface of segments III and IV almost completely infuscate. Base of aculeus, subaculear tubercle infuscate.

Carapace: Carapace 1.12 times longer than posterior width. Frontal margin sublinear lacking medial notch. Carapace matte, cover with fine granules throughout. Median ocular tubercle raised, positioned on anterior half of carapace. Three lateral eyes, two frontal pair same size, posterior reduced approximately in half. Median eyes approximately double size of lateral frontal pair. Anteromedian sulcus deep with anterior depression; posteromedian moderate on

proximal half and deep distally, anterolateral obsolete, posterolateral shallow, posterior transverse vestigial.

Sternum and coxal region: Sternum pentagonal subequilateral, 1.6 times wider than longer, finely granulated, three pairs of macroseta, median sulcus deep. Anterior margin of coxa II smooth, subbasally with three oblique slit-like structures, adjacent to low and smooth protuberance. Proximal margin of coxal endite II with shallow depression each, median edge finely granular. Coxa IV less 1.91 times longer than coxa II.

Chelicerae: Dorsal surface smooth, distal manus, movable finger base with reticular infuscation. Distal manus with three setae, reducing in size from medially to laterally. Serrula present on ventral distal half of movable finger, tines numbering 14.

Pedipalps: Trichobothrial pattern Type C, orthobothriotaxic. Chela wider than patella, patella wider than femur. Femur: All intercarinal surfaces matted. Carinae: Dorsal prolateral, dorsal retrolateral, ventral prolateral carinae complete, moderately granular; retrolateral dorsosubmedian obsolete, expressed by two macrosetae on medial aspect of the femur; retrolateral ventral vestigial expressed only on proximal extreme by few granules, ventral median obsolete, prolateral ventrosubmedian partial reaching proximal half of segment with a proximal spinoid tubercle, two or three enlarged granules, two macrosetae; prolateral ventral partial reaching proximal third of segment, expressed by one proximal, one medial, one distal granules each with a macroseta on top, ventral prolateral obsolete.

Patella: All intercarinal surfaces matted. Carinae: Dorsal prolateral complete moderated proximal half smooth, distal half crenulated, dorsal retrolateral, ventral retrosubmedian obsolete; carinae of retrolateral surface obsolete, carinae expressed by infuscation; ventral prolateral complete and granular; ventral median vestigial weakly costate, reaching proximal third of

segment with minute granules distally; prolateral ventral obsolete, two macrosetae demarcating longitudinal partial expression on medial aspect of segment; prolateral median complete, positioned on vaulted projection, protruding strongly medially with coarse sparse serrated granules, distal extreme angling dorsally almost reaching dorsal prolateral carinae on distal fifth of patella with two macrosetae, one proximal and one distal; all other carinae absent.

Chela: Manus rounded, relatively incrassate, smooth with all carinae obsolete, except for prolateral median, ventral prolateral strongly costate, making prolateral surface convex comparatively to other surfaces. Trichobothrium *Db* positioned on dorsal retrolateral carina, subbasal on chelae; *Dt* positioned close to mid manus, but on proximal half.

Fingers: Fixed finger, PD = 7, proximal PD positioned by proximal third of finger, MD rows = 6, RD = 6, proximal RD positioned by proximal third of finger. All prolateral denticles and retrolateral denticles subpaired and prolateral larger than retrolateral. Movable finger, PD = 7, MD rows = 6, distal row bearing one minute granule, RD = 6. All PD, RD paired, prolateral larger than retrolateral. In both fingers, basal two retrolateral denticles slightly dislocated from rows of medina denticles. Dentate margin straight lacking notch or lobe. Trichobotrium *ib* and *it* positioned subbasal on fixed finger, midway between PD6 and PD7, PD7 lacking macrosetae.

Legs: Spinules: Spinules: Basitarsi I–II with retrolateral ventral, retrolateral dorsal carinae with row of spinules complete, on III retrolateral ventral row of spinules on distal fourth, retrolateral dorsal on distal half, in IV absent; retrolateral, prolateral ventral rows absent in I–IV. Telotarsi I–IV with one pair of ventral distal spinules. Setae: Basitarsi setal counts: Prolateral ventral, 3:4:4:4, median two in III–IV spiniform, stout; retrolateral ventral, 3:4:4:5; retrolateral dorsal, 3:3:3:3; dorsal 2:2:2:2. Retrolateral dorsal, dorsal series arranged in two independent rows.

Tergites: Pretergites matte, posttergites matte medially, shagreened laterally. Pretergites I–VII matter, posttergites with ventral median, ventral submedian carinae partial, weakly costate, smooth distally in all segments; except in IV–VI with proximal weak granulation. Tergite VII with dorsal median carina granular reaching distal third, strongly costate; dorsal lateral, lateral supramedian strongly, crenatoserrate, curving towards each other almost merging forming a pair of semi rings in each side, internal surfaces of these semi rings shagreened.

Genital operculum: Male genital operculum: Wider than long, with three macrosetae. Sclerites free on longitudinal margin moving independently, unable to open more than 45°. Genital papillae protruding posteriorly. Female genital operculum sclerites fuse longitudinally.

Sternites: Sternites I–VII finely punctuated. Sternite V with moderated distal median hyaline glandular area. Sternite VII with carinae ventral submedian, ventral lateral, lateral ventral obsolete, expressed by pairs of macrosetae except lateral ventral with one proximal pair. Sternite VII distal median hyaline glandular area obsolete. Spiracles minute sub ovoid.

Pectines: Basal piece with one pairs of macrosetae. Marginal lamella consist of three sclerites, medial lamella proximally fuse distally progressively forming seven conspicuous beads. Fulcra with 12/11 beads. Pectinal tooth count 13/13 in males, 12/12 in females, basal pair of pectines reduced to half size of preceding pectines. Pectines longer than distal margin of coxa VI in males, in females almost at margin of coxa VI.

Hemispermatophore: Lamina 2.12 times longer than trunk. Median lobe ental terminus moderate, rounded. Dorsal through margin long, narrow, curving proximally, removed from ventral trough. Primary, secondary hooks elongate, broad, positioned on apex of lateral margin extension of lamina (flange), forming a deep notch. Hemi-mating plug developed from inner lobe, distal barb margin with approximately 10 long spinules. Basal plate of inner lobe distal to

ventral trough. Neck of inner lobe shorter than basal plate (0.4 times longer than basal plate). Measurements, lamina, 2.38; trunk, 1.12; dorsal trough/laminar hooks, 1.16; ventral trough/laminar hook, 0.75; neck, 0.17; basal plate, 0.48.

Metasoma: All intercarinal surfaces matted except dorsal surface shagreened, with scattered moderated granules. Metasoma 2.0 times longer than mesosoma. Metasomal segments I–III wider than longer. Carinae: Dorsal lateral carinae of segments I–V, lateral median in I–IV strongly crenatoserrate, in dorsal lateral I–IV, lateral median I–III terminating in moderated enlarge spinoid granules pointing backwards, lateral median in IV with a moderated enlarged granule by inflexion point where edge of flared terminal start. Lateral inframedian carinae in I, II complete, crenatoserrate; in incomplete; in III partial, present on posterior half, weakly extending to anterior; in VI partial expressed on posterior end by few granules; in V almost complete, crenatoserrated anteriorly, becoming weaker posteriorly reaching posterior end of dorsal lateral carinae. Ventral lateral in I–V complete, strongly crenatoserrated. Ventral submedian in I partially crenulated and costate, in II–IV strongly crenatoserrated. Ventral median in V strongly crenatoserrated. Setae: Dorsal lateral, 0:1:1:1:3; lateral median, 0:1:1:2; lateral inframedian, 0:0:0:0:2; ventral lateral, 2:3:3:3:5; ventral submedian, 3:3:3:3:3; ventral sublateral, 2.

Telson: Telson 2.1 times longer than wider. Metasomal segment V 1.6 times wider than vesicle. Vesicle 1.3 longer than aculeus. Intercarinal surface smooth. Ventral median, ventral sublateral, ventral lateral, lateral median carinae granular on distal half. Ventral medina carinae with subaculear tubercle complex, major tubercle followed of four or more, smaller spiniform tubercles, forming a row sometimes complete or on distal half. Carinae with three pairs of macrosetae. Microserration on laterobasal aculeus numbering 7 (unknown in male worn out, in female visible remaining buds resulting of wearing).

DISTRIBUTION: *Konetontli nayarit* is endemic to the southern valleys and mountain ranges of Nayarit, Mexico.

ECOLOGY: This species was recorded at altitudes of 126 to 870 m. The dominant vegetation collection at the site was secondary vegetation of tropical forest at Jesus María Corte, however the type locality has tropical deciduous forest. According to Armas and Martín-Frías (2001) the type specimens were collected in the backyard of a house, under a railway sleeper at an altitude of 850 m with a subtropical humid climate and tropical deciduous forest vegetation.

REMARKS: *Konetontli nayarit* was described as a species of *Vaejovis* (Armas and Martín-Frías, 2001). These authors proposed a close relation with *Wernerius*. However, Sissom (1993) concluded that these last two species are more closely related to the genus *Serradigitus*. Subsequently, Soleglad and Fet (2008) transferred *K. nayarit* along with other species with a subaculear tubercle: *K. chamelaensis*, *K. kuarapu*, *K. acapulco*, and *K. pattersoni* to the *mexicanus* group of *Vaejovis*. The phylogenetic analyses conducted in chapter 1 falsified Soleglad and Fet's (2008) relative placement of the Mexican species with a subaculear tubercle in to the *mexicanus* group and instead retrieved as a monophyletic group these species within the Syntropinae subfamily.

MATERIAL EXAMINED: **MEXICO: Nayarit: [***Municipio de El Nayar*]: Río Santiago, 16.v.1996, 1 ♀ (IBUNAM). *Municipio de Tepic*: Jesus María Corte, 4 km N, 2 km along gravel road E of main paved road, ca. 30 km N of Tepic, 21°45.203'N 104°51.213'W, 126 m, 29.vii.2005, E. González and R. Mercurio, collected at night with UV light, 1 ♀ (AMNH [LP 4725]).

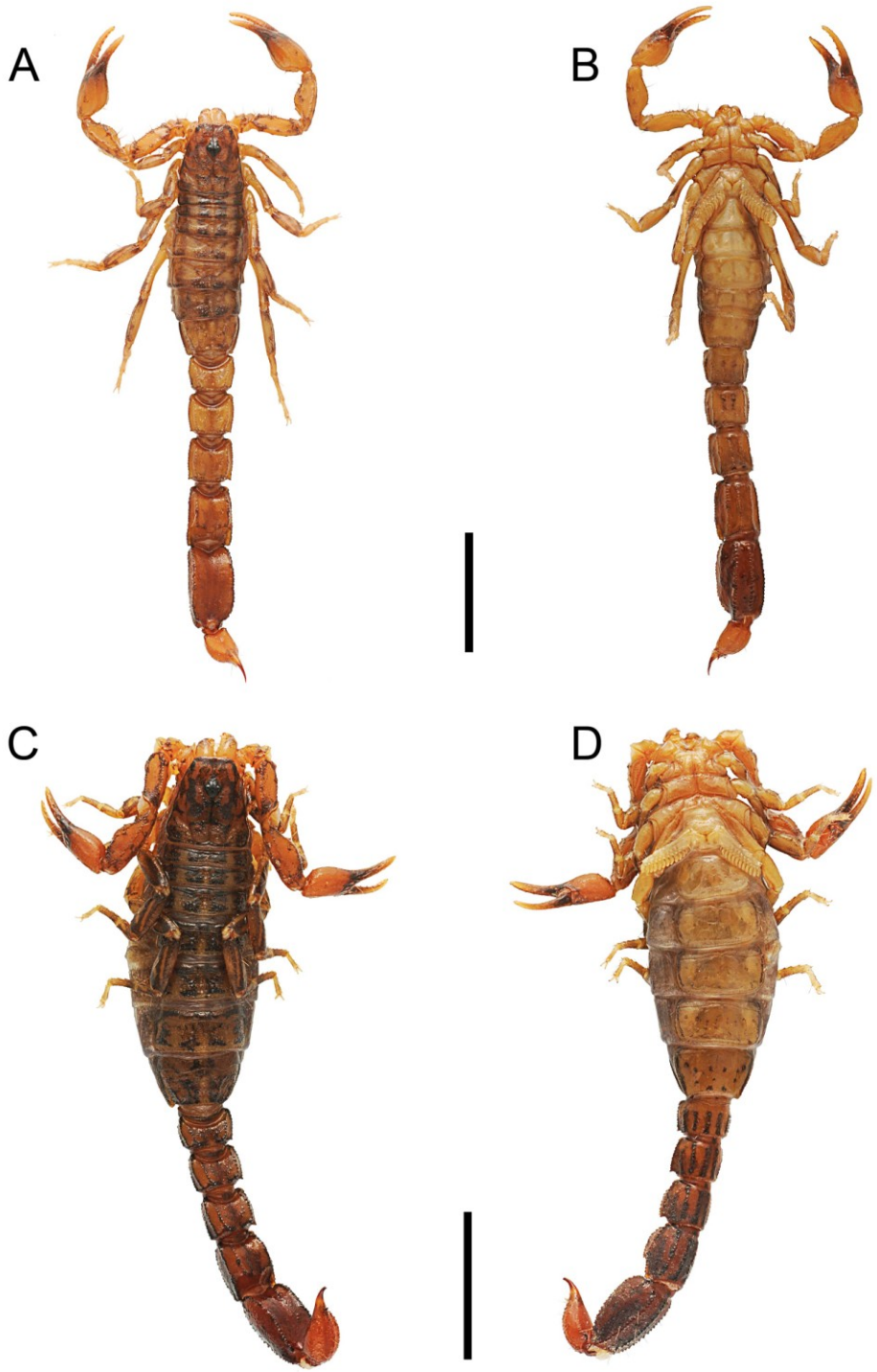


Figure 60. *Konetontli nayarit* (Armas and Martín-Frías, 2001), habitus. **A**. **B**. Holotype ♂ (IBUNAM). **C**, **D**. ♀ (IBUNAM). **A**, **C**. Dorsal aspect. **B**, **D**. Ventral aspect. Scale bars = 5 mm.

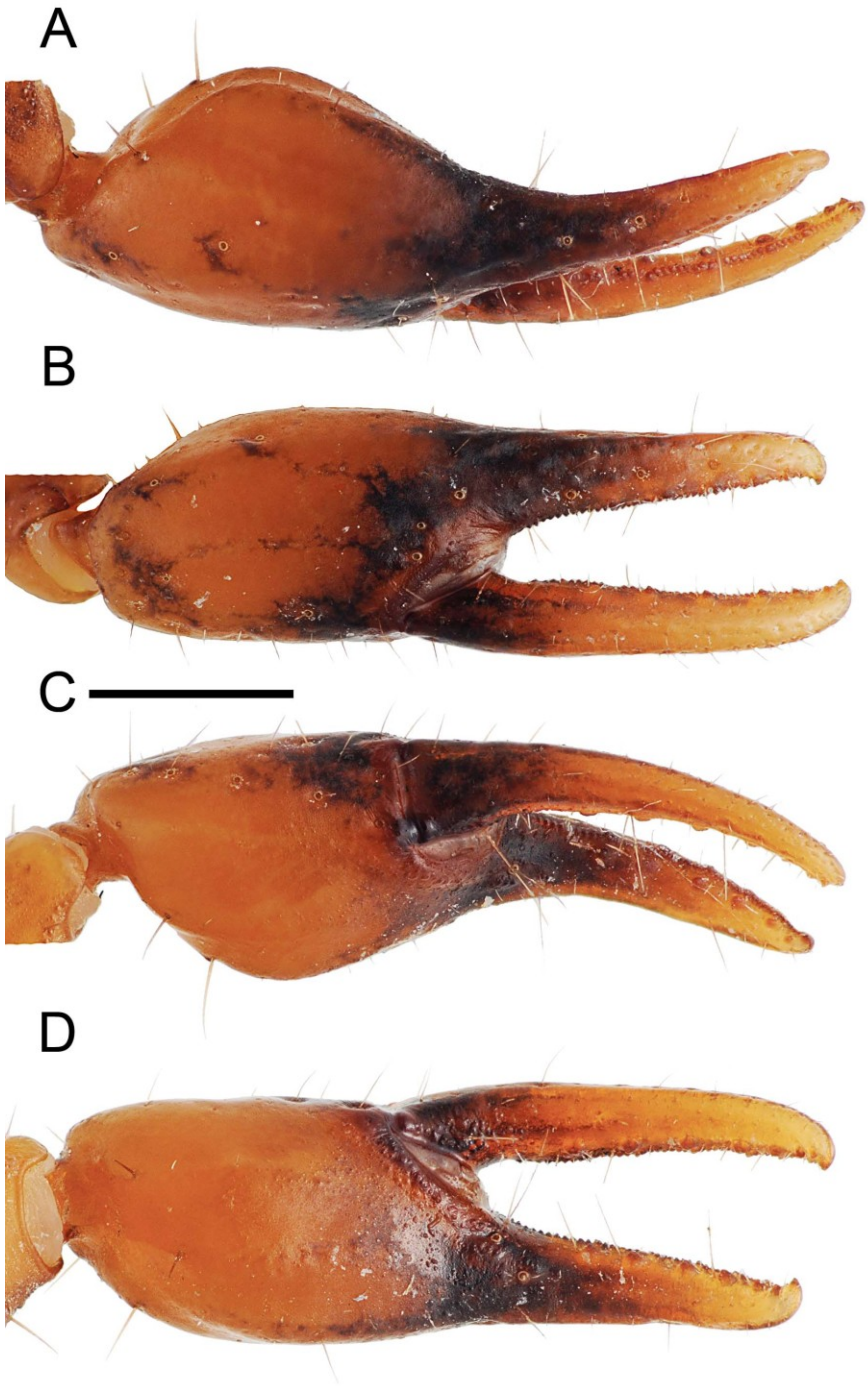


Figure 61. *Konetontli nayarit* (Armas and Martín-Frías, 2001), holotype ♂ (IBUNAM), dextral pedipalp chela. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

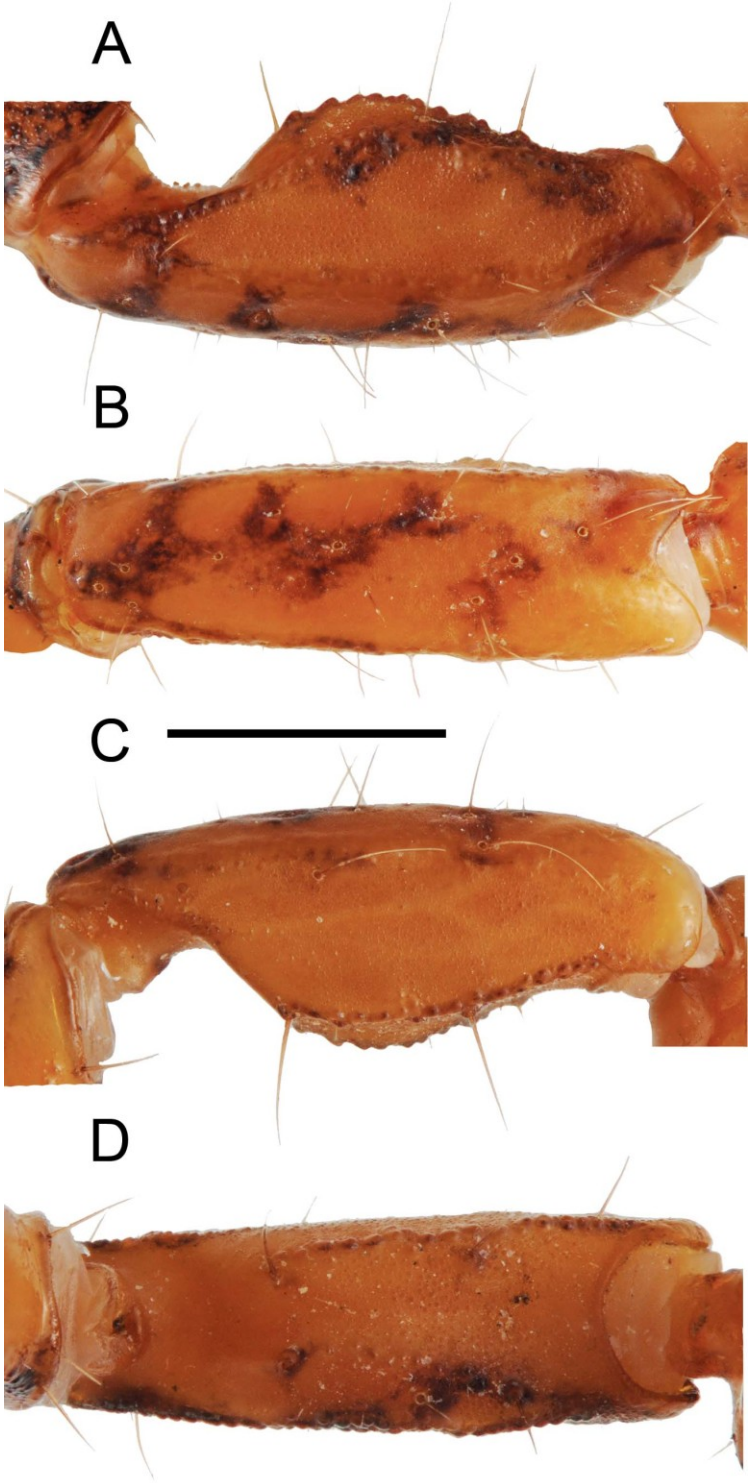


Figure 62. *Konetontli nayarit* (Armas and Martín-Frías, 2001), holotype ♂ (IBUNAM), dextral pedipalp patella. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

Konetontli pattersoni (Williams and Haradon)

Figures 38, 63–65, 71A, 74B, 77D, 78D, 80C, 82C, 84D

Vaejovis pattersoni Williams and Haradon, in Williams, 1980: 54, 65, 66, fig. 56F, 69, 75; Beutelspacher, 2000: 102, 138, 153, map 82; Sissom, 2000: 542; González-Santillán, 2004: 29; Francke and Ponce-Saavedra, 2005: 63, 66, 67; Sissom and Hendrixson, 2005a: 127, tab. 6.2; Soleglad and Fet, 2008: 74, 89, 100.

Vaejovis monticola: Kovařík, 1998: 147.

TYPE MATERIAL: **MEXICO: Baja California Sur:** Holotype ♂ (CAS, Type No. 12250), La Laguna, Sierra de La Laguna, 1707 m, 1–3.viii.1974, R.M. Haradon, V.F. Lee, and W.E. Savary, under bark and under rocks. Paratypes: 24 ex. (CAS, including ♀ allotype), same locality as holotype.

DIAGNOSIS: *Konetontli pattersoni* is closely related to *K. chamelanesis*, *K. ilitchi*, **n. sp.**, *K. migrus*, **n. sp.**, and *K. nayarit*, with which it forms a monophyletic group sister to the other five species of *Konetontli*. These species are related by the unique derived apomorphic character: ventral submedian carinae granular in metasomal segment I–IV. *K. pattersoni* is closely related to *K. nayarit* from which can be distinguished by having a mottled infuscation, especially metasomal carination with sparse botches of infuscation, instead of marbled infuscation, specially metasomal carinae outlined with intense infuscation. Whereas *K. pattersoni* has metasomal segments I–IV wider than long, *K. nayarit* has only I–III wider than long. *K. pattersoni* has internal cutting margin of fingers moderately scalloped with proximal notch of fixed finger moderated and median lobe weak in consequence fingers closure is uneven, exhibiting a strong gap straight, instead of lacking lobes or notches and in consequence, fingers

closure is even, no gap evident, *K. pattersoni* has subaculear tubercle simple, relatively smaller and sharper than *K. nayarit*, which subaculear tubercle is compound with four or more secondary tubercles and primary tubercle is moderately enlarged and blunt.

DESCRIPTION: The following redescription supplements Williams and Haradon' s (1980) original description.

Color and infuscation: Color base yellow to pale orange. Carapace, tergites, base of macrosetae on sternites, prolateral side of legs, pedipalp femur, patella, metasomal intercarinal surface, carinae sparsely infuscate with dusky markings producing a mottled appearance. Pedipalp manus dorsal, ventral, retrolateral carinae with diffuse weak infuscation on distal aspect, base of fingers heavily infuscate. Tergites with ventral median, ventral submedian carinae infuscated. Sternite sprinkled with diffuse infuscation, lateral margins heavily infuscated. Pedipalp manus, metasomal segments and telson slightly more bright orange. Telson with base of macrosetae infuscated, base of subaculear tubercle infuscate.

Carapace: Carapace as long as posterior width (2.8mm). Frontal margin sublinear lacking medial notch. Carapace covered with minute granulation with few scattered moderated granules. Median ocular tubercle raised, positioned on anterior third of carapace. Three lateral eyes, two frontal pair same size, posterior reduced approximately in half. Median eyes approximately double size of lateral frontal pair. Anteromedian longitudinal sulcus narrow, deep, posteromedian shallow, narrow.

Sternum and coxal region: Sternum pentagonal subequilateral, 1.6 times wider than longer, finely granulated, three pairs of macroseta, median sulcus deep. Coxal region with scatter matte spots in ♂, in ♀ smooth. Anterior margin of coxa II smooth, subbasally three oblique slit-

like structures, adjacent to low smooth protuberance; proximal margin of coxal endite II with deep depression each, median edge finely granular. Coxa IV 2 times longer than coxa II.

Chelicerae: Dorsal surface smooth, distal manus, movable finger base with weak, diffuse infuscation. Distal manus with one macrosetae. Serrula present on ventral distal half of movable finger, tines numbering 13.

Chelicerae: Dorsal surface smooth, distal manus, movable finger base with weak, diffuse infuscation. Distal manus with one macrosetae. Serrula present on ventral distal half of movable finger, tines numbering 13.

Pedipalps: Trichobothrial pattern Type C, orthobothriotaxic. Chela wider than patella, patella wider than femur. Femur: Dorsal, ventral, retrolateral intercarinal surfaces matted, prolateral shagreened, covered with scattered irregular moderated conical granules. Carinae: Dorsal prolateral, dorsal retrolateral, ventral prolateral carinae complete, moderately granular; retrolateral dorsosubmedian finely crenatoserrated, expressed by two macrosetae on medial aspect of femur; retrolateral ventral, ventral median vestigial expressed by proximal few granules, prolateral ventrosubmedian partial reaching proximal half delimited by proximal spinoid tubercle, two or three proximal enlarged granules, one medial macrosetae; prolateral ventral partial reaching proximal half of the segment, expressed by one proximal, one medial, one distal granules each with a macroseta on top.

Patella: All intercarinal surfaces matted. Carinae: Dorsal prolateral, ventral prolateral complete moderate, dorsal retrolateral, ventral retrosubmedian comparatively weaker with smaller irregular granules, carinae of retrolateral surface obsolete, expressed by infuscation; ventral median partial moderate irregularly granular, expressed on proximal third; prolateral ventral obsolete, two macrosetae demarcating longitudinal partial expression on medial aspect of

the segment; prolateral median complete, positioned on vaulted projection, protruding strongly medially with coarse sparse granules, distal extreme angling dorsally almost reaching dorsal prolateral carinae on distal forth of patella with two macrosetae, one proximal, one distal.

Chela: Manus rounded, relatively incrassate, smooth, acarinated. Trichobotrium *ib* and *it* positioned basal on fixed finger, at level of *ib* PD7 (being PD7 expressed only by macrosetae, denticle absent), *it* midway between PD6 and PD7. *Dt* positioned close to mid manus, on proximal half. Fingers: proximal notch on fixed finger moderated and proximal lobe of movable finger weakly developed, basal gap when fingers closed moderated. Fixed finger, PD = 6, proximal PD positioned by proximal third of finger, MD rows = 6, RD = 6, proximal RD positioned by proximal third of finger. All prolateral, retrolateral denticles subpaired, prolateral slightly larger than retrolateral. Movable finger, PD = 7, MD rows = 6, distal row bearing one minute granule, RD = 6. All PD and RD paired, prolateral larger than retrolateral. In both fingers, basal three retrolateral denticles slightly dislocated from rows of medina denticles.

Legs: Spinules: Basitarsi I–II with retrolateral ventral, retrolateral dorsal carinae with complete row of spinules, on III retrolateral ventral row of spinules on distal fourth, retrolateral dorsal on distal half, retrolateral ventral, retrolateral dorsal in IV absent; retrolateral, prolateral ventral rows absent in I–IV. Telotarsi I–IV with one pair of ventral distal spinules. Setae: Basitarsi: Prolateral ventral 4:4:4:4, median two in III–IV spiniform, stout. Retrolateral ventral 3:5:5:5. Retrolateral dorsal: 3:3:3:3 Dorsal 3:3:3:3. Retrolateral dorsal, dorsal series arranged in two independent rows.

Tergites: Tergites shagreened, surface covered by moderate, minute granulation. Pretergites I–VII matter, posttergites with ventral median, ventral submedian carinae partial, granular distally in all segments. Tergite VII with dorsal median carina matte strongly costate,

expressed on distal half; dorsal lateral, lateral supramedian strongly granular, curving towards each other almost merging forming a pair of semi rings in each side, internal surface of these semi rings matte; lateral inframedian, lateral supramedian intercarinal surfaces shagreened.

Genital operculum: Male genital operculum: as long as wide, with three macrosetae. Sclerites free on longitudinal margin moving independently, unable to open more than 45°. Genital papillae protruding posteriorly. Female genital operculum sclerites fuse longitudinally.

Sternites: Sternites I–VI finely punctuated, VII shagreened. Sternite V with moderated distal median hyaline glandular area. Sternite VII with ventral submedian, lateral ventral obsolete expressed by proximal granules, distal pairs of macrosetae except lateral ventral with one proximal pair, ventral lateral weakly granular expressed medially, delimited by one proximal, one distal macrosetae. Sternite VII distal median hyaline glandular area vestigial. Spiracles minute subovoid.

Pectines: Pectines longer than distal margin of coxa VI in males, in females almost at margin of coxa VI. Basal piece with three pairs of macrosetae. Marginal lamella consist of three sclerites, medial lamella proximally fuse distally progressively forming eight conspicuous beads. Fulcra with 12/11 beads. Pectinal tooth numbering 11–15 ♂, 11–12 ♀, basal pair of pectines reduced slightly compared to proceeding pectines. Pectines relatively long, second sclerite of marginal lamella at level of distal edge of coxa IV in ♂, in ♀ mid distal sclerite at level of distal edge of coxa IV.

Hemispermatophore: Lamina 2.43 times longer than trunk. Median lobe ental terminus moderate, rounded. Dorsal through margin long, narrow, curving proximally, removed from ventral trough. Primary, secondary hooks elongate, broad, positioned on apex of lateral margin extension of lamina (flange), forming deep notch. Hemi-mating plug developed from inner lobe,

distal barb margin with approximately 12 long spinules. Basal plate of inner lobe distal to ventral trough. Neck of inner lobe shorter than basal plate (0.4 times longer than basal plate). Measurements, lamina, 2.89; trunk, 1.19; dorsal trough/laminar hooks, 1.16; ventral trough/laminar hook, 0.68; neck, 0.20; basal plate, 0.51.

Metasoma: All intercarinal surfaces matted. Metasomal segments I–IV wider than longer. Carinae: Dorsal lateral carinae of segments I–V, lateral median in I–IV strongly crenatoserrate, in dorsal lateral I–IV, lateral median I–III terminating in enlarged spinoid granules pointing backwards, lateral median in IV with flared extension of terminal half. Lateral median, end of dorsal lateral intercarinal surface with pair of deep depressions where dorsal lateral carina of metasomal segment V couples when the metasomal is retracted; lateral inframedian carinae in I complete, crenatoserrate, in II, III partial expressed on posterior half and crenatoserrate; in VI absent; in V partial expressed medially, crenatoserrated anteriorly, becoming weaker posteriorly. Ventral lateral in I–V complete, strongly crenatoserrated. Ventral submedian in I partially crenulated, costate, in II–IV, ventral median in V strongly crenatoserrated. Setae: Dorsal lateral, 0:0:1:1:4, lateral median, 0:1:1:2, lateral inframedian, 1:0:0:0:2, ventral lateral, 2:3:3:3:5, ventral submedian, 2:3:3:3:2, ventral sublateral, 2.

Telson: Telson 2.1 times longer than wider. Metasomal segment V 1.5 times wider than vesicle. Vesicle 2.7 longer than aculeus. Intercarinal weakly granular, granules low, scattered. Ventral median, ventral sublateral, ventral lateral, lateral median carinae smooth to weakly granular. Ventral medina carinae with subaculear tubercle solitary, conical, blunt. Carinae with three pairs of macrosetae. Microserration on laterobasal aculeus numbering 3/3.

DISTRIBUTION: *Konetontli pattersoni* is endemic to the Sierra de la Laguna in Baja California Sur, Mexico.

ECOLOGY: *Konetontli pattersoni* has been recorded from 782 to 1800 m altitude. This species is established in the oak-pine forest of the Sierra de la Laguna. It is commonly found under bark of fallen logs and under rocks. On the southern face of the Sierra (the drier area of the Sierra), the populations are less abundant and specimens tend to be smaller. In this area, several specimens were collected by disturbing leaf litter accumulated under palm trees.

REMARKS: Williams and Haradon (1980) placed *K. pattersoni* inside the *eusthenura* group of *Vaejovis*. Subsequently Sissom (2000) transferred these species within the *mexicanus* group of *Vaejovis*, where it resided until the creation of *Konetontli*.

MATERIAL EXAMINED: **MEXICO: Baja California Sur:** *Municipio de Los Cabos*: Sierra de La Laguna, M. Vázquez and G. Arnaud, 1700 m, 30.v.2008, 1 ♂ (IBUNAM), 23°14.2848'N 109°57.1314'W, 23°14'17.1"N 109°57'7.9"W, 782 m, 10.vii.2004, E. González, O. Francke, W.E. Savary, and A. Valdez, under leaf litter, cumulated under palm trees, 1 ♀ (AMNH [ARA3082]), 23°33'1.6"N 109°59'27.4"W, 1800 m, 21.vii.2004, E. González, A. Valdez, O. Francke, and W.E. Savary, under bark of fallen log, 1 ♂, 1 ♀ (AMNH [LP 3150]), 1 ♀, 6 juv. (IBUNAM), 23°41.1666'N 109°56.6832'W, 850 m, 9.vii.2004, A. Valdez and E. González, under rock, 1 ♀, 6 juv. (AMNH [ARA3083]), 1 ♀ (IBUNAM [ARA2128]), 23°41'10"N 109°56'41.1"W, 850 m, 9.vii.2004, O. Francke, E. González, and A. Valdez, 3 juv. (AMNH [LP 3149]), 2 ♀, 7 juv. (AMNH); Sierra de La Laguna, nucleus zone, 1800 m, 20.vii.2006, 23°33.0162'N 109°59.4498'W, oak forest, under rock, 2 ♂, 3 ♀ (AMNH [ARA3064]), 1 ♂, 2 ♀ (AMNH [ARA1585]), 23°33'1.6"N 109°59'27.4"W, under rock, 4 ♂, 8 ♀, 8 juv. (AMNH), A. Valdez, E. González, O. Francke, and W.E. Savary; Sierra de La Laguna and Palo Extraño, E.L. Sleeper, and F.J. Moore, 22.x.1972, 5 ♂, 18 ♀ (OSAL), M. Vázquez, 9.iii.1983, 1 juv. (CAECIB), 2.iv.1983, 2 juv. (CAECIB), 4.v.1983, 1 ♂, 2 juv. (CAECIB), 14–15.ix.1983, 2 juv.

(CAECIB), 10.xi.1983, 1 juv. (CAECIB), 8.9.xii.1983, 2 juv. (CAECIB), 21–24.v.1984, 1 juv. (CAECIB), 2.viii.1984, 1 ♂, 1 juv. (CAECIB), 6.xii.1984, 1 juv. (CAECIB), 8.ix.1984, 2 juv. (CAECIB), 10.i.1985, 1 juv. 8 ex. (CAECIB), 7.ii.1985, 1 juv. (CAECIB), 2–3.iii.1985, 2 juv. (CAECIB).

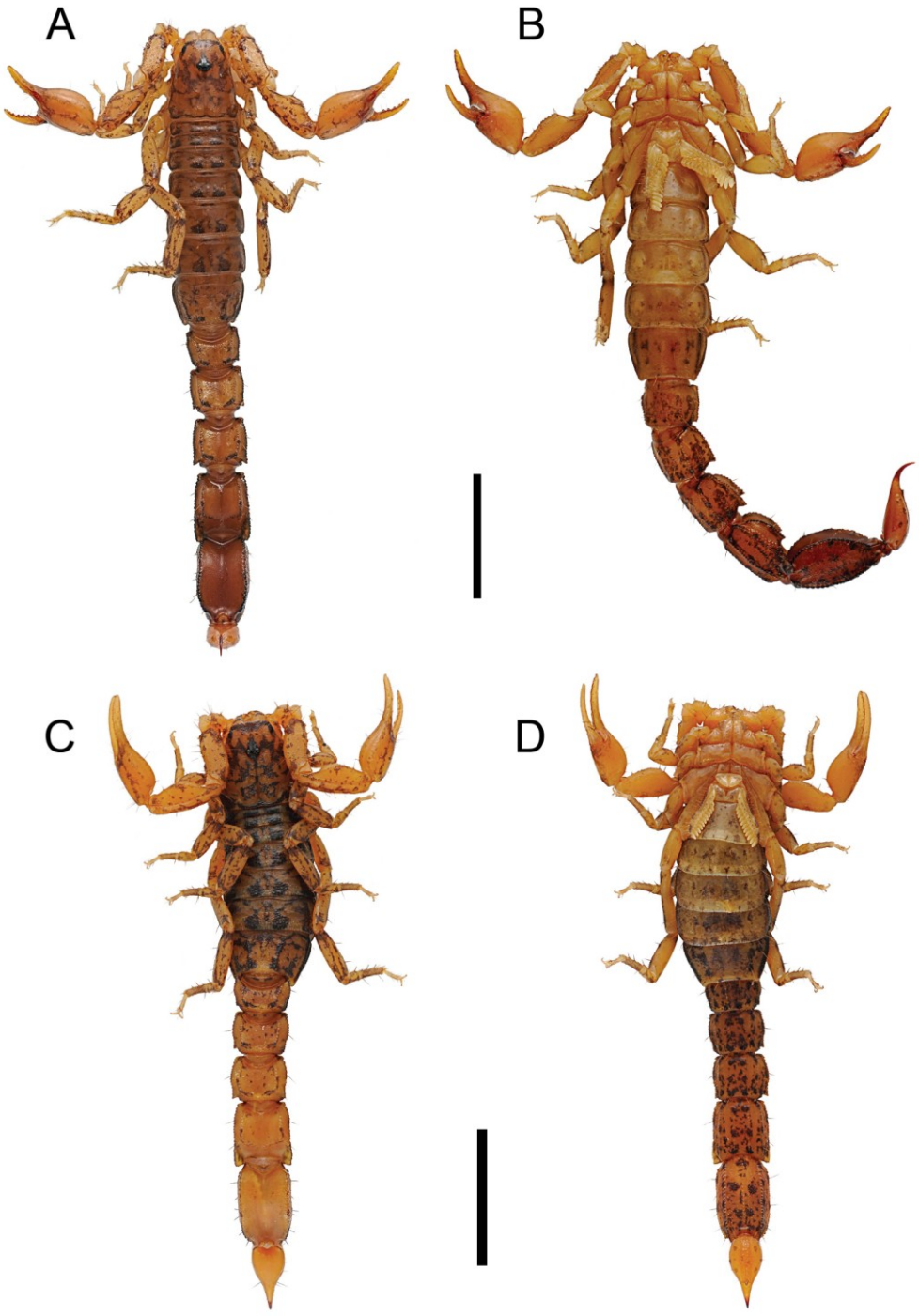


Figure 63. *Konetontli pattersoni* (Williams and Haradon, in Williams, 1980), habitus. **A**, **B**. ♂ (AMNH). **C**, **D**. ♀ (AMNH). **A**, **C**. Dorsal aspect. **B**, **D**. Ventral aspect. Scale bars = 5 mm.

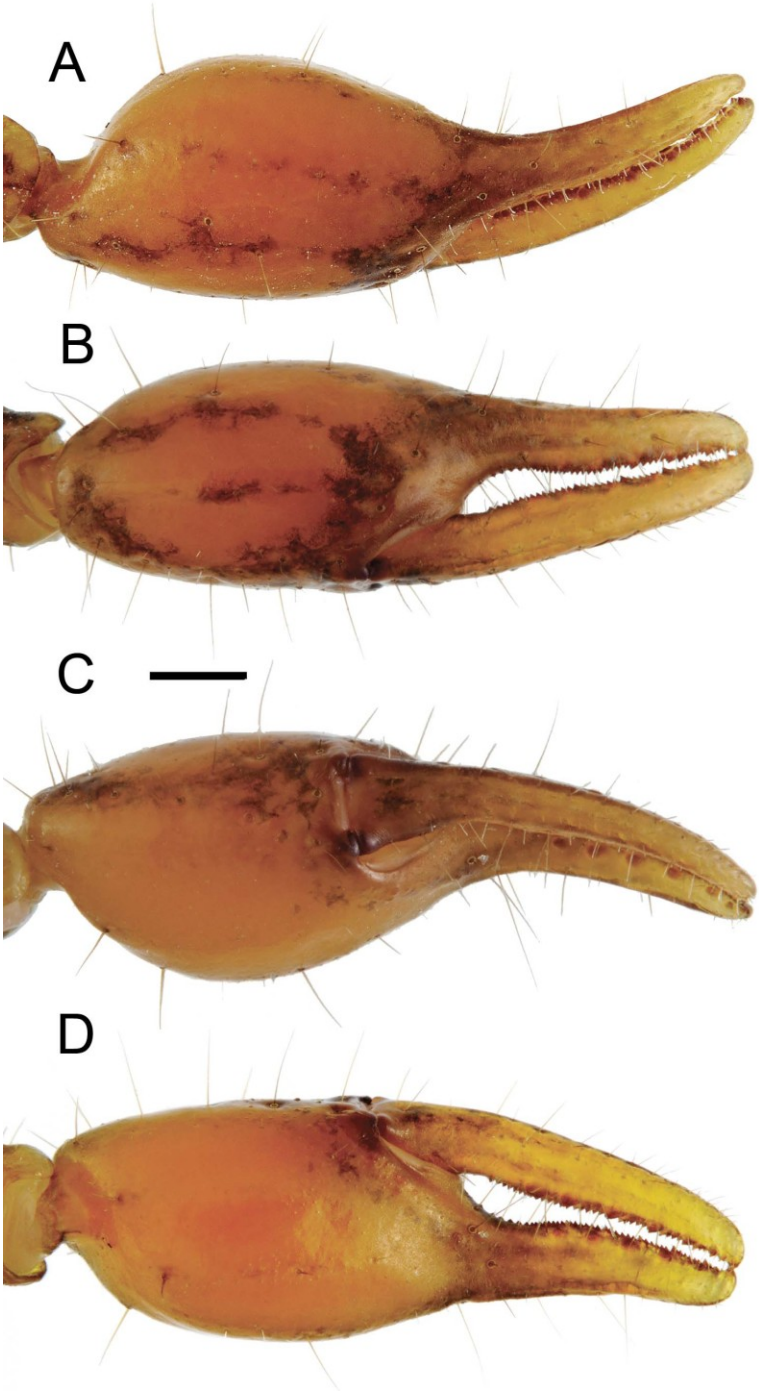


Figure 64. *Konetontli pattersoni* (Williams and Haradon, in Williams, 1980), ♂ (AMNH), dextral pedipalp chela. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 0.5 mm.

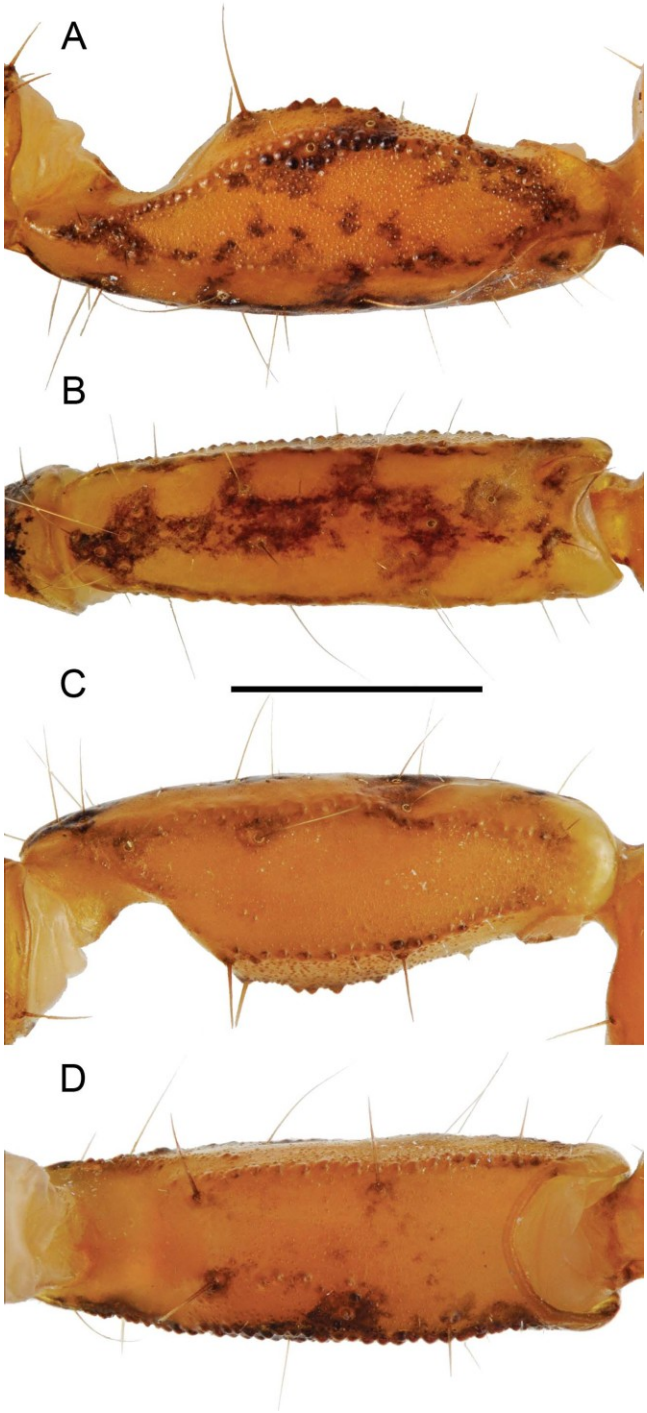


Figure 65. *Konetontli pattersoni* (Williams and Haradon, in Williams, 1980), ♂ (AMNH), dextral pedipalp patella. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

Konetontli zihuatanejensis (Baldazo-Monsivais, 2003)

Figures 38, 66–68, 71B, 73D, 77E, 78E, 80D, 82D, 84E, 85G–H; Table 8

Vaejovis zihuatanejensis Baldazo-Monsivais, 2003: 67–71, figs. 1, 2.

Vaejovis acapulco: Francke and Ponce-Saavedra, 2005: 63, 64, 66, fig. 11, 67, figs. 18, 19.

TYPE MATERIAL: **MEXICO: Guerrero:** *Municipio de José Azueta*: Holotype ♀ (UAGRO), Colonia Agua de Correa, Zihuatanejo [lost], 24.ii.1994, J.G. Baldazo-Monsivais. Paratypes: 1 ♀, same data as holotype; 1 ♀, Colonia la Noria, 20.viii.1994; 1 ♀, Poblado Barrio Viejo, 25.iv.1995; Norma Godoy Marroqui, 1 ♂, Pantla, 27.iv.1991, Javier Palacios S. (UAGRO) [lost]. *Municipio de La Unión*: Neotype: ♂ (IBUNAM), La Majahua, 17°48'740"N 101°43'732"W, 6.viii.2010, J. Ponce, M. Villaseñor, A. Quijano, E. Miranda, J. Baldazo, T. Nuñez, and J. Portillo.

DIAGNOSIS: *Konetontli zihuatanejensis* is closely related to *K. acapulco*, *K. kuarapu*, *K. ignis*, **n. sp.**, and *K. juxtlahuaca*, **n. sp.**, with which it forms a monophyletic group (see *K. kuarapu* for details). These species are related by the unique derived apomorphic character: ventral submedian carinae obsolete to vestigial in metasomal segment I–IV. *K. zihuatanejensis* and *K. acapulco* are the closely related species and they differ in that the former has prolateral dorsal, dorsal prosubmedian, dorsal prolateral, prolateral median, and prolateral submedian carinae obsolete with smooth surface, whereas the latter has these carinae finely granular distally, with scattered moderated. *K. zihuatanejensis* has ventral lateral carina of metasoma segment V finely serrated and ventral submedian in IV vestigial, expressed as a short row of denticles on distal fourth, *K. acapulco* has ventral lateral in V expressed as a short row of denticles on distal fourth and ventral submedian in IV obsolete. *K. zihuatanejensis* has

compound subaculear tubercle, beside the primary, it has an additional secondary tubercle and the ventral surface with enlarged scattered granules, whereas *K. acapulco* has ventral median carinae of telson with a solitary subaculear tubercle and ventral surface smooth. From *K. kuarapu* differs by having pedipalp chela movable finger with seven retrolateral denticles and seven rows of median denticles, instead of six each. From *K. ignis*, **n. sp.** and *K. juxtlahuaca*, **n. sp.** *K. acapulco* differs by having pedipalp manus immaculate, instead of having intercarinal surfaces heavily infuscated and carinae outlined with infuscation.

DESCRIPTION: The following redescription supplements Baldazo-Monsivais' (2003) original description. It is based on fresh material and designed neotype.

Color and infuscation: Color base yellow to pale orange. Carapace, tergites, prolateral side of legs, dorsal, prolateral, retrolateral surfaces of pedipalp femur, patella carinae, metasomal intercarinal surface infuscate with dusky markings. Dorsal surface, base of chelicerae movable finger with reticulated infuscation. Distal aspect of pedipalp manus diffusely infuscate, base of fingers heavily infuscate. Tergites with ventral median carinae immaculate, ventral submedian carinae infuscated, intercarinal surface heavily infuscate with broad dusky markings. Sternite immaculate except VII with base of macrosetae, lateral margins diffusely infuscate. Metasomal segments slightly darker than mesosoma. Telson base color orange lighter, brighter than metasomal segments, with band of diffuse infuscation on lateral aspect, Aculeus dark reddish.

Carapace: Carapace longer than posterior width (2.90 mm, 2.45 mm respectively). Frontal margin sublinear lacking medial notch but slightly indented, with median epistome slightly protruding. Carapace covered with minute granulation with few scattered moderated granules. Median ocular tubercle raised, positioned on anterior third of carapace. Three lateral eyes, two frontal pair same size, posterior reduced approximately one third. Median eyes

approximately double size of lateral frontal pair. Anteromedian longitudinal sulcus narrow, shallow, posteromedian narrow, deep, posterolateral moderated, posterior transversal obsolete.

Sternum and coxal region: Sternum pentagonal subequilateral, 1.3 times wider than longer, finely granulated with three pairs of macroseta, median sulcus deep, moderately broad. All coxa, coxapaphysis matte. Anterior basal margin of coxa II with three oblique slit-like structures, adjacent to low, smooth protuberance; proximal margin of coxal endite II with shallow depression each, median edge finely granular. Coxa IV 1.9 times longer than coxa II.

Chelicerae: Distal manus with one macrosetae. Serrula present on ventral distal half of movable finger, tines numbering 18–21.

Pedipalps: Trichobothrial pattern Type C, orthobothriotaxic. Chela as wide as patella, these wider than femur. Femur: All intercarinal surfaces matted. Carinae Dorsal prolateral, dorsal retrolateral, ventral prolateral carinae complete, finely granular; retrolateral dorsosubmedian, expressed by four or five scattered moderated conical granules, two media macrosetae; retrolateral ventral obsolete, ventral median vestigial expressed by proximal few granules, prolateral ventrosubmedian partial expressed on proximal half delimited by a proximal rounded tubercle and two or three scattered enlarged granules and one medial macrosetae, one distal macrosetae; prolateral ventral partial expressed on proximal third of segment delimited by one proximal, one medial, one distal granules each flanking one macroseta.

Patella: All intercarinal surfaces matted. Carinae: Dorsal prolateral, ventral prolateral complete finely granulated, dorsal retrolateral, ventral retrosubmedian vestigial, weakly costate, carinae of retrolateral surface obsolete, expressed by infuscation; ventral median vestigial, expressed by proximal costa, two or three minute granules; prolateral ventral obsolete, expressed by one proximal, one median, one distal macrosetae demarcating partial longitudinal length on

medial aspect of segment; prolateral median complete, positioned on vaulted projection, protruding strongly medially with coarse sparse subserrate granules, distal extreme angling dorsally almost reaching dorsal prolateral carinae on distal forth of patella with two macrosetae, one proximal, one distal; all other carinae absent.

Chela: Manus rounded, moderated, smooth, acarinated. Trichobotrium *ib* and *it* positioned basal on fixed finger, *ib* at level of PD7 (PD7 expressed by macrosetae, denticle absent), *it* midway between PD6 and PD7. *Dt* positioned close to mid manus but on proximal half. Fingers: Lacking scallop, basal gap when fingers closed moderated. Fixed finger, PD = 6, proximal PD positioned by proximal third of finger, MD rows = 6, RD = 6, proximal RD positioned by proximal third of finger. All prolateral, retrolateral denticles subpaired; prolateral, retrolateral denticles similar size. Movable finger, PD = 7, MD rows = 6, distal row bearing one minute granule, RD = 6. All PD, RD subpaired; prolateral, retrolateral denticles similar in size. In both fingers, basal three retrolateral denticles slightly dislocated from rows of medina denticles.

Legs: Spinules: Spinules: Basitarsi I–II with prolateral ventral, retrolateral ventral carinae with complete row of spinules, on III retrolateral ventral row of spinules on distal fourth, prolateral ventral vestigial expressed by few distal spinules; retrolateral ventral, prolateral ventral in IV absent; retrolateral median absent in I–IV, retrolateral dorsal with rows of irregular, scattered minute tubercles. Telotarsi I–IV with one pair of ventral distal spinules. Setae: Basitarsi setal counts: Prolateral ventral 4:4:5:5, median two in IV spiniform, stout. Retrolateral ventral 4:5:5:5. Retrolateral dorsal: 2:2:4:4 Dorsal prolateral 2:3:3:3. Retrolateral dorsal, dorsal prolateral series arranged in two independent rows.

Tergites: Pretergites I–VII matter, posttergites shagreened, granulation slightly coarser than pretergites, especially on lateral surfaces. Ventral median and ventral submedian carinae finely granulated. Tergite VII with dorsal median carina scattered granular, strongly costate, expressed on distal half, dorsal submedian weakly costate, granular expressed on subdistal fourth, dorsal lateral, lateral supramedian strongly granular, curving towards each other almost merging by a field of moderated granules forming pair of semi rings in each side, internal surfaces of these semi rings shagreened, cover with moderated and fine granules; lateral inframedian, lateral supramedian intercarinal surface shagreened.

Genital operculum: Male genital operculum: wider than long, with six pairs macrosetae. Sclerites free on longitudinal margin moving independently but unable to open more than 45°. Genital papillae protruding posteriorly. Female genital operculum wider than long, with two pairs of macrosetae, sclerites fuse longitudinally.

Sternites: Sternites I–VII matte. Sternite V with moderated, bright whitish distal median glandular spot. Sternite VII with ventral submedian, lateral ventral obsolete, former expressed by three macrosetae and latter by two. Sternite VII distal median hyaline glandular area vestigial. Spiracles minute subovoid.

Pectines: Pectines longer than distal margin of coxa VI in males, in females almost at margin of coxa VI. Basal piece with three pairs of macrosetae. Marginal lamella consist of three sclerites, medial lamella proximally fuse distally progressively forming 10−11 conspicuous beads. Fulcra with 11−14 beads. Pectinal tooth numbering 13−15 in males and 12−14 in females, basal pair of pectines reduced slightly compared to preceding pectines.

Hemispermatophore: Lamina 2.00 times longer than trunk. Median lobe ental terminus moderate and rounded. Dorsal through margin long, narrow, curving proximally, removed from

ventral trough. Primary and secondary hooks elongate, broad, positioned on apex of lateral margin extension of lamina (flange), forming deep notch. Hemi-mating plug developed from inner lobe, distal barb margin with approximately 12 long spinules. Basal plate of inner lobe distal to ventral trough. Neck of inner lobe shorter than basal plate (0.5 times longer than basal plate). Measurements, lamina, 2.38; trunk, 1.19; dorsal trough/laminar hooks, 1.96; ventral trough/laminar hook, 0.92; neck, 0.20; basal plate, 0.51.

Metasoma: All intercarinal surfaces matted except dorsal surface in I–V moderately shagreened, ventral surface of V with field of scattered granules becoming denser distally. Metasoma 1.5 times longer than mesosoma. Metasomal segments I–III wider than longer. Carinae: Dorsal lateral carinae of segments I–IV, lateral median in I–III strongly crenatoserrated, terminating in enlarged spinoid granules pointing backwards, dorsal lateral in V strongly crenatoserrated proximally half, moderately on distal half, lateral median in IV with a flared extension of terminal third, lateral inframedian carinae in I complete strongly crenatoserrate, in II complete strongly crenatoserrate on distal half, weakening proximally, in III partial expressed on posterior half strongly crenatoserrate on distal third becoming weaker; in VI expressed by few scattered distal low conical granules; in V partial, vestigial expressed by proximal spinoid tubercle, few low serrated granules. Ventral lateral in I–IV complete, moderately crenatoserrated. Ventral submedian in I–III obsolete, in IV vestigial with few scattered low serrated granules distally. Ventral median in V obsolete. Setae: Dorsal lateral, 0:1:1:2:4, lateral median, 0:1:2:3, lateral inframedian, 1:1:1:1:3, ventral lateral, 2:3:3:3:6, ventral submedian, 3:3:3:3:2, ventral sublateral, 2.

Telson: Telson 1.6 times longer than wider. Metasomal segment V as wide as vesicle. Vesicle 1.7 longer than aculeus. Ventral submedian, ventral median, lateral median carinae with

irregular, scattered large conical granules, Intercarinal surface smooth. Ventral median carinae with subaculear tubercle compound with primary enlarged spiniform, blunt tubercle followed by secondary smaller, conical tubercle, positioned approximately proximal half length of the primary tubercle. Carinae with four or five rows of macrosetae. Microserration on laterobasal aculeus vestigial with two small tines, observable only in juveniles.

DISTRIBUTION: *Konetontli zihuatanejensis* is endemic to the pacific coast of the state of Guerrero Mexico, from the Ixtapa-Zihuatanejo area to La Unión close to the border of Michoacán.

ECOLOGY: *Konetontli zihuatanejensis* was collected from 5 to 273 m altitude in tropical deciduous forest during the day by rolling rocks.

REMARKS: *Konetontli zihuatanejensis* was described based on five adult specimens that were deposited at UAGRO. Subsequently, Francke and Ponce-Saavedra (2005) described a related species and reported that the types of *K. zihuatanejensis* are lost and proposed the synonymy with *K. acapulco*. This taxonomic action is reverted here based on the study of abundant fresh material, it is determined here that *K. zihuatanejensis* is a valid species.

MATERIAL EXAMINED: **MEXICO: Guerrero:** *Municipio de Ciudad Altamirano*: 18.3 km junction Zihuatanejo-Ciudad Altamirano, 17°46.8498'N 101°28.7304'W, 273 m, 2.viii.2008, O. Francke, J. Ponce, H. Montaño, and A. Quijano, 1 ♀ (UNAM). *Municipio de La Unión*: La Majahua, 17°48'740"N 101°43'732"W, 6.viii.2010, J. Ponce, M. Villaseñor, A. Quijano, E. Miranda, J. Baldazo, T. Nunez, and J. Portillo, 4 ♀ 2 juv. (IBUNAM); Troncones, 17°46.8558'N 101°43.1916'W, 5 m, 1.viii.2008, O. Francke, J. Ponce, H. Montaño, and A. Quijano, 1 ♂ 1 ♀ (AMNH). *Municipio de Zihuatanejo*: Agua de Correa, [17°38.96267'N 101°31.61616667'W], 28.v.1997, J. Baldazo-Monsivais, 1 ♀ (IBUNAM).

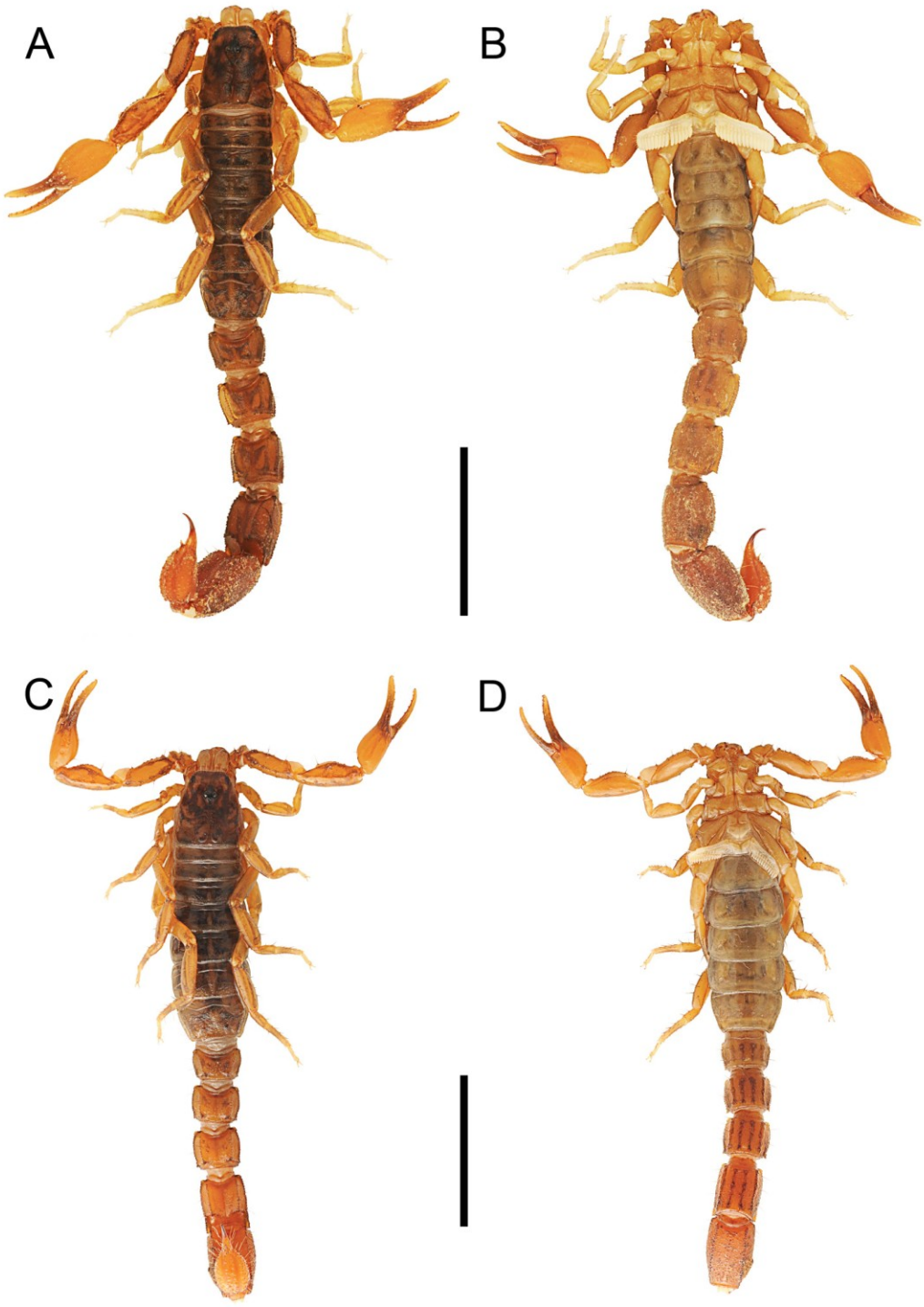


Figure 66. *Konetontli zihuatanejensis* (Baldazo-Monsivais, 2003), habitus. **A**, **B**. ♂ (IBUNAM). **C**, **D**. ♀ (IBUNAM). **A**, **C**. Dorsal aspect. **B**, **D**. Ventral aspect. Scale bars = 5 mm.

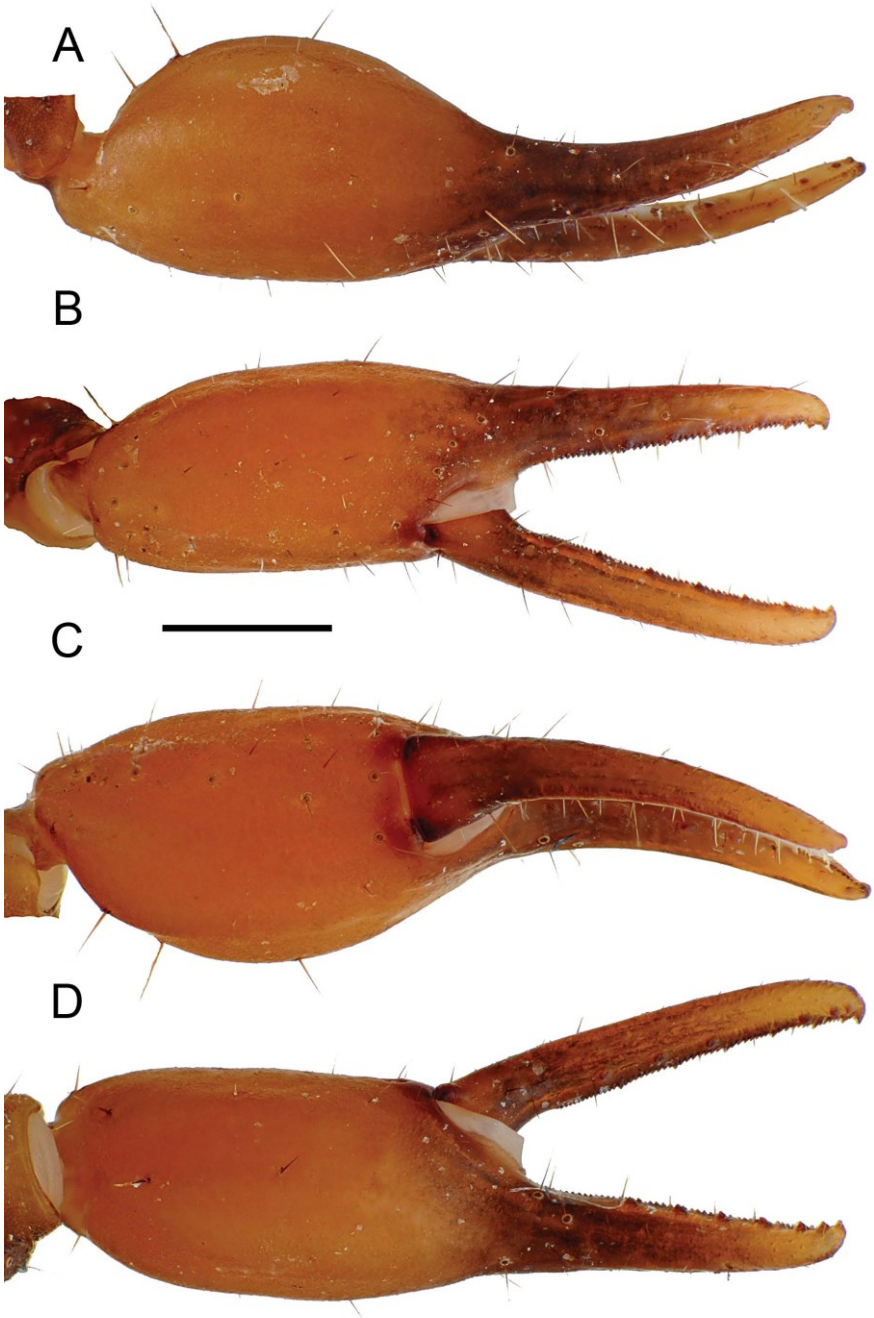


Figure 67. *Konetontli zihuatanejensis* (Baldazo-Monsivais, 2003), ♂ (IBUNAM), dextral pedipalp chela. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

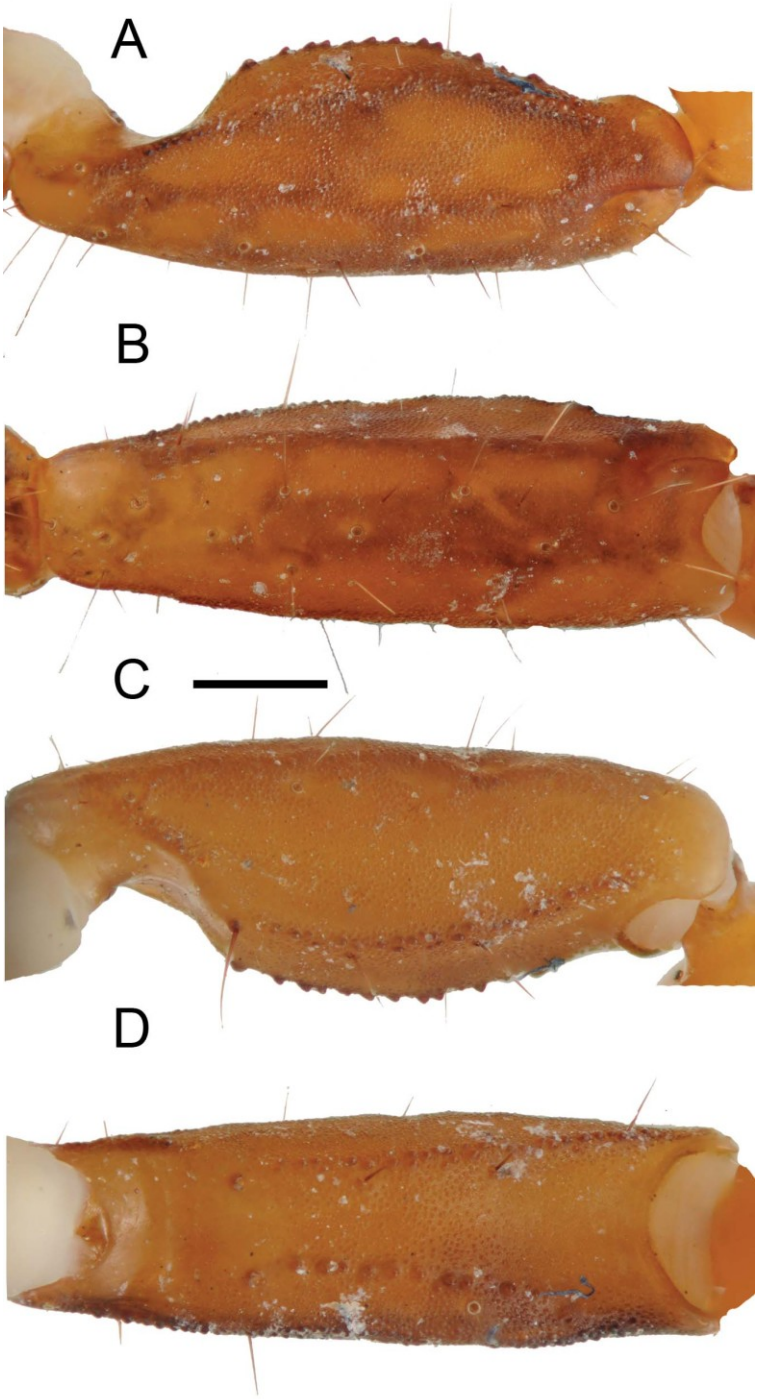


Figure 68. *Konetontli zihuatanejensis* (Baldazo-Monsivais, 2003), ♂ (IBUNAM), dextral pedipalp patella. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 0.5 mm.

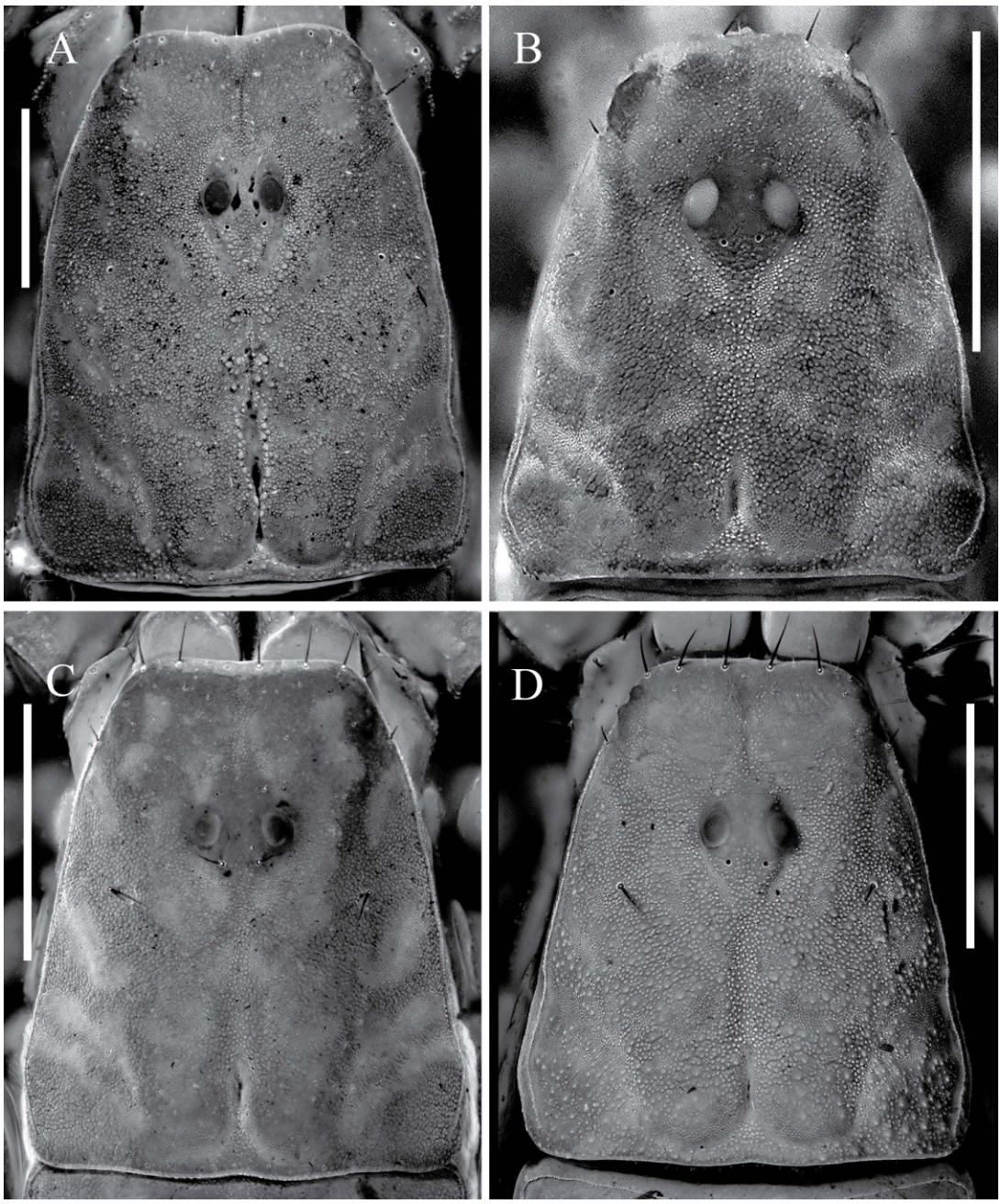


Figure 69. *Konetontli* González-Santillán and Prendini, in prep., carapace. **A**. *Konetontli acapulco* (Armas and Martín-Frías, 2001), holotype ♂ (IBUNAM). **B**. *Konetontli chamelaensis* (Williams, 1986), holotype ♂ (CAS). **C**. *Konetontli ignis*, **n. sp.**, holotype ♀ (IBUNAM). **D**. *Konetontli ilitchi*, **n. sp.**, holotype ♀ (IBUNAM). Scale bars = 1 mm.

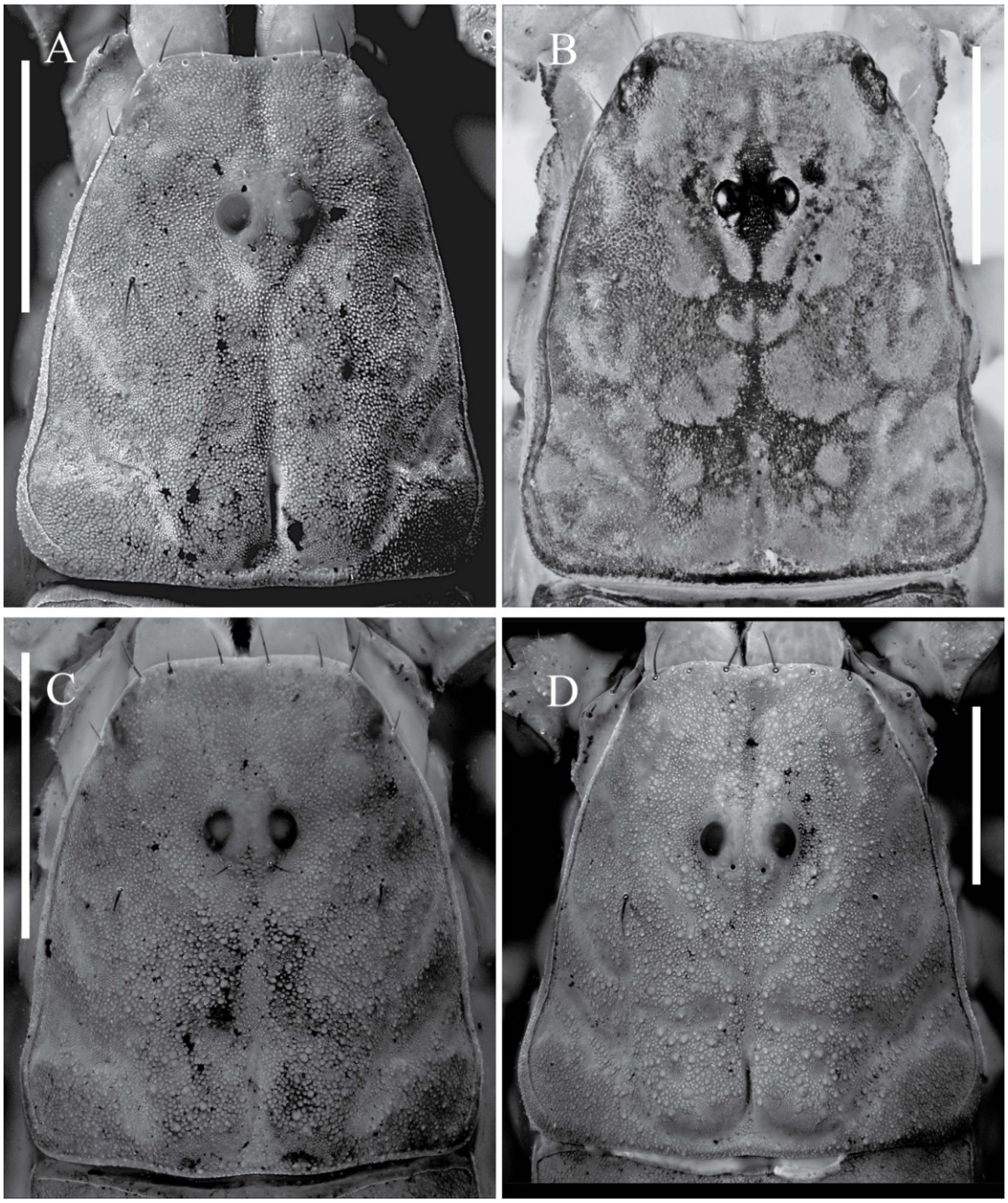


Figure 70. *Konetontli* González-Santillán and Prendini, in prep., carapace. **A**. *Konetontli juxtlahuaca*, **n. sp.**, holotype ♂ (IBUNAM). **B**. *Konetontli kuarapu* (Francke and Ponce-Saavedra, 2005), paratype ♂ (AMNH). **C**. *Konetontli migrus*, **n. sp.**, holotype ♂ (IBUNAM). **D**. *Konetontli nayarit* (Armas and Martín-Frías, 2001), ♂ (IBUNAM). Scale bars = 1 mm.

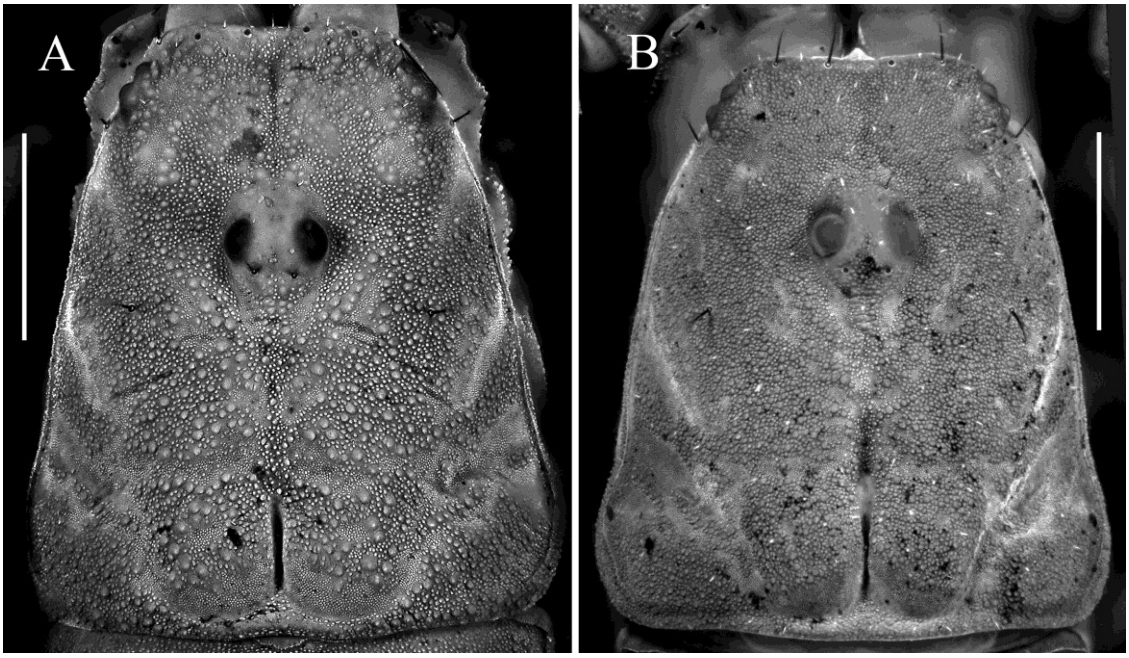


Figure 71. *Konetontli* González-Santillán and Prendini, in prep., carapace. **A**. *Konetontli pattersoni* (Williams and Haradon, in Williams, 1980), ♂ (AMNH). **B**. *Konetontli zihuatanejensis* (Baldazo-Monsivais, 2003), ♂ (IBUNAM). Scale bars = 1 mm.

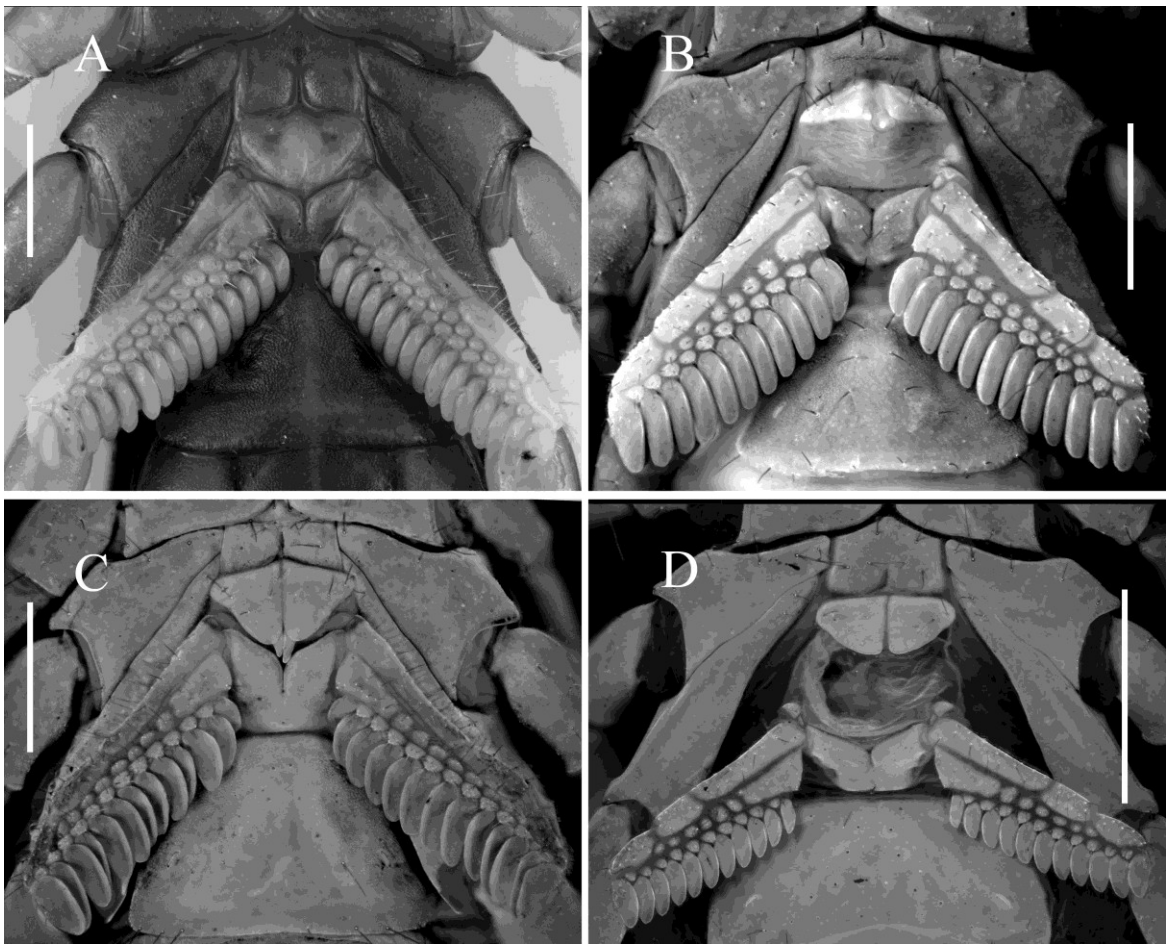


Figure 72. *Konetontli* González-Santillán and Prendini, in prep., sternum, genital operculum and pectines. **A**. *Konetontli acapulco* (Armas and Martín-Frías, 2001), ♂ (IBUNAM). **B**. *Konetontli juxtlahuaca*, **n. sp.**, holotype ♂ (IBUNAM). **C**. *Konetontli nayarit* (Armas and Martín-Frías, 2001), ♂ (IBUNAM). **D**. *Konetontli ilitchi*, **n. sp.**, holotype ♀ (IBUNAM). Scale bars = 1 mm.

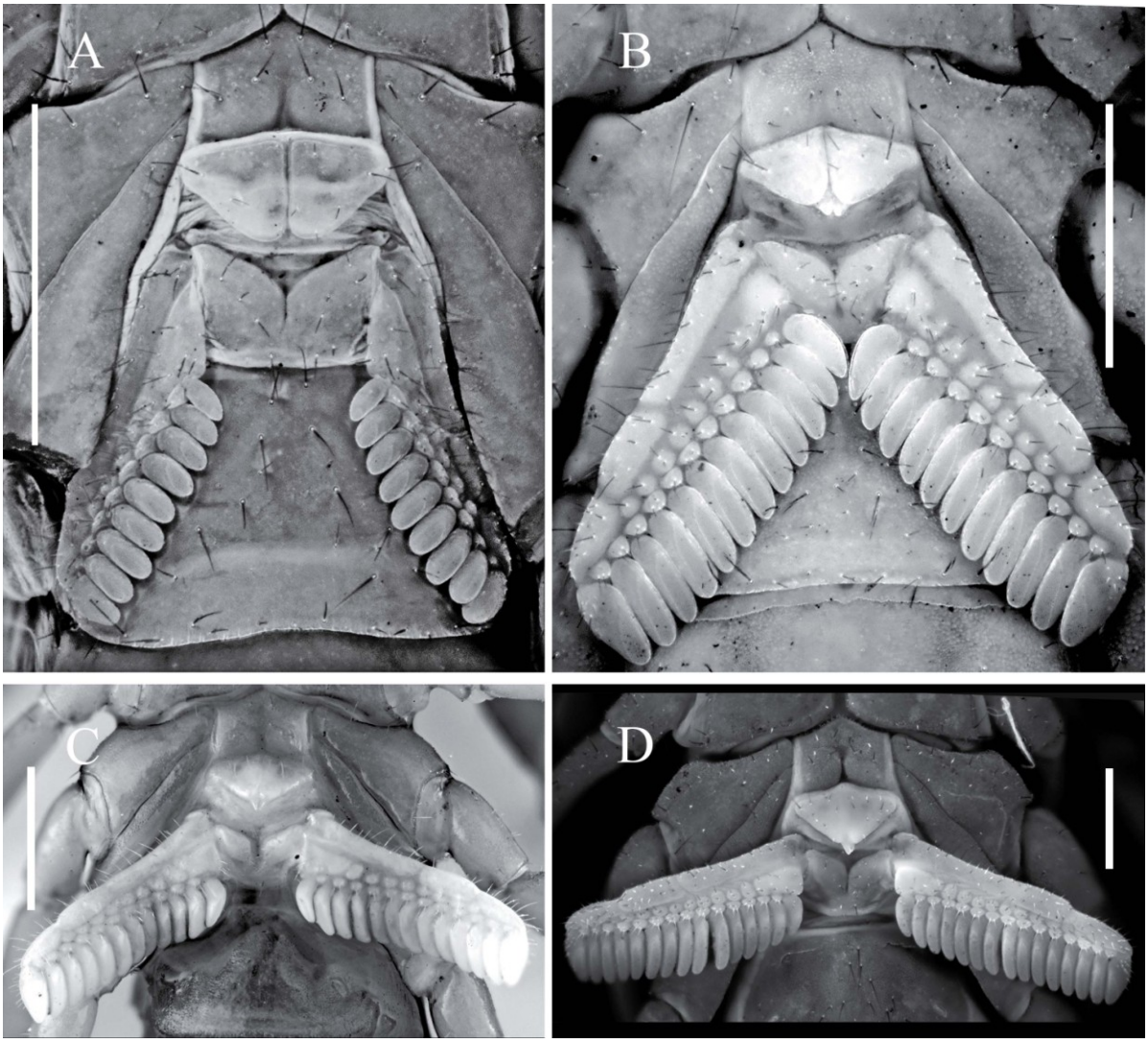


Figure 73. *Konetontli* González-Santillán and Prendini, in prep., sternum, genital operculum and pectines. **A**. *Konetontli ignis*, **n. sp.**, holotype ♀ (IBUNAM). **B**. *Konetontli migrus*, **n. sp.**, holotype ♂ (IBUNAM). **C**. *Konetontli kuarapu* (Francke and Ponce-Saavedra, 2005), paratype ♂ (AMNH). **D**. *Konetontli zihuatanejensis* (Baldazo-Monsivais, 2003), ♂ (IBUNAM). Scale bars = 1 mm.

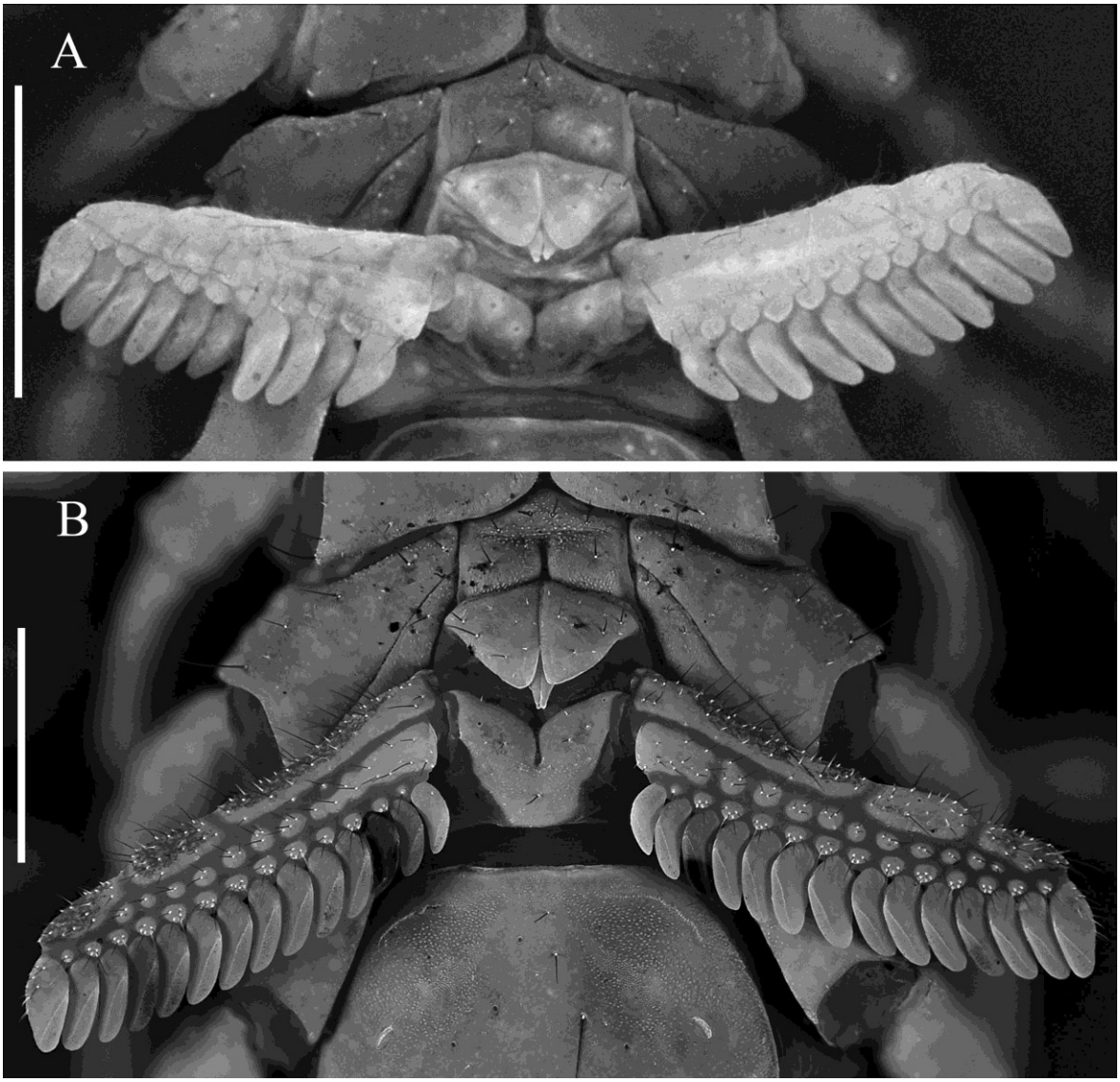


Figure 74. *Konetontli* González-Santillán and Prendini, in prep., sternum, genital operculum and pectines. **A**. *Konetontli chamelaensis* (Williams, 1986), ♂ (CAS). **B**. *Konetontli pattersoni* (Williams and Haradon, in Williams, 1980), ♂ (AMNH). Scale bars = 1 mm.

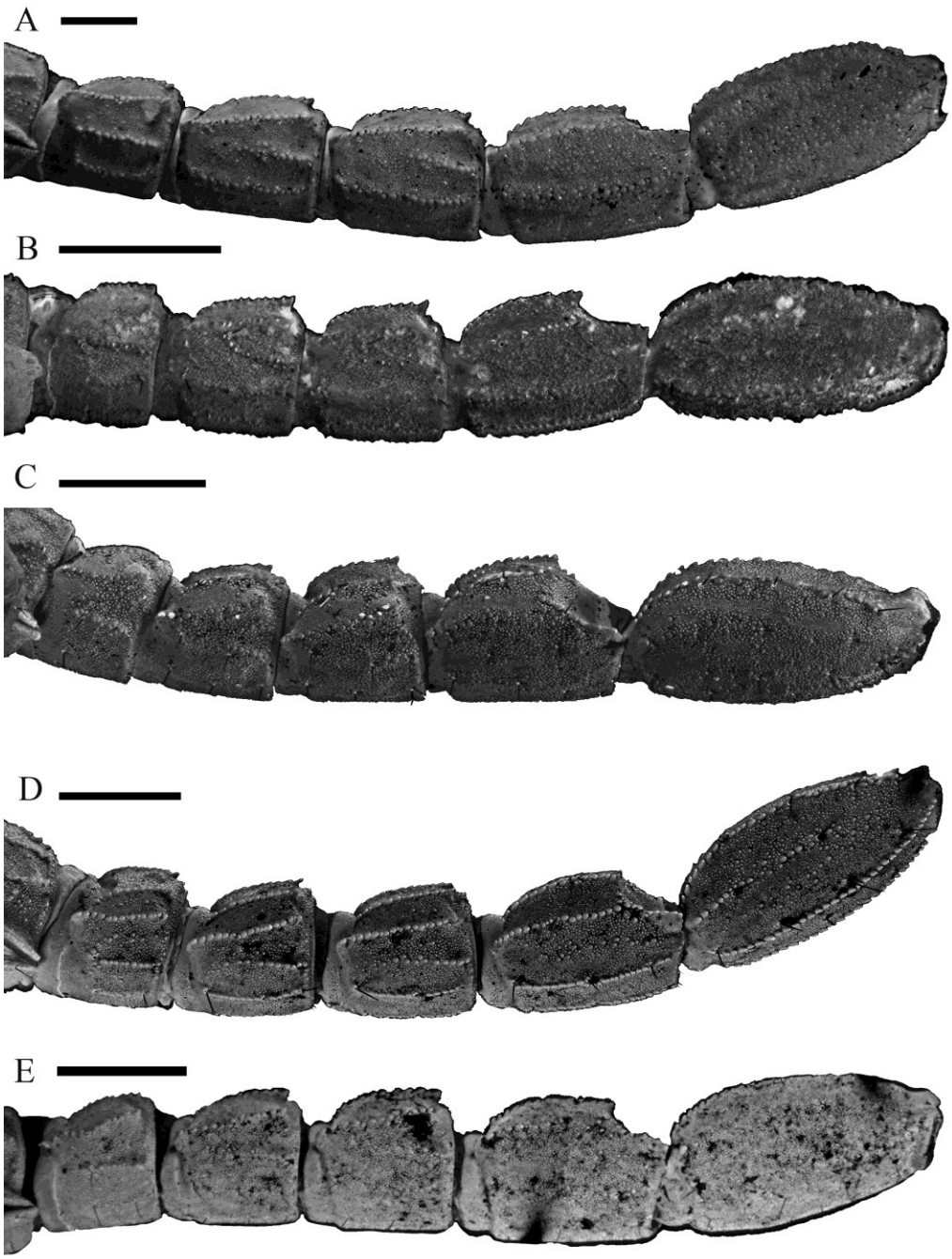


Figure 75. *Konetontli* González-Santillán and Prendini, in prep., metasomal segments I–V, lateral aspect. **A**. *Konetontli acapulco* (Armas and Martín-Frías, 2001), holotype ♂ (IBUNAM). **B**. *Konetontli chamelaensis* (Williams, 1986), holotype ♂ (CAS). **C**. *Konetontli ignis*, **n. sp.**, holotype ♀ (IBUNAM). **D**. *Konetontli ilitchi*, **n. sp.**, holotype ♀ (IBUNAM). **E**. *Konetontli juxtlahuaca*, **n. sp.**, holotype ♂ (IBUNAM). Scale bars = 1 mm.

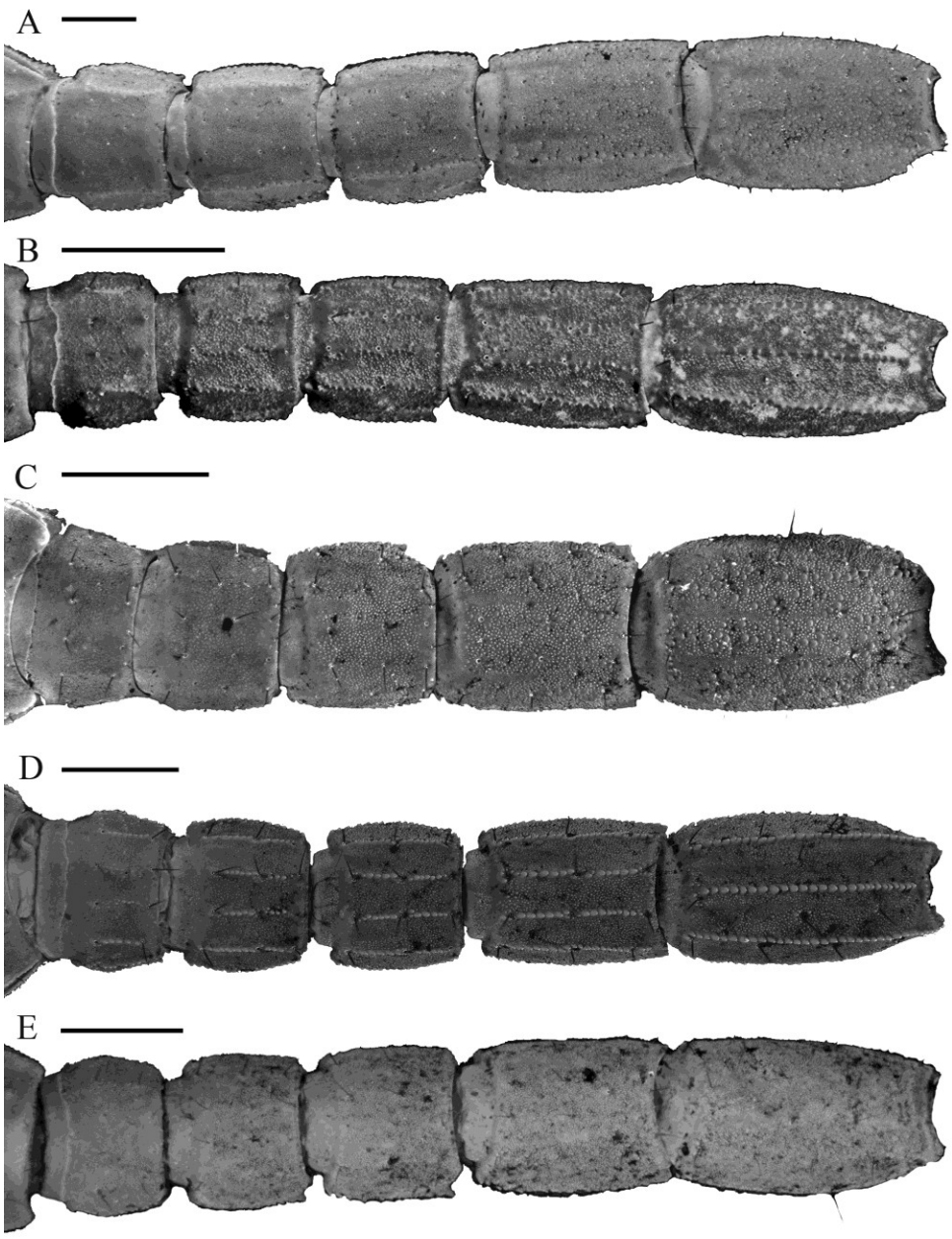


Figure 76. *Konetontli* González-Santillán and Prendini, in prep., metasomal segments I–V, ventral aspect. **A**. *Konetontli acapulco* (Armas and Martín-Frías, 2001), holotype ♂ (IBUNAM). **B**. *Konetontli chamelaensis* (Williams, 1986), holotype ♂ (CAS). **C**. *Konetontli ignis*, **n. sp.**, holotype ♀ (IBUNAM). **D**. *Konetontli ilitchi*, **n. sp.**, holotype ♀ (IBUNAM). **E**. *Konetontli juxtlahuaca*, **n. sp.**, holotype ♂ (IBUNAM). Scale bars = 1 mm.

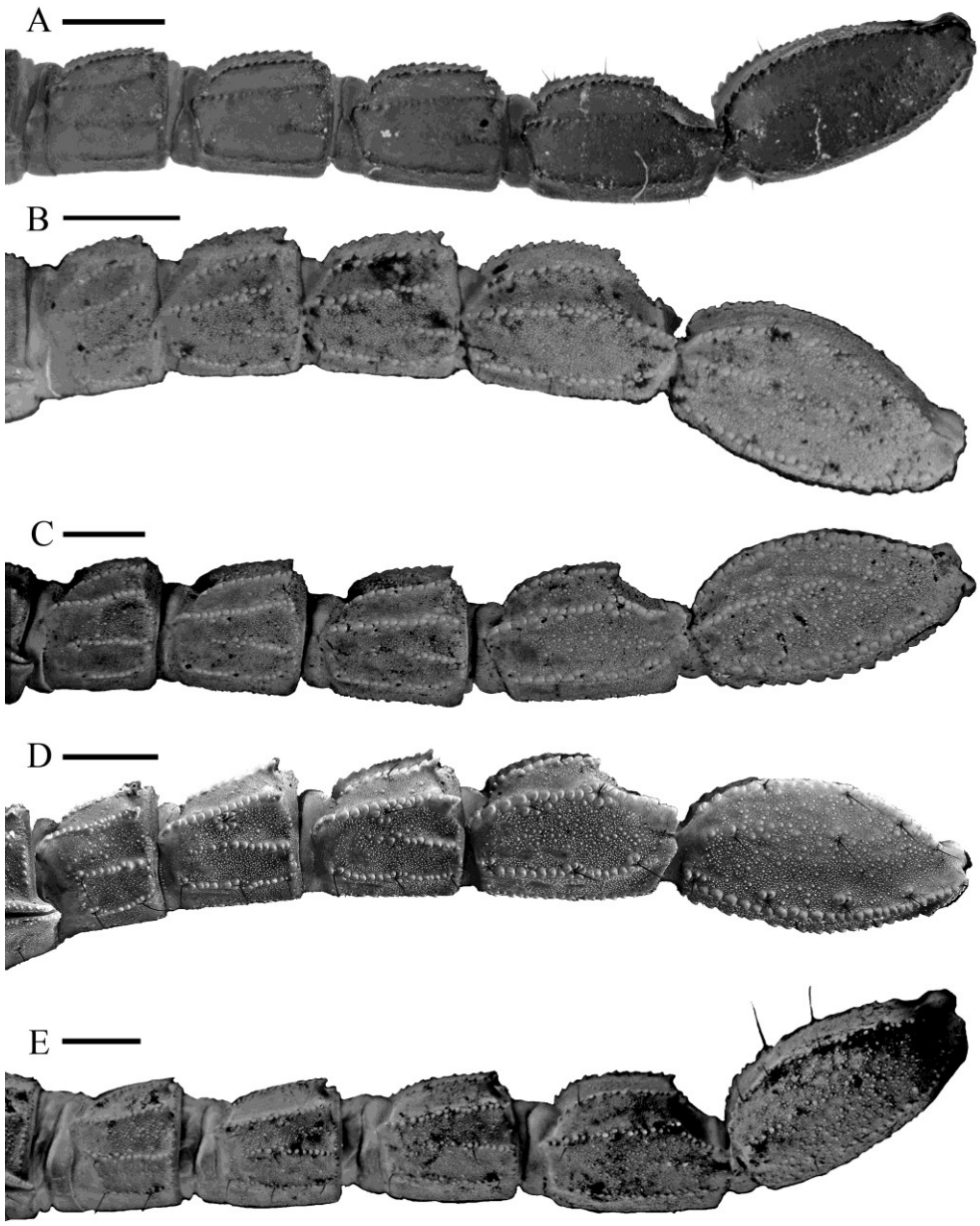


Figure 77. *Konetontli* González-Santillán and Prendini, in prep., metasomal segments I–V, lateral aspect. **A**. *Konetontli kuarapu* (Francke and Ponce-Saavedra, 2005), paratype ♂ (AMNH). **B**. *Konetontli migrus*, **n. sp.**, holotype ♂ (IBUNAM). **C**. *Konetontli nayarit* (Armas and Martín-Frías, 2001), ♂ (IBUNAM). **D**. *Konetontli pattersoni* (Williams and Haradon, in Williams, 1980), ♂ (AMNH). **E**. *Konetontli zihuatanejensis* (Baldazo-Monsivais, 2003), ♂ (IBUNAM). Scale bars = 1 mm.

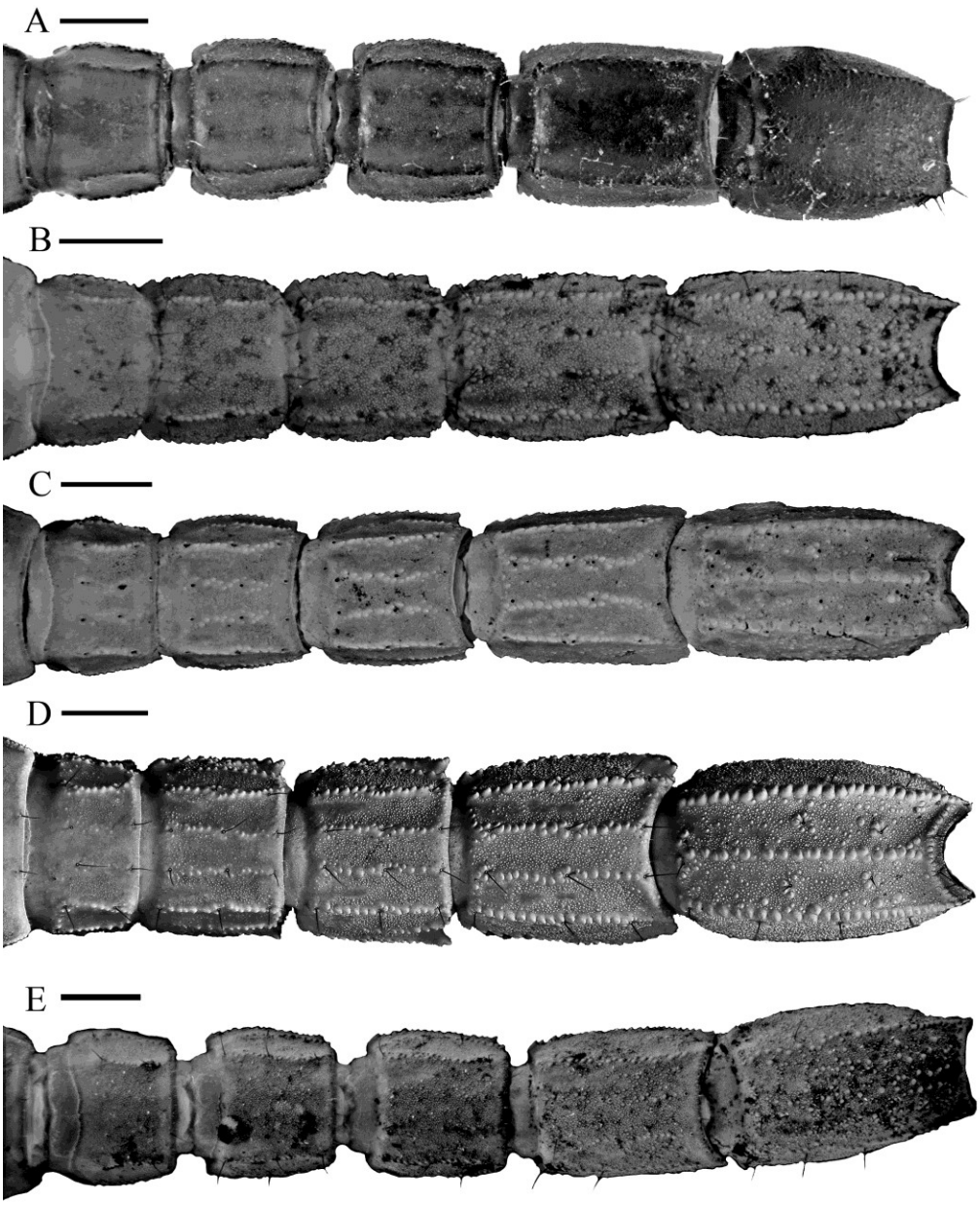


Figure 78. *Konetontli* González-Santillán and Prendini, in prep., metasomal segments I–V, ventral aspect. **A**. *Konetontli kuarapu* (Francke and Ponce-Saavedra, 2005), paratype ♂ (AMNH). **B**. *Konetontli migrus*, **n. sp.**, holotype ♂ (IBUNAM). **C**. *Konetontli nayarit* (Armas and Martín-Frías, 2001), ♂ (IBUNAM). **D**. *Konetontli pattersoni* (Williams and Haradon, in Williams, 1980), ♂ (AMNH). **E**. *Konetontli zihuatanejensis* (Baldazo-Monsivais, 2003), ♂ (IBUNAM). Scale bars = 1 mm.

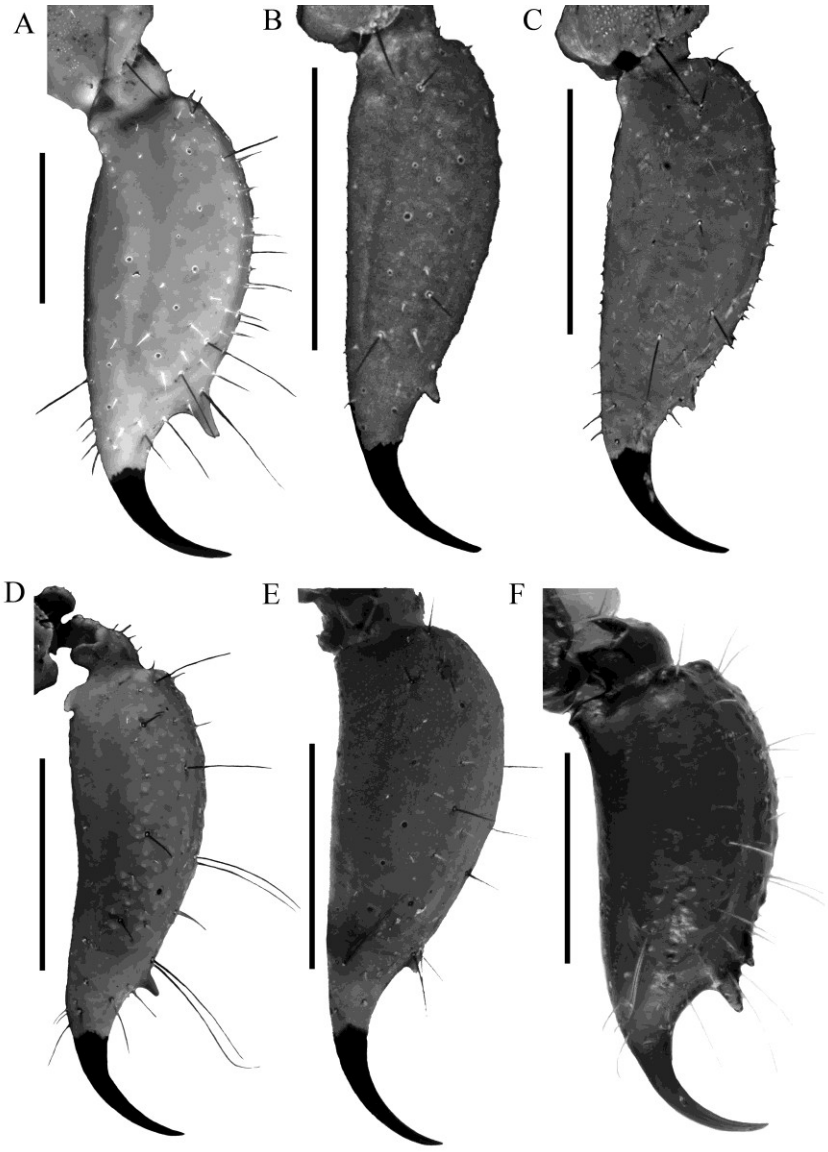


Figure 79. *Konetontli* González-Santillán and Prendini, in prep., telson, lateral aspect. **A**. *Konetontli acapulco* (Armas and Martín-Frías, 2001), holotype ♂ (IBUNAM). **B**. *Konetontli chamelaensis* (Williams, 1986), holotype ♂ (CAS). **C**. *Konetontli ignis*, **n. sp.**, holotype ♀ (IBUNAM). **D**. *Konetontli ilitchi*, **n. sp.**, holotype ♀ (IBUNAM). **E**. *Konetontli juxtlahuaca*, **n. sp.**, holotype ♂ (IBUNAM). **F**. *Konetontli kuarapu* (Francke and Ponce-Saavedra, 2005), paratype ♂ (AMNH). Scale bars = 1 mm.

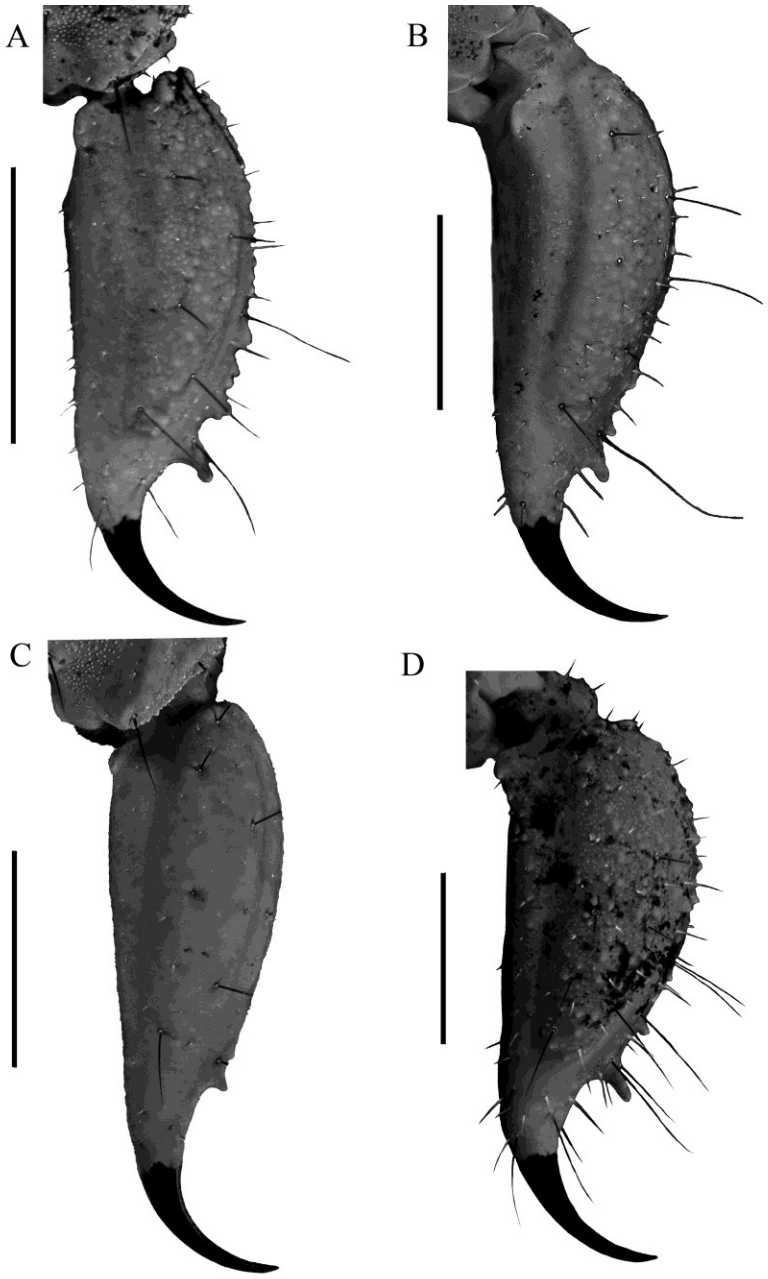


Figure 80. *Konetontli* González-Santillán and Prendini, in prep., telson, lateral aspect. **A**. *Konetontli migrus*, **n. sp.**, holotype ♂ (IBUNAM). **B**. *Konetontli nayarit* (Armas and Martín-Frías, 2001), ♂ (IBUNAM). **C**. *Konetontli pattersoni* (Williams and Haradon, in Williams, 1980), ♂ (AMNH). **D**. *Konetontli zihuatanejensis* (Baldazo-Monsivais, 2003), ♂ (IBUNAM). Scale bars = 1 mm.

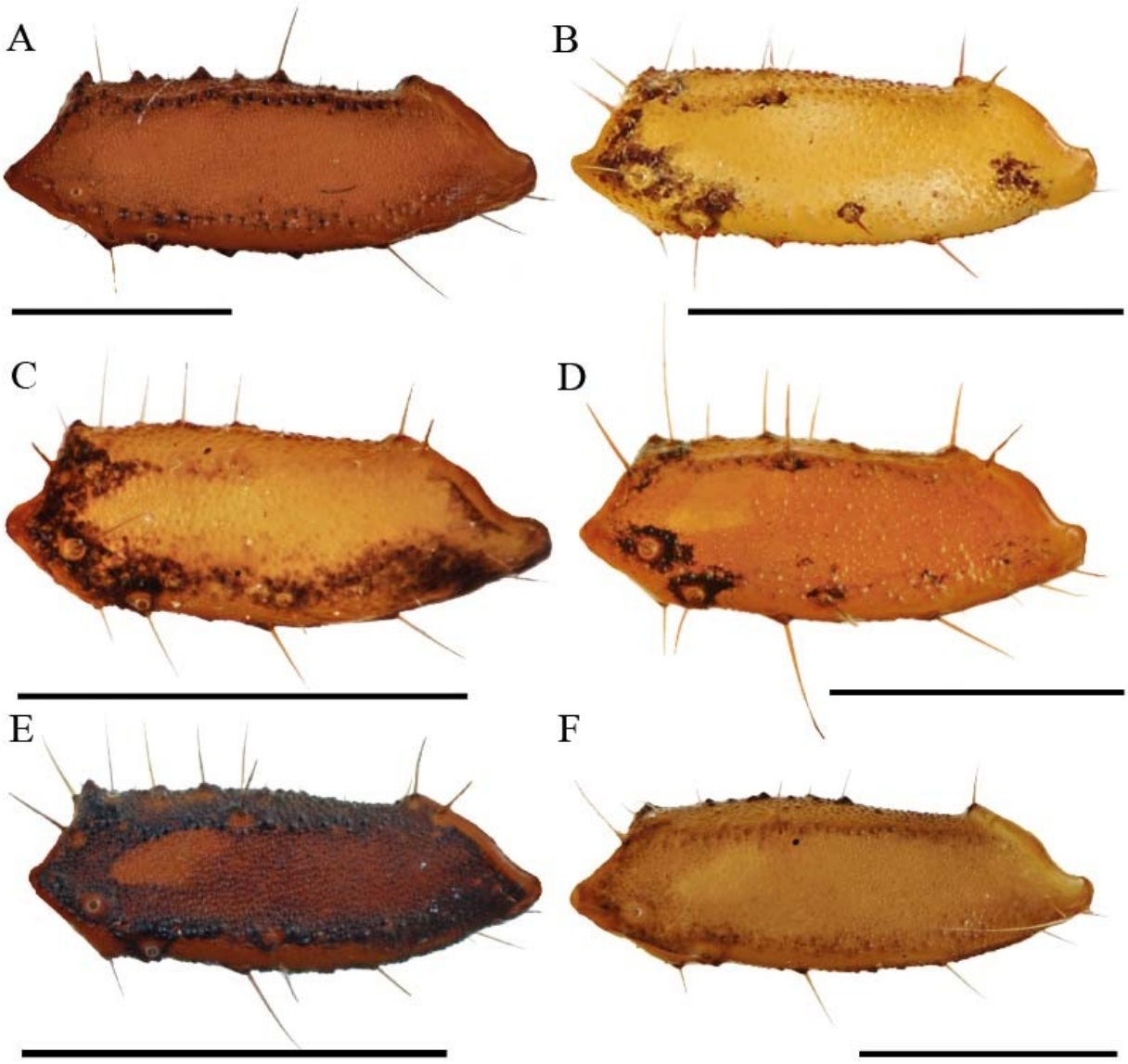


Figure 81. *Konetontli* González-Santillán and Prendini, in prep., dextral dorsal pedipalp femur. **A**. *Konetontli acapulco* (Armas and Martín-Frías, 2001), holotype ♂ (IBUNAM). **B**. *Konetontli chamelaensis* (Williams, 1986), holotype ♂ (CAS). **C**. *Konetontli ignis*, **n. sp.**, holotype ♀ (IBUNAM). **D**. *Konetontli ilitchi*, **n. sp.**, holotype ♀ (IBUNAM). **E**. *Konetontli juxtlahuaca*, **n. sp.**, holotype ♂ (IBUNAM). **F**. *Konetontli kuarapu* (Francke and Ponce-Saavedra, 2005), paratype ♂ (AMNH). Scale bars = 1 mm.

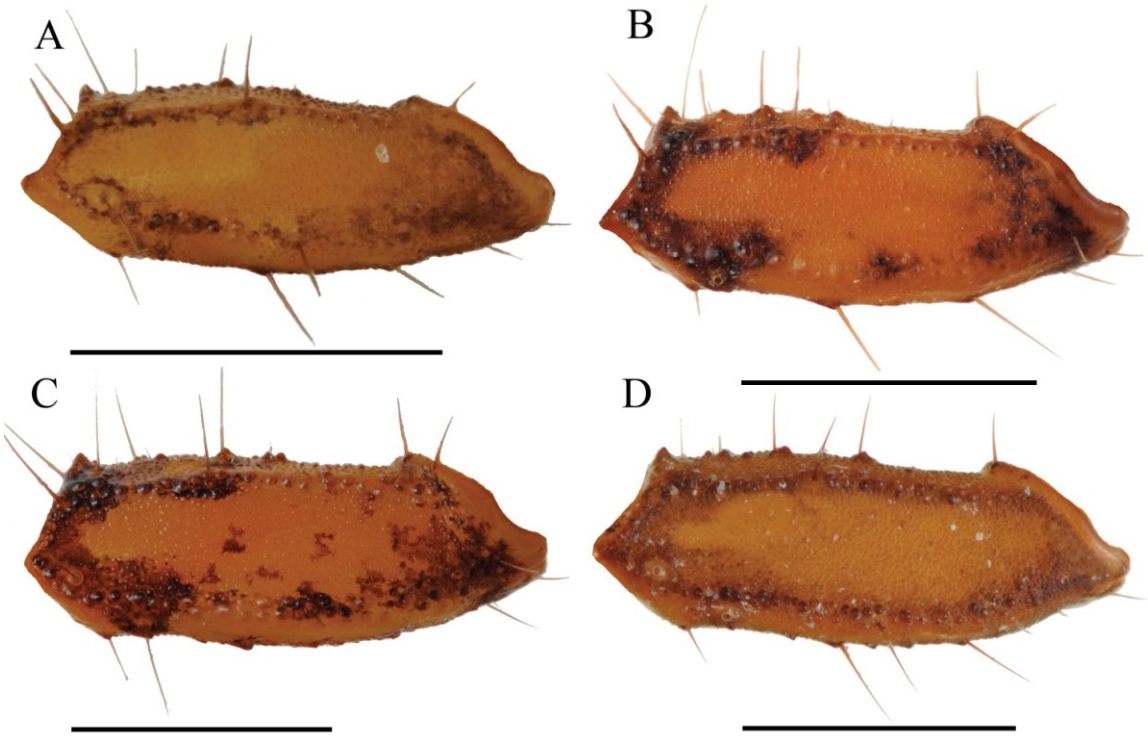


Figure 82. *Konetontli* González-Santillán and Prendini, in prep., dextral dorsal pedipalp femur. **A**. *Konetontli migrus*, **n. sp.**, holotype ♂ (IBUNAM). **B**. *Konetontli nayarit* (Armas and Martín-Frías, 2001), ♂ (IBUNAM). **C**. *Konetontli pattersoni* (Williams and Haradon, in Williams, 1980), ♂ (AMNH). **D**. *Konetontli zihuatanejensis* (Baldazo-Monsivais, 2003), ♂ (IBUNAM). Scale bars = 1 mm.

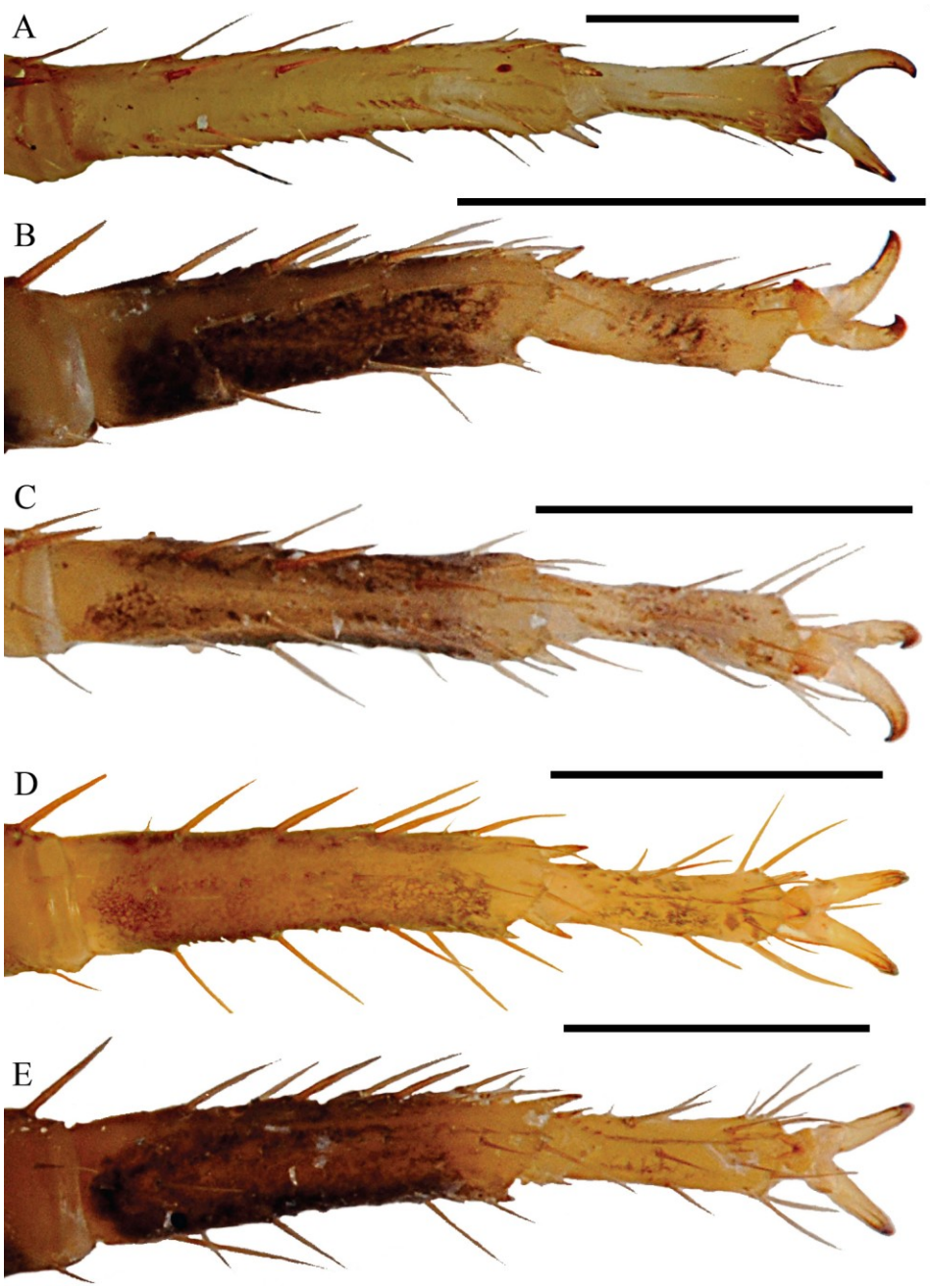


Figure 83. *Konetontli* González-Santillán and Prendini, in prep., dextral basitarsus and telotarsus III. **A**. *Konetontli acapulco* (Armas and Martín-Frías, 2001), holotype ♂ (IBUNAM). **B**. *Konetontli chamelaensis* (Williams, 1986), holotype ♂ (CAS). **C**. *Konetontli ignis*, **n. sp.**, holotype ♀ (IBUNAM). **D**. *Konetontli ilitchi*, **n. sp.**, holotype ♀ (IBUNAM). **E**. *Konetontli juxtlahuaca*, **n. sp.**, holotype ♂ (IBUNAM). Scale bars = 0.5 mm.

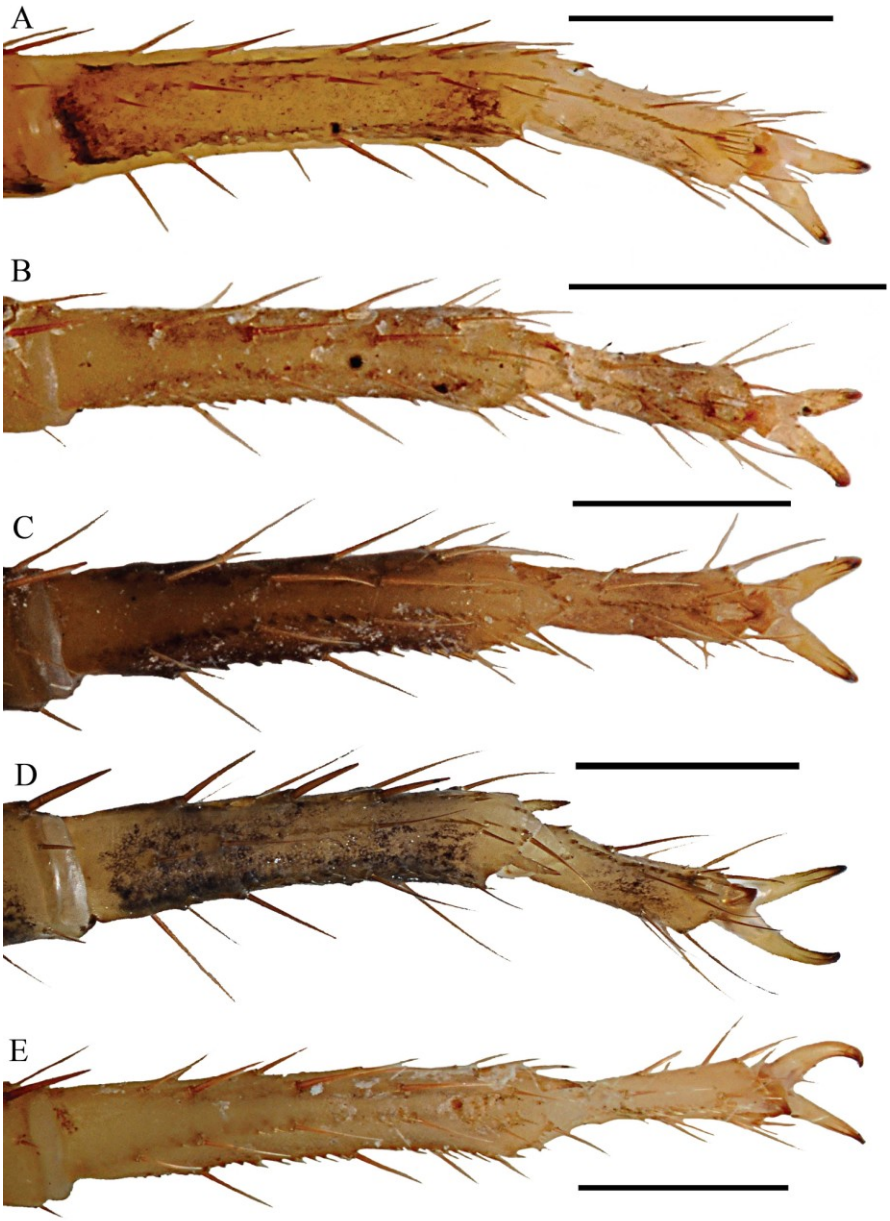


Figure 84. *Konetontli* González-Santillán and Prendini, in prep., dextral basitarsus and telotarsus III. **A**. *Konetontli kuarapu* (Francke and Ponce-Saavedra, 2005), paratype ♂ (AMNH). **B**. *Konetontli migrus*, **n. sp.**, holotype ♂ (IBUNAM). **C**. *Konetontli nayarit* (Armas and Martín-Frías, 2001), ♂ (IBUNAM). **D**. *Konetontli pattersoni* (Williams and Haradon, in Williams, 1980), ♂ (AMNH). **E**. *Konetontli zihuatanejensis* (Baldazo-Monsivais, 2003), ♂ (IBUNAM). Scale bars = 0.5 mm.

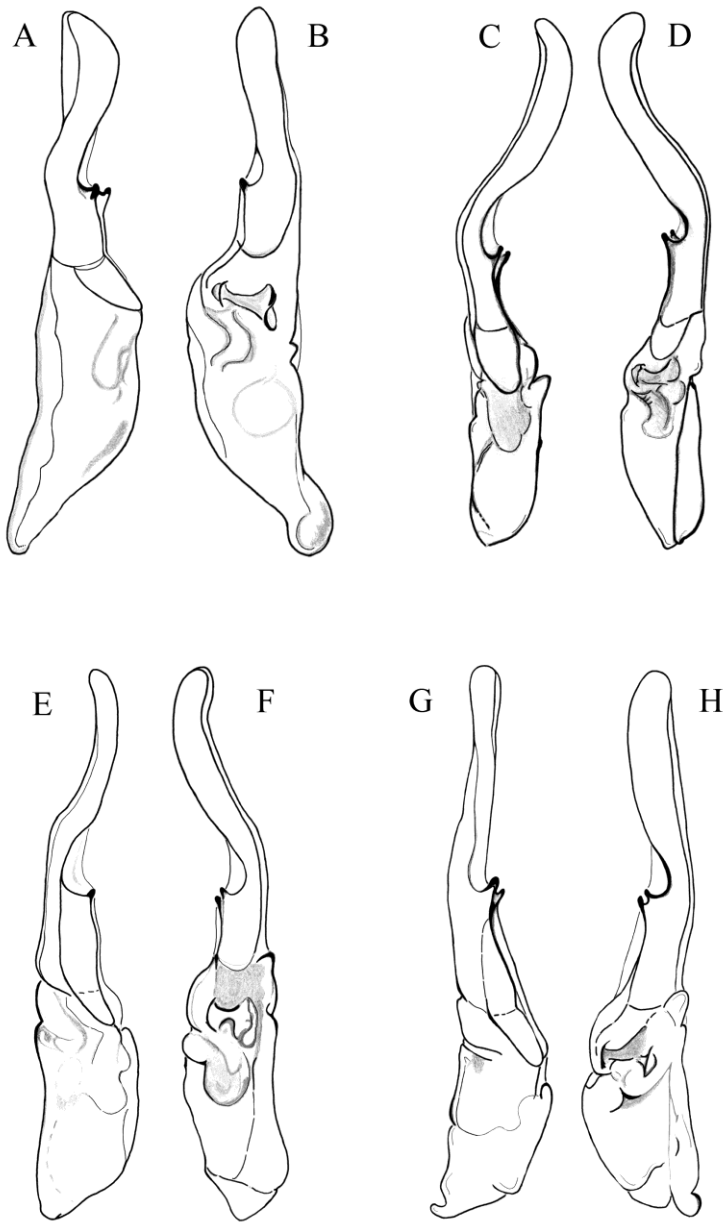


Figure 85. *Konetontli* González-Santillán and Prendini, in prep., dorsal and ventral view of dextral hemispermatophore. **A**, **B**. *Konetontli ilitchi*, **n. sp.**, holotype ♀ (IBUNAM). **C**, **D**. *Konetontli juxtlahuaca*, **n. sp.**, holotype ♂ (IBUNAM). **E**, **F**. *Konetontli migrus*, **n. sp.**, holotype ♂ (IBUNAM). **G**, **H**. *Konetontli zihuatanejensis* (Baldazo-Monsivais, 2003), ♂ (IBUNAM).

MAAYKUYAK González-Santillán and Prendini, in prep.

KEY TO IDENTIFICATION OF THE SPECIES OF *Maaykuyak*

Intercarinal surfaces of pedipalp chelae manus and metasomal segment V partially infuscated, six rows of median denticles and six prolateral denticles on fixed finger six, on movable finger seven, hemispermatophore with median lobe ental terminus prominent and spiniform, pectinal tooth counts [♂ 19–21 (n=10), ♀ 16–18 (n=10)]……..……..*M. vittatus*

Intercarinal surfaces of pedipalp chelae manus and metasomal segment V completely infuscated, five rows of median denticles and five prolateral denticles on fixed finger and on movable finger, hemispermatophore median lobe ental terminus moderate and rounded, pectinal tooth counts [♂ 13–15 (n=10) and ♀ 10–13 (n=10)].....*M. waueri*

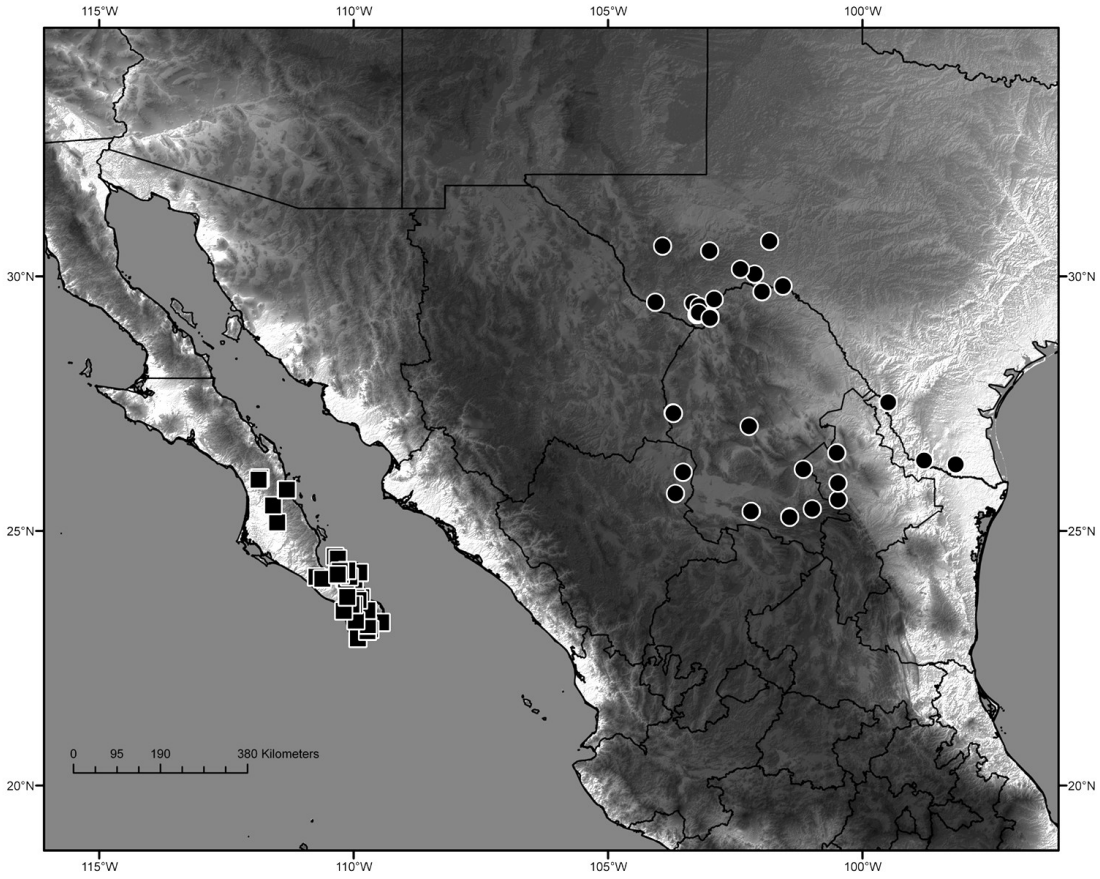


Figure 86. Map of North America, plotting known locality records for two species in the Syntropinae scorpion genus *Maaykuyak* González-Santillán and Prendini, in prep., based on data collected in the present study: *Maaykuyak vittatus* (Williams, 1970) (squares) and *Maaykuyak waueri* (Gertsch and Soleglad, 1972) (circles), darker contour indicates increment of altitudinal gradient.

Maaykuyak vittatus (Williams, 1970)

Figures 86, 87–89, 107A, 109A, 110A, 111A, 114A, 115A, 117A

Vejovis vittatus Williams, 1970c: 290–297, figs. 10–12.

Vaejovis vittatus: Díaz-Nájera, 1975: 7, 17; Williams, 1980: 54, 72, 73, fig. 74, 75; Kovařík, 1998: 148; Beutelspacher, 2000: 113, 138, 154, map 96; Lourenço and Sissom, 2000: 73, 77; Sissom, 2000: 536; Soleglad and Fet, 2003b: 9, 151, fig. B–1, 152, fig. B–2, 161; Sissom and Hendrixson, 2005a: 127, tab. 6.2, 133,134; McWest, 2009: 19, tab. 1, 55, 63, 64, 119; Jiménez-Jiménez and Palacios-Cardiel, 2010: 72, tab. 1, 73, 74.

Hoffmannius vittatus: Soleglad and Fet, 2008: 4, 71, 91.

TYPE MATERIAL: **MEXICO: Baja California Sur:** Holotype ♂ (CAS, Type No. 10430), 8.0 km SW San Miguel Comondú, 2–3.vii.1968, S.C. Williams and M.A. Cazier. Paratypes: 1 ♀ (CAS, allotype, Type No. 10430), same data as holotype; 4 ♂ (AMNH), San Miguel Comondú, 8–16 km SW, 304 m, 3.vii.1968, S.C. Williams and M. Cazier.

DIAGNOSIS: *M. vittatus* differs from *M. waueri* by having different patterns of infuscation, total length, dentition number of pedipalp fingers, and pectinal tooth number. Whereas *M. vittatus* has intercarinal surfaces of chelae and metasomal segment V partially infuscated, *M. waueri* has complete dark infuscation. These species also differ by the number of median denticles and prolateral denticles of the fixed finger, *M. vittatus* has six and *M. waueri* has five, the former has on the movable finger seven median denticles and prolateral denticles and the letter only five. *M. vittatus* has higher pectinal tooth counts, [♂ 19–21 (n=10), ♀ 16–18 (n=10)], than *M. waueri* [♂ 13–15 (n=10) and ♀ 10–13 (n=10)].

DESCRIPTION: The following descriptions supplements William's (1970c) original description. It is based on additional freshly collected and museum ♂ and ♀ specimens of the collections mentioned in material examined.

Color and infuscation (in alcohol): Base color pale yellow straw, carapace, tergites, prolateral surface of legs, pedipalps, metasoma, and telson infuscate with dusky markings. These markings scattered producing an appearance of mottling infuscation, eespecially on ventral and lateral surfaces of metasoma, where only the sockets of each macrosetae is infuscate. Base of pedipalp fingers lightly orange to reddish, manus immaculate. Aculeus reddish at base turning brownish distally.

Carapace: Carapace anterior margin sublinear lacking median notch and with 10 macrosetae, four lateral pairs and one median. Median surface from distal lobes to proximal margin shagreened with scattered moderated and minute granules, lateral surface matte. Anteromedian sulcus shallow, posteromedian and posterolateral moderated, posterior transverse obsolete. Median ocular tubercle moderately raised, superciliary carina smooth and weak approximately at the level of median eyes. Median eyes approximately double size of lateral frontal pair. Three lateral eyes, two frontal pairs same size and posterior reduced approximately in half.

Sternum and coxal region: Sternum pentagonal subequilateral, wider than long, with three pairs of setae, one distal, one median pair and one pair on the lobes, median notch deep. Anterior margin of coxa II with three oblique slit-like structures, adjacent to a moderated protuberance with few fine granules, rest of the margin finely granulated. Base of coxal endite II with a broad depression each.

Chelicerae: Dorsal surface smooth, dentition of fixed and movable fingers as in typical Syntropinae. Subdistal margin of manus with one median macrosetae each. Serrula with 11−15 tines.

Pedipalps: Trichobothrial pattern Type C, orthobothriotaxic. Femur: All intercarinal surfaces matte, except dorsal surface with few scattered moderated granules and ventral surface with a field of proximal moderated granules; dorsal retrolateral, dorsal prolateral, and ventral prolateral carinae irregularly granulated, with moderated and fine granules; retrolateral dorsosubmedian obsolete with a proximal tubercle and three macrosetae positioned medially; prolateral ventrosubmedian vestigial expressed by a proximal tubercle and two median enlarge conical granules with a macroseta on base; prolateral ventral vestigial, expressed by a proximal tubercle with a macroseta on base and three enlarged conical granules with a macroseta on base, distal granule and macrosetae reduced, distributed from the basal to the distal third of the segment, additionally with two or three intersperse lower conical granules; ventral median vestigial expressed by a proximal row of enlarge conical granules merging with ventral prolateral carinae; retrolateral ventral vestigial expressed by few proximal scattered fine granules, ventral retrosubmedian obsolete.

Patella: All intercarinal surfaces matte. Dorsal prolateral strongly and irregularly granular with moderated, enlarge and fine granules; ventral retrosubmedian strongly granular with homogeneous large granules; dorsal retrolateral crenulated with rounded moderated granules medially and proximal and distal extremes becoming weakly crenulated to smooth, ventral prolateral weakly crenulated; ventral median vestigial expressed as a basal short row of conical granules; retrolateral dorsosubmedian and retrolateral median obsolete, expressed only by bands of infuscation; prolateral median on a vaulted projection extending from a basal to mid distal

third segment with a proximal tubercle with a macroseta on top and a row of six or more large conical granules and one medial and one distal macrosetae trichobothrium d_2 positioned by midway the extension of this carinae; prolateral ventral obsolete expressed on medial third by a proximal low tubercle with a macroseta on top and one median minor setae and one distal macrosetae.

Chelae: Manus moderate, rounded and all carinae obsolete, expressed by diffuse bands or infuscation. Trichobothria *Db* positioned on dorsal retrolateral carina and *Dt* positioned close to mid manus but on the proximal half.

Fingers: Fixed finger dentition: PD = 6, RD = 6, MD rows = 6, retrolateral denticles comparatively smaller than prolateral denticles. Movable finger PD = 7, RD = 7, MD rows = 7, distal row with one denticle, prolateral and retrolateral denticles subpaired. Trichobothria *ib* and *it* positioned between PD6 and PD7, PD7 lacking granule. Trichobothria series *db–dt* and *eb–et* distributed along the entire length of fixed finger. Trichobothria *db* and *eb* positioned basal on fixed finger. Fingers lacking scalloped and gap created when fingers are closed.

Legs: Spinules: Basitarsi I–II with prolateral ventral and retrolateral ventral carinae with complete rows of spinules, in III partial expressed on distal half and prolateral ventral absent, in IV absent; retrolateral median rows in I–IV vestigial expressed as few terminal spinules; retrolateral dorsal in I–III partial expressed on the distal third, in IV vestigial expressed on the distal margin as few distal spinules. Telotarsi I–IV with one or two pairs of ventrodistal spinules in I–IV. Setae: Prolateral ventral 4:4:5:5, median two in III and IV stout; retrolateral ventral 4:7:9:9, in III and IV four setae major and five minor; retrolateral dorsal, 3:3:3:4, dorsal 3:3:3:3, retrolateral dorsal and dorsal series arranged in two independent rows.

Tergites: Pretergites matte, posttergites shagreened, surface with scattered coarse and fine granules. Dorsal median and dorsal submedian carinae weak, with few distal moderated granules on proximal half. Tergite VII with intercarinal surfaces strongly shagreened with moderated rounded granules and minute granules. Dorsal median carina partial, expressed on proximal half, strongly costate and with few minute granulation; dorsal submedian vestigial expressed as a pair of distal irregular short row of granules; dorsal lateral and lateral supramedian comparatively stronger than prior carinae, with large conical crenulations, terminating in slightly larger spiniform tubercle projecting dorsally, dorsal lateral projecting and curving laterally almost reaching lateral supramedian distal margin, creating a semi ring.

Genital operculum: Male genital operculum: wider than long, with five pairs of macrosetae. Sclerites free on longitudinal edge moving independently but unable to open more than 45°. Genital papillae protruding posteriorly. Female genital operculum: Wider than long, with three macrosetae. Sclerites fuse longitudinal.

Sternites: Sternites III–VI with all carinae obsolete and surface punctuated, V in ♂ with distomedian glandular spot wide, distal white band occupying the surface between spiracles, protruding slightly from adjacent surfaces, in ♀ vestigial. Sternite VII matte, with carinae expressed only by setae: Ventral submedian with three enlarged microsetae, ventral lateral with three macrosetae. Distomedian glandular spot vestigial, weakly protruding from adjacent surfaces, translucent. Spiracle elongated, slit-like, approximately two times longer than wide.

Pectines: Distal margin of marginal lamella in ♂ evidently longer than distal margin of coxa VI, in ♀ slightly longer than distal margin of coxa VI. Basal piece in with three pairs of macrosetae. Marginal lamella consist of three sclerites, median lamella proximally fuse and with two rows of beads, one upper short subbasal with one to three beads and one lower complete row

with 15–17 beads. Fulcra with 17–19 in ♂ and 16–17 beads in ♀. Pectinal tooth count 19–21 in males and 17–18 in females.

Hemispermatophore: Lamina 1.3 longer than trunk. Median lobe ental terminus prominent and spiniform. Dorsal through margin long, narrow, curving proximally, and removed from the ventral trough. Primary and secondary hook positioned on the apex of the lateral margin extension of the lamina (flange), forming a deep notch. Hemi-mating plug developed from the inner lobe, distal barb margin with 11 elongated spinules. Basal plate of inner lobe adjacent to ventral trough. Neck of inner lobe almost as long as basal plate (0.9 times longer than basal plate). Measurements, lamina, 2.33; trunk, 1.83; dorsal trough/laminar hooks, 1.13; ventral trough/laminar hook, 0.86; neck, 0.36; basal plate, 0.40.

Metasoma: All intercarinal surfaces smooth and lustrous, except dorsal surface of metasomal segment I–IV and ventral surfaces in V with scattered moderated granules. Dorsal lateral carinae of metasomal segments I–IV and lateral median carinae of segments I–III strongly serrated, distal terminus with and enlarged spiniform tubercle pointing backwards; dorsal lateral in V with proximal serrated granules, medially with irregular moderated crenulations and distally these crenulations turning moniliform; lateral median in IV proximal terminus expanded or flared; lateral inframedian in I complete serrated, in II serrated expressed in distal half, in III serrated expressed in distal third, in IV absent, in V partial, proximal tubercle with few low and moderated scattered granules extending to proximal half; ventral lateral I–V strongly crenulated; ventral submedian I–III obsolete, expressed by macrosetae and infuscation, in IV obsolete except distal third with weak crenulations; ventral median in V strongly serrated. Setae: In ♀ dorsal lateral, 0:0:1:2:4; lateral median, 0:1:2:3; lateral inframedian, 1:1:1:1:3; ventral lateral, 2:3:3:3:7; ventral submedian, 3:3:3:4; ventral sublateral, 2; all carinae major, in ♂ all macrosetae relatively

smaller. Ventral submedian intercarinal surface in II and III with one or two accessory major macrosetae.

Telson: Ventral and dorsal surfaces smooth, four to five pairs of macrosetae per carinae in both sexes, proximal ventral margin of ventral submedian and lateral median carinae with a pair of enlarged crenulations. Laterobasal microserration of aculeus 3–6 sharp tines. Subaculear tubercle minute, expressed as a broad and low tubercle. Dorsal surface in males with an oval glandular spot positioned medially, slightly concave of variable size occupying approximately one third of the dorsal surface.

DISTRIBUTION: *Maaykuyak vittatus* is endemic to Baja California Sur and adjacent islands in the Sea of Cortez, Mexico. It is distributed from the San Isidro-La Purisima area in the central ranges of the Sierra de la Giganta to the south end of the peninsula in Los Cabos. It has been recorded on the following islands: Coronados, Partida, Espíritu Santo, and Cerralvo. *M. vittatus* presents a disjunct distribution: From San Isidro-La Purisima to the Comondús area represents the northern populations and the southern population extends from the Isthmus of La Paz to Los Cabos region. Museum specimens and recent fieldwork confirm the disjunction of this species in the area indicated in figure 89. Recent collections were conducted at El Pilar and 5−10 km S San Evaristo, which represent intermediate localities west and east of the Sierra de la Giganta respectively within the disjunction area; no specimens of *M. vittatus* were obtained.

ECOLOGY: This species has been collected at altitudes ranging from sea level to 850 m, these highest one in the Sierra de la Laguna. *M. vittatus* prefers mesic habitats; in Sierra de la Laguna it was collected on the slopes of the transitional plant community between deciduous tropical forest and oak-pine forest. According to Williams (1970c), the species is a burrower and prefers sandy compacted soils. However, *M. vittatus* has moderate leg armature and only makes

provisional shelters under rock by scraping soil, which agrees more with a lapidicolous ecomorphotype. In the vicinities of Sierra de la Laguna it was observed in burrows dug around rocks and root systems of trees. The texture of the soil at that locality had moderately compacted fine to sandy consistency (E. González-Santillán per. obs.). At that same locality the chactid scorpion *Nullibrotheas allennii* (Wood, 1863) was observed preying on *M. vittatus*. Jiménez-Jiménez and Palacios-Cardiel (2010) reported that *M. vittatus* is one of the most common species encountered within an assemblage of 16 species in five oases of Baja California Sur. The results of this survey also indicate that the Pacific coast of southern Baja California Sur, dominated by flat sandy areas, is a habitat inappropriate for this species, because the oases surveyed there did not yield any specimens of this species.

REMARKS: *Maaykuyak vittatus* was initially assigned to the *eusthenura* group of *Vaejovis* (Williams, 1970c) and then transferred to *Hoffmannius* (Soleglad and Fet, 2008). The genus *Hoffmannius* was recovered as polyphyletic consistently in the phylogenetic analyses conducted in chapter one and *Maaykuyak* as monophyletic, comprised of *M. vittatus* and *M. waueri.*

MATERIAL EXAMINED: **MEXICO: Baja California Sur:** Colonia de La Toba, 27 km N, 25°10'N 111°30'W, 30.i.1965, V. Roth, 2 ♂ (AMNH). *Municipio de Comondú*: El Crucero [Ciudad Constitución], 16 km N, 25°30'N 111°35'W, 15.ii.1966, V. Roth, 1 ♀ (AMNH); San Miguel de Comondú, 220 m, 12.vii.2004, 26°02'26.7"N 111°49'55.3"W, collected at night with UV light, 3 ♂ (AMNH [LP 3180]), 45 ♂, 21 ♀ (AMNH), 26°2.4330'N 111°49.9164'W, desert, collected at night with UV light, 16 ♂, 8 ♀ (AMNH [ARA 2554]), 10 ♂, 3 ♀, 2 subad. ♀ (CAS [ARA 1514]), 16 ♂, 6 ♀ (IBUNAM [ARA 2047]), E. González, O. Francke, W.E. Savary, and A. Valdez; San Miguel de Comondú, 2 km SW, 169 m, 12.vii.2004, 26°0.3'N 111°52.0164'W, desert, collected at night with UV light, 5 ♂, 5 ♀ (AMNH [ARA 2549]), 3 ♂, 2 subad. ♀ (CAS

[ARA 1509]), 5 ♂, 2 ♀, 1 subad. ♀ (IBUNAM [ARA 2042]), 26°0'18.5"N 111°52'1.3"W, collected at night with UV light, 9 ♂, 13 ♀, 2 juv. (AMNH), E. González, O. Francke, W.E. Savary, and A. Valdez. *Municipio de La Paz*: El Triunfo, 12 km W, 23°49.9980'N 109°58.99'W, 457 m, 12.x.1972, E.L. Sleeper and F.J. Moore, 2 ♂, 1 ♀, 3 subad. ♀ (OSAL); El Triunfo, S of La Paz, [23°49.9980'N 109°58.99'W], 3.ii.1965, V. Roth, 1 ♂, 1 ♀ (AMNH); Isla Cerralvo, [24°10.9332'N 109°53.2332'W], 6.vii.1921, 1 ♂ (AMNH), 4.viii.1986, 1 juv. (IBUNAM); Isla Espíritu Santo, [24°30'N 110°22'W], 29.ii.2005, 1 ♀ (IBUNAM), 3.i.2009, 2 ♂ (IBUNAM), ii.2011, 2 ♂, 4 ♀ (IBUNAM), 2.i.2012, 1 ♀ (IBUNAM), W. López-Forment; Isla Espíritu Santo, Ensenada de la Ballena, 5.v.1988, 1 juv. (IBUNAM); Isla Espíritu Santo, Playa Bonanza, 50 m, 31.v.2008, 24°27.3636'N 110°18.47'W, desert, collected at night with UV light, 7 ♂, 1 ♀, 2 subad. ♂ (AMNH [ARA 2859]), 8 ♂, 1 ♀, 2 subad. ♂ (IBUNAM [ARA 2239]), 24°27.364'N 110°18.471'W, bajada with cacti and scrub, collected at night with UV light, 1 ♀ (AMNH [LP 8800]), E. González and I.G. Nieto; La Paz, 15 km SE, 8.vii.2004, 24°3.7332'N 110°10.53'W, 476 m, desert, collected at night with UV light, 13 ♂, 7 ♀, 7 subad. ♀ (AMNH [ARA 2547]), 6 ♂, 4 ♀, 2 subad. ♀ (CAS [ARA 1507]), 13 ♂, 9 ♀ (IBUNAM [ARA 2040]), 24°3'44.7"N 110°10'32"W, 474 m, collected at night with UV light, 33 ♂, 12 ♀, 13 juv. (AMNH), O. Francke, E. González and A. Valdez; La Paz, 18 km SE, 24°2.7498'N 110°8.85'W, 626 m, 8.vii.2004, desert, collected at night with UV light, 21 ♂, 12 ♀, 3 subad. ♂, 11 subad. ♀ (AMNH [ARA 2553]), 7 ♂, 5 ♀, 6 subad. ♀ (CAS [ARA 1513]), 19 ♂, 8 ♀, 19 subad. ♀ (IBUNAM [ARA 2046]), 24°2'45.9"N 110°8'51.9"W, 625 m, collected at night with UV light, 47 ♂, 62 ♀, 43 ex. (AMNH), O. Francke, E. González, and A. Valdez; La Paz, 41 km NW, 256 m, 7.vii.2004, 24°4.5996'N 110°36.9498'W, desert, collected at night with UV light, 3 ♂, 3 ♀ (AMNH [ARA 1510]), 1 ♂, 1 ♀ (CAS [ARA 1511]), 2 ♂, 2 ♀ (IBUNAM [ARA 2044]),

24°4'36.2"N 110°36'57.1"W, collected at night with UV light, 5 ♂, 5 ♀ (AMNH), O. Francke, E. González, and A. Valdez; La Paz, 50 km NW, 24°5'56.2"N 110°43'41"W, 256 m, 7.vii.2004, O. Francke, E. González, and A. Valdez, collected at night with UV light, 1 ♂, 1 ♀ (AMNH [LP 3179]); La Paz, 51 km NW, 256 m, 7.vii.2004, 24°5.9328'N 110°4.98'W, desert, collected at night with UV light, 4 ♂, 1 ♀ (AMNH [ARA 2552]), 1 ♂ (CAS [ARA 1512]), 2 ♂, 1 ♀ (IBUNAM [ARA 2045]), 24°5'56.2"N 110°4.3'41"W, collected at night with UV light, 6 ♂, 2 juv. (AMNH), O. Francke, E. González, and A. Valdez; La Paz, ca. 10 km SE on BCS 286 to San Juan de los Planes, 24°08.433'N 110°15.333'W, 106 m, 9.vii.2005, L. Prendini and R. Mercurio, collected at night with UV light, 1 ♀ (AMNH [LP 4427]); La Paz, ca. 38 km N, 1 km off Route 1 on Ley Federal de la Reforma Agraria, 24°03.609'N 110°36.777'W, 256 m, 9.vii.2005, W.E. Savary and E. González, desert, collected at night with UV light, 1 ♂ (AMNH [LP 4442]), 2 ♂, 2 ♀ (AMNH [ARA 2559]); Las Cruces, 4 km NW, 31 m, 24.vi.2008, 24°13.5108'N 110°7.41'W, desert, collected at night with UV light, 5 ♂, 2 ♀ (AMNH [ARA 2873]), 5 ♂, 2 ♀ (IBUNAM [ARA 2258]), 24°13.511'N 110°07.410'W, collected at night with UV light, 1 ♀ (AMNH [LP 8815]), H. Montaño and E. González; Libramiento to Pichilingue marker km 4, by the Termoeléctrica Punta Prieta, 24°12.843'N 110°16.214'W, 105 m, 23.vi.2008, M. Correa, I.G. Nieto, and E. González, arroyo wash, sandy area, collected at night with UV light, 1 ♂ (AMNH [LP 8810]), 1 ♂ (AMNH [ARA 2872]), 2 ♂ (IBUNAM [ARA 2257]); Los Aripes, 56 km NW, [24°8.5333'N 110°18.65'W], 1.viii.1975, M.E. Soleglad and Erickson, 2 ♀ (AMNH); Todos los Santos, South, 10.vii.2004, 23°25.7832'N 110°11.5998'W, 80 m, desert, collected at night with UV light, 5 ♂, 4 ♀, 1 subad. ♂ (AMNH [ARA 2548]), 3 ♂, 2 ♀, 1 subad. ♀ (CAS [ARA 1508]), 5 ♂, 2 ♀, 1 subad. ♀ (IBUNAM [ARA 2041]), 23°25'47.6"N 110°11'36.1"W, 82 m, collected at night with UV light, 13 ♂, 6 ♀, 5 juv. (AMNH), 2 ♂ (AMNH

[LP 3182]), E. González, O. Francke, W.E. Savary, and A. Valdez; Valle Perdido, 4.3 km SE, 23°42.1860'N 110°7.5'W, 549 m, 16.x.1972, E.L. Sleeper and F.J. Moore, 4 subad. ♂ (OSAL). *Municipio de Loreto*: Boca de la Sierra, near Miraflores, 23°12'9.52"N 109°27'28.95"W, 10.ii.1966, V. Roth, 2 ♀ (AMNH); Loreto, 25 km S on gravel road ca. 250 m E Route 1, 25°48.6660'N 111°19.26'W, 6 m, 7.vii.2005, W.E. Savary, E. González, L. Prendini, and R. Mercurio, desert, collected at night with UV light, 9 ♂, 3 ♀ (AMNH [ARA 2557]), 8 ♂, 3 ♀ (IBUNAM [ARA 2050]); Loreto, 25 km S, on gravel road ca. 0.25 km E Route 1, 25°48.666'N 111°19.266'W, 6 m, 7.vii.2005, W.E. Savary, L. Prendini, R. Mercurio, and E. González, collected at night with UV light, 2 ♀ (AMNH [LP 4444]); Puerto Escondido, 1.6 km S, 25°48.6'N 111°18.55'W, 12 m, 12.xi.1972, E.L. Sleeper and F.J. Moore, 1 ♀ (OSAL); Santa Anita, 5 km N, [23°9'N 109°43'W], 152 m, 2.xii.1972, E.L. Sleeper and F.J. Moore, 1 ♀ (OSAL). *Municipio de Los Cabos*: Cabo San Lucas, 24 km E, [22°53.3833'N 109°54.933'W], 1.vi.1999, M.E. Soleglad, 1 ♀ (AMNH [LP 1681]); San Bartolo, 6 km SW, 23°41.8158'N 109°50.7996'W, 100 m, 13.vii.2008, H. Montaño and E. González, desert, collected at night with UV light, 13 ♂, 17 ♀, 9 juv. (AMNH [ARA 2853]), 13 ♂, 17 ♀, 9 juv. (IBUNAM [ARA 2233]), 1 ♂ (AMNH [LP 8842]); San José del Cabo, 27 km N, [23°3.9060'N 109°40.65'W], 9.ii.1966, V. Roth, 1 ♂, 1 ♀ (AMNH); San José del Cabo, 9.7 km E, 23°3.9060'N 109°40.65'W, 27.x.1972, E.L. Sleeper and F.J. Moore, 1 ♀ (OSAL); San José del Cabo, ca. 10 km S off Route 1, 23°1.7622'N 109°43.49'W, 50 m, 10.vii.2005, W.E. Savary, E. González, and R. Mercurio, desert, collected at night with UV light, 3 ♂, 1 ♀ (AMNH [LP 4440]), 10 ♂, 4 ♀ (AMNH [ARA 2558]), 9 ♂, 3 ♀ (IBUNAM [ARA 2051]); Santiago, 225 m, 9.vii.2004, 23°26.4'N 109°43.5666'W, desert, collected at night with UV light, 3 ♂, 10 ♀ (AMNH [ARA 2550]), 2 ♂, 1 subad. ♀, 2 juv. (CAS [ARA 1510]), 3 ♂, 4 ♀, 1 subad. ♂, 4 subad. ♀ (IBUNAM [ARA

2043]), 23°26'24.5"N 109°43'34.6"W, collected at night with UV light, 1 ♀ (AMNH [LP 3181]), 11 ♂, 11 ♀, 10 juv. (AMNH), O. Francke, E. González, and A. Valdez; Sierra de La Laguna, A. Valdez, E. González, O. Francke, and W.E. Savary, 782 m, 10.vii.2004, 23°14.2848'N 109°57.1314'W, tropical deciduous forest, collected at night with UV light, 1 ♂ (AMNH [ARA 2556]), 23°14'17.1"N 109°57'7.9"W, collected at night with UV light, 1 ♂ (AMNH), E. González and A. Valdez, 9.vii.2004, 23°38.5500'N 109°54.0828'W, 717 m, transitional forest, under rock, 1 ♂ (AMNH [ARA 2555]), 23°41.1666'N 109°56.6832'W, 850 m, 1 ♂, 1 ♀ (IBUNAM [ARA 2048]), O. Francke, E. González, and A. Valdez, 9.vii.2004, 23°38'33.5"N 109°54'5.1"W, 717 m, collected at night with UV light, 1 ♂, 1 ♀, 2 juv. (AMNH), 23°41'10"N 109°56'41.1"W, 850 m, collected at night with UV light, 1 ♂ (AMNH); Sierra de La Laguna, Ejido de La Burrera, [23°33'1.6"N 110°2'28.7"W], 517 m, 20.vii.2004, A. Valdez, E. González, O. Francke, and W.E. Savary, tropical deciduous forest, collected at night with UV light, 7 ♂, 4 ♀, 1 juv. (AMNH), 5 ♂, 1 ♀ (AMNH [ARA 2546]), 1 ♂, 1 ♀ (CAS [ARA 1506]), 2 ♂, 2 ♀ (IBUNAM [ARA 2039]); Sierra de La Laguna, La Burrera, 18.x.1972, E.L. Sleeper and F.J. Moore, 4 ♀ (OSAL).

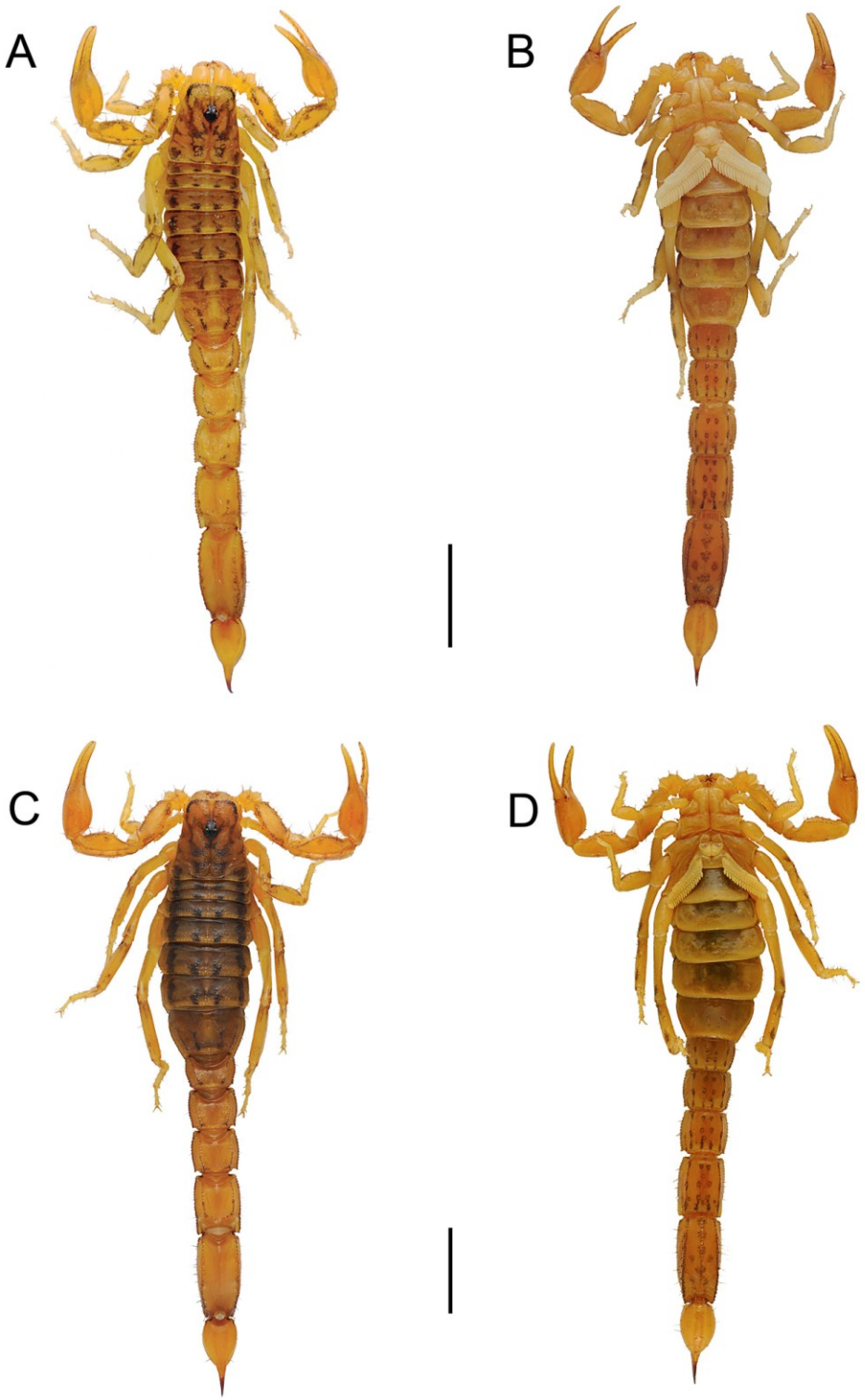


Figure 87. *Maaykuyak vittatus* (Williams, 1970), habitus. **A**, **B**. ♂ (AMNH). **C**, **D**. ♀ (AMNH). **A**, **C**. Dorsal aspect. **B**, **D**. Ventral aspect. Scale bars = 5 mm.

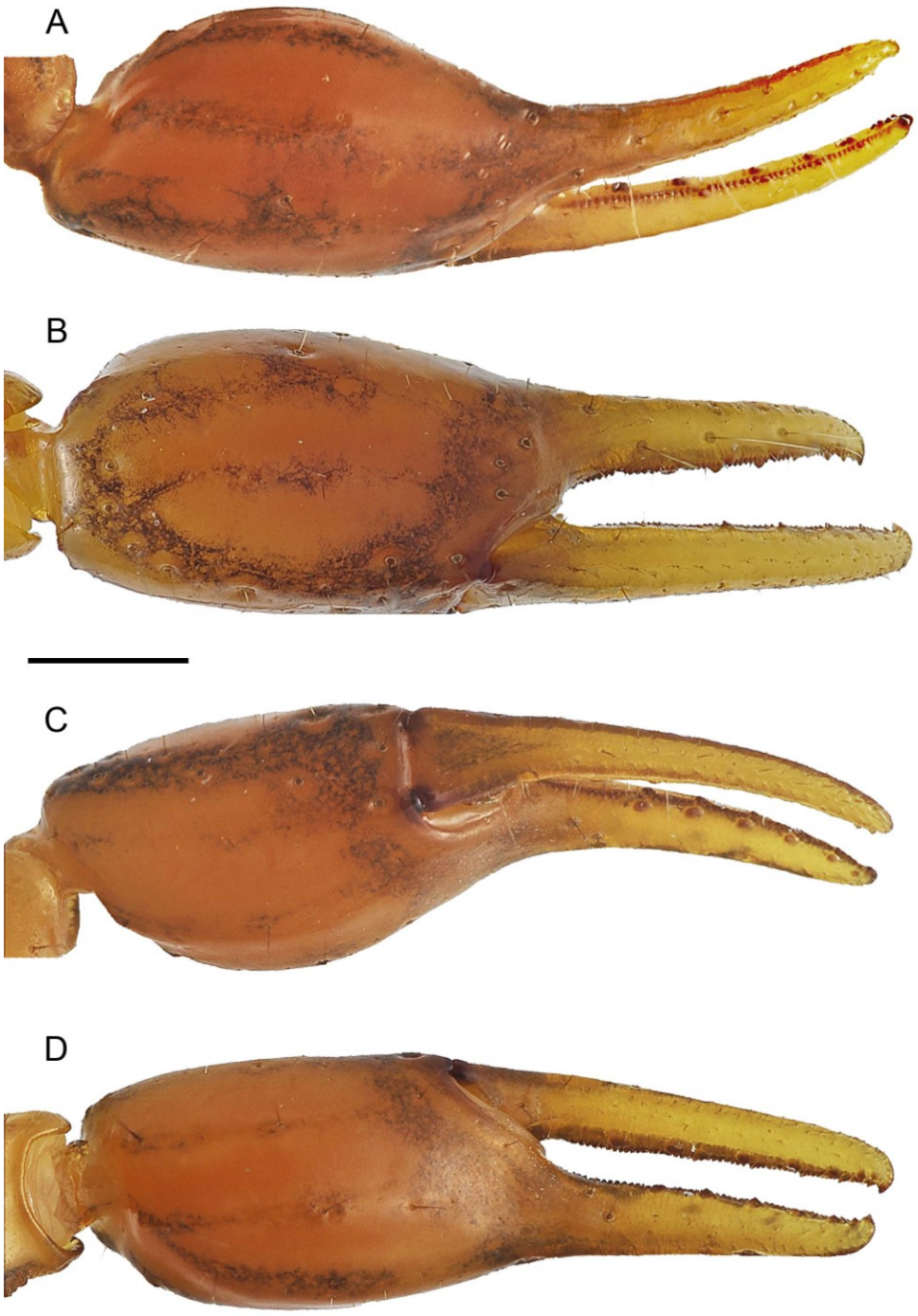


Figure 88. *Maaykuyak vittatus* (Williams, 1970), ♂ (AMNH), dextral pedipalp chela. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

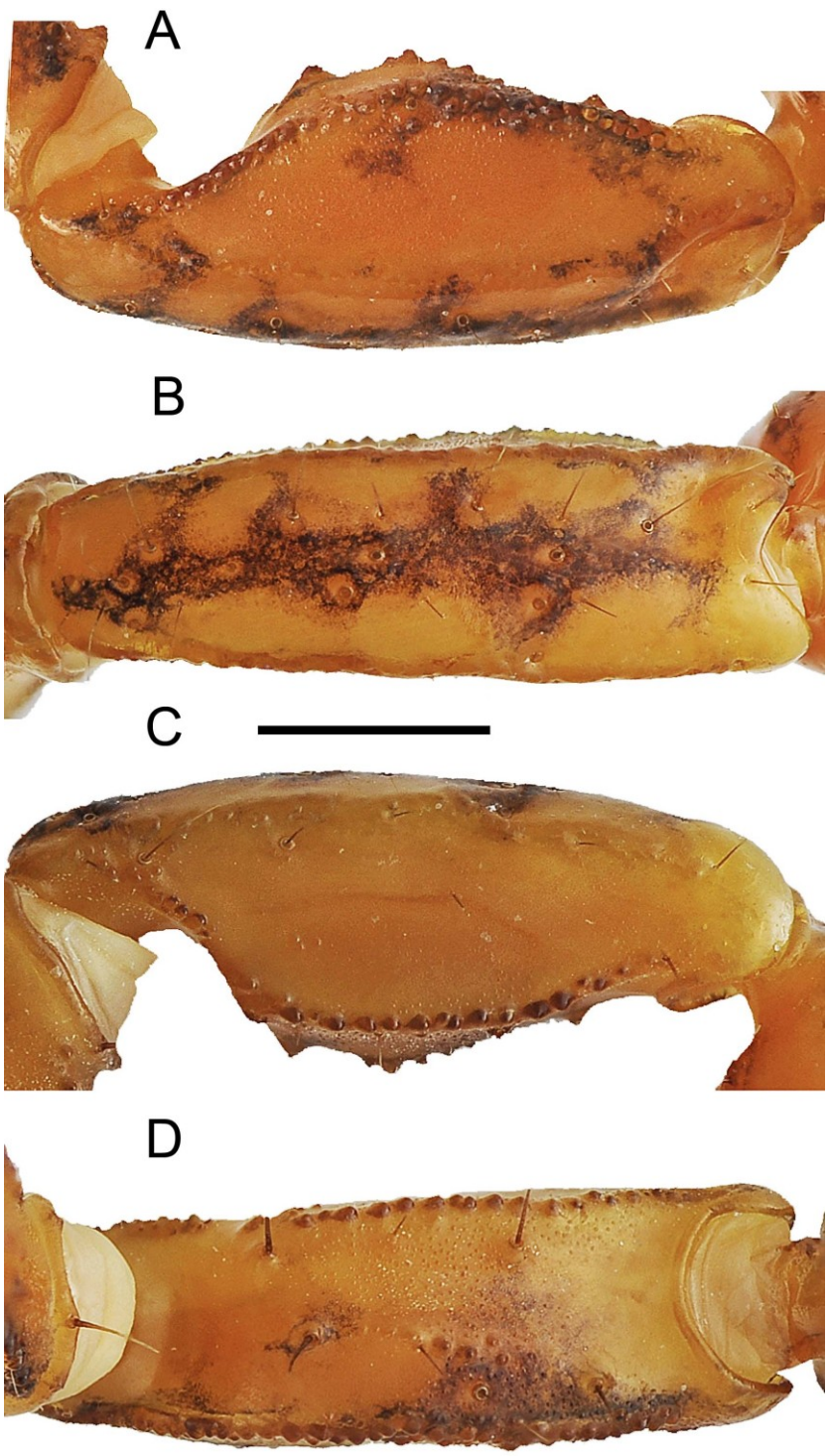


Figure 89. *Maaykuyak vittatus* (Williams, 1970), ♂ (AMNH), dextral pedipalp patella. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

Maaykuyak waueri (Gertsch and Soleglad, 1972)

Figures 86, 90–92, 107B, 109B, 110B, 111B, 114B, 115B, 117B

Vejovis waueri Gertsch and Soleglad, 1972: 605, figs. 145, 146.

Vejovis bilineatus: Gertsch, 1939: 18 (probable misidentification).

Vaejovis waueri: Stahnke, 1974: 136; Sissom and Francke, 1983: 70; Brown and Formanowick, 1996: 41, 46; Yahia and Sissom, 1996: 86; Kovařík, 1998: 148; Sissom and Jackman, 1997: 151, 155; Beutelspacher, 2000: 116, 143, 154, map 97; Sissom, 2000: 537; Hendrixson, 2001: 47, 49, 52, 54, figs. 1, 3; Brown et al., 2002: 409, 411, 412, fig. 1, 413, 414, fig. 3, 415, 416, fig. 5, 417, 418; Brown, 2003: 2187, 2188; Sissom and Hendrixson, 2005a: 127, tab. 6.2, 133, 134; 2005b: 34, 41 (identification key); Graham and Fet, 2006: 6, 9; Barron and Weidlich, 2009: 400, 401; McWest, 2009: 16, fig. 11, 19, tab. 1, 20, 41, 54, 55, 62–67, 99, 119; Warburg, 2011: 177.

Hoffmannius waueri: Soleglad and Fet, 2008: 4, 68, 71, 91.

TYPE MATERIAL: **U.S.A.: Texas:** *Brewster Co.*: Holotype ♀ (AMNH), The Basin, Chisos Mountains, Big Bend National Park, 28.ix.1950.

DIAGNOSIS: *Maaykuyak waueri* (adults at 25 mm) is distinctly smaller than *M. vittatus* (adults at 36 mm). These two species share pale coloration of the cuticle, although some populations of *M. waueri* have darker coloration. *M. waueri* has pedipalp chelae and metasomal segment V completely infuscate, in *M. vittatus* the infuscation of intercarinal surfaces nerve converge and is more diffuse. The lateral inframedian carina of metasomal segments I–III is expressed on distal half in *M. waueri*, but in *M. vittatus* are expressed in the distal third. The basitarsi of *M. waueri* has macrosetae equally developed in all carinae, *M. vittatus* has the

prolateral ventral macrosetae stouter in I–IV, which is more obvious in basitarsi II–IV. The telotarsi of *M. waueri* has commonly one pair of ventral distal spinules, occasionally one side with two spinules; in *M. vittatus* there are consistently two pairs. Whereas *M. waueri* has the ental terminus of the hemispermatophore median lobe moderated and rounded, *M. vittatus* has the ental terminus prominent and spiniform.

DESCRIPTION: The following descriptions supplements Gertsch and Soleglad's (1972) original description. It is based on additional freshly collected and museum ♂ and ♀ specimens of the collections mentioned below.

Color and infuscation (in alcohol): Base color pale yellow straw to orange, carapace, tergites, pedipalps, metasoma, and telson infuscate with dusky markings. Markings may vary from scattered disperse blotches to more extended converging patters creating continuous variegated infuscation, eespecially on carapace and tergites. Ocular tubercle intensely infuscate. Intercarinal surfaces of pedipalp chelae and base of pedipalp fingers intensely to diffusely infuscate, all carinae outlined with intense darker infuscation. Ventral and lateral carinae of metasomal segments I–V outlined with fine infuscation; ventral lateral and submedian carinae from I to V progressively more infuscate, starting with macrosetae base in I and II to infuscation connecting basal macrosetae infuscation. Segment V with all intercarinal surfaces intensely infuscate. Telson bright orange to yellowish, contrasting with pale yellow of metasomal segments Aculeus reddish at base turning brownish distally. Ventral surface of telson diffusely infuscate turning more intense on distal aspect and base of aculeus.

Carapace: Carapace anterior margin sublinear lacking median notch and with three pairs of macrosetae. Carapace surface matte. Anteromedian, posteromedian, and posterolateral moderated, posterior transverse obsolete. Ocular tubercle raised, superciliary carina smooth and

weak lower than medina eyes. Median eyes approximately double size of lateral frontal pair. Three lateral eyes, two frontal pairs same size and posterior reduced approximately in half.

Sternum and coxal region: Sternum pentagonal subequilateral with three pairs of setae, one distal, one median pair and one pair on the lobes, median notch deep. Anterior margin of coxa II with three oblique slit-like structures, adjacent to a low smooth protuberance, rest of the margin smooth. Base of coxal endite II with a broad depression each.

Chelicerae: Dorsal surface smooth, dentition of fixed and movable fingers as in typical vaejovids. Subdistal margin of manus with one median macrosetae each. Serrula with 6–7 tines.

Pedipalps: Trichobothrial pattern Type C, orthobothriotaxic. Femur: All intercarinal surfaces matte. Dorsal retrolateral, dorsal prolateral, and ventral prolateral carinae irregularly granulated; retrolateral dorsosubmedian obsolete, expressed by two medial macrosetae; prolateral ventrosubmedian vestigial expressed by a proximal tubercle and two moderated conical granules with a macroseta on base distributed the first, at first third, and the second on mid segment; prolateral ventral vestigial, expressed by a proximal tubercle with a macroseta on base and two enlarged conical moderated granules with a macroseta on base, distributed the first at basal fourth , and second by median third; ventral median vestigial expressed by a proximal row of enlarge subserrate granules merging with ventral prolateral carinae; retrolateral ventral obsolete; ventral retrosubmedian vestigial, expressed by two or three proximal broad crenulations.

Patella: All intercarinal surfaces matte. Dorsal prolateral and ventral prolateral strongly and irregularly granular with moderated granules; ventral retrosubmedian and dorsal retrolateral weakly angular to costate smooth; ventral median vestigial expressed as a basal short row of low crenulations; retrolateral dorsosubmedian and retrolateral median obsolete, expressed only by

bands of infuscation; prolateral median on a vaulted projection extending from a basal granule with a macroseta on top, to distal end of the segment, expressed by a row of six to seven large subserrate granules and one medial and one distal macrosetae, trichobothrium d_2 positioned by midway the extension of this carinae; prolateral ventral obsolete expressed on medial third by a proximal low tubercle with a macroseta on top and one distal macrosetae, lacking ornamentation.

Chelae: Manus moderate, rounded and all carinae obsolete, expressed by intense bands or infuscation. Trichobothria *Db* positioned on dorsal retrolateral carina, subbasal on chela manus and *Dt* positioned close to mid manus but on the proximal half.

Fingers: Fixed finger dentition: PD = 6, RD = 5, MD rows = 5. Movable finger PD = 7, RD = 5, MD rows = 5, distal row with one denticle. Prolateral and retrolateral denticles subpaired; trichobothrium *ib* positioned at PD7, PD7 lacking granule, and *it* positioned between PD6, and PD7, both positions lacking granule. Trichobothria series *db–dt* and *eb–et* distributed along the entire length of fixed finger. Trichobothria *db* and *eb* positioned basal on fixed finger. Fingers lacking scalloped and gap created when fingers are closed.

Legs: Spinules: Basitarsi I–II with prolateral ventral and retrolateral ventral carinae with complete rows of spinules, in III prolateral ventral and retrolateral ventral incomplete expressed on distal half, in IV prolateral ventral and retrolateral ventral carinae rows absent; retrolateral median rows in I–IV vestigial expressed as few terminal spinules; retrolateral dorsal in I–III partial expressed on the distal third, in IV vestigial expressed on the distal margin as few distal spinules prolateral ventral absent in I–IV. Telotarsi I–IV with one pair of ventrodistal spinules in I–IV, occasional with two. Setae: Prolateral ventral, 3:3:3:3, basal two in IV stout; retrolateral ventral, 3:4:4:5; retrolateral dorsal, 3:3:3:4; dorsal, 3:3:3:3; retrolateral dorsal, dorsal series arranged in two independent rows.

Tergites: Pretergites matte, posttergites shagreened, surface mostly matte, with few scattered moderated granules. Dorsal median and dorsal submedian carinae vestigial, with few distal moderated granules on proximal half. Tergite VII with intercarinal surfaces matte. Dorsal median carina vestigial, expressed on proximal third, weakly costate; dorsal submedian vestigial expressed as a paired short row of two or three granules; dorsal lateral and lateral supramedian comparatively stronger than prior carinae, with large serrated granules, increasing in size distally, terminating in a larger spiniform tubercle projecting backwards, dorsal lateral expressed on distal two third and lateral supramedian on distal third.

Genital operculum: Male genital operculum: wider than long, with three pairs of macrosetae. Sclerites free on longitudinal edge moving independently but unable to open more than 45°. Genital papillae protruding. Female genital operculum: Wider than long, with three macrosetae. Sclerites fuse longitudinal.

Sternites: Sternites III–VI with all carinae obsolete and surface punctuated, V with distomedian glandular spot absent, in both sexes. Sternite VII matte, with carinae obsolete expressed only by setae; ventral submedian with three enlarged microsetae; ventral lateral with three macrosetae, ventral sublateral and lateral inframedian intercarinal surface with a cluster of three to six macrosetae; distomedian glandular spot vestigial, weakly protruding from adjacent surfaces in ♂, obsolete in ♀. Spiracle elongated, slit-like, approximately two times longer than wide.

Pectines: Distal margin of marginal lamella in ♂ evidently longer than distal margin of coxa VI, in ♀ slightly longer than distal margin of coxa VI. Basal piece in with one pairs of macrosetae. Marginal lamella consist of three sclerites densely covered with macrosetae, median lamella proximally fuse and with two rows of beads, one proximal short subbasal with one to

three beads and one distal complete row with 7–9 beads. Fulcra with 11–14 in ♂ and 10–14 beads in ♀. Pectinal tooth count 12–15 in ♂and 11–15 in ♀.

Hemispermatophore: Lamina 1.2 longer than trunk. Median lobe ental terminus moderated and rounded. Dorsal through margin long, narrow, curving proximally, and removed from ventral trough. Primary and secondary lamellar hook positioned on the apex of lateral margin extension of the lamina. Primary and secondary hooks terminus spiniform, both hooks enlarged, separated, bended dorsally, and forming a deep notch. Hemi-mating plug developed from the inner lobe, distal barb margin with 10 short spinules. Basal plate of inner lobe removed from ventral trough. Neck of inner lobe relatively short (0.7 times longer than basal plate). Measurements, lamina, 1.43; trunk, 1.16; neck, 0.30; basal plate, 0.23; ratios: dorsal trough/laminar hooks, 0.53; ventral trough/laminar hook, 0.40.

Metasoma: All intercarinal surfaces matte. Dorsal lateral carinae of metasomal segments I–IV and lateral median carinae of segments I–III crenatoserrate, distal terminus with and enlarged spiniform tubercle pointing backwards; dorsal lateral in V strong, irregular with rounded moderated, and serrated granules; lateral median in IV proximal terminus expanded or flared; lateral inframedian in I complete serrated, in II irregular with scattered low serrations expressed in distal half, in III irregular with scattered low serrations expressed in distal third, in IV absent, in V partial, with a proximal serrated tubercle and few low moderated scattered granules extending to proximal half; ventral lateral I–III partial with scattered moderated serrations on distal half, in IV complete with scattered moderated serrations; ventral submedian I–III obsolete, expressed by macrosetae and infuscation, in IV vestigial, with distal third weakly crenulated; ventral median in V strongly serrated. Setae: In ♀ dorsal lateral, 1:2:2:3:8; lateral median, 1:2:3:5; lateral inframedian, 4:4:5:5:13; ventral lateral, 3:3:3:5:7; ventral submedian,

3:3:3:4; ventral sublateral, 2; all carinae major, distal margin of segment IV with three pairs of macrosetae. Ventral lateral and ventral submedian intercarinal surface in all segments with two or four additional macrosetae, creating a hirsute appearance of the metasoma.

Telson: Ventral surface weakly crenulated, proximal edge of ventral submedian and ventral sublateral with a paired tubercle; distal surface of these carinae with broad crenulations; ventral median carinae with a small rounded subaculear tubercle; each carinae with six or seven macrosetae. Dorsal surface in ♂ with an oval glandular spot positioned medially, of variable size occupying approximately one third of the dorsal surface, in ♀ reduced to half the size.

DISTRIBUTION: *Maaykuyak waueri* is endemic to the Chihuahuan desert and has been recorded in the states of Coahuila, Durango, and Nuevo León in Mexico, and in the U.S.A. only in the state of Texas. Although there is not published locality of this species in Chihuahua, Sissom (2000) and Sissom and Hendrixson (2005a) cited the presence of this species in the state. The distribution map presented here complements that of Hendrixson (2001) showing new records of distribution for the states of Coahuila, Durango, and Nuevo León.

ECOLOGY: *Maaykuyak waueri* is a small and fragile scorpion adapted to rocky arid slopes, which conforms to lapidicolous ecomorphotype. It has been recorded at elevations of 619–1922 m. It is commonly found resting under rocks during the day and observed on the surface at night using ultraviolet detection. It was also collected in leaf litter by disturbing upper layers during daylight. At Chandler Independence Creek Preserve, Terrell Co., Texas, Brown et al. (2002) reported that *M. waueri* is the second most abundant species in an assemblage of eight species. This species is more active at night during summer and fall, which corresponds to the rainy season in that area. This annual period also coincides with parturition and mating.

REMARKS: Gertsch and Soleglad (1972) originally assigned *Maaykuyak waueri* to the *spinigerus* group of *Vaejovis*. They also reported specimens from Sonora in the region of Alamos, which were subsequently were assigned to *Vaejovis pequeno* Hendrixson, 2001, restricting *M. waueri* to the Chihuahuan Desert. More recently, Soleglad and Fet (2008) devised the name *Hoffmannius* (which it was recovered as polyphyletic in the phylogenetic analyses conducted elsewhere), to include the species of the former *eusthenura* group of *Vaejovis* (Sissom, 2000).

MATERIAL EXAMINED: **MEXICO: Coahuila:** *Municipio de Cuatro Ciénegas*: Ojo de Agua, Ejido El Oso, 27°3.3594'N 102°13.5816'W, 1039 m, 19.vii.2006, E. González, W.D. Sissom, K. McWest, and O. Francke, 2 ♂ (AMNH [LP 6544]), 1 subad. ♂ (IBUNAM). *Municipio de General Cepeda*: El Nogal, 2 km S, Sierra de la Concordia, 25°16.788'N 101°25.775'W, 1730 m, 22.vii.2006, O. Francke, S. Grant, and A. Ballesteros, 1 juv. (AMNH [LP 6565]); El Nogal, 5 km S, Sierra de la Concordia, 1804 m, 22–23.vii.2006, 25°16.2498'N 101°25.6338'W, 1 ♂, 1 ♀ (IBUNAM), 5 ♂ (AMNH [ARA 1132]), 25°16.250'N 101°25.634'W, collected at night with UV light, 2 ♂ (AMNH [LP 6485]). *Municipio de Monclova*: El Rayo Ranch, P. Brandant, 1 ♀ (IBUNAM). *Municipio de Parras*: Sierra Parras, ca. 8 km S of Parras, 21.vii.2006, 25°23.0550'N 102°10.89'W, 1900 m, scrubland, collected at night with UV light, 2 ♂ (IBUNAM [ARA 0075]), 2 ♂ (IBUNAM), 25°22.974'N 102°11.145'W, 1922 m, 1 ♂ (AMNH [LP 6487]), B. Hendrixson, K. McWest, E. González, and S. Grant. *Municipio de Ramos Arizpe*: Sierra La Gavia, 26°12'44.8"N 101°9'35.9"W, 1153 m, 28.i.2006, P. Sprouse, 1 ♀, 2 juv. (AMNH [LP 6375]). *Municipio de Saltillo*: Saltillo, [25°26.00150'N 100°59.0033'W], 22.viii.1947, W.J. Gertsch, 1 ♀ (AMNH). *Municipio de Sierra Mojada*: Sierra Mojada, 20.vii.2006, 27°18.5988'N 103°42.74'W, 1604 m, desert, collected at night with UV light, 3 ♂

(AMNH [ARA 1106]), 1 ♂ (AMNH [LP 6453]), 27°19.188'N 103°43.135'W, 1605 m, 1 ♂ (AMNH [LP 6421]). **Durango:** *Municipio de Gómez Palacio*: Dinamita, 1328 m, 29.viii.2005, 25°44.0886'N 103°40.3998'W, collected at night with UV light, 2 ♂, 1 ♀ (IBUNAM [ARA 2062]), 25°44.089'N 103°40.400'W, collected at night with UV light, 1 ♂, 1 ♀ (AMNH [LP 5295]). *Municipio de Tlahualilo*: Hwy 49, at deviation Montes Claros-Tlahualilo de Zaragoza, 26°9.242'N 103°31.284'W, 1107 m, 6.viii.2005, O. Francke, W.D. Sissom, K. McWest, C. Lee, H. Montaño, J. Ballesteros, L. Jarvis, and C. Durán, collected at night with UV light, 1 ♀ (AMNH [LP 5270]). **Nuevo León:** *Municipio de Bustamante*: Bustamante, 4.8 km S, at base of Sierra de Bustamante, [26°32.06667'N 100°30.1666'W], 21.ii.1964, J. Reddell, 1 ♀ (AMNH); Bustamante, 6.4 km S, 26.iii.1964, B. Russell, under rock, 1 ♀ (AMNH); near the town of Bustamante, 26.xii.1963, B. Russell, under rock, 1 ♀ (AMNH). *Municipio de Monterrey*: Cañón de La Huasteca, 25°36.8796'N 100°28.53'W, 780 m, 24.vii.2006, O. Francke, W.D. Sissom, K. McWest, B. Hendrixson, S. Grant, A. Jaimes, and M. Córdova, scrubland, collected at night with UV light, 2 ♂ (AMNH [ARA 1076]), 2 ♂ (IBUNAM [ARA 0090]); La Huasteca Recreation Park, Santa Catarina Mountains, 723 m, 10.vi.2006, R.C. West, 1 ♀ (AMNH [LP 6217]); Potrero de Chico, N of Monterrey, 25°56'24.40"N 100°28'41.15"W, 731 m, 3.v.2008, R.C. West, 1 ♀ (AMNH [LP 8551]). *Municipio de Santa Catarina*: Cañón de La Huasteca, 25°36.8736'N 100°28.5306'W, 780 m, 24.vii.2006, O. Francke, W.D. Sissom, K. McWest, B. Hendrixson, S. Grant, A. Jaimes, M. Córdova, E. González, and A. Ballesteros, 1 ♀ (AMNH [LP 6513]). **U.S.A.: Texas:** *Brewster Co.*: Basin, Chisos Mountains, [29°28'25.80"N 103°19'23.10"W], S. Mulaik, 5.x.1938, 1 subad. ♂ (IBUNAM), 28.v.1952, 1 subad. ♀ (IBUNAM), C.A. Triplehorn, 12.vii.1968, 1 ♂ (IBUNAM); Big Bend National Park: J.A. Brubaker and F.J. Moore, 4.ix.1972, 1 ♀ (OSAL), Chisos Mountains Cat-tail Canyon, [29°17'14.42"N 103°12'44.73"W], 20.iii.1977,

V. Roth and Schroepfer, 1 ♀, 1 juv. (AMNH), Grapevine Hills, N side, 29°24.6241'N 103°12.4611'W, 1.viii.2008, W.D. Sissom, G. Casper and T. Anton, 1 ♂ (AMNH), in Basin, [29°17'14.42"N 103°12'44.73"W], J.A. Brubaker and F.J. Moore, 3.ix.1968, 1 ♀ (IBUNAM), W.E. and M.K. McAlister, 22.viii.1959, 1 subad. ♂ (IBUNAM), 1 subad. ♀ (AMNH), Old One Road, 29°12.4890'N 102°59.5974'W, 619 m, 30.vii.2008, W.D. Sissom, G. Casper, and T. Anton, 1 ♂ (AMNH), Pine Canyon trail, Chisos Mountains, 29°16.0709'N 103°14.2254'W, 1.viii.2008, W.D. Sissom, G. Casper, and T. Anton, 1 ♂, 1 ♀ (AMNH), Pine Canyon, 3.ix.1968, J.A. Brubaker and F.J. Moore, 1 ♂ (IBUNAM), 1 subad. ♂ (IBUNAM), Rio Grande Village, 23.iii.1977, V. Roth and Schroepfer, 1 ♀ (AMNH), The Basin, Chisos Mountains, [29°17'14.42"N 103°12'44.73"W], C.D. Duncan, 16.vii.1921, 1 ♀, 16 juv. (AMNH), S. Mulaik, 26.vii.1938, 1 ♀ (AMNH), 5.viii.1938, 2 ♂, 1 ♀ (AMNH), W.J. Gertsch, 28.ix.1950, 1 ♀ (IBUNAM), 1 ♂, 2 ♀ (AMNH), W.J. Gertsch and Hastings, 28.v.1952, 17 ♀, 1 juv. (AMNH), 1828 m, 25.viii.1967, 2 ♂, 1 ♀ (AMNH); Black Gap Wildlife Management Area, 1.8 km down S fork of Camp 18 Road, [29°32.84200'N 102°54.6285'W], 18.vii.2004, L. Jarvis and T. Anton, 1 juv. (AMNH [LP 2973]), 1 juv. (AMNH [LP 2974]); Bruce Ranch, Glass Mountains, [30°30'N 103°W], 1430 m, 1.i.2005, P. Sprouse, 1 ♀ (AMNH [LP 3637]); Hot Springs, 16 km N, on Marathon Road, [29°10.9326'N 102°59.5464'W], 21.vii.1938, S. Mulaik, 1 ♀ (AMNH), 1 subad. ♀ (IBUNAM). *Hidalgo Co.*: Edinburg, [26°18.250'N 98°9.833'W], xii.1939, S. Mulaik, 2 ♂, 1 ♀ (AMNH), 1 subad. ♀ (IBUNAM). *Jeff Davis Co.*: Fort Davis, [30°35.750'N 103°55.55'W], 8.vi.1902, 1 ♀ (AMNH). *Presidio Co.*: Big Bend Ranch State Park, Ojito Adentro, 29°29.5'N 104°4'W, Platnick Expedition, 3.x.2005, 1 ♂ (AMNH), D. Ubick, 1 ♂ (IBUNAM). *Starr Co.*: Rio Grande City, 26°23.025'N 98°47.091'W, 25.viii.2008, W.D. Sissom, G. Casper, and T. Anton, 1 ♀ (AMNH); base of rocky hill on N side of town, 1 subad. ♂ (AMNH [LP 11042]), 1

♀ (AMNH); Rio Grande, 8 km E, [26°23.025'N 98°47.091'W], 1.vi.1939, D. Mulaik, 1 ♀, 14 juv. (AMNH). *Terrell Co.*: Dryden, 14.5 km W, [30°2.66633'N 102°6.850166667'W], 13.i.1950, 1 ♀ (AMNH); Sanderson, [30°8.46667'N 102°23.75'W], 26.v.1952, M. Cazier, W.J. Gertsch, and R. Scrammel, 1 ♀ (AMNH), 1 ♂ (IBUNAM); Sheffield, 30 km S, Blackstone Ranch, [30°41.433'N 101°49.35'W], 16–17.vii.1958, W. McAlister, 1 ♀ (IBUNAM); Sheffield, 30.5 km S, Blackstone Ranch, 16–17.vi.1958, W. McAlister, 5 ♀ (AMNH). *Val Verde Co.*: Langtry, [29°48.51783'N 101°33.57533'W], 19.iii.1960, W.J. Gertsch, W. Ivei, and Schrammel, 3 ♀ (AMNH); Pecos River, 29°41.9820'N 101°58.29'W, 3.ix.1972, J.A. Brubaker and F.J. Moore, 1 ♀ (OSAL). *Zapata Co.*: Laredo, 51 km E, [27°31.46667'N 99°29.43566667'W], S. Mulaik, 11.xi.1934, 1 ♂, 4 ♀ (AMNH), 1 subad. ♂ (IBUNAM), 9.ii.1935, 1 ♀ (AMNH); Laredo, 51 km SE, 6.vi.1941, S. Mulaik, 3 ex. (AMNH).

Figure 90. *Maaykuyak waueri* (Gertsch and Soleglad, 1972), habitus. **A**, **B**. ♂ (AMNH). **C**, **D**. ♀ (AMNH). **A**, **C**. Dorsal aspect. **B**, **D**. Ventral aspect. Scale bars = 5 mm.

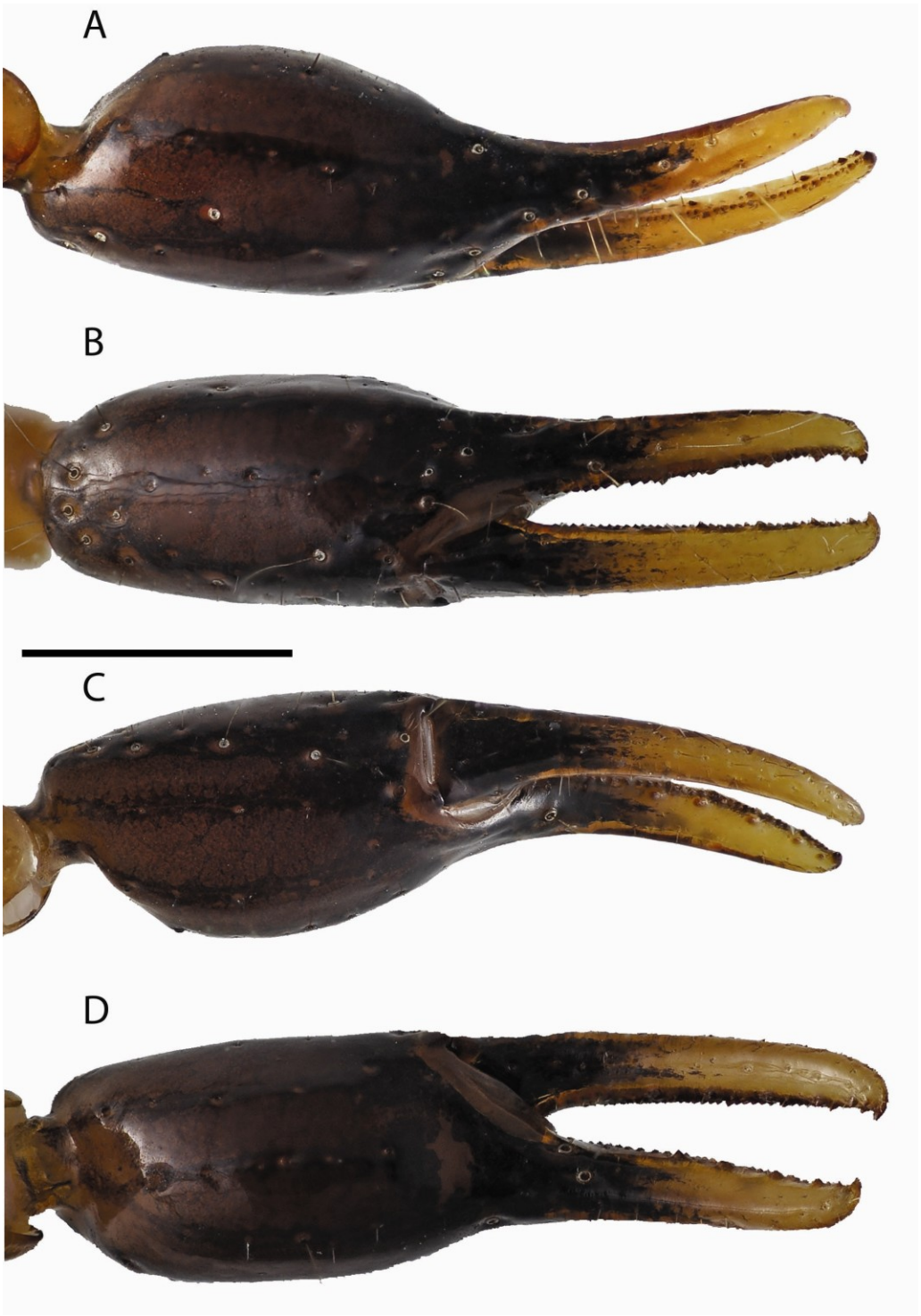


Figure 91. *Maaykuyak waueri* (Gertsch and Soleglad, 1972), ♂ (AMNH), dextral pedipalp chela. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

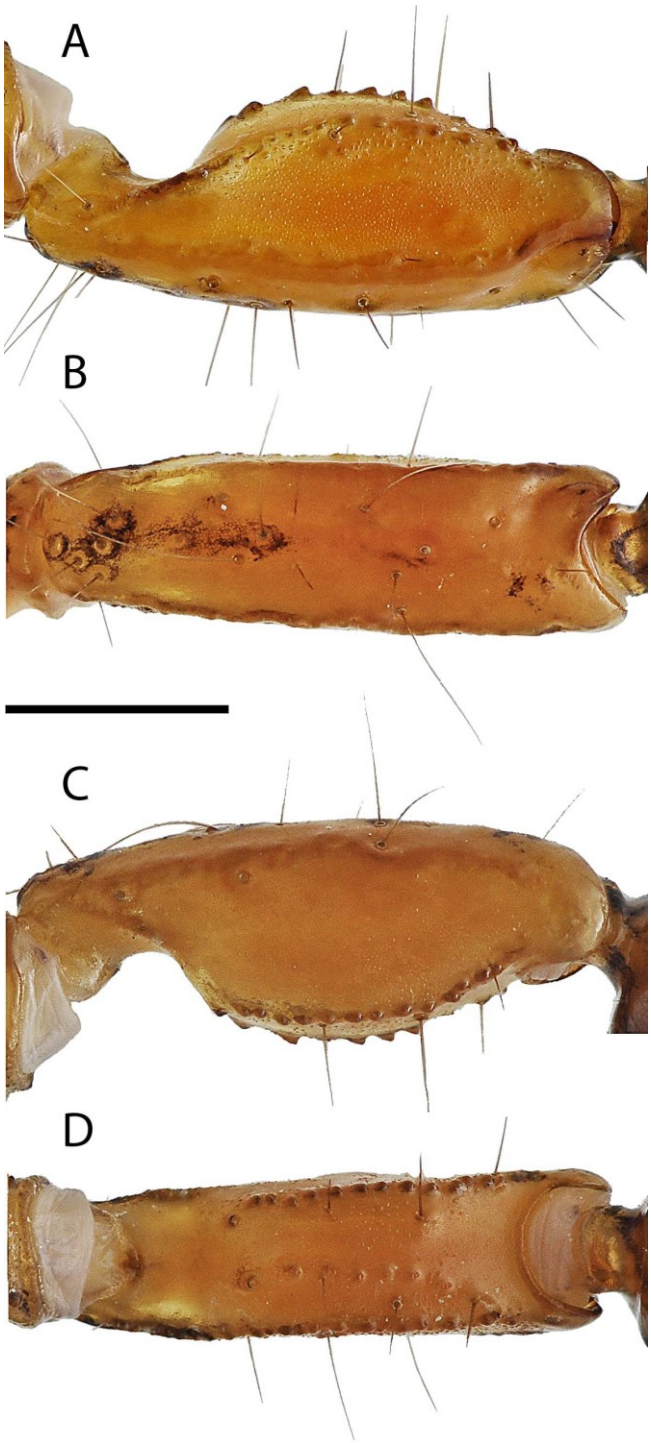


Figure 92. *Maaykuyak waueri* (Gertsch and Soleglad, 1972), ♂ (AMNH), dextral pedipalp patella. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

VIZCAINO González-Santillán and Prendini, in prep.

Vizcaino viscainensis (Williams, 1970)

Figures 93–96, 97D, 109D, 110C, 111C, 114C, 115C, 117C

Vejovis viscainensis Williams, 1970a: 410–413, figs. 9, 10.

Vejovis viscainensis: Soleglad, 1973b: 359, tab. 4.

Paruroctonus viscainensis: Stahnke, 1974: 138; Kovařík, 1998: 144.

Vaejovis viscainensis: Díaz-Nájera, 1975: 7, 10, 17; Williams, 1980: 54, 70, 71, figs. 53O, 54L, 59, 73; 1986: 355; Beutelspacher, 2000: 113, 137, 138, 154, map 95; Sissom, 2000: 536; Soleglad and Fet, 2003b: 9, figs. 6, 70; Sissom and Hendrixson, 2005a: 127, tab. 6.2; Soleglad and Fet, 2005: 6; McWest, 2009: 4, 19, tab. 1, 54, 58, 62, 63, 98, 119, figs. 174–178.

Hoffmannius viscainensis: Soleglad and Fet, 2008: 50, tab. 3, 50, 53, 56, fig. 150, 60, fig. 166, 69, 73, 82, 91.

TYPE MATERIAL: **MEXICO: Baja California:** *Municipio de Ensenada*: Holotype ♂ (CAS, Type No. 10429), 2 mi [3.2 km] NW Miller's Landing, [ca. 5 km W of Route Mexico 1, ca. 65 km N of Guerrero Negro], [28°29'10.63"N 114° 4'0.82"W], 21.vi.1968, S.C. Williams, M. Cazier, and party. Paratypes: 5 ♂, 4 ♀ (CAS), same locality as holotype. **Baja California Sur:** 1 ♀ (CAS, allotype), 14 miles [23 km] south of Guerrero Negro, 16.iv.1969, S.C. Williams.

DIAGNOSIS: As in genus description (González-Santillán and Prendini, in prep.)

DESCRIPTION: The following descriptions supplements William's (1970a) original description. It is based on additional freshly collected and museum specimens of the aforementioned collections.

Color and infuscation (Alive): Body and appendices pale yellow somewhat translucent, entirely void of pigmentation. Pedipalp fingers pinkish, telson yellow reddish, aculeus brown reddish. *(In alcohol)*: The difference in color of pedipalp fingers and telson is not evident, the body and appendices are completely pale yellow, except aculeus that maintain its original color.

Carapace: Carapace weakly emarginated anteriorly, sublinear, with a shallow median notch. Entire surface shagreened, minute and moderately large granules combine over most of the surface. Anterior edge with two pairs of short spiniform macrosetae. Anteromedian sulcus moderate, posteromedian deep, posterolateral moderate, broader towards lateral margin, posterior transverse obsolete. Median ocular tubercle raised, superciliary carinae granular, higher than eyes. Base of coxal endite II with a depression each. Anterior margin of coxa II with three oblique slit-like structures. Sternum pentagonal subequilateral with three pairs of anterior setae, one distal median pair and one pair on the lobes, median notch deep.

Chelicerae: Dorsal surface smooth, dentition of fixed and movable fingers as in typical vaejovids. Distal margin of manus with one median macrosetae. Serrula with 10–12 tines.

Pedipalps: Trichobothrial pattern Type C, orthobothriotaxic. Pedipalp segment ratio length/wide, femur 3.8, patella 3.1, chela 6.2. Pedipalp chela slender, being patella wider than chela and femur. Femur: Dorsal prolateral and ventral prolateral intercarinal surface with scattered moderate granules. Dorsal prolateral, dorsal retrolateral, and ventral prolateral carinae finely granular; retrolateral retrosubmedian smooth with three macrosetae; prolateral ventral and prolateral submedian with scattered enlarged irregular granules, and with three setae on each carinae; ventral median vestigial with cluster of granules; ventral retrosubmedian and retrolateral ventral vestigial with enlarged scattered serrated granules.

Patella: All intercarinal surfaces matte, covered with densely minute granules. Dorsal prolateral, dorsal retrolateral, ventral retrosubmedian, and ventral prolateral carinae finely crenulated; all retrolateral carinae obsolete; prolateral median and prolateral ventrosubmedian with enlarged spiniform denticles and three macrosetae, being the proximal larger than the other two; prolateral ventral carina obsolete indicated by a proximal tubercle and three macrosetae.

Chela: Manus and fingers gracile. All intercarinal surfaces matte. Prolateral dorsal, dorsal prolateral, dorsal median, dorsal retrosubmedian accessory, dorsal retrolateral, prolateral median, and prolateral ventrosubmedian carinae irregularly and finely granular, other carinae obsolete. Trichobothrium *Db* positioned on dorsal retrolateral carina, subbasal on chelae and *Dt* positioned close at mid manus.

Fingers: Fixed finger dentition: PD = 6 and RD = 5, MD = 5 rows of denticles, movable finger PD = 7, RD = 5, MD = 4 rows of medial denticles, distal row of one to three denticles missing. Fingers lacking scalloping, straight with a vestigial gap when fingers closed. Distal terminus of fingers with a moderate whitish elevated cap. Trichobothrium *ib* at the level of PD6 and *it* positioned between at PD5 and PD6 closer to PD6, these trichobothria positioned at mid finger. Trichobothria series *db–dt* distributed along the length of fixed finger and *eb–et* positioned on the distal two thirds of fixed finger.

Legs: Basitarsi I–III prolateral ventral, retrolateral ventral, and retrolateral dorsal carinae with complete rows of spinules, in III partial expressed on distal two thirds, in IV absent; ventral median in I–IV absent. Telotarsi I–IV ventral distal, median and basal series of spinules acuminated, unusually elongated and thin, in II–IV, median and basal series arranged in cluster. Two pairs of ventral distal spinules in I–IV. Setae: Prolateral ventral, 4:4:4:4; retrolateral ventral, 4:8:8:8, variable in size (major or minor); retrolateral dorsal, 4:4:4:4; dorsal, 3:3:3:3. In IV only

the proximal retrolateral ventral, distal retrolateral dorsal and median are major, the other setae are minor. Retrolateral dorsal and dorsal series forming setal combs by being arranged in a sublinear row with dorsal median setae offset of the row.

Tergites: All pretergites matte, densely covered by minute granules and postergite shagreened, posttergites I–VI with intercarinal surfaces shagreened with scatter coarser granules. Dorsal median carinae partially developed, expressed as a short row of granules distally, becoming more evident on distal segments. Tergite VII with dorsal median carina on proximal half as a strong costa with scattered granules; dorsal submedian as a pair of proximal protuberances; dorsal lateral and lateral supramedian strongly protruding and densely granular.

Genital operculum: Male genital operculum: wider than long, with two pairs of macrosetae. Sclerites free on longitudinal edge moving independently but unable to open more than 45°. Genital papillae protruding posteriorly. Female genital operculum: Wider than long, with three macrosetae. Sclerites fuse longitudinal.

Sternites: Sternites III–VI acarinated, surface smooth. Sternite VII ventral submedian carinae obsolete with three pairs of setae; ventral lateral carinae moderate, granular, and with two pairs of macrosetae; lateral ventral obsolete with a proximal small elevated area with a setae on the top.

Pectines: Median sclerite of marginal lamella at the level of the distal marginal of coxa IV in ♂, in ♀ distal sclerite marginal lamella at the level of the distal marginal of coxa IV. Basal piece with three pairs of major macrosetae. Marginal lamella consist of three sclerites, medial lamella proximally fuse distally progressively forming conspicuous 9–11 beads. Pectinal tooth counts 16–18 in ♂ (n=10), 13–16 ♀ (n=10).

Hemispermatophore: Lamina 1.1 longer than trunk. Dorsal through margin long, narrow, curving proximally, and removed from ventral trough. Primary and secondary hook positioned on the apex of lateral margin extension of the lamina (flange). Primary hook rounded, secondary hook terminus spiniform, both hooks enlarged and separated forming a deep notch. Median lobe ental terminus moderate and rounded. Hemimating plug developed from the inner lobe, distal barb margin with 13 elongated spinules. Basal plate of inner lobe removed from ventral trough. Neck relatively shorter than basal plate (0.5 times longer than basal plate). Measurements, lamina, 2.43; trunk, 2.23; neck, 0.30; basal plate, 0.53; ratios: dorsal trough/laminar hooks, 0.86; ventral trough/laminar hook, 0.50.

Metasoma: Segments I–V progressively slender. Segment ratios length/wide, I, 1.00, II, 1.3, III, 1.4, IV, 1.9, V, 2.8. All intercarinal surfaces matte, densely finely granular; dorsal lateral intercarinal surface with scattered granules. Dorsal lateral and lateral median carinae I–IV finely serrated, terminus with a moderate spiniform projection, dorsal lateral in V finely granular, mid segment with clusters of granules becoming moniliform both distal and proximally; lateral supramedian I–III vestigial, with a short row of distal granules; lateral inframedian in I complete finely serrated, in II present on distal third finely serrated, in III present on distal fifth finely serrated, in IV absent, in V present on proximal half finely serrated; ventral lateral carinae I–V complete and finely serrated; ventral submedian, in I costate smooth, in II–III proximal two thirds costate and smooth, final third finely serrated, in IV costate and weakly finely crenatoserrate; ventral median V complete finely serrated. Setae: Dorsal lateral, 1:1:1:1:4; lateral median, 1:1:2:2; lateral inframedian, 1:0:0:0:2; ventral lateral, 2:3:3:3:7; ventral submedian, 3:3:3:4:2; ventral sublateral, 3. All macrosetae minor in ♂, in ♀ all macrosetae major.

Telson: Relatively elongated, 2.4 times longer than wide. Base of the aculeus with lateral microserration well developed with 10 sharp tines. Subaculear tubercle expressed as a low and broad blob. Proximal margin of ventral sublateral and lateral carinae with low and broad blobs, each carina with six minor macrosetae. Dorsal and ventral surface completely smooth and glabrous.

DISTRIBUTION: *Vizcaino viscainensis* is endemic to the Vizcaino Desert situated on the border of Baja California and Baja California Sur, Mexico. The type locality of *V. viscainensis* refers to a beach ca. 5 km W of Route Mexico 1, ca. 65 km N of Guerrero Negro corresponding to the northern limit of the Vizcaino desert.

ECOLOGY: As in genus description.

REMARKS: *Vizcaino viscainensis* was initially assigned to the *eusthenura* group of *Vaejovis* (Williams, 1970a) and subsequently assigned to *Hoffmannius* (Soleglad and Fet, 2008). Williams (1970a) stated 'this species is of systematic interest because it appears to represent a distinct branch from the *eusthenura* group of *Vaejovis*'. William's observation was prescient phylogenetic analyses consistently place this species basal within Syntropinae and sister to *Syntropis*, instead of being part of the former *eusthenura* group = *Hoffmannius*, divided hereby into *Paravaejovis*, *Mesomexovis* and *Chihuahuanus*.

MATERIAL EXAMINED: **MEXICO: Baja California:** *Municipio de Ensenada*: Miller's Landing, [28°29'10.63"N 114° 4'0.82"W], 17.i.1965, V. Roth, 1 ♀ (AMNH). **Baja California Sur:** *Municipio de Guerrero Negro*: Vizcaino desert, 27°29'54.7"N 114°17'35.6"W, 223 m, 16.vii.2004, O. Francke, W.E. Savary, E. González, and A. Valdez, collected at night with UV light, 2 ♀ (AMNH [LP 3171]); Guerrero Negro, 11 km SE, W side Route 1, 27°54.916'N 113°55.333'W, 18 m, 4.vii.2005, L. Prendini and R. Mercurio, collected at night with UV light, 1

♂, 1 subad. ♂ (AMNH [LP 4449]); Guerrero Negro, 12 km S, E. González, O. Francke, W.E. Savary, and A. Valdez, 27°56'5.8"N 113°54'23.1"W, 25 m, 15.vii.2004, collected at night with UV light, 8 ♂, 3 ♀, 11 juv. (AMNH), 1 ♂, 1 ♀ (AMNH [LP 3174]), 27°56.0832'N 113°54.3828'W, desert, collected at night with UV light, 2 ♂, 2 ♀, 6 juv. (AMNH [ARA 2567]), 2 ♂, 1 subad. ♀, 2 juv. (CAS [ARA 1520]), 3 ♂, 2 subad. ♀, 2 subad. ♂ (IBUNAM[ARA 2059]), H. Montaño and E. González, desert, 27°56.3838'N 113°58.1028'W, 4 m, 29.vi.2008, 7 ♂, 8 ♀, 13 juv. (AMNH [ARA 2863]), 8 ♂, 9 ♀, 14 juv. (IBUNAM[ARA 2242]), 1 ♀ (AMNH [LP 8786]); Guerrero Negro, 4 km SE towards Laguna Ojo de Liebre, 27°53.850'N 113°57.626'W, 10 m, 29.vi.2008, H. Montaño and E. González, san dunes, collected at night with UV light, 1 juv. (AMNH [LP 8806]); Las Bombas, 3.2 km E, [27°58.08'N 113°57.18'W], 30 m, 16.iv.1969, S.C. Williams, 1 ♀, 1 juv. (AMNH), 1 ♀ (AMNH); Road Punta Abreojos, marker km 6, 27°17'23.6"N 113°9'28.1"W, 104 m, 17.vii.2004, E. González, O. Francke, W.E. Savary, and A. Valdez, collected at night with UV light, 1 ♀, 3 juv. (AMNH); San Angel Dunes, 27°14.0832'N 113°13.7664'W, 25 m, 14.vii.2004, A. Valdez, E. González, O. Francke, and W.E. Savary, desert, collected at night with UV light, 1 ♀, 1 ♂ (AMNH [ARA 2569]); Sierra del Placer, 21 km to junction Bahía Tortugas and Bahía Asunción, 98 km E of Vizcaino towards Bahía Tortugas, 262 m, 28.vi.2008, 27°28.9278'N 114°17.0928'W, desert, collected at night with UV light, 8 ♂ (AMNH [ARA 2855]), 6 ♀ (AMNH [ARA 2855]), 13 juv. (AMNH [ARA 2855]), 8 ♂, 6 ♀, 13 juv. (IBUNAM[ARA 2245]), 27°28.928'N 114°17.093'W, stabilized sand dunes, collected at night with UV light, 2 juv. (AMNH [LP 8809]), H. Montaño and E. González; Vizcaino desert, 223 m, 16.vii.2004, 27°29.8998'N 114°17.58'W, desert, collected at night with UV light, 3 juv. (AMNH [ARA 2568]), 3 juv. (IBUNAM[ARA 2060]), 27°29'54.7"N

114°17'35.6"W, collected at night with UV light, 5 ex. (AMNH), E. González, O. Francke, W.E. Savary, and A. Valdez.

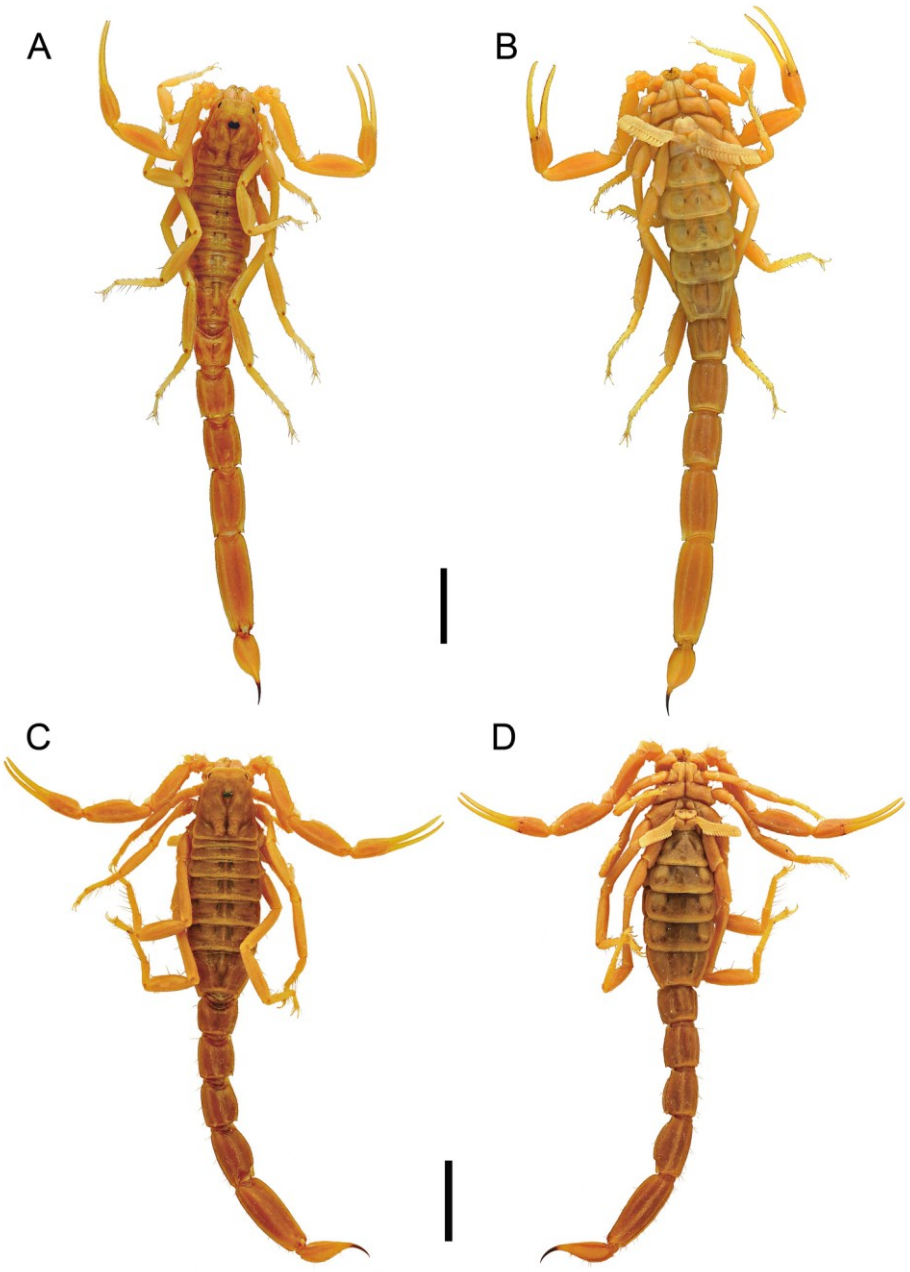


Figure 93. *Vizcaino viscainensis* (Williams, 1970), habitus. **A**, **B**. ♂ (AMNH). **C**, **D**. ♀ (AMNH). **A**, **C**. Dorsal aspect. **B**, **D**. Ventral aspect. Scale bars = 5 mm.

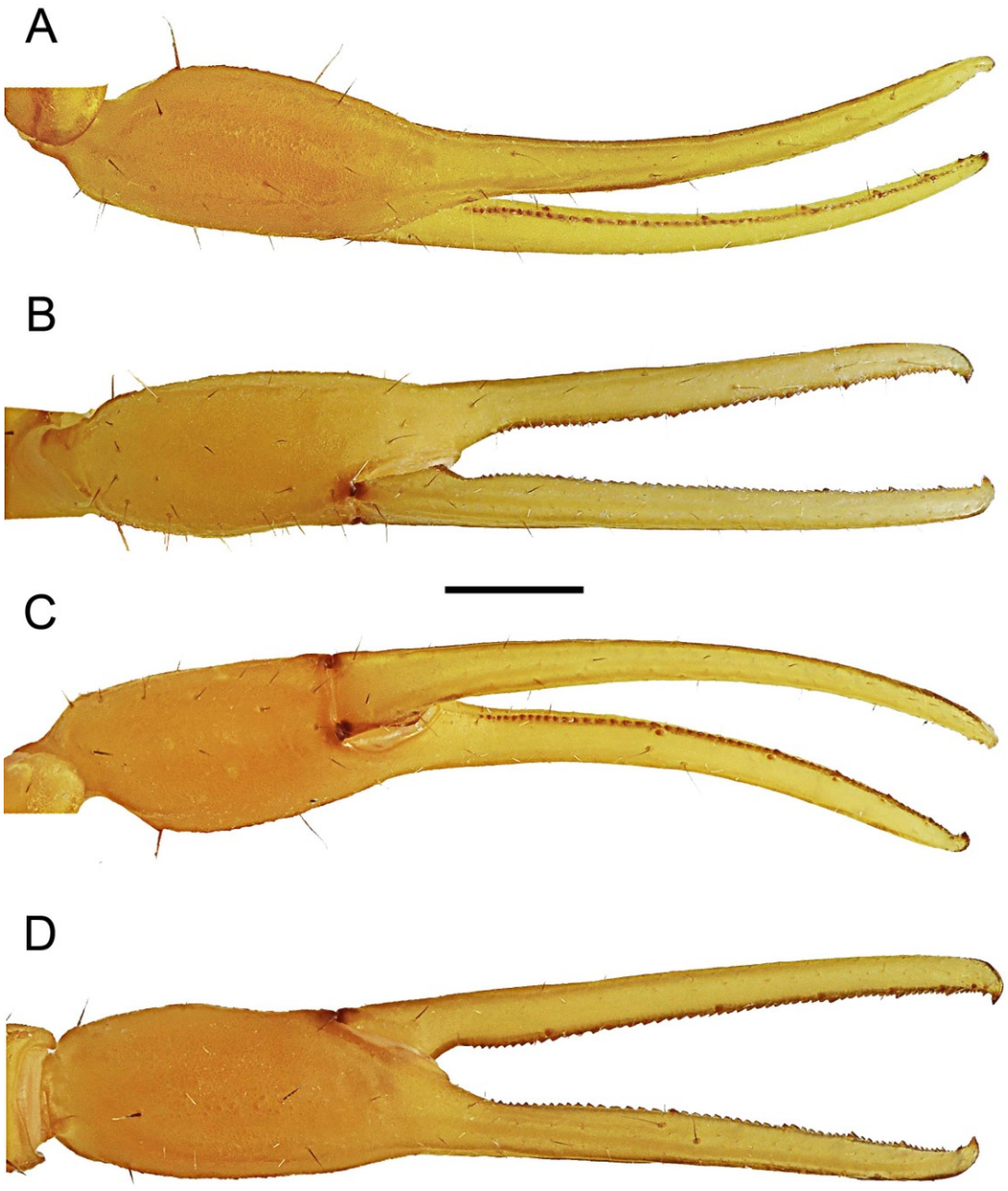


Figure 94. *Vizcaino viscainensis* (Williams, 1970), ♂ (AMNH), dextral pedipalp chela. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

Figure 95. *Vizcaino viscainensis* (Williams, 1970), ♂ (AMNH), dextral pedipalp patella. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

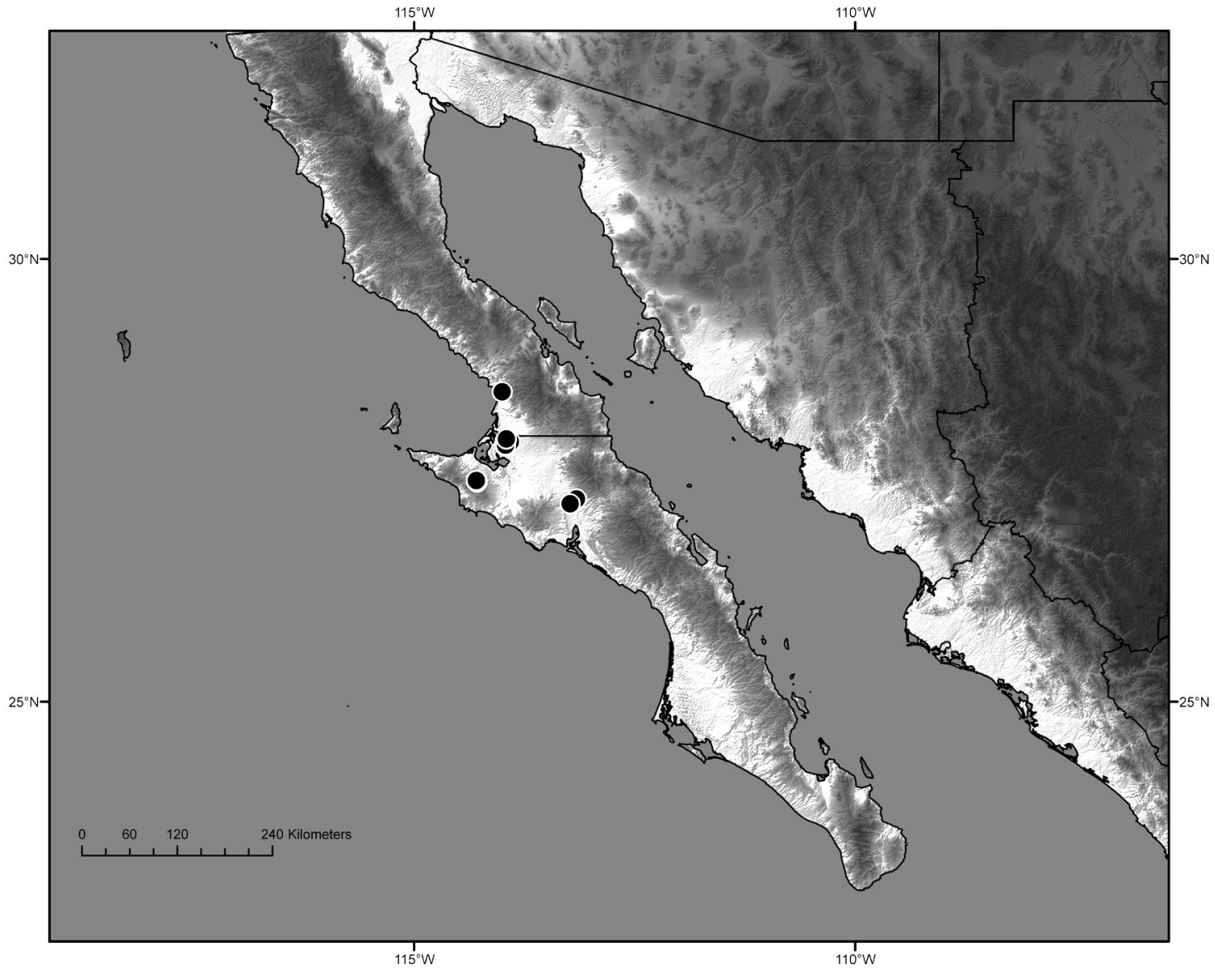


Figure 96. Map of Baja California Peninsula, plotting known locality records for the monotypic Syntropinae scorpion *Vizcaino viscainensis* (Williams, 1970), based on data collected in the present study, darker contour indicates increment of altitudinal gradient.

SYNTROPIS Kraepelin, 1900

KEY TO IDENTIFICATION OF THE SPECIES OF *Syntropis*

1. Dorsal prolateral and prolateral median carinae of pedipalp chelae obsolete and smooth in ♀; metasomal segment V less than 4 times longer than wide, telson less than 2.5 times longer than wide, telson less than 3 times longer than high (table 16).....*S. aalbui*

- Dorsal prolateral and prolateral median carinae of pedipalp chelae carinae finely to moderately granular, granules extending to intercarinal surfaces in ♀, metasomal segment V more than 4 times longer than wide, telson more than 2.5 times longer than wide, telson more than 3 times longer than high (table 17)..…..2

2. Base of pedipalp fingers intensely reddish to brownish, carapace moderately shagreened, granules rounded, pedipalp ventral prosubmedian and ventral median carinae with more than five macrosetae, ♂ slender: segment V more than 6 times longer than wide, pedipalp chelae more than 7 times longer than wide, telson more elongated, more than 4 times longer than wide and high, ♀: patella more than 5 times longer than wide……*S. macrura*

- Base of pedipalp fingers weakly reddish, carapace strongly shagreened, granules conical and sharp, pedipalp ventral prosubmedian and ventral median carinae with less than five macrosetae, ♂ robust: segment V less than 6 times longer than wide, pedipalp chelae less than 7 times longer than wide, telson less elongated, less than 4 times longer than wide and high, ♀: patella less than 5 times longer than wide……...…….....*S. williamsi*

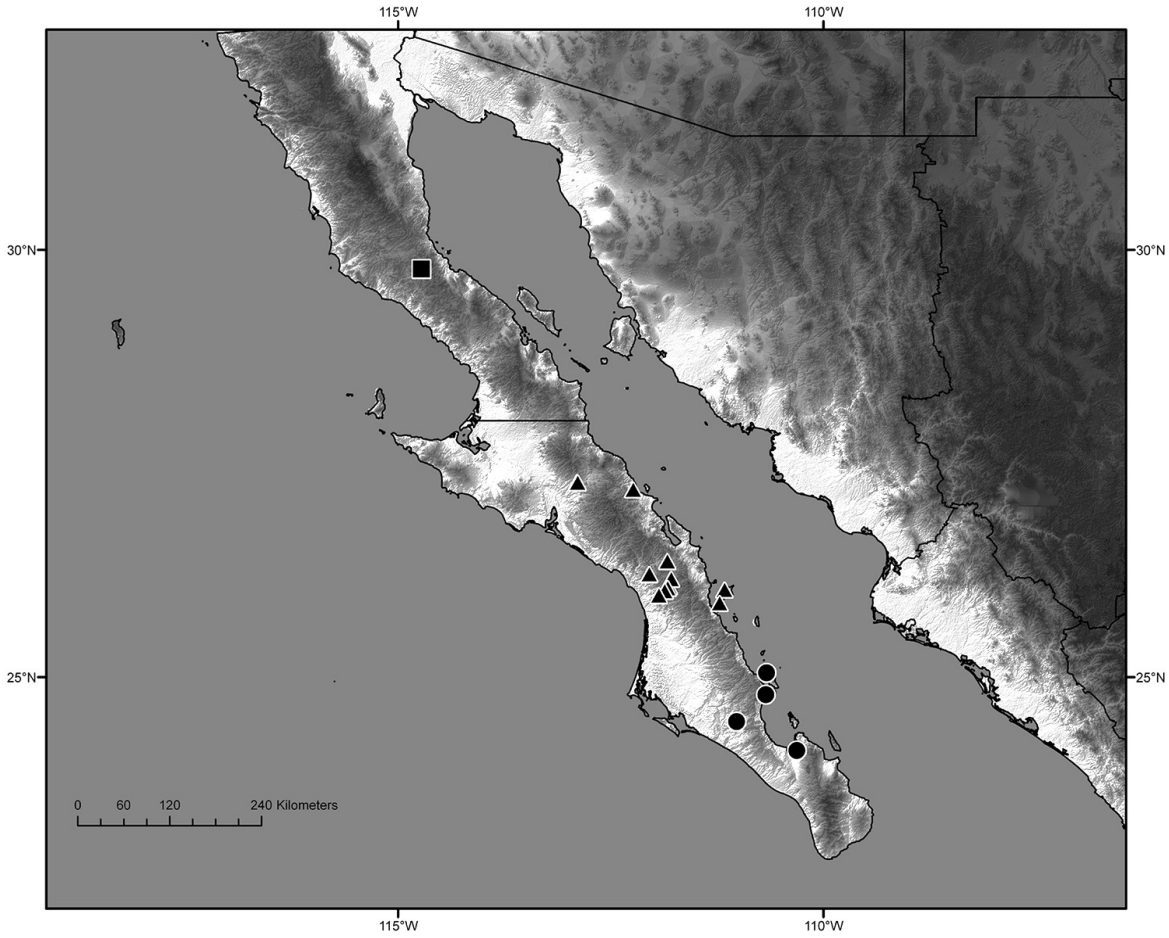


Figure 97. Map of Baja California Peninsula, plotting known locality records for three species in the Syntropinae scorpion genus *Syntropis* Kraepelin, 1900 based on data collected in the present study: *Syntropis aalbui* Lowe, Soleglad, and Fet, 2007 (triangle) *Syntropis macrura* Kraepelin, 1900 (squares), and *Syntropis williamsi* Soleglad, Lowe, and Fet, 2007 (circles), darker contour indicates increment of altitudinal gradient.

Syntropis aalbui Lowe, Soleglad, and Fet, 2007

Figures 97–100, 108A, C, 112A, 113A, 114D, 116A, 118A; Table 9, 10

Syntropis macrura Kreapelin, 1900: Williams, 1980: 47 (misidentified, in part).

Syntropis macrura Kreapelin, 1900: Lourenço, 2002: 140 (misidentified).

Syntropis aalbui Soleglad, Lowe, and Fet, 2007: 126–133, fig. 3, 16–23, 26, 27, 35, 36, tabs. I, II.

TYPE MATERIAL: **MEXICO: Baja California:** [*Municipio de Ensenada*]: Holotype ♀ (MNHG), Blue Palm Canyon, 5 km N Cataviña [La Bocana canyon], [29°46'34.64"N 114°43'32.48"W], 29, 13.vii.1979, R. Aalbu.

DIAGNOSIS: (based on ♀ holotype) *Syntropis aalbui* is closely related to *S. macrura* and *S. williamsi*, with which it forms a monophyletic group with the following scheme of relationship: (*S. aalbui* (*S. macrura* + *S. williamsi*)). *Syntropis aalbui* ♀ may be distinguished from the other ♀ species by having dorsal prolateral, prolateral median, and ventral retrolateral carinae of pedipalp chelae weakly costate and smooth, instead of having these carinae expressed as low, broad, and smooth costa, finely granulated distally. *S. aalbui* has pedipalps, metasomal segments, and telson intermediate, it is not as slender as in *S. macrura* but not as robust as in *S. williamsi*. *S. aalbui* pedipalp femur, patella and chela are 6.1, 5.6, and 6.9 longer than wide, metasoma V 3.8 times longer than wide and 4.4 longer than deep, vesicle of telson moderately elongated, 2.2 times longer than wide and 2.2 times longer than deep (table 16). From *S. macrura* may be separated by having ventral prosubmedian carina of pedipalp chelae with four macrosetae, instead of having eight.

DESCRIPTION: The following redescription supplements Soleglad et al's (2007) original description. It is based on the adult ♀ holotype.

Color and infuscation (in alcohol): Base of color uniform dark yellowish, carapace with subtle diffuse infuscation, rest of the body immaculate. Base of pedipalp fingers slightly reddish. Aculeus brownish.

Carapace: Anterior margin sublinear moderately concave, lacking median notch and with three pairs of submarginal macrosetae. Entire surface shagreened, moderate granules mix with minute granules, except for anterior lobes with surface mostly smooth. Anteromedian sulcus moderate, posteromedian comparatively deeper, posterolateral moderate, posterior transverse weak. Median ocular tubercle, slightly raised, with superciliary carinae weak and smooth, slightly higher than eyes. Median eyes approximately double size of lateral frontal pair. Three lateral eyes, two frontal pairs same size and posterior reduced approximately in half.

Sternum and coxal region: Sternum pentagonal subequilateral, slightly wider than long with three pairs of setae, one distal pair, one medial pair, and one pair on the lobes, median notch deep. Anterior margin of coxa II with two oblique slit-like structures, adjacent to a small and finely granular protuberance. Base of coxal endite II with a shallow depression each. Coxa IV 2.09 times longer than coxa II.

Chelicerae: Dorsal surface smooth, dentition of fixed and movable fingers as in typical syntopines. Subdistal margin of manus with one median macrosetae. Serrula with 15/15 tines.

Pedipalps: Trichobothrial pattern Type C, orthobothriotaxic. Femur: All intercarinal surfaces weakly matte. Carinae: Dorsal retrolateral, dorsal prolateral, and ventral prolateral carinae moderate and granular, retrolateral dorsosubmedian irregularly crenulated with five enlarged granules and few smaller scattered ones, with six macrosetae becoming smaller distally;

prolateral ventral complete, with scattered enlarged irregular granules, and five median macrosetae; prolateral ventrosubmedian expressed by few enlarged scattered granules on the proximal half of the segment and with three spiniform minor macrosetae, starting at proximal mid surface slanting gently towards distal end of dorsal prolateral carinae; ventral median vestigial with enlarged serrated granules, ventral retrosubmedian partial, expressed on proximal half with scattered irregular serrated granules; retrolateral ventral vestigial expressed by few proximal enlarged scattered serrated granules.

Patella: All intercarinal surfaces weakly matte. Carinae: Dorsal retrolateral, dorsal prolateral, ventral retrosubmedian, and ventral prolateral carinae finely granular; all retrolateral carinae obsolete; ventral median vestigial, expressed as a short proximal row of scattered fine granules; prolateral median on a moderate vaulted projection, extending from a proximal median tubercle with a major macroseta at top to an irregular and scattered row of serrated granules reducing in size distally with five major and minor intersperse macrosetae, the row of denticles gently slanting dorsally towards a distal tubercle; prolateral ventral carina obsolete indicated by a proximal tubercle and seven major and minor intersperse macrosetae.

Chela: Manus and fingers gracile. All intercarinal surfaces smooth. Carinae: All carinae obsolete except prolateral median and prolateral ventrosubmedian carinae weakly crenulated and with irregular fine granulation. Trichobothrium *Db* positioned on dorsal retrolateral carina, subbasal on chelae and *Dt* positioned close at mid manus.

Fingers: fixed finger denticles: PD = 6, RD = 6, MD rows = 6, all denticles serrated, retrolateral denticles comparatively smaller than prolateral denticles. Movable finger PD = 8, RD = 7, MD rows = 7, distal row with one median denticle, proximal six and seven dislocated. Distal terminus of fingers with a distinct whitish elevated cap. Fixed fingers lacking scalloping,

movable finger with subtle proximal lobe, gap created when fingers close obsolete. Trichobothria *ib* and *it* positioned at PD6, these three positioned at mid finger. Trichobothria series *db–dt* and *eb–et* positioned on the distal two thirds of fixed finger.

Legs: Spinules: Basitarsi I–III retrolateral ventral and retrolateral dorsal carinae with complete rows of spinules, retrolateral and prolateral ventral rows in I–III vestigial, expressed as few terminal spinules, IV devoid of spinules. Telotarsi I–IV with two or three pairs of ventrodistal spinules. Macrosetae: Prolateral ventral macrosetae 9:9:9:9; retrolateral ventral 9:9:12:12, retrolateral dorsal 6:6:6:6, dorsal 3:3:3:3 plus dorsal median; retrolateral dorsal and dorsal series arranged in separated rows.

Tergites: All pretergites lustrous and smooth and posttergites poorly granular. Dorsal median carinae of posttergites I–VI with costate and smooth; dorsal submedian carinae of posttergites I–VI obsolete to weakly develop on distal aspect. Postergite VII with intercarinal surfaces moderately granular medially. Dorsal median carinae of postergite VII with carina expressed on proximal third, granular; dorsal submedian expressed as a pair of proximal tubercles weakly granular; dorsal lateral and lateral supramedian comparatively stronger than prior carinae, ending in an enlarged spiniform tubercle projecting backwards, dorsal lateral carinae projecting and curving laterally almost reaching lateral supramedian distal margin, creating a semi ring of granulation.

Genital operculum: Female genital operculum: Wider than long, with three macrosetae. Sclerites fuse longitudinal.

Sternites: Sternites III–VI with all carinae obsolete and surface smooth. Spiracles slit-like shaped. Sternite VII with ventral lateral carinae strongly costate, smooth proximally, crenulated distally; ventral submedian carina obsolete expressed by two pairs of macroseta. Distomedian

glandular spot moderate, extending the whole length of the sternite, occupying dorsal sublateral intercarinal surface.

Pectines: Marginal lamella as long as coxa IV and half-length of trochanter IV. Basal piece with a distal median major macrosetae. Marginal lamella consist of three sclerites, medial lamella proximally fuse distally progressively forming conspicuous 17 beads. Fulcra with 26 beads. Pectinal tooth counts 27

Hemispermatophore: Unknown.

Metasoma: Segments I–V diminishing width distally, IV and V slender than previous. All intercarinal surface smooth. Carinae: Dorsal lateral and lateral median in I–IV serrated, moderate, terminus in I–IV not evidently enlarged spiniform process, rather rounded with serrated granules similar to preceding granules; except in IV lateral median carinae with terminus slightly flared, dorsal lateral in V granular, mid segment with clusters of granules becoming moniliform distal and proximally. Lateral inframedian in I irregular broken row of proximal and distal subserrate granules, in II vestigial with three distal granules, in III and IV obsolete in V serrate expressed on proximal third becoming obsolete distally. Ventral lateral carinae in I–V moderately crenatoserrate. Ventral submedian in I–IV obsolete. Ventral median I and II costate and weakly crenulated on distally third, in III almost completely crenatoserrate except for proximal end, in IV and V, complete strong, serrated. Setae: dorsal lateral, 0:1:2:3:11, lateral median, 0:2:2:4, lateral inframedian, 3:0:0:0:5, ventral lateral, 3:4:5:6:13, ventral submedian, 5:6:6:7:4, ventral sublateral, 4.

Telson: Vesicle relatively elongated, 2.16 times longer than wide. Lateral microserration at base of the aculeus 2/3 worn out tines. Aculeus short, 4 times shorter than telson. Subaculear

tubercle absent. Vesicle ventral surface smooth and globose 2.2 times longer than wide, each carina with eight pairs of setae.

DISTRIBUTION: This species is endemic to the Baja California peninsula and is known from the vicinity of Cataviña, a rather isolated small location within the Central Desert of Baja California. This species was collected at the 'blue palm canyon' where *Brahea armata* S. Watson, the blue tree palm, is common. This canyon corresponds to La Bocana River, the drainage of which runs from the extinct volcano, Aguatosa Mountain, down to the Pacific coast at Puerto Canoas. Central Baja California Desert, a subtype of the Sonoran desert, dominates the area. This area is also known for the presence of rocky habitats where large rounded boulders form archipelagoes among sandy flat areas.

ECOLOGY: Other species collected at this locality were: *Hadrurus concolor* Stahnke, 1969, *Hadrurus pinteri* Stahnke, 1969, *Paravaejovis schwenkmeyeri* (Willimas, 1970) and *Serradigitus* aff. *gertschi*.

REMARKS: Several attempts to collect *S. aalbui* using UV light at the type locality did not produce specimens.

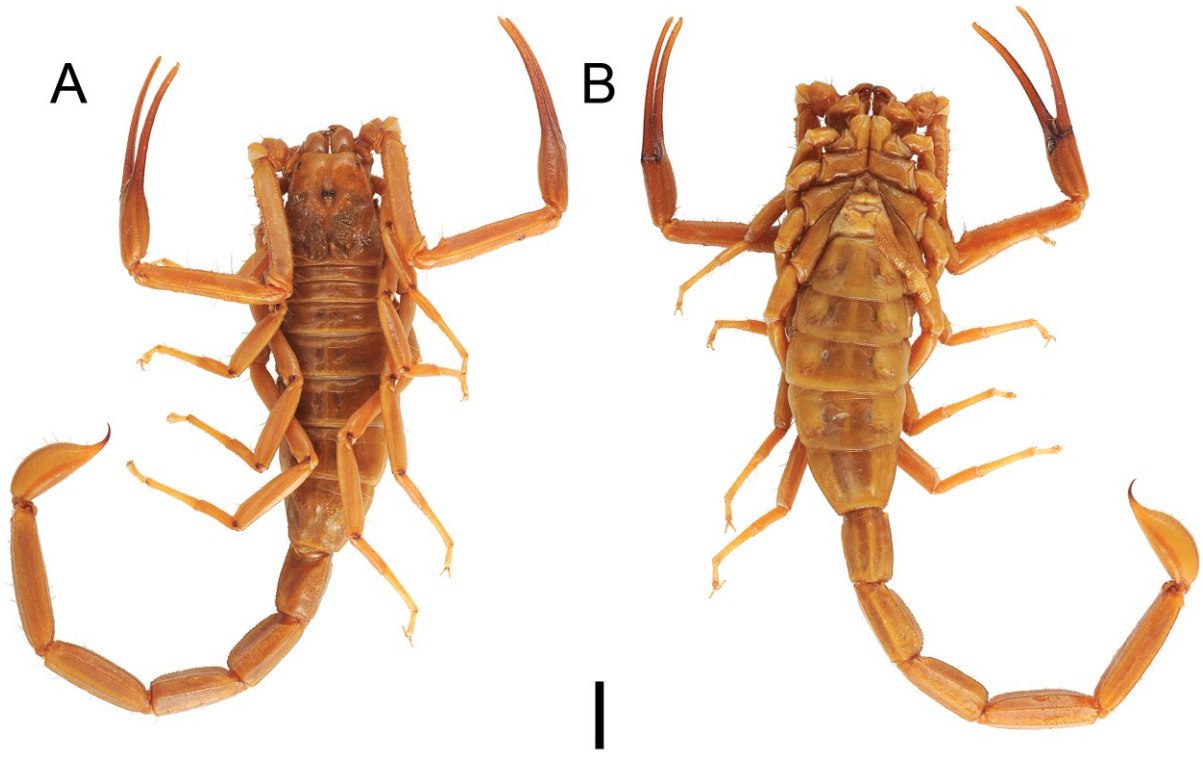


Figure 98. *Syntropis aalbui* Soleglad, Lowe, and Fet, 2007, holotype ♀ (MNHG), habitus. **A**. Dorsal aspect. **B**. Ventral aspect. Scale bars = 5 mm.

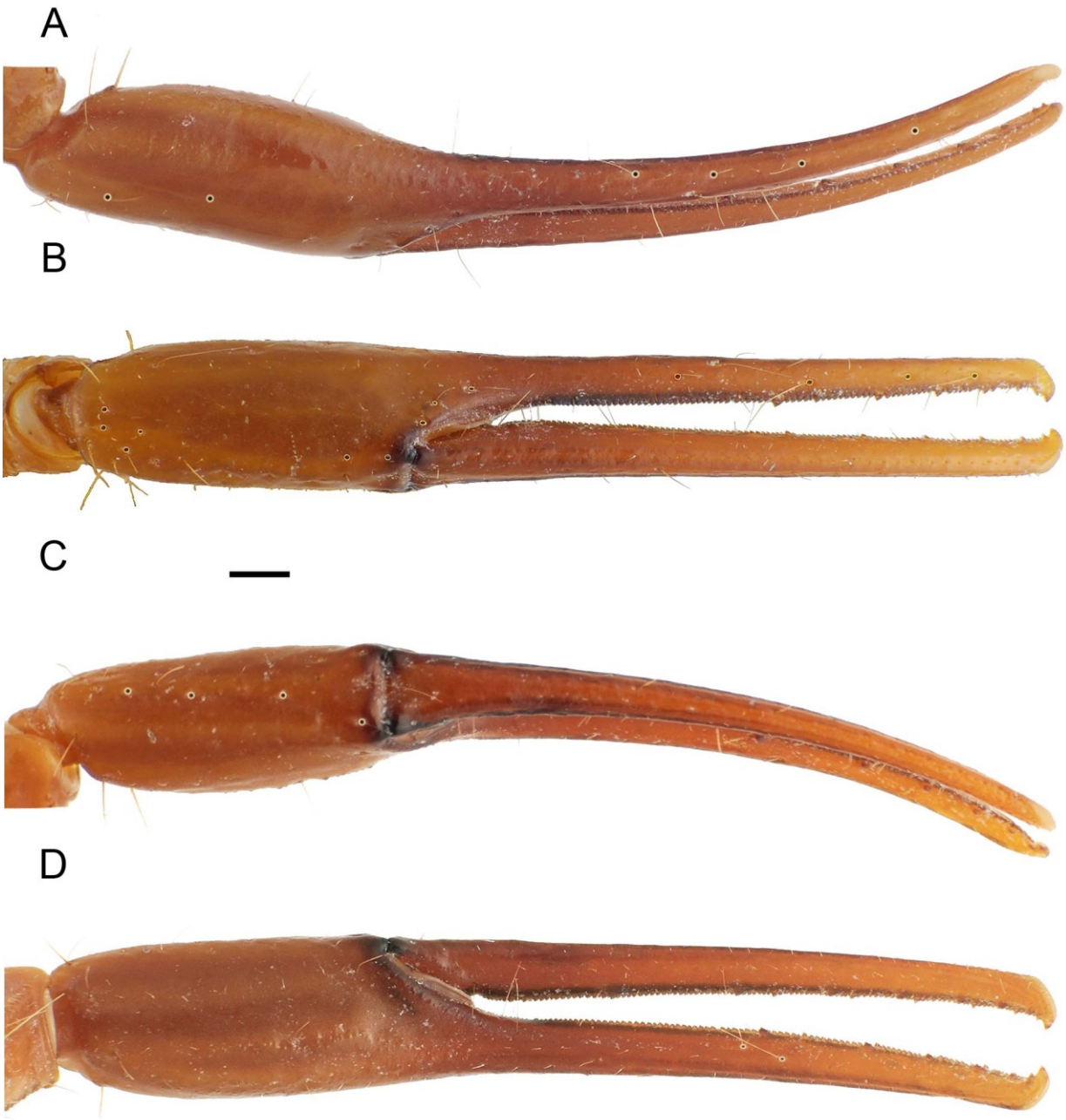


Figure 99. *Syntropis aalbui* Soleglad, Lowe, and Fet, 2007, holotype ♀ (MNHG), dextral pedipalp chela. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

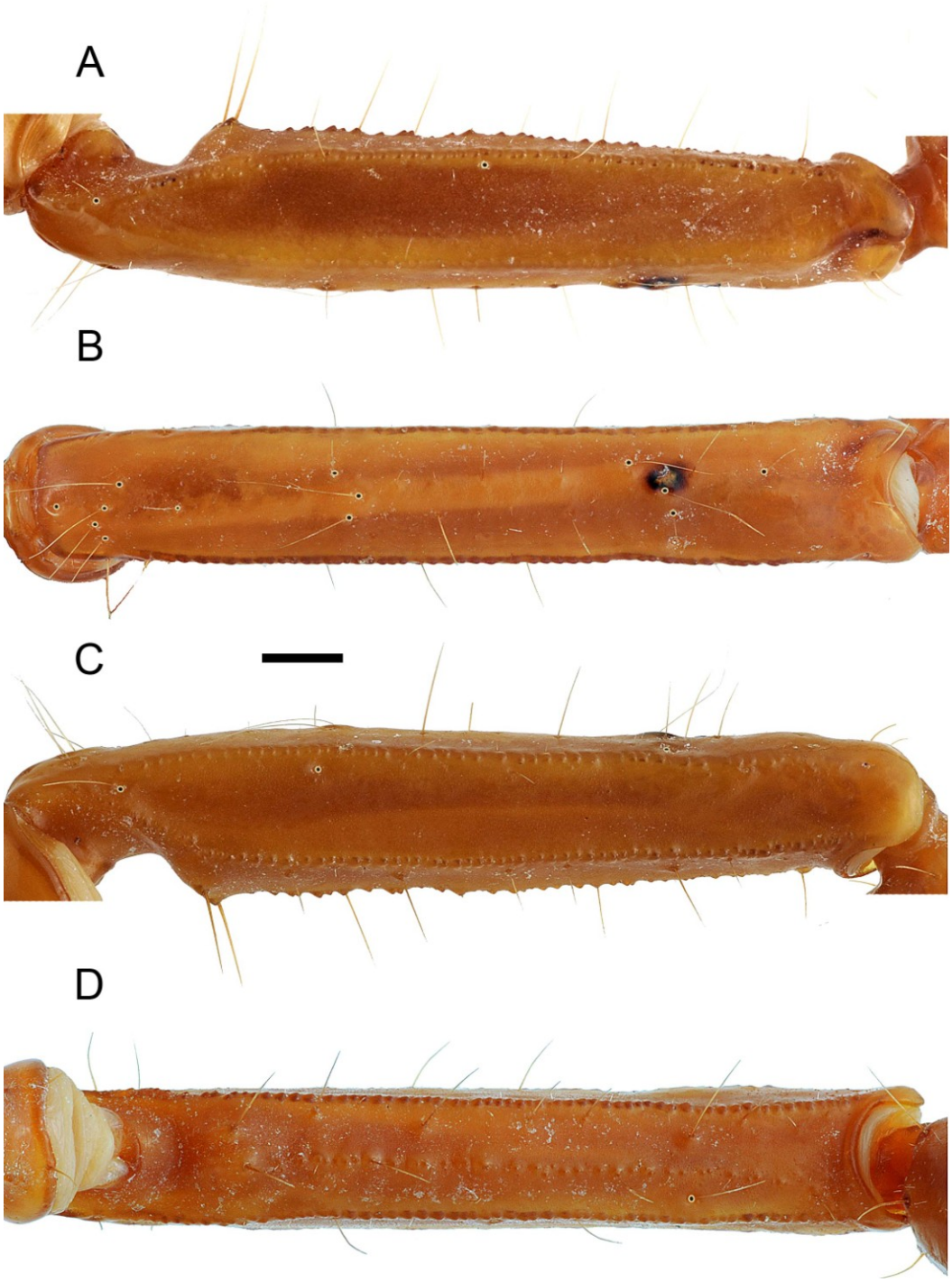


Figure 100. *Syntropis aalbui* Soleglad, Lowe, and Fet, 2007, holotype ♀ (MNHG), dextral pedipalp patella. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

Syntropis macrura Kraepelin, 1900

Figures 97, 101–103, 107C, 109C, 112B, 113B, 114E, 116B, 118B; Table 9, 10

Syntropis macrura Kraepelin, 1900: 270; Werner, 1934: 281; Gertsch, 1958: 14, 15; Stahnke, 1965: 257–263, figs. 1, 2; Williams, 1969: 285, 290, 291 (in part); Hjelle, 1974: 221–226, figs. 3, 5; Stahnke, 1974: 113–120; Vachon, 1974: 914, 916, fig. 140, 148–150; Díaz-Nájera, 1975: 6, 12; Williams, 1980: 47, 48, fig. 49, 50, 108B (in part); Sissom, 1993: 68; Kovařík, 1998: 146; Beutelspacher, 2000: 70, 136, 152, map 43 (in part); Sissom, 2000: 526; Soleglad and Fet, 2003a: 6, fig. 7; 2003b: 8; Prendini and Wheeler, 2005: fig. 24; Soleglad, et al., 2007: 119–123, 128–133, fig. 1, 24, 25, 31, 32, tab. I–II; Soleglad and Fet, 2008: 32, 30, 38, fig. 53, 82, 92: Kamenz and Prendini, 2008: 28, plate 93; McWest, 2009: 19, tab. 1, 48, figs. 119–123, 116.

TYPE MATERIAL: **MEXICO:** Holotype ♂ (MNHG), 'Lower California', L. Diguet [not examined].

DIAGNOSIS: *Syntropis macrura* may be distinguished by having dorsal prolateral, prolateral median, and ventral prolateral carinae of pedipalp chelae with distal scattered fine granules, instead of having larger and denser granules, extended to intercarinal surface and fixed ginger in *S. williamsi* or having smooth or less and smaller granules restricted to carinae in *S. aalbui*. Ventral retrolateral finely granular. *S. macrura* has ventral prosubmedian carinae with low and fine granulation, in contrast, *S. williamsi* has it dense and strong granulation; and *S. aalbui* has it smooth. Both sexes, adult and juvenile specimens of *S. macrura* have more elongated metasomal segments, telson and pedipalps than the other two species. Relatively

higher pectinal counts with 27–31 in ♀ and 28–32 in ♂; in *S. williamsi* 24–26 in ♀ and 25–27 in ♂; and in *S. aalbui* 27 in ♀. Comparative measurements are presented in table 16.

DESCRIPTION: The following redescription supplements Kraepelin (1900) original description. It is based on the adult ♂ and ♀, subadults and juveniles from the collections indicated below.

Color and infuscation (in alcohol): Base of color uniform dark yellowish to medium brownish, carapace with subtle diffuse infuscation, rest of the body immaculate. Base of pedipalp fingers intensely reddish to brownish. Pectines, and genital operculum whitish. Femur, patella and legs slightly paler than the rest of the body. Aculeus brownish.

Carapace: Anterior margin weakly emarginated, sublinear, with a shallow median notch and three pairs of submarginal pairs of macrosetae. Entire surface shagreened, scattered moderate granules mix with minute granules, except for anterior lobes with surface mostly smooth. Anterior edge with three pairs of minor macrosetae. Anteromedian sulcus moderated and broad, posteromedian comparatively deeper, distally completely obliterated by posterior lobes, posterolateral moderate, posterior transverse obsolete. Ocular tubercle shallow, slightly raised, with superciliary carinae obsolete, higher than eyes. Median eyes approximately one and half times the size of lateral frontal pair. Three lateral eyes, two frontal pairs same size and posterior reduced approximately in half.

Sternum and coxal region: Sternum pentagonal subequilateral, slightly longer than wide in ♂ and slightly wider than long in ♀, with three pairs of setae, one distal, one median pairs and one pair on the lobes, median notch deep. Anterior margin of coxa II with two oblique slit-like structures, adjacent to a moderate finely granular protuberance. Base of coxal endite II with a shallow depression each. Coxa IV 2.08 times longer than coxa II.

Chelicerae: Dorsal surface smooth, dentition of fixed and movable fingers as in typical syntropine. Subdistal margin of manus with one median macrosetae. Serrula with 18 tines.

Pedipalps: Trichobothrial pattern Type C, orthobothriotaxic. Femur: All intercarinal surfaces weakly matte, covered with scattered minute granules. Carinae: dorsal retrolateral, dorsal prolateral, and ventral prolateral carinae moderate and granular; retrolateral dorsosubmedian irregularly crenulated with five enlarged granules and smaller scattered ones with four macrosetae: prolateral ventral complete with scattered enlarged irregular granules and five macrosetae; prolateral ventrosubmedian expressed on the proximal half, with few enlarged scattered granules and three spiniform minor macrosetae; ventral median vestigial expressed as a short proximal row of enlarged serrated granules; ventral retrosubmedian and retrolateral ventral vestigial expressed by few proximal enlarged scattered serrated granules.

Patella: All intercarinal surfaces weakly matte, covered with scattered minute granules. Dorsal retrolateral, dorsal prolateral, ventral retrosubmedian, and ventral prolateral carinae moderately granular; all retrolateral carinae obsolete; prolateral median on a moderate vaulted projection, extending from a proximal median tubercle with a major macroseta on top, and a irregular and scattered row of serrated granules reducing in size distally, gently slanting dorsally towards a distal tubercle with a macroseta on top adjacent to dorsal prolateral carinae minor macrosetae; row of granules with five additional intersperse major and minor macrosetae; prolateral ventral obsolete expressed by a proximal tubercle with a macroseta on top, one distal minor macrosetae and five intersperse major and minor macrosetae.

Chela: Manus and fingers gracile. Ventral and retrolateral surfaces smooth, dorsal and prolateral surfaces finely granular on distal half. Dorsal prolateral, prolateral median, and ventral prolateral with irregular fine granulation on distal half, ventral retrolateral partial with irregular

fine crenulations limited by V_4 and the level of *Est* trichobothrium. All other carinae obsolete. Trichobothrium *Db* positioned on dorsal retrolateral carina, subbasal on chelae and *Dt* positioned close at mid manus.

Fingers: fixed finger denticles: PD = 6, RD = 6, MD rows = 6, all denticles serrated, retrolateral denticles comparatively smaller than prolateral denticles. Movable finger PD = 8, RD = 7, MD rows = 7, distal five prolateral and retrolateral denticles subparied, proximal six and seven dislocated, distal row with one median denticle. Fingers with moderate scalloping, proximal notch and median lobe of fixed and movable fingers moderated, positioned on proximal fifth; gap created when fingers close moderate, fingers fit unevenly in ♂, scalloping and gap in ♀ obsolete. Distal terminus of fingers with a distinct whitish elevated cap. Trichobothria *ib* and *it* positioned at PD6, these three positioned at mid finger. Trichobothria series *db–dt* and *eb–et* positioned on the distal two thirds of fixed finger.

Legs: Spinules: Basitarsi I–III prolateral ventral, retrolateral ventral and retrolateral dorsal carinae with complete rows of spinules; retrolateral and prolateral ventral and retrolateral dorsal rows in I–III vestigial, expressed as few terminal spinules, in IV devoid of spinules; retrolateral median rows in I–IV vestigial expressed as few terminal spinules. Telotarsi I–IV with two or three pairs of ventrodistal spinules in I–IV. Macrosetae: Setae: Prolateral ventral 9:9:9:9; retrolateral ventral 9:9:12:12, retrolateral dorsal 6:6:6:6, dorsal 3:3:3:3; retrolateral dorsal and dorsal series arranged in separated rows.

Tergites: Tergite I–VI pretergite smooth and postergite poorly granular. Dorsal median carina in postergite I–VI costate and smooth; dorsal submedian carinae obsolete to weakly developed on distal aspect. Dorsal median carina in tergite VII granular expressed on proximal third, dorsal submedian expressed as a proximal granular tubercle; dorsal lateral and lateral

supramedian connected by a transverse granular to costate carinae on proximal margin, creating a horseshoe.

Genital operculum: Male genital operculum: wider than long, with four pairs of macrosetae. Sclerites free on longitudinal edge moving independently but unable to open more than 45°. Genital papillae protruding posteriorly. Female genital operculum: Wider than long, with three macrosetae. Sclerites fuse longitudinal.

Sternites: Sternites III–VI with all carinae obsolete, surface matte and lustrous; sternite V and VI with distomedian glandular spot moderated whitish contrasting with base color darker, in ♂, in ♀ obsolete. Sternite VII with ventral lateral carinae finely crenulated; ventral submedian obsolete expressed by two pairs of macrosetae. Distomedian glandular spot strong, extending the whole length of the sternite, occupying dorsal sublateral intercarinal surface, protruding moderately from adjacent surface in ♂, in ♀ lower and less developed. Spiracle elongated, slit-like, approximately three times longer than wide.

Pectines: Marginal lamella as long as coxa IV and half the length of trochanter IV in both sexes. Basal piece with a distal median major macrosetae. Marginal lamella consist of three sclerites, medial lamella proximally fuse distally progressively forming conspicuous 17–20 beads. Fulcra with 27–31 beads in ♂, 26–30 beads in ♀. Pectinal tooth count 28–32 in ♂, 27–31 in ♀.

Hemispermatophore: Lamina 1.1 longer than trunk. Median lobe ental terminus moderate and rounded. Dorsal through margin long, narrow, curving proximally, and removed from ventral trough. Primary and secondary hook positioned on the apex of lateral margin extension of the lamina (flange). Primary hook terminus rounded, secondary hook terminus spiniform, both hooks enlarged, and separated. Hemimating plug developed from the inner lobe, distal barb

margin with ca. 15 indentations, without define spinules. Basal plate of inner lobe adjacent to ventral trough, the basal plate exhibits two distinctive sections, being one piece closer to the neck and the basal plate connected to the distal plate. Neck shorter than basal plate (0.6 times longer than basal plate). Measurements (mm), lamina, 3.70; trunk, 3.33; neck, 0.56; basal plate, 0.96; ratios: dorsal trough/laminar hooks, 0.73; ventral trough/laminar hook, 1.76.

Metasoma: Segments I–V diminishing width distally, IV and V slender than previous. All intercarinal surfaces smooth Carinae: Dorsal lateral and lateral median in I–IV serrated, moderate, terminus in I–IV not evidently enlarged spiniform process, rather rounded with serrated granules similar to preceding granules; except in IV lateral median carinae with terminus slightly flared, dorsal lateral in V granular, mid segment with clusters of granules becoming moniliform distal and proximally. Lateral inframedian in I irregular broken row of proximal and distal subserrate granules, in II vestigial with three distal granules, in III and IV obsolete in V serrate expressed on proximal third becoming obsolete distally. Ventral lateral carinae in I–V moderately crenatoserrate. Ventral submedian in I–IV obsolete. Ventral median I and II costate and weakly crenulated on distally third, in III almost completely crenatoserrated except for proximal end, in IV and V, complete strong, serrated. Setae: dorsal lateral, 0:1:2:3:11, lateral median, 0:2:2:4:10, lateral inframedian, 3:0:0:0, ventral lateral, 3:4:5:6:13, ventral submedian, 5:6:6:7:4, ventral sublateral, 4.

Telson: Vesicle relatively elongated, 2.16 times longer than wide. Lateral microserration at base of the aculeus with 5–8 tines. Aculeus short, 4 times shorter than telson. Subaculear tubercle absent. Vesicle ventral surface smooth and globose 2.2 times longer than wide, each carina with eight pairs of setae.

DISTRIBUTION: *Syntropis macrura* is endemic to Sierra de la Giganta of Baja California Peninsula, in the state Baja California Sur and El Carmen Island, Mexico.

Beutelspacher (2000: 136) erroneously listed *Syntropis macrura* for Baja California rather than for Baja California Sur (Sissom, 2000). Williams (1980) reported a distribution range from San Ignacio south to Los Aripes near La Paz, and El Carmen Island. Soleglad et al. (2007) restricted the range from San Ignacio to San Miguel de Comondú and El Carmen Island in the Sea of Cortez, including the Sierra Guadalupe and de la Giganta.

ECOLOGY: *Syntropis macrura* is a lithophilous species found volcanic outcrops (Polis, 1990), this species conforms to this ecomorphotype by having attenuated appendices, and mesosomal compressed dorso-ventrally. *S. macrura* is also synanthropic in some areas. Williams (1980) reported that this species was collected on rocky fences of roads and stalls in the Comondús area. Jiménez-Jiménez and Palacios-Cardél (2010) mentioned that locals collected some specimens on house walls in the same locality. The authors also used pitfall traps in the Comondús and the San Isidro-La Purisima, where they obtained 12 specimens. This is unusual for a lithophilous species, however, *S. macrura* seems to be able to displace well in softer substrata.

Hjelle (1972) observed the life history of *S. macrura*, especially parturition and post-parturition. Hjelle obtained and kept a gravid ♀ collected in El Carmen Island and observed similarities to other vaejovids (for instance, *S. macrura* stilting posture during parturition, gestation period, average number of young, and orientation of first instar tendency toward being longitudinal). According to Hjelle the time for the first molt is similar to that observed in *Hadrurus* spp.; although morphologically and ecologically different, these genera share a relatively large body size.

The only ♀ specimen studied from El Carmen Island (total length 88.2 mm) is distinctly larger than the females from the peninsula (larger total length 76.7 mm), although no other morphological difference was noted; it is fundamental to obtain material for genetic studies and ♂ specimens, which possess the most diagnostic characters, to test whether the population on the island is a different species.

MATERIAL EXAMINED: **MEXICO: Baja California Sur:** *Municipio de Comondú*: La Purísima, 26°12'3"N 112°2'54"W, C. Palacios, x.2002, 1 ♂, 2 ♀ (CAECIB), I.G. Nieto, 14.xii.2002, collected at night with UV light, 1 ♂ (CAECIB); San Isidro, La Purísima, [26°12.22933'N 112°2.7785'W], C. Palacios, 26.viii.2003, mesic vegetation, pitfall trap, 1 ♀ (CAECIB), I.G. Nieto, 11.x.2003, xerophyte vegetation, pitfall trap, 1 ♂, 1 ♀ (CAECIB), 24.xi.2002, mesic vegetation, pitfall trap, 1 ♂, 1 ♀ (CAECIB); San José Comondú, M. Correa, 11.x.2003, 1 ♂ (CAECIB), C.M. Jiménez, 29.x.2003, 1 ♂ (CAECIB), Eva, 31.x.2003, 1 ♂ (CAECIB), 26°03.542'N 111°48.985'W, 7.vii.2005, L. Prendini, R. Mercurio, E. González, and W.E. Savary, collected at night with UV light, 3 juv. (AMNH [LP 4729]), 26°3'34"N 111°49'13"W, C. Palacios, 27.viii.2006, 1 ♂ (CAECIB); San José Comondú, Arroyo, I.G. Nieto, 26.viii.2003, mesophyte vegetation, pitfall trap, 1 ♂, 1 ♀ (CAECIB), C. Palacios, 27.viii.2003, mesic vegetation, pitfall trap, 1 ♂ (CAECIB); San José de Comondú, 12 km N, 26°08.729'N 111°47.326'W, 504 m, 8.vii.2008, H. Montaño and E. González, collected at night with UV light, 1 ♀ (AMNH [LP 8708]); San José de Comondú, 30 km N, between Rosarito and San Isidro, 26°21.252'N 111°50.109'W, 258 m, 27.vi.2008, H. Montaño and E. González, bottom of a canyon, sandy area, 1 ♀ (AMNH [LP 8709]), collected at night with UV light, 1 ♀ (AMNH [ARA 2824]); San Miguel de Comondú, 26°02'26.7"N 111°49'55.3"W, 220 m, 12.vii.2004, E. González, O. Francke, W.E. Savary, and A. Valdez, collected at night with UV light, 3 juv.

(AMNH [LP 3146]), 3 juv. (IBUNAM [ARA 2207]), 1 ♂, 1 ♀, 3 juv. (AMNH [ARA 3813]); San Miguel de Comondú, 2 km SW, 169 m, 12.vii.2004, 26°0.3'N 111°52.0164'W, collected at night with UV light, 2 juv. (AMNH [ARA 3081], 1 juv. (IBUNAM [ARA 2283]), 26°0'18.5"N 111°52'1.3"W, collected at night with UV light, 3 ex. (AMNH), E. González, O. Francke, W.E. Savary, and A. Valdez. *Municipio de* Loreto: El Carmen Island, Ensenada el Marquez, 25°51'51.84"N 111°13'12.16"W 60 m, 17.v.1982, 1 ♀ (WDS). *Municipio de Mulegé*: Microwave antenna station San Lucas, ca. 5 km SW of Santa Rosalia, 185 m, 5.vii.2005, 27°11.550'N 112°14.150'W, W.E. Savary and R. Mercurio, collected at night with UV light 1 ♀ (IBUNAM [ARA 3810]), 6 juv. (AMNH [LP 5149]); San Ignacio, 3 km S on road to La Laguna, 27°16.533'N 112°53.366'W, 167 m, 12.vii.2005, E. González, W.E. Savary, L. Prendini, and R. Mercurio, collected at night with UV light, 1 juv. (AMNH [LP 4736]).

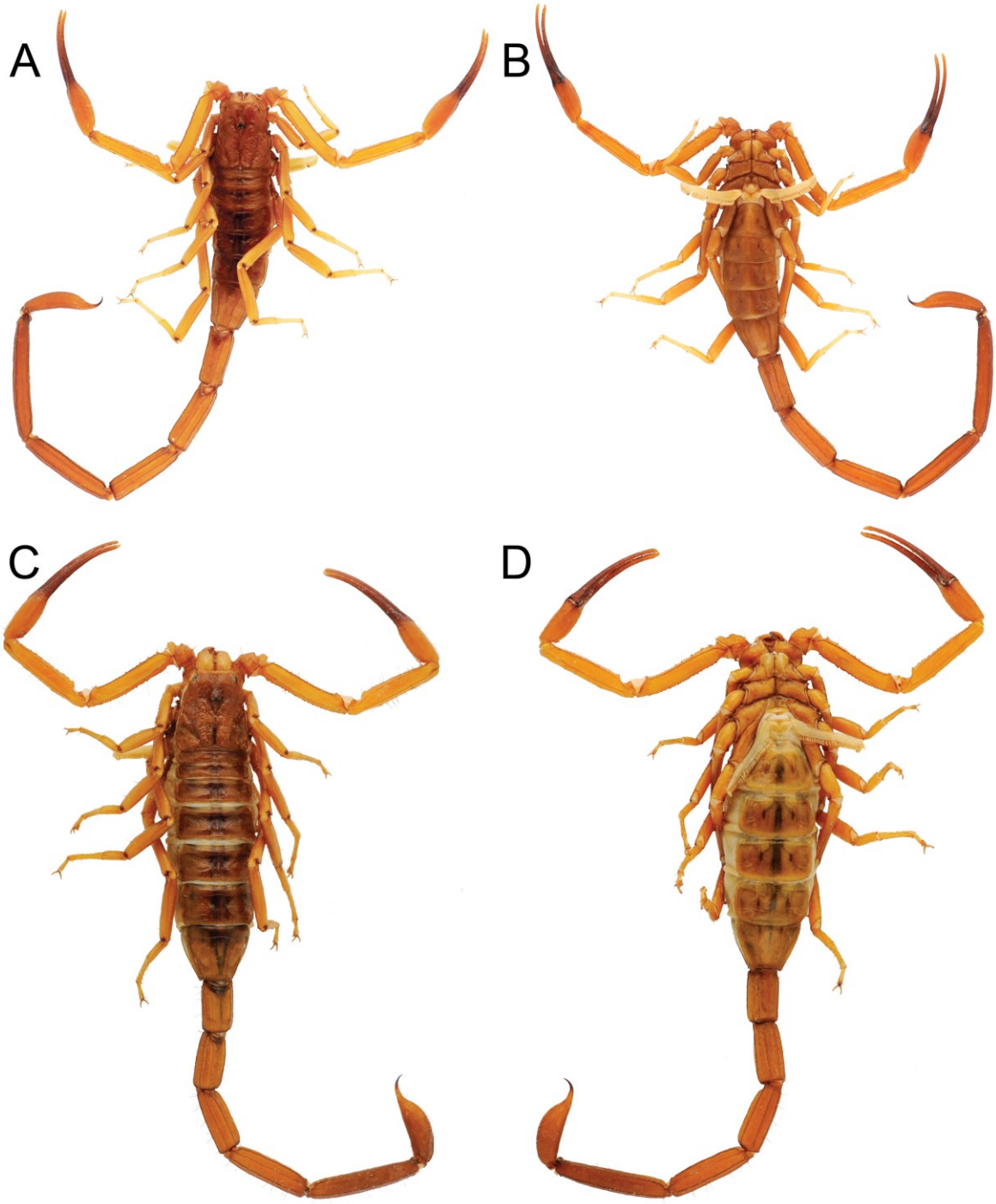


Figure 101. *Syntropis macrura* Kraepelin, 1900, habitus. **A**, **B**. ♂ (CAECIB). **C**, **D**. ♀ (AMNH). **A**, **C**. Dorsal aspect. **B**, **D**. Ventral aspect. Scale bars = 5 mm.

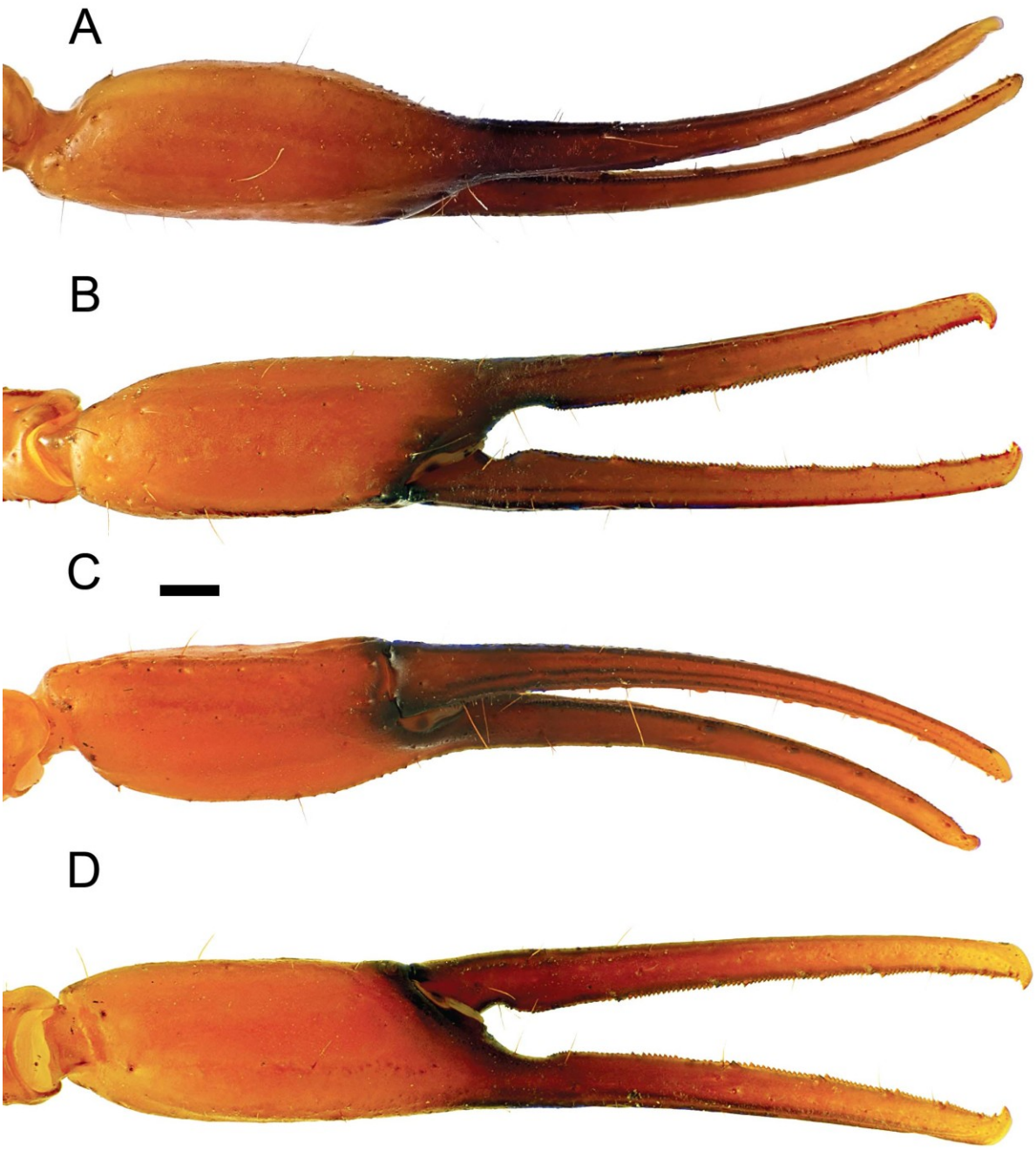


Figure 102. *Syntropis macrura* Kraepelin, 1900, ♂ (CAECIB), dextral pedipalp chela. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

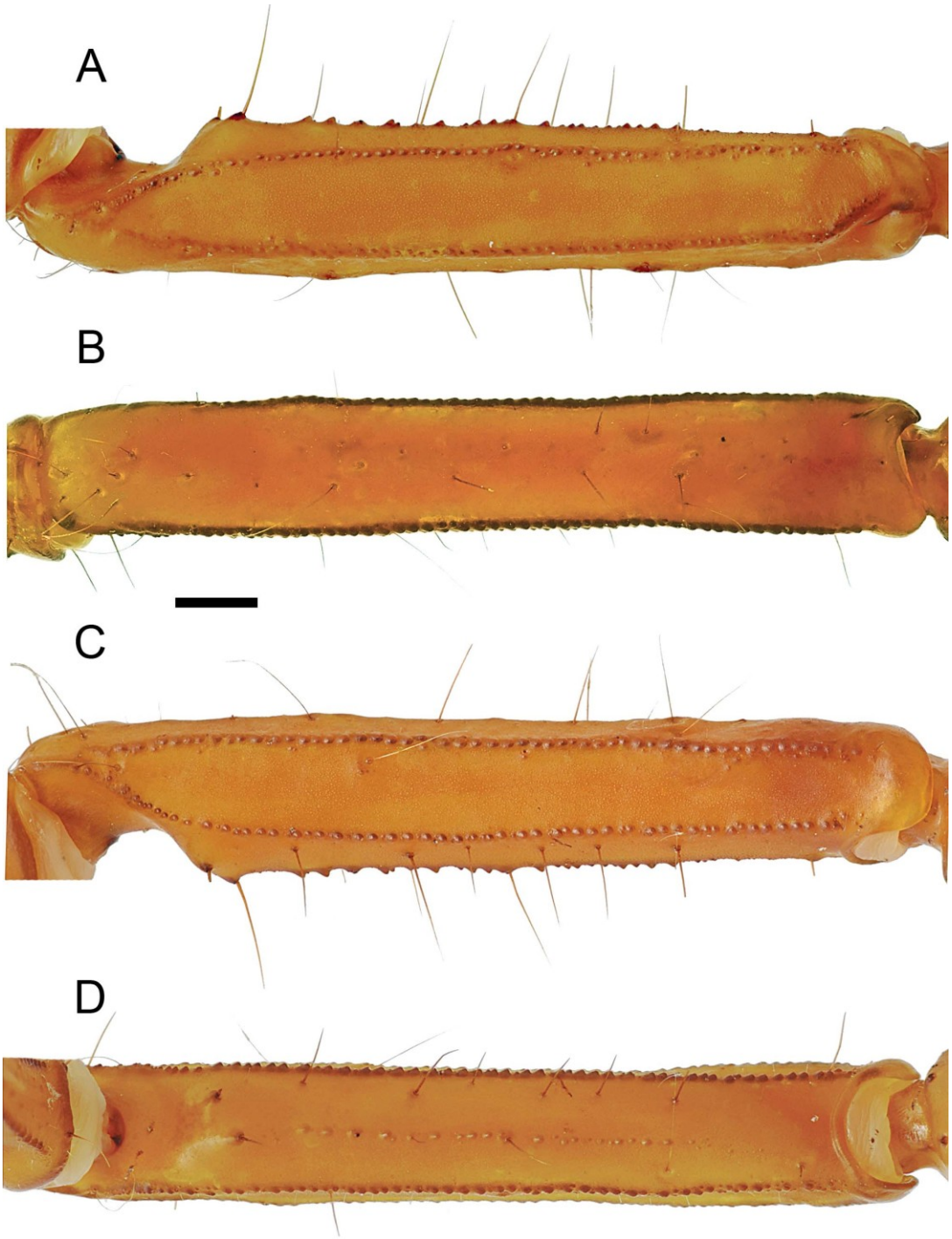


Figure 103. *Syntropis macrura* Kraepelin, 1900, ♂ (CAECIB), dextral pedipalp patella. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

Table 9. Measurements (mm) of *Syntropis aalbui* Soleglad, Lowe, and Fet, 2007, holotype; *Syntropis macrura* Kraepelin, 1900, and *Syntropis williamsi* Soleglad et al., 2007.

	S. aalbui ♀, holotype, MNHG	*S. macrura* ♀, AMNH	*S. williamsi* ♀, AMNH
Length			
Carapace	8.4	8.0	9.2
Pedipalps: femur	10.9	10.8	10.0
Pedipalps: patella	11.2	11.0	11.2
Pedipalps: chela	15.9	16.1	16.3
Fixed finger	9.4	9.1	9.3
Movable finger	10.7	10.9	11.2
Mesosoma	20.4	19.8	21.6
Metasomal segment I	5.0	5.2	5.7
Metasomal segment II	5.9	6.3	6.9
Metasomal segment III	6.4	7.1	7.4
Metasomal segment IV	8.7	9.4	9.8
Metasoma total	36.5	39.9	41.9
Metasomal segment V	10.5	11.9	12.1
Telson: vesicle	6.7	6.9	7.8
Telson: aculeus	2.2	2.1	2.5
Telson total	8.9	9.0	10.3
Total Length	74.2	76.7	83.0
Width			
Pedipalps: femur	1.8	1.8	2.1
Pedipalps: patella	2.0	2.0	2.4
Pedipalps: chela	2.3	2.4	3.1
Metasomal segment I	3.9	3.6	4.1
Metasomal segment II	3.4	3.1	3.5
Metasomal segment III	3.2	2.9	3.3
Metasomal segment IV	2.8	2.5	2.9
Metasomal segment V	2.8	2.2	2.9
Telson: vesicle	3.1	2.8	4.1
Depth			
Pedipalps: chela	2.2	2.4	3.1
Metasomal segment I	3.4	3.0	3.5
Metasomal segment II	3.2	2.7	3.6
Metasomal segment III	3.0	2.6	3.1
Metasomal segment IV	2.9	2.6	2.9
Metasomal segment V	2.6	2.3	2.7
Telson: vesicle	3.0	2.8	3.4

Table 10. Comparative ratios (mm) of selected segment of adult specimens of *Syntropis aalbui* Soleglad et al., 2007, *Syntropis macrura* Kraepelin, 1900, and *Syntropis williamsi* Soleglad, Lowe, and Fet, 2007.

	S. aalbui ♀ Holotype, MNHG	*S. macrura* ♀, (N=9), AMNH, CAECIB, IBUNAM	*S. williamsi* ♀, (N=3) AMNH, IBUNAM	*S. macrura* ♂ (N=10) AMNH, CAECIB, IBUNAM	*S. williamsi* ♂ (N=2) AMNH, IBUNAM
Length/Width					
Metasoma I	1.28	1.45	1.45	2.01	2.00
Metasoma II	1.74	1.99	2.01	2.84	2.58
Metasoma III	2.00	2.40	2.30	3.48	3.12
Metasoma IV	3.11	3.55	3.37	4.97	4.52
Metasoma V	3.75	4.94	4.28	7.24	5.90
Telson vesicle	2.16	2.54	2.87	4.61	3.49
Patella	5.60	5.25	4.55	5.85	5.37
Chelae	6.91	6.48	5.65	6.18	5.37
Length/Depth					
Metasoma I	1.47	1.73	1.69	2.26	2.42
Metasoma II	1.84	2.24	2.14	3.16	3.17
Metasoma III	2.13	2.61	2.41	3.76	3.61
Metasoma IV	3.00	3.60	3.41	5.18	4.61
Metasoma V	4.04	5.05	4.44	7.16	6.02
Telson vesicle	2.23	3.40	3.07	4.67	3.43

Syntropis williamsi Soleglad, Lowe, and Fet, 2007

Figures 97, 104–106, 108B, D, 112C, 113C, 114F 116C, 118C; Tables 9–11

Syntropis williamsi Soleglad, Lowe, and Fet, 2007: 121–126, 128–133, fig. 2, 4–15, 28–30, 33, 34, tabs. I, II.

TYPE MATERIAL: **MEXICO: Baja California Sur:** Holotype ♀ (MHNG), N Los Aripes, 25.vi.1985, W.R. Lourenço and G.A. Polis. Paratypes: 1 ♂, 2 ♀ (MHNG), same locality as holotype.

DIAGNOSIS: Dorsal median, dorsal prolateral, prolateral median, prolateral ventrosubmedian, and ventral median carinae of pedipalp chelae with clusters of fine to moderate granules, granulation scattered and weak proximally but denser distally, including intercarinal surfaces and extending to dorsal fingers approximately two thirds on fixed finger, instead of having weaker and scatter fine granulation restricted to carinae in *S. macrura* or surface mostly smooth in *S. aalbui*. Fixed finger of pedipalp chela with proximal third on prolateral and retrolateral surface finely granulated, instead of having these surfaces smooth in the other species. Relatively lower pectinal counts with 24–26 in ♀ and 25–27 in ♂; in *S. macrura* 27–31 in ♀ and 28–32 in ♂; and in *S. aalbui* 27 in ♀. S. *williamsi* has carapace surface slightly denser and stronger granulation than *S. aalbiu* and *S. macrura.* S. *williamsi* is the stoutest species among *Syntropis*. Comparative measurements are presented in table 16.

DESCRIPTION: The following redescription supplements Soleglad et al's (2007) original description. It is based on adult ♂ and ♀ and the material examined.

Color and infuscation (alive): Base of color uniform yellow straw. Median and lateral tubercles intensely infuscate, carapace slightly orange. Condyle articulations of legs dark

reddish. Pectines and genital operculum contrastingly paler whitish. Pedipalp fingers reddish, aculeus brownish.

Carapace: Carapace anterior margin sublinear, lacking median notch and with three pairs of minor submarginal macrosetae in ♂, in ♀ major macrosetae. Entire surface with scattered moderate and minute granules, except anterior lobes with surface mostly smooth. Anteromedian sulcus moderate, posteromedian comparatively deeper, posterolateral moderate, and posterior transverse obsolete. Median ocular tubercle moderately raised, superciliary carina weak and smooth, slightly higher than median eyes. Median ocular tubercle positioned on distal half of carapace. Median eyes approximately one and half times the size of lateral frontal pair. Three lateral eyes, two frontal pairs same size and posterior reduced approximately in half.

Sternum and coxal region Sternum pentagonal subequilateral, slightly longer than wide in ♂, slightly wider than long in ♀, with three pairs of setae, one distal, one median pairs and one pair on the lobes, median notch deep. Anterior margin of coxa II with two oblique slit-like structures, adjacent to a small and weakly and finely granular protuberance. Base of coxal endite II with a shallow depression each. Coxa IV 2.09 times longer than coxa II.

Chelicerae: Dorsal surface smooth, dentition of fixed and movable fingers as in typical syntropines. Subdistal margin of manus with one median macrosetae. Serrula with 4–7 tines.

Pedipalps: Trichobothrial pattern Type C, orthobothriotaxic. Femur: All intercarinal surfaces smooth. Dorsal retrolateral, dorsal prolateral, and ventral prolateral carinae moderate moniliform, regularly finely granular; retrolateral dorsosubmedian with scatter crenatoserrations six median macrosetae becoming smaller distally; prolateral ventrosubmedian vestigial, with a low proximal tubercle followed by a oblique row of scatter irregular granules and three median macrosetae, starting at proximal median surface slanting gently towards distal end of dorsal

prolateral carinae; prolateral ventral vestigial with four enlarged granules with a macroseta on base and few irregular fine granules; ventral median vestigial expressed by a proximal fine row of rounded granules; retrolateral ventral vestigial expressed by few proximal enlarge, scatter, and serrate granules; ventral retrosubmedian partial, expressed by scattered irregular serrate granules, reaching proximal half.

Patella: All intercarinal surfaces matte. Carinae: Dorsal retrolateral, dorsal prolateral, ventral retrosubmedian, and ventral prolateral carinae finely granular; retrolateral dorsosubmedian and retrolateral median vestigial, expressed as a moderate costa on median retrolateral surface; prolateral median on a moderate vaulted projection, extending from a proximal median tubercle with a major macroseta on top, and a irregular and scattered row of serrated granules reducing in size distally, slanting dorsally gently reaching a distal tubercle with a macroseta on top adjacent to dorsal prolateral carinae minor macrosetae; prolateral ventral obsolete expressed by a proximal tubercle with a macroseta on top and one distal minor macrosetae.

Chela: Manus and fingers gracile. All intercarinal surfaces on dorsal distal half finely granulated, proximally less dense granulated matte. Carinae: Dorsal prolateral and dorsal median carinae expressed as a low broad smooth costa finely granulated distally extending onto the proximal third of fixed finger; dorsal retrosubmedian accessory dorsal retrolateral, and prolateral median obsolete; ventral retrolateral partial, expressed on median two thirds as a irregular row of fine granulation, limited by V_4 and the level of *Est* trichobothrium; ventral prosubmedian, weakly finely angular; ventral prolateral weakly costate and almost smooth, with scattered few irregular granules; prolateral median scattered crenatoserrate. Trichobothrium *Db* positioned on dorsal retrolateral carina, subbasal on chelae and *Dt* positioned close at mid manus.

Pedipalp fixed finger denticles: PD = 6, RD = 6, MD rows = 6; all denticles serrated, retrolateral denticles comparatively smaller than prolateral denticles. Movable finger PD = 8, RD = 7, MD rows = 7, distal five prolateral and retrolateral denticles subparied, proximal six and seven dislocated, distal row with one median denticle. Fingers with moderate scalloping, with proximal notch and median lobe of fixed and movable moderate, positioned on proximal fifth; gap created when fingers close moderate, fingers fit unevenly in ♂, scalloping and gap in ♀ vestigial. Distal terminus of fingers with a distinct whitish elevated cap. Trichobothria *ib* and *it* positioned at PD6, these three positioned at mid finger. Trichobothria series *db–dt* and *eb–et* positioned on the distal two thirds of fixed finger.

Legs: Spinules: Basitarsi I–III with prolateral ventral, retrolateral ventral and retrolateral dorsal carinae with complete rows of spinules, prolateral ventral and retrolateral ventral in IV absent, retrolateral dorsal in IV vestigial, expressed in distal two thirds; retrolateral median rows in I–IV vestigial expressed as few terminal spinules. Telotarsi I–IV with two pairs of ventrodistal spinules in I–IV. Setae: Prolateral ventral 5:6:6:6; retrolateral ventral 12:14:14:11; retrolateral dorsal 3:5:4:5; dorsal 5:3:3:3; retrolateral median 1:3:3:6; retrolateral dorsal and dorsal series arranged in two independent rows.

Tergites: All pretergites lustrous and smooth, postergite smooth medially, laterally shagreened with few scatter coarser granules. Dorsal median and dorsal submedian carinae vestigial in segments I–III, with low minute distal granules, in IV–VII moderate with a short row of minute to moderate granules positioned on distal third. Tergite VII with intercarinal surfaces weakly matte, with fine scattered minute granules, lustrous; dorsal median carina vestigial expressed by a weak proximal short costa positioned on proximal fifth; dorsal submedian vestigial expressed as moderate tubercle positioned on proximal fifth; dorsal lateral and lateral

supramedian finely granular, strongly costate producing a concave appearance of the intercarinal surface, which are weakly granulated medially; dorsal lateral and lateral supramedian connected by a transverse costate carinae on proximal margin distal, creating a semi ring.

Genital operculum: ♂ genital operculum: wider than long, with four pairs of macrosetae. Sclerites free on longitudinal edge moving independently but unable to open more than 45°. Genital papillae protruding posteriorly. ♀ genital operculum: Wider than long, with three macrosetae. Sclerites fuse longitudinal.

Sternites: Sternites III–VI with all carinae obsolete and surface matte and lustrous; IV sternites V with distomedian glandular spot moderate whitish, in ♂, in ♀ obsolete. Sternite VII with ventral lateral carinae finely crenulated; ventral submedian obsolete expressed by two pairs of macrosetae. Distomedian glandular spot strong, extending the whole length of the sternite, occupying ventral lateral intercarinal surface, protruding moderately from adjacent surface in ♂, in ♀ lower and less developed. Spiracle elongated, slit-like, approximately three times longer than wide.

Pectines: Pectines in as long as mid length of trochanter VI, in both sexes. Basal piece with a distal median minor macrosetae. Marginal lamella consist of three sclerites, medial lamella proximally fuse distally progressively forming conspicuous 16–19 beads. Fulcra with 25–26 beads in ♂, 23–25 beads in ♀. Pectinal tooth count 26–27 in ♂, 24–26 in ♀.

Hemispermatophore: Lamina 0.9 longer than trunk. Median lobe ental terminus moderate and rounded. indentations, never forming independent spinules, just the distal tip of spine distinguishable. Dorsal through margin long, narrow, curving proximally, and removed from ventral trough. Primary and secondary hook positioned on the apex of lateral margin extension of the lamina (flange). Primary hook terminus rounded and secondary hook terminus spiniform,

hooks enlarged forming a deep notch, and separated. Hemimating plug developed from the inner lobe, distal barb margin with ca. 25 indentations, without define spinules. Basal plate of inner lobe adjacent to ventral trough, separated in two sections, each in a different plane on ventral view, such that they appear to be independent pieces, being the proximal section closer to the neck and the distal appears to be 'behind'. Neck shorter than basal plate (0.3 times longer than basal plate). Measurements, lamina, 3.76; trunk, 4.1; dorsal trough/laminar hooks, 0.60; ventral trough/laminar hook, 1.66; inner lobe (mating plug) neck, 0.43; basal plate, 1.26.

Metasoma: All intercarinal surfaces matter and lustrous. Dorsal lateral carinae of metasomal segments I–IV and lateral median carinae of segments I–IV finely crenatoserrate, dorsal lateral with irregular rows of fine crenulations. Lateral inframedian in I incomplete crenatoserrate expressed proximally and distally only, median aspect with a gap of smooth and flat surface; in II vestigial expressed by a distal pair of fine and minute granules; in III vestigial expressed by one minute distal granule, in IV absent, in V partial, proximally with a moderate tubercle followed by fine crenatoserrations, irregularly costate, expressed on proximal half. Ventral lateral I–V finely crenatoserrate; ventral submedian I–IV obsolete; ventral median I–III costate, IV and in V completely crenatoserrate. Setae: dorsal lateral, 0:0:1:2:6, lateral median, 0:2:2:2, lateral inframedian, 2:0:0:0:3, ventral lateral, 2:2:2:4:9, ventral submedian, 3:4:5:6:2, ventral sublateral, 3; all carinae major.

Telson: Ventral and dorsal surfaces smooth, in ♂ moderately elongated, (measurements) relatively bald with microsetae only, in ♀ relatively globose, hirsute with 5 major macrosetae in each carinae, macrosetae regularly arranged along carinae. Laterobasal microserration of aculeus with 5–7 sharp tines. Subaculear tubercle vestigial expresses as a low and broad tubercle.

DISTRIBUTION: *Syntropis williamsi* is endemic to the southern end of the Sierra de la Giganta in Baja California Sur, Mexico.

ECOLOGY: *Syntropis williamsi* was collected at low altitudes, from sea level to 92 m. In the oasis at El Pilar, *S. williamsi* was collected on sedimentary conglomerated walls carved by the intermittent San Francisco River. The area was dominated by a rocky landscape including gravel, boulders, and sandy banks. The specimens were collected at night using ultraviolet light. At San José Island, the only juvenile collected was found on a bare compacted sedimentary sandy hill. This habitat of sedimentary deposits contrasts with volcanic material and metamorphic schist, where *S. macrura* and *S. aalbui* inhabit respectively.

MATERIAL EXAMINED: **MEXICO: Baja California Sur:** *Municipio de La Paz*: El Pilar, ca. 20 km NE of Las Pocitas, 24°28.7616'N 111°1.12'W, 92 m, 25.vi.2008, H. Montaño and E. González, collected at night with UV light, 1 ♂, 1 ♀, 2 juv. (AMNH [ARA 2825]), 2 juv. (CAS [ARA 1571]), 3 ♂, 2 ♀ (IBUNAM [ARA 2215]), oasis, collected at night with UV light, 1 subad. ♀ (AMNH [LP 8706]); Isla San José, fishing camp Palma Sola, 25°03.091'N 110°40.037'W, 0–50 m, 3.vi.2008, I.G. Nieto and E. González, arroyo wash, sandy area, collected at night with UV light, 1 juv. (AMNH [LP 8707]); San Evaristo, 10–15 km S, dirty road, 24°47.757'N 110°40.502'W, 27–50 m, 12.vii.2008, H. Montaño and E. González, sand banks, collected at night with UV light, 1 ♂ (AMNH [LP 8826]).

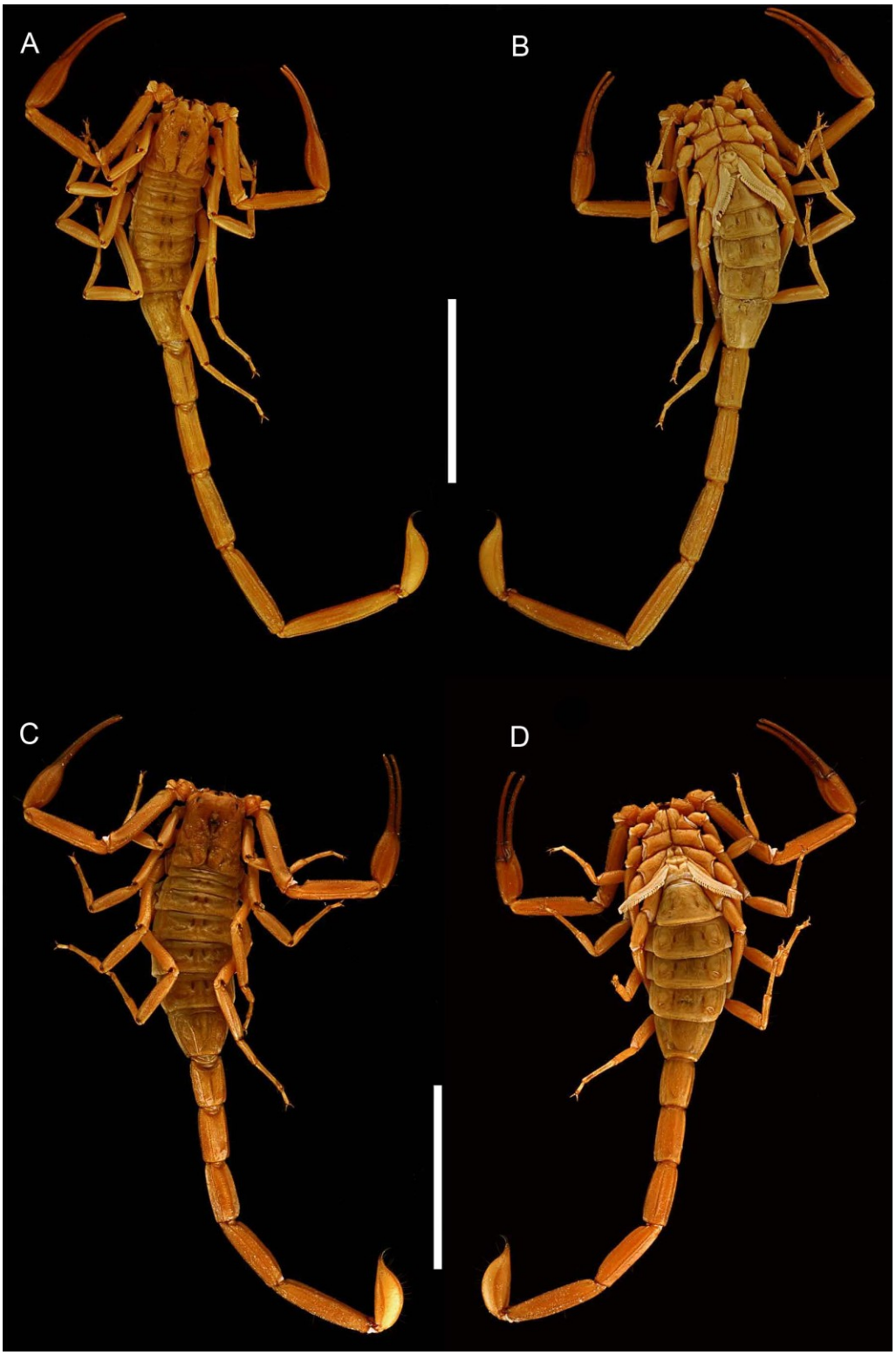


Figure 104. *Syntropis williamsi* Soleglad, Lowe, and Fet, 2007, habitus. **A**, **B**. ♂ (AMNH). **C**, **D**. ♀ (AMNH). **A**, **C**. Dorsal aspect. **B**, **D**. Ventral aspect. Scale bars = 10 mm.

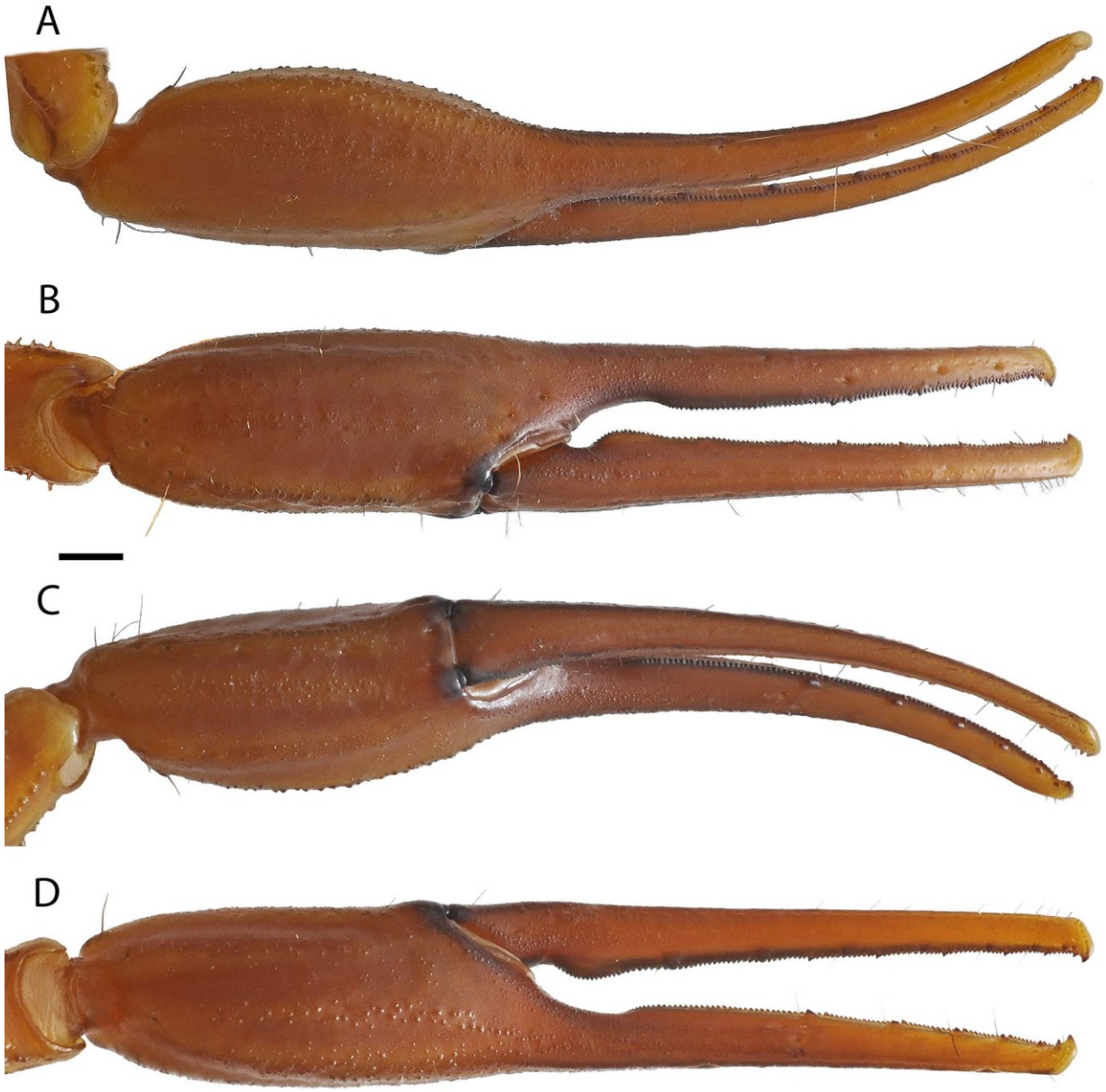


Figure 105. *Syntropis williamsi* Soleglad, Lowe, and Fet, 2007, ♂ (AMNH), dextral pedipalp chela. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

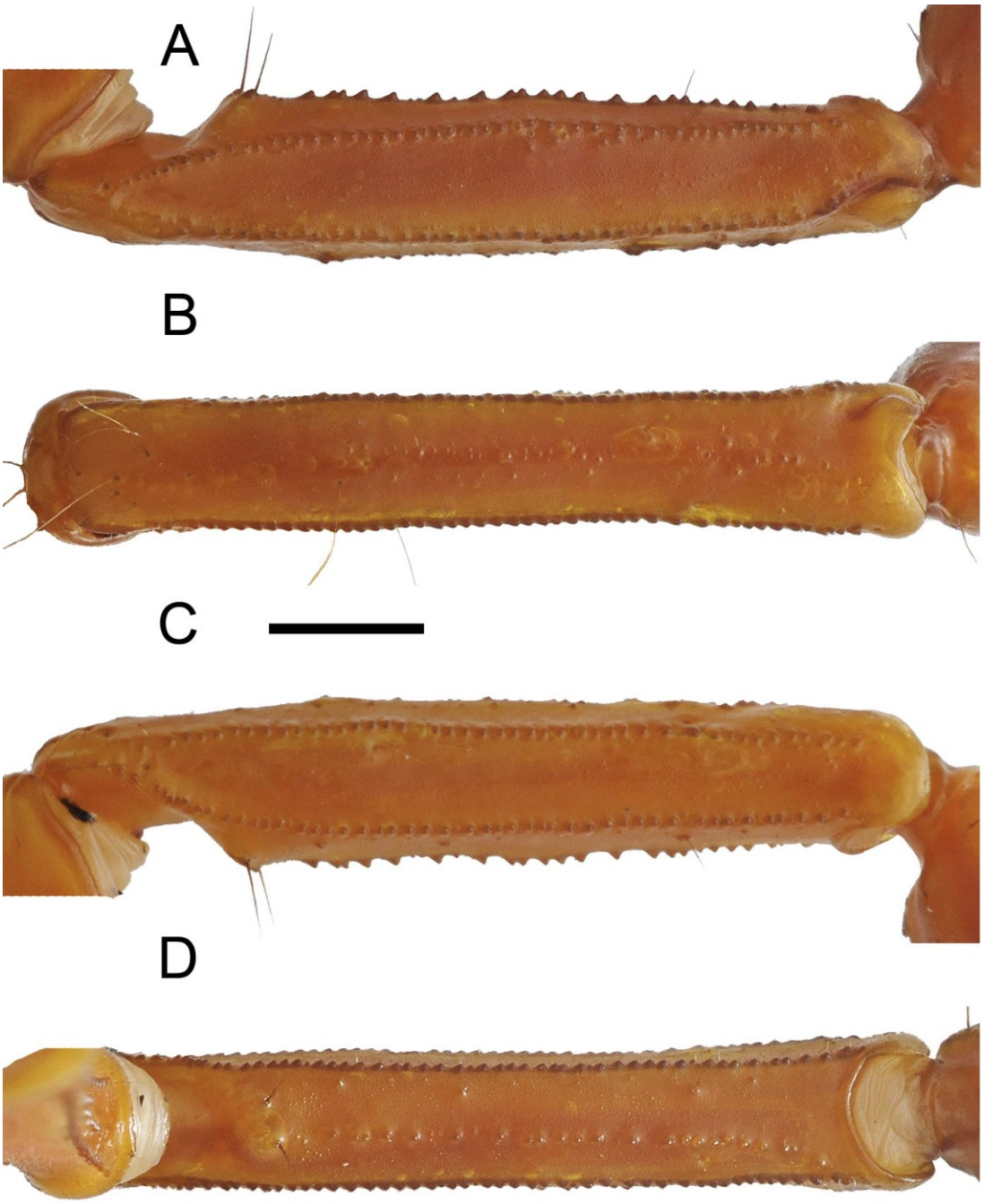


Figure 106. *Syntropis williamsi* Soleglad, Lowe, and Fet, 2007, ♂ (AMNH), dextral pedipalp patella. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

Table 11. Measurements (mm) of *Syntropis williamsi* Soleglad, Lowe, and Fet, 2007, adult ♂ (AMNH).

		Length/Width	Length/Depth
Total length	95.00		
Carapace length	8.70		
Mesosoma length	20.60		
Metasoma length	54.70		
Metasomal segment I length	7.30	2.03	2.52
Metasomal segment I width	3.60		
Metasomal segment I depth	2.90		
Metasomal segment II length	9.00	2.65	3.33
Metasomal segment II width	3.40		
Metasomal segment II depth	2.70		
Metasomal segment III length	9.90	3.19	3.67
Metasomal segment III width	3.10		
Metasomal segment III depth	2.70		
Metasomal segment VI length	12.50	4.63	4.63
Metasomal segment VI width	2.70		
Metasomal segment VI depth	2.70		
Metasomal segment V length	16.00	6.15	6.15
Metasomal segment V width	2.60		
Metasomal segment V depth	2.60		
Telson length	11.00		
Telson: vesicle	8.60	0.80	0.75
Telson: vesicle width	3.20		
Telson: aculeus length	2.40		
Pedipalps: femur length	10.80	5.68	
Pedipalps: femur width	1.90		
Pedipalps: patella length	11.50	5.48	
Pedipalps: patella width	2.10		
Pedipalps: chela length	16.70	5.57	5.22
Pedipalps: chela width	3.00		
Pedipalps: chela depth	3.20		
Fixed finger length	9.00		
Movable finger length	10.70		

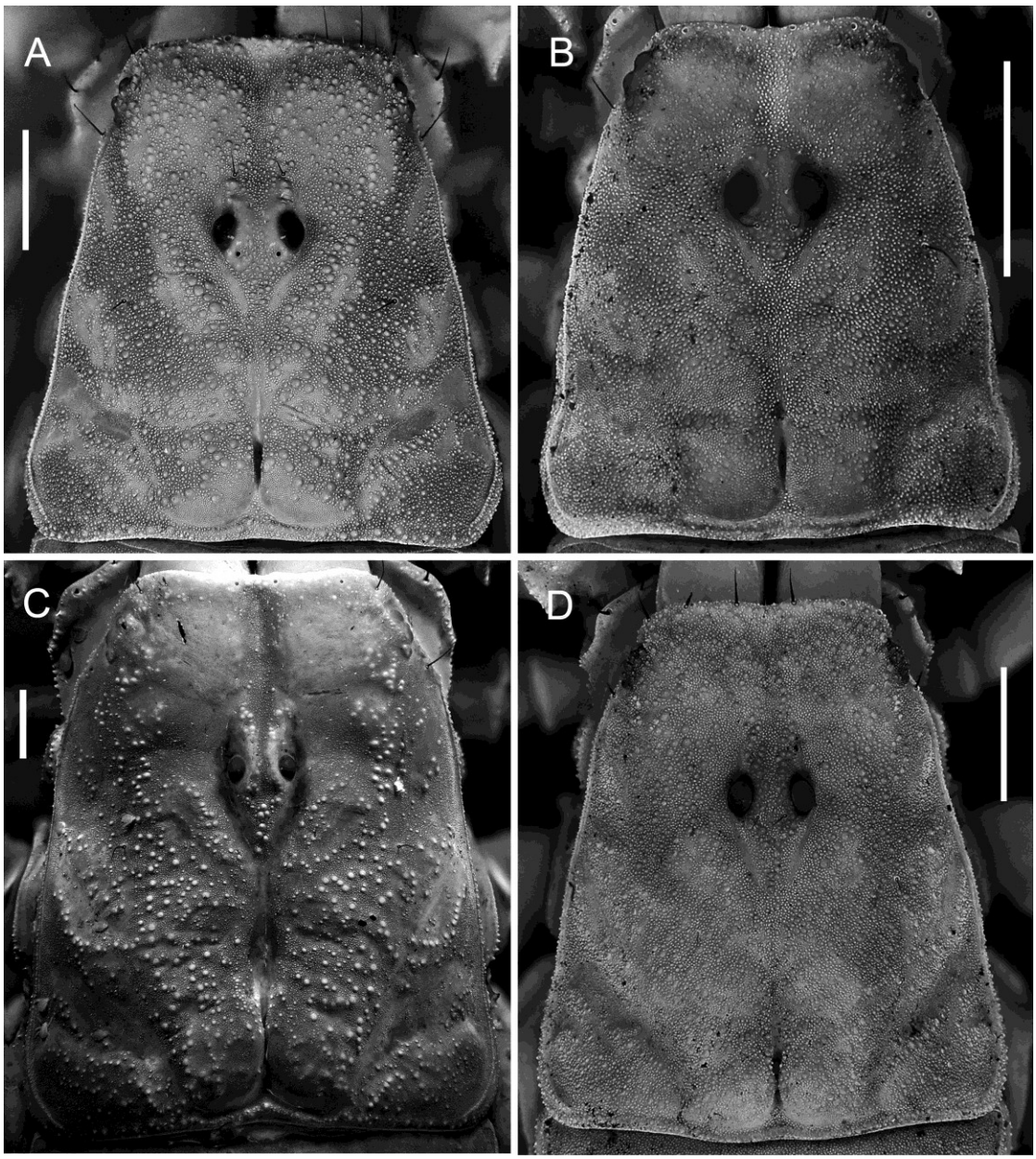


Figure 107. *Maaykuyak* González-Santillán and Prendini, in prep., *Syntropis* Kraepelin, 1900, and *Vizcaino* González-Santillán and Prendini, in prep., carapace. **A**. *Maaykuyak vittatus* (Williams, 1970), ♂ (AMNH). **B**. *Maaykuyak waueri* (Gertsch and Soleglad, 1972), ♂ (AMNH). **C**. *Syntropis macrura* Kraepelin, 1900, ♂ (AMNH). **D**. *Vizcaino viscainensis* (Williams, 1970), ♂ (AMNH). Scale bars = 1 mm.

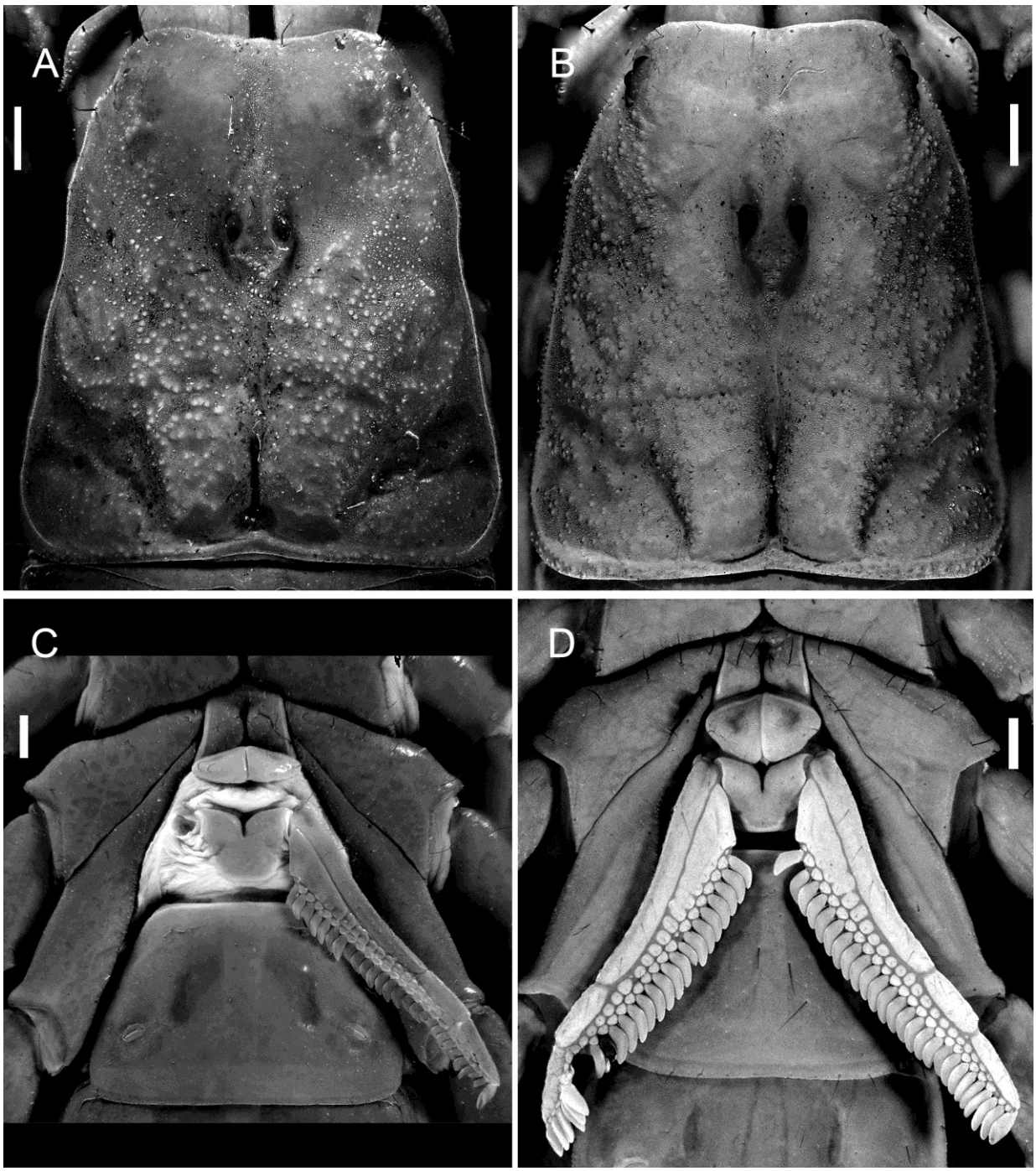


Figure 108. *Syntropis* Kraepelin, 1900, carapace, sternum, genital operculum, and pectines. **A**, **C**. *Syntropis aalbui* Lowe, Soleglad, and Fet, 2007, holotype ♀ (MNHG). **B**, **D**. *Syntropis williamsi* Soleglad, Lowe, and Fet, 2007, ♂ (AMNH). Scale bars = 1 mm.

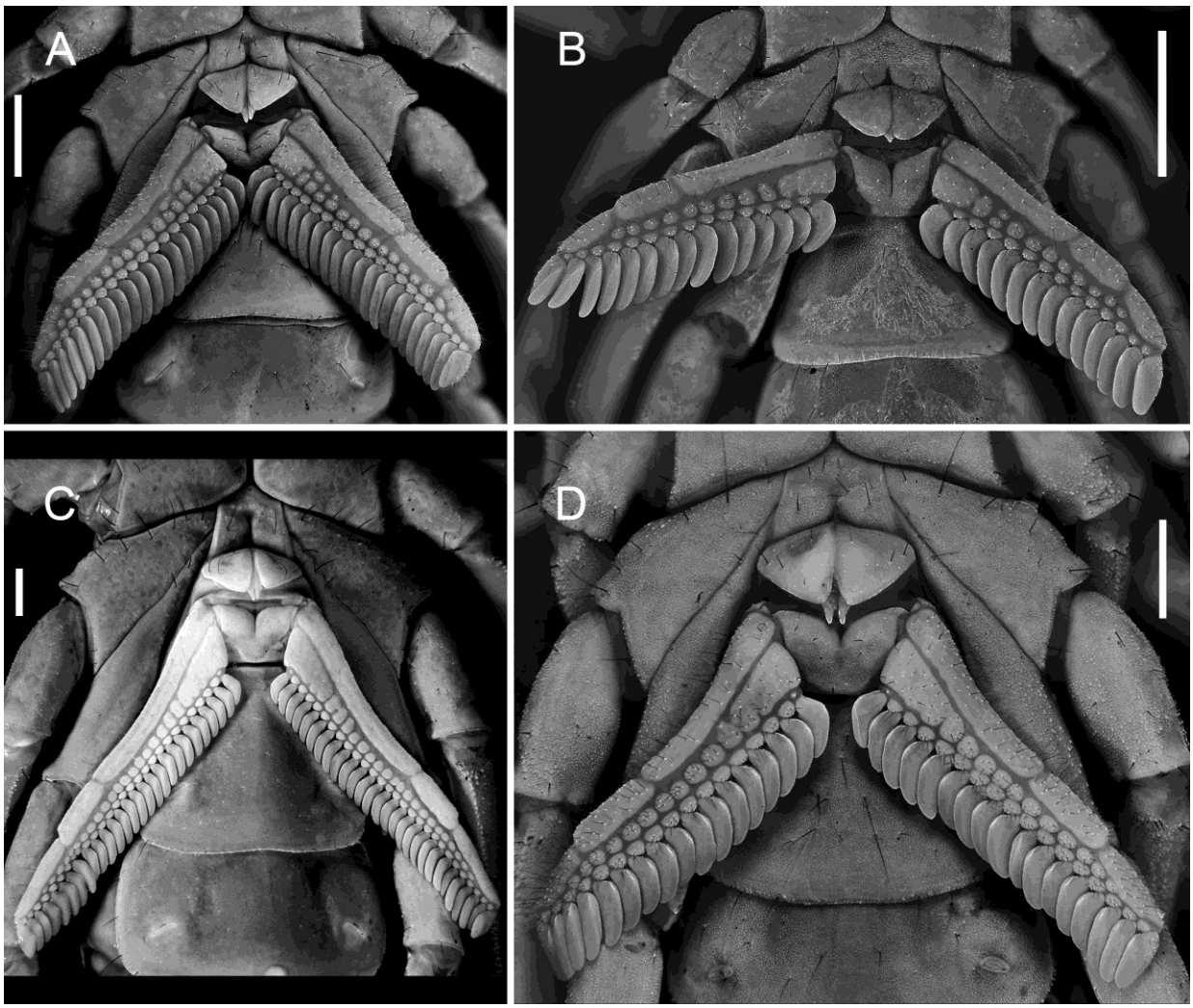


Figure 109. *Maaykuyak* González-Santillán and Prendini, in prep. *Syntropis* Kraepelin, 1900 and *Vizcaino* González-Santillán and Prendini, in prep., sternum, genital operculum, and pectines. **A**. *Maaykuyak vittatus* (Williams, 1970), ♂ (AMNH). **B**. *Maaykuyak waueri* (Gertsch and Soleglad, 1972), ♂ (AMNH). **C**. *Syntropis macrura* Kraepelin, 1900, ♂ (AMNH). **D**. *Vizcaino viscainensis* (Williams, 1970), holotype ♂ (AMNH). Scale bars = 1mm.

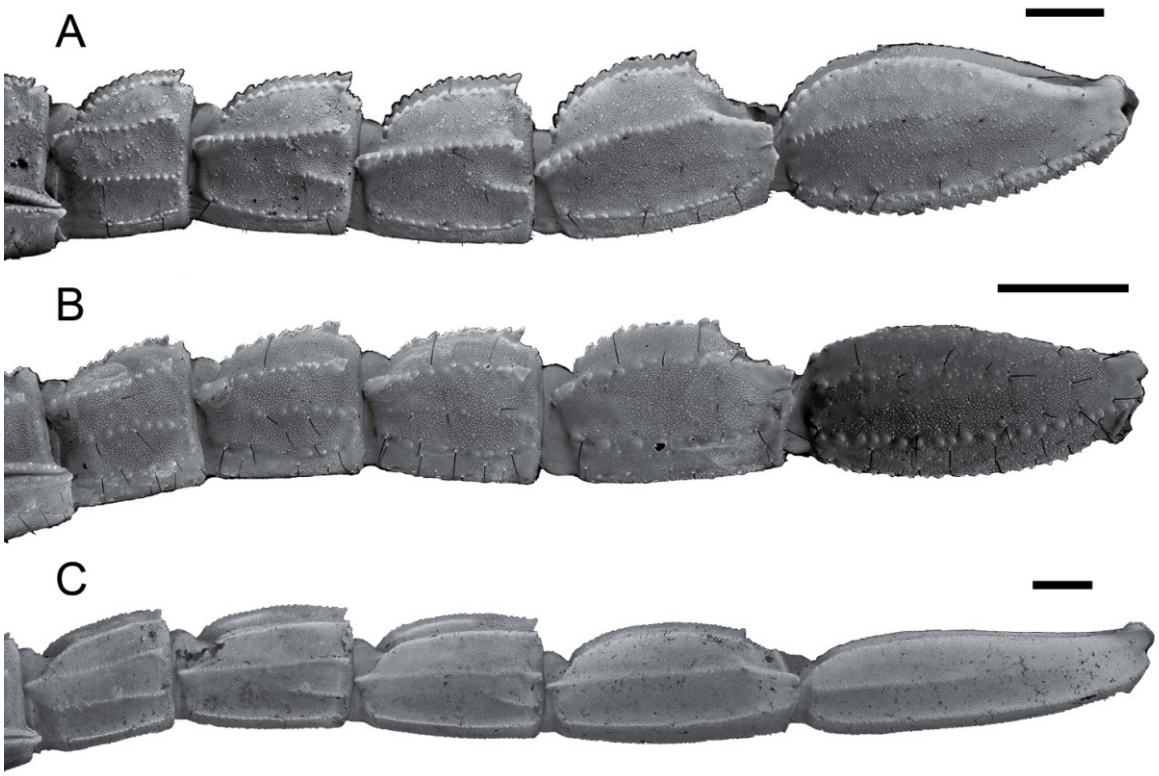


Figure 110. *Maaykuyak* González-Santillán and Prendini, in prep. and *Vizcaino* González-Santillán and Prendini, in prep., lateral aspect of metasomal segments I–V. **A**. *Maaykuyak vittatus* (Williams, 1970), ♂ (AMNH). **B**. *Maaykuyak waueri* (Gertsch and Soleglad, 1972), ♂ (AMNH). **C**. *Vizcaino viscainensis* (Williams, 1970), holotype ♂ (AMNH). Scale bars = 1 mm.

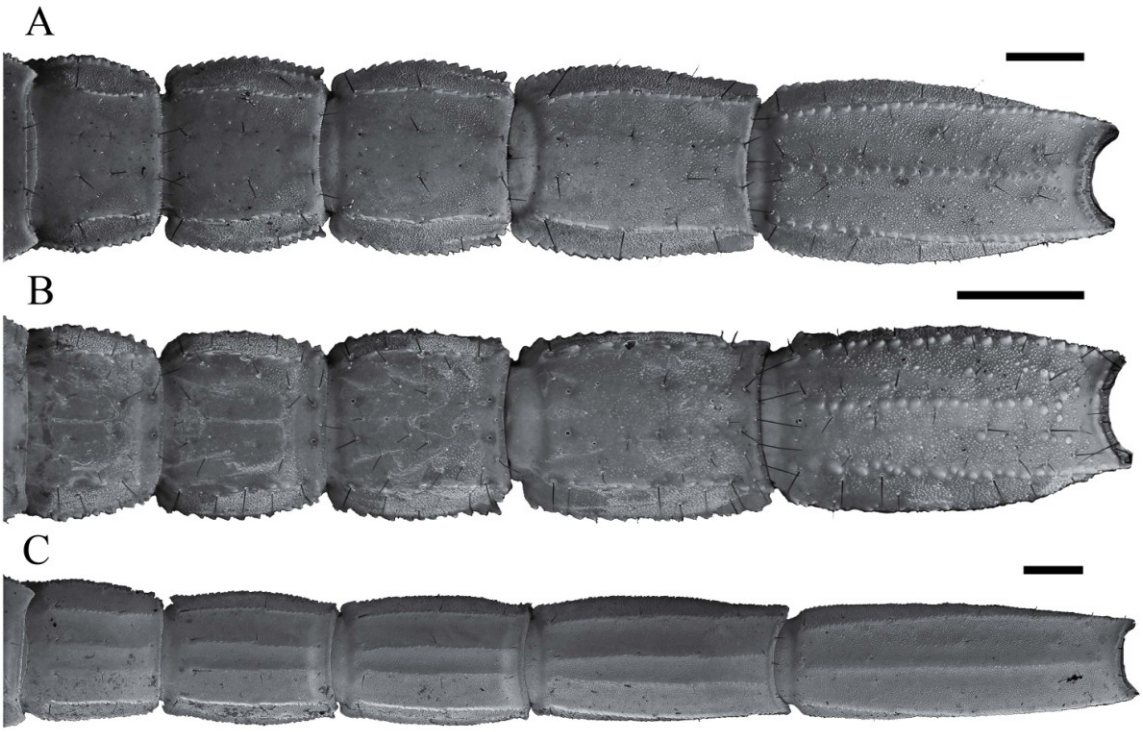


Figure 111. *Maaykuyak* González-Santillán and Prendini, in prep. and *Vizcaino* González-Santillán and Prendini, in prep., ventral aspect of metasomal segments I–V. **A**. *Maaykuyak vittatus* (Williams, 1970), ♂ (AMNH). **B**. *Maaykuyak waueri* (Gertsch and Soleglad, 1972), ♂ (AMNH). **C**. *Vizcaino viscainensis* (Williams, 1970), ♂ (AMNH). Scale bars = 1 mm.

Figure 112. *Syntropis* Kraepelin, 1900, lateral metasomal segments I–V. **A**. *Syntropis aalbui* Lowe, Soleglad, and Fet, 2007, holotype ♀ (MNHG). **B**. *Syntropis macrura* Kraepelin, 1900, ♂ (AMNH). **C**. *Syntropis williamsi* Soleglad, Lowe, and Fet, 2007, ♂ (AMNH). Scale bars = 5 mm.

Figure 113. *Syntropis* Kraepelin, 1900, ventral metasomal segments I–V. **A.** *Syntropis aalbui* Lowe, Soleglad, and Fet, 2007, holotype ♀ (MNHG). **B**. *Syntropis macrura* Kraepelin, 1900, ♂ (AMNH). **C**. *Syntropis williamsi* Soleglad, Lowe, and Fet, 2007, ♂ (AMNH). Scale bars = 5 mm.

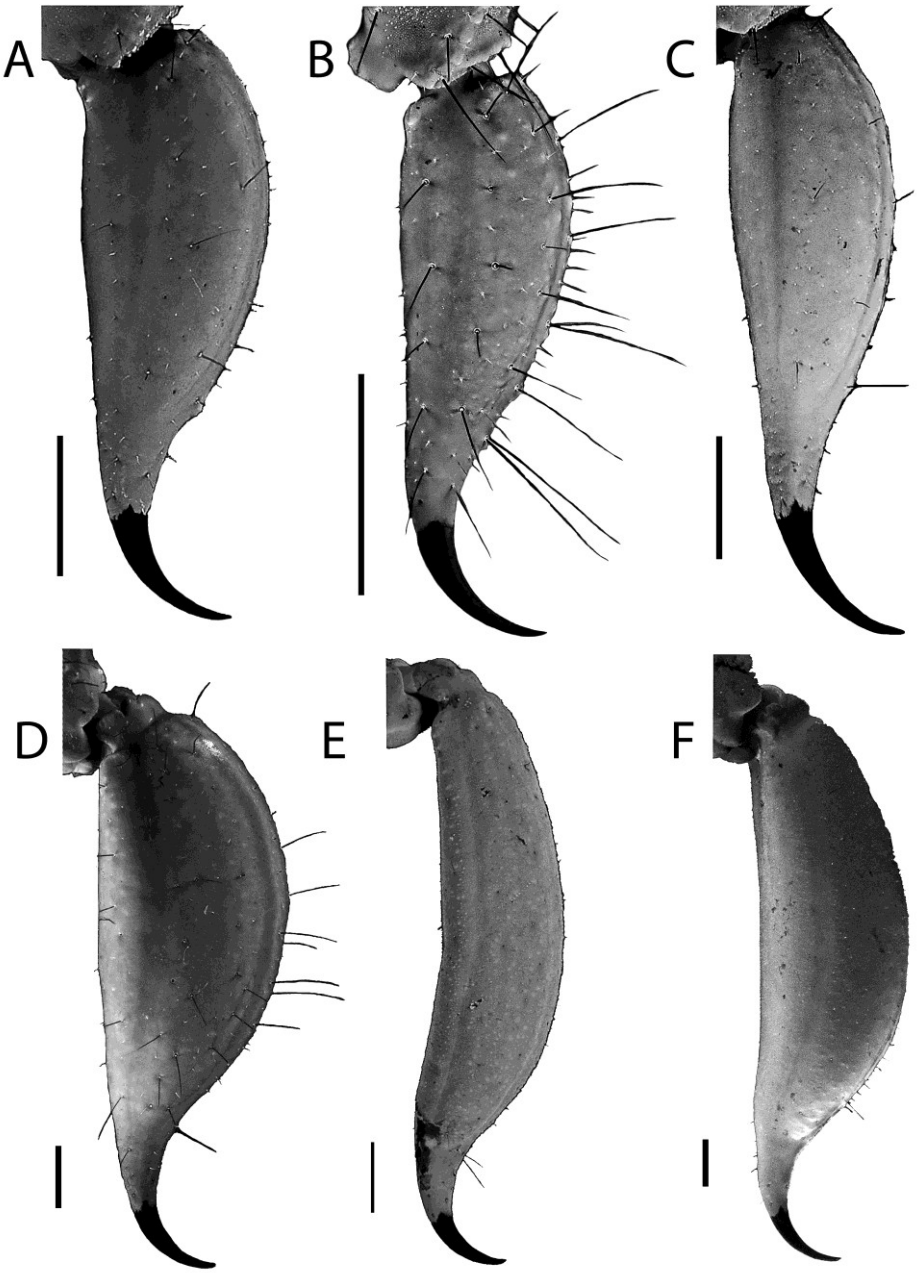


Figure 114. *Maaykuyak* González-Santillán and Prendini, in prep., *Syntropis* Kraepelin, 1900 and *Vizcaino* González-Santillán and Prendini, in prep., telson, lateral aspect **A**. *Maaykuyak vittatus* (Williams, 1970), ♂ (AMNH). **B**. *Maaykuyak waueri* (Gertsch and Soleglad, 1972), ♂ (AMNH). **C**. *Vizcaino viscainensis* (Williams, 1970), ♂ (AMNH). **D**. *Syntropis aalbui* Lowe, Soleglad, and Fet, 2007, holotype ♀ (MNHG). **E**. *Syntropis macrura* Kraepelin, 1900, ♂ (AMNH). **F**. *Syntropis williamsi* Soleglad, Lowe, and Fet, 2007, ♂ (AMNH). Scale bars = 1 mm.

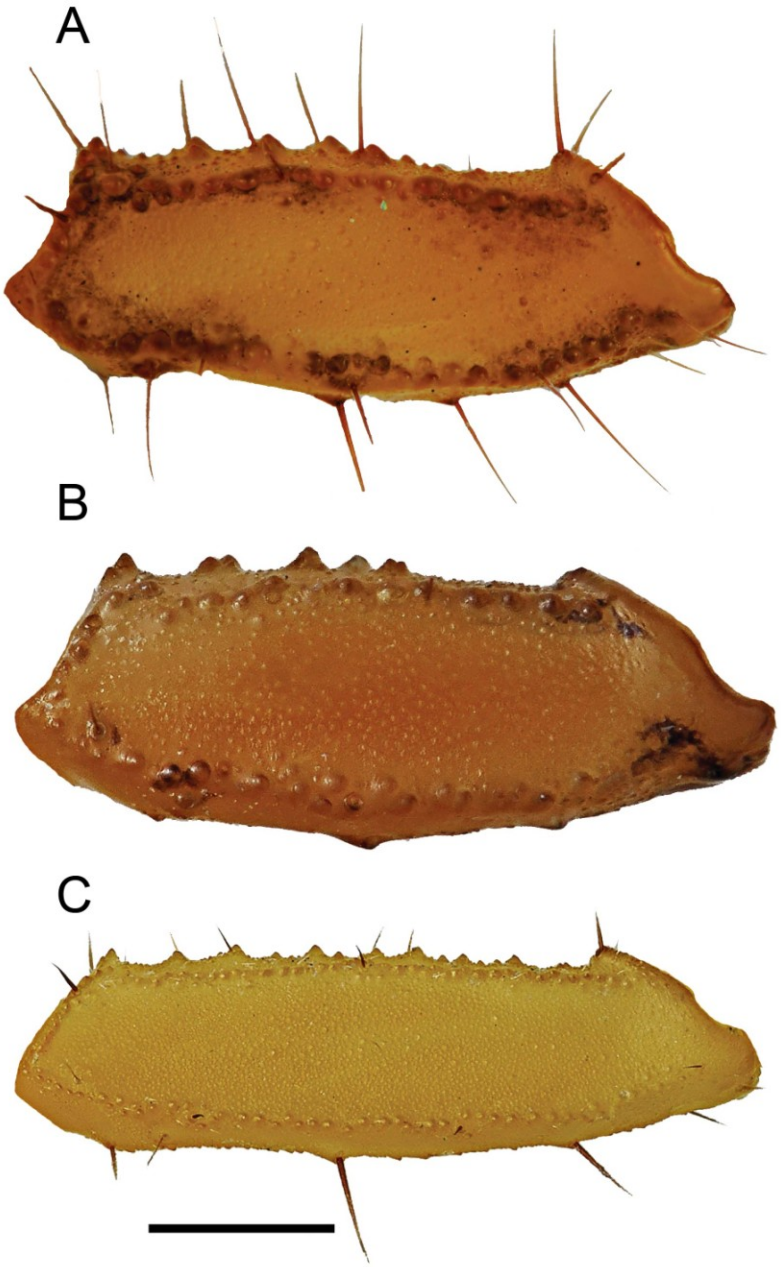


Figure 115. *Maaykuyak* González-Santillán and Prendini, in prep. and *Vizcaino* González-Santillán and Prendini, in prep., dextral dorsal pedipalp femur. **A**. *Maaykuyak vittatus* (Williams, 1970), ♂ (AMNH). **B**. *Maaykuyak waueri* (Gertsch and Soleglad, 1972), ♂ (AMNH). **C**. *Vizcaino viscainensis* (Williams, 1970), ♂ (AMNH). Scale bars = 1 mm.

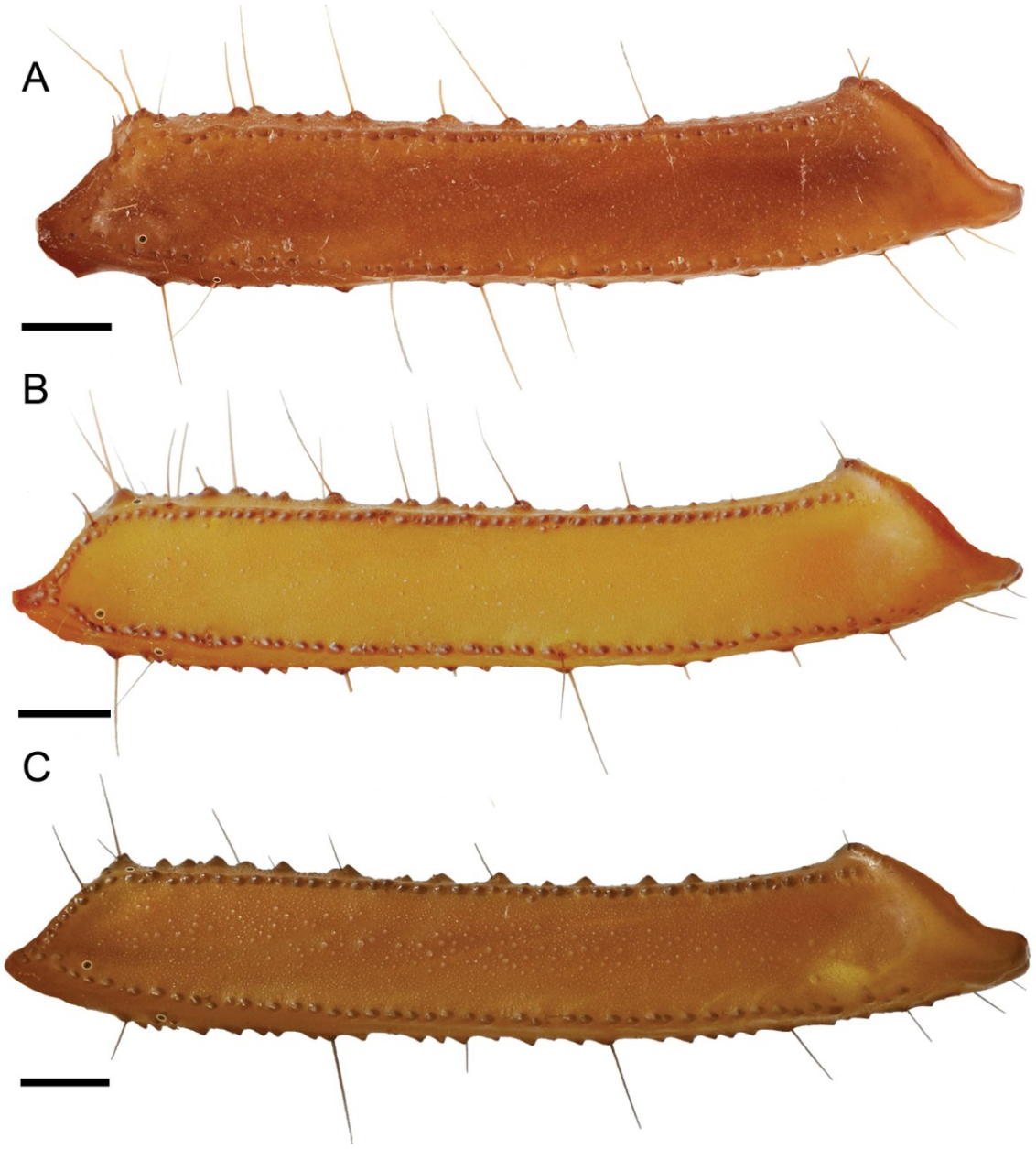


Figure 116. *Syntropis* Kraepelin, 1900, dextral dorsal pedipalp femur. **A**. *Syntropis aalbui* Lowe, Soleglad, and Fet, 2007, holotype ♀ (MNHG). **B**. *Syntropis macrura* Kraepelin, 1900, ♂ (AMNH). **C**. *Syntropis williamsi* Soleglad, Lowe, and Fet, 2007, ♂ (AMNH). Scale bars = 1 mm.

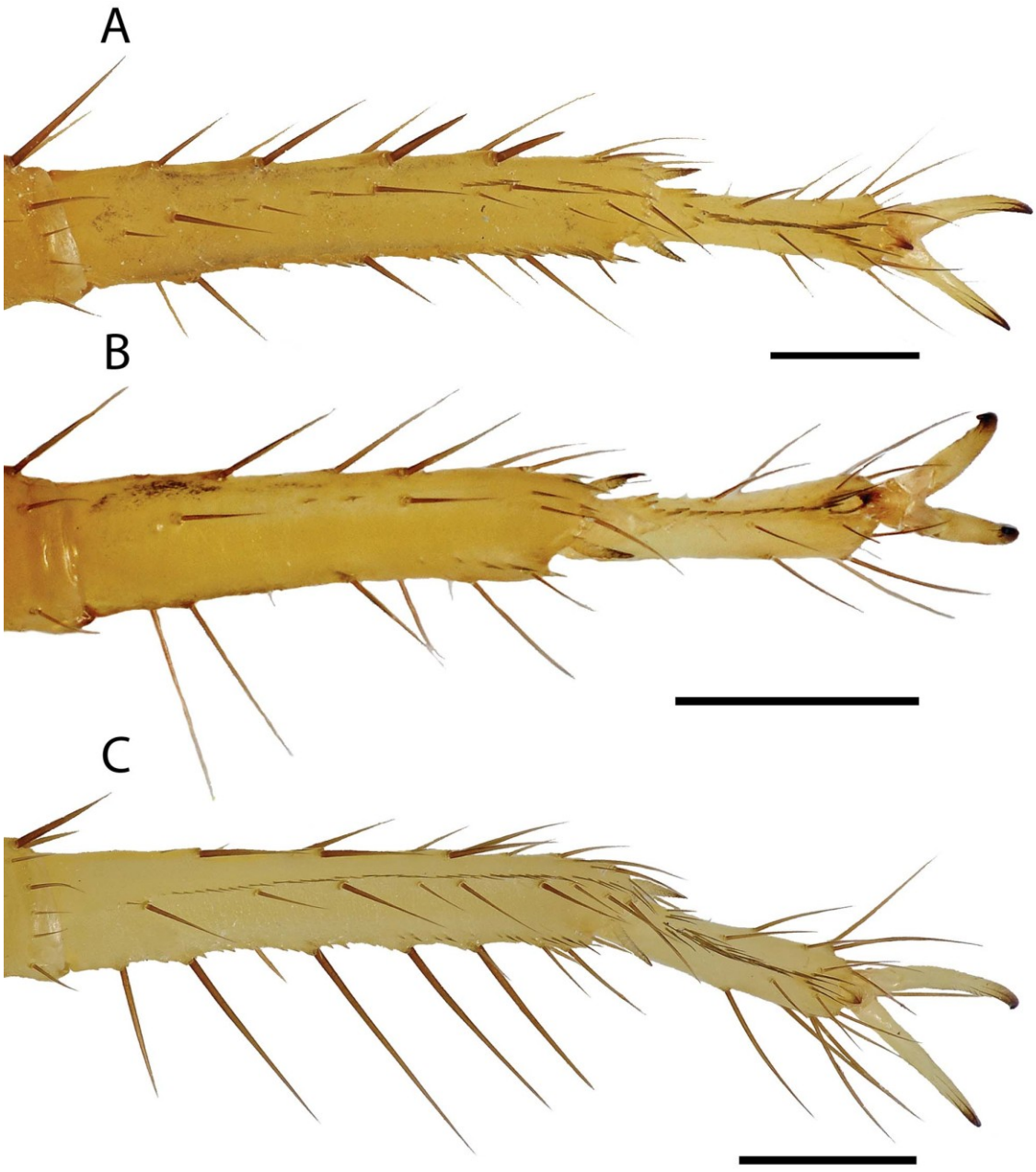


Figure 117. *Maaykuyak* González-Santillán and Prendini, in prep., *Syntropis* Kraepelin, 1900 and *Vizcaino* González-Santillán and Prendini, in prep., dextral basitarsus and telotarsus III. **A**. *Maaykuyak vittatus* (Williams, 1970), ♂ (AMNH). **B**. *Maaykuyak waueri* (Gertsch and Soleglad, 1972), ♂ (AMNH). **C**. *Vizcaino viscainensis* (Williams, 1970), ♂ (AMNH). Scale bars = 0.5 mm.

Figure 118. *Syntropis* Kraepelin, 1900, dextral basitarsus and telotarsus III. **A**. *Syntropis aalbui* Lowe, Soleglad, and Fet, 2007, holotype ♀ (MNHG). **B**. *Syntropis macrura* Kraepelin, 1900, ♂ (AMNH). **C**. *Syntropis williamsi* Soleglad, Lowe, and Fet, 2007, ♂ (AMNH). Scale bars = 0.5 mm.

VOLUME II

KUARAPU Francke and Ponce-Saavedra, 2010

Kuarapu purhepecha Francke and Ponce-Saavedra, 2010

Figures 119–122, 196D, 204C, 208G, 212G, 215F, 218H, 224C

Kuarapu purhepecha Francke and Ponce-Saavedra, 2010: 52–57, figs. 1–27; Ayrey, 2011: 1.

TYPE MATERIAL: **MEXICO: Michoacán:** *Municipio de la Huacana*: Holotype ♂ (IBUNAM T-0411), ‘‘El Vado’’, km 17 road from Zicuarán to Churumuco, 18.8142°'N 101.91593°W, 248 m, 30.vii.2008, O. Francke, J. Ballesteros, J. Ponce, A. Quijano, and M. Villaseñor. Paratypes: 2 ♂, 2 ♀, (IBUNAM T-0412), 1 ♂, 1♀ (AMNH), same data as holotype; 1 ♀, (IBUNAM T-0413), same locality as holotype, 20.v.2007.

DESCRIPTION: The following redescription complements Francke and Ponce-Saavedra ‘s (2010), it is base on the holotype and paratype specimens.

Color and infuscation (in alcohol): Base color pale cream to medium orange, dorsal surface of chelicerae infuscate with reticulate markings. Carapace with a marbled patter of fuscous markings lateral and median ocular tubercles intensely infuscate; terga also infuscate with marbled, broader, dense markings. Femur, patella, and chelae with dorsal, prolateral, and retrolateral surfaces diffusely infuscate and all carinae outlined with intense infuscation. Base of fingers intensely infuscate; prolateral surface of legs partially infuscate. Metasoma with broad marbled dusky infuscation, lighter in metasomal segments I and II becoming heavier in the other segments. Ventral surface of telson infuscate with two lateral broad and a median longitudinal bands with dusky markings, dorsal entirely infuscate. Pectines, basal peace and genital

operculum pale whitish. Sternites immaculate, except lateral margin with a diffuse outline of infuscation. Aculeus base reddish to brownish.

Carapace: Carapace anterior margin sublinear, lacking median notch and with three pairs of major macrosetae. Surface completely matte in male, shagreened in female with moderated and minute rounded granules. Anteromedian, posteromedian, and posterolateral sulci moderate, posterior transverse obsolete. Median ocular tubercle moderately raised, superciliary carina weakly smooth, higher than median eyes. Median ocular tubercle positioned on distal half of carapace. Median eyes approximately double size of lateral frontal pair. Three lateral eyes, two frontal pairs same size and posterior reduced approximately in half.

Sternum and coxal region: Sternum pentagonal subequilateral with four pairs of setae, one distal, two median pairs and one pair on the lobes, median notch deep. Anterior margin of coxa II with two oblique slit-like structures, adjacent to a small and smooth protuberance. Base of coxapophysis II with a shallow depression each. Coxa IV 2.00 times longer than coxa II.

Chelicerae: Dorsal surface smooth, dentition of fixed and movable fingers as in typical vaejovids. Distal margin of manus with one median macrosetae. Serrula with 14 tines.

Pedipalps: Trichobothrial pattern Type C, orthobothriotaxic. Chelae wider than patella and patella wider than femur. Femur: all surface matte. Carinae: Dorsal retrolateral, dorsal prolateral, and ventral prolateral carinae strongly granular; retrolateral dorsosubmedian complete, weakly crenatoserrate with a moderated proximal tubercle and two major macrosetae medially; prolateral ventrosubmedian complete and strong, oblique row of sharp, conical, and enlarged granules, starting at mid surface slanting gently towards distal end of dorsal prolateral carinae, with two median minor macrosetae; prolateral ventral vestigial, expressed by two proximal tubercles, ventral one with a macroseta on top and three additional lower conical

granules, proximal with a macroseta on top, median bicuspid, smaller with a minor macroseta, distal with a major macroseta on top, distributed from the basal to the mid aspect of the segment; ventral median and retrolateral ventral vestigial expressed by scattered serrated granules; ventral retrosubmedian obsolete.

Patella: All intercarinal surfaces matte. Carinae: Dorsal prolateral and dorsal retrolateral complete minutely crenular; ventral prolateral complete with scattered irregular coarse and minute crenulations; ventral retrosubmedian vestigial with few basal moderated granules, strongly angular but not costate; ventral median vestigial expressed as a short costa with few low crenulations; retrolateral carinae obsolete, expressed by bands of infuscation; prolateral median complete on a moderate vaulted projection, extending from a proximal tubercle with a major macroseta on top as a strong costa with a row of scattered and coarse subserrate granules slanting gently at the level of trichobothrium d_2 towards dorsal prolateral carinae ending on one distal minor macrosetae; prolateral ventral obsolete expressed by one proximal macrosetae on top of a moderate granule, on medina minor macrosetae and a distal major macrosetae on top of a moderate granule

Chelae: Pedipalp manus elongate and slender (manus 1.04 times longer than fixed finger). Intercarinal surface matte. Carinae: All carinae obsolete expressed only by infuscation. Trichobothria *Db* positioned on dorsal retrolateral carinae, *Dt* dorsal to dorsal retrolateral carinae. Trichobothrium *Dt* positioned subbasal on manus. Trichobothrium *Dt* positioned at mid manus.

Fingers: Fixed finger dentition: PD = 6, RD = 5, MD rows = 5, all denticles serrated, retrolateral denticles similar in size as prolateral denticles, distal retrolateral denticle on enlarged claw-like denticle. Movable finger PD = 7, RD = 5, MD rows = 5, distal row with one denticle,

prolateral and retrolateral denticles subpaired, distal retrolateral denticle on enlarged claw-like denticle. Trichobothrium *ib* positioned at the level of PD6 and *it* positioned between PD5 and PD6. Fingers with moderate scalloping, proximal notch and median lobe of pedipalp fixed finger moderate, proximal notch and median lobe of pedipalp movable finger weak. Gap created when fingers close moderate, fingers fit unevenly, in ♂, in ♀ fingers lacking scalloping and gap when fingers close.

Legs: Spinules: Basitarsi I–II with prolateral ventral, retrolateral ventral and retrolateral dorsal carinae with complete rows of spinules; prolateral ventral in III vestigial, expressed by few distal spinules, in IV absent; retrolateral ventral in III complete, in IV absent; retrolateral dorsal in III–IV partial expressed on distal half; retrolateral median rows in I–IV vestigial expressed as few terminal spinules; Telotarsi I–IV with two pairs of ventrodistal spinules in I–IV. Setae: Prolateral ventral, 3:3:5:5, retrolateral ventral, 3:5:6:6; retrolateral dorsal, 2:3:3:3; dorsal, 3:3:3:3; retrolateral dorsal and dorsal series arranged in two independent rows.

Tergites: Preterga matte, posterga matte, except lateral surface with scattered moderated and coarse conical granules. Dorsal median and dorsal submedian carinae weak with a few distal granules on proximal half. Tergite VII with intercarinal surfaces matte, except lateral inframedian and lateral median intercarinal surface with scattered large conical granules; dorsal median carina partial and strong expressed on proximal half, moderately costate; dorsal submedian vestigial expressed as a pair of distal short protuberances; dorsal lateral and lateral supramedian strong, distal extreme with a pair of spiniform.

Genital operculum: Male genital operculum: wider than long, with three pairs of macrosetae. Sclerites free on longitudinal edge moving independently but unable to open more than 45°. Genital papillae protruding posteriorly.

Sternites: Sternites III–VI with all carinae obsolete and surface matte, V in ♂ with distomedian glandular spot moderate, slightly protruding from adjacent surfaces, in ♀ obsolete. Sternite VII with ventral lateral carinae weakly crenulated and costate; ventral submedian carinae vestigial expressed by three macrosetae in both sexes. Distomedian glandular spot rounded, moderated, protruding moderately in both sexes. Spiracle elongated, slit-like, approximately two times longer than wide.

Pectines: Distal margin of marginal lamella in ♂ one third longer than distal margin of coxa VI, in ♀ one fourth longer than coxa IV. Basal piece with two minor macrosetae. Marginal lamella consist of three sclerites, medial lamella proximally fuse distally progressively forming conspicuous 11–13 beads. Fulcra with 16–17 in ♂, 15–16 in ♀. Pectinal tooth count 17–18 in ♂, 16–17 in ♀.

Hemispermatophore: Lamina 1.76 longer than trunk. Dorsal through margin long, narrow, curving proximally, and removed from ventral trough. Hemimating plug developed from the inner lobe, distal barb margin with 9 elongated spinules. Primary and secondary hook positioned on the apex of lateral margin extension of the lamina (flange). Both hooks sharp, separated slightly, forming a shallow notch. Median lobe ental terminus moderated and rounded. Basal plate of inner lobe proximal to ventral trough. Spine of inner lobe moderate, secondary spine on ventromedian aspect of neck absent. Neck relatively short (0.59 times longer than basal plate). Measurements, lamina, 2.33; trunk, 1.32; dorsal trough/laminar hooks, 0.99; ventral trough/laminar hook, 0.63; neck, 0.43; basal plate 0.73.

Metasoma: All intercarinal surfaces matter. Dorsal lateral carinae of metasomal segments I–IV and lateral median carinae of segments I–III strongly crenatoserrated, proximally end with an elongated spiniform tubercle pointing backwards; dorsal lateral in V strongly crenatoserrated

on proximal half, becoming finely crenulated distally; Lateral median in IV distal terminus moderately expanded or flared laterally. Lateral inframedian in I complete crenatoserrated, in II partial irregularly expressed on distal half, becoming weaker proximally; in III vestigial irregularly serrated expressed in distal third, in IV absent, in V partial, strongly crenatoserrated proximally becoming fine and weakly costate, expressed in distal two thirds. Ventral lateral I–V, finely crenulated and strongly costate; ventral submedian I–II smooth but strongly costate, in III proximal two third smooth, distal third finely crenatoserrated; in IV scattered and finely crenatoserrated; ventral median in V finely crenatoserrated. Setae: In ♀ dorsal lateral, 1:2:3:3:9; lateral median, 1:2:3:4; lateral inframedian, 3:2:1:0:5; ventral lateral, 3:3:3:4:12; ventral submedian, 3:3:4:3; ventral sublateral, 3; ventral median, 6; segments II–IV with three accessory macroseta on median surface, all carinae major; in ♂ dorsal lateral 0:0:1:1:4; lateral median, 1:1:1:2; lateral inframedian, 1:1:1:0:2; ventral lateral, 2:2:2:3:5; ventral submedian, 3:3:3:3; ventral sublateral, 3; ventral median, 4.

Telson: Ventral and dorsal surfaces smooth, relatively hirsute with five to six macroseta in each carinae in ♀, in ♂ three, restricted to distal surface. Laterobasal microserration of aculeus with 7 sharp tines. Subaculear tubercle vestigial, proximal pair of macrosetae positioned on a low and broad tubercle, weakly protruding from adjacent surface.

DISTRIBUTION: *Kuarapu purhepecha* is endemic to the Balsas Depression, where it has been recorded in a locality of La Huacana municipality, in the state of Michoacán, Mexico.

ECOLOGY: According to Francke and Ponce-Saavedra (2010) the specimens were collected during the night on rock faces along a road-cut. The authors observed that the scorpions displaced rapidly among the cracks of the rocks. Although the relatively elongated pedipalps are

the only evident morphological adaptation, the behavior described is typical scorpions with a lithophilic ecomorphotype.

REMARKS: Francke and Ponce-Saavedra (2010) discussed the relative position of this species according to the classification proposed by Soleglad and Fet (2008). They concluded that because the characters proposed in that classification are not polarized, the position of *K. purhepecha* in Syntropini or Stahnkeini couldn't be established. The analyses conducted in this revision indicate that this species belongs in the Syntropinae, as defined in chapter 1. Several molecular and morphological character-states unambiguously support the inclusion of this species in this subfamily.

MATERIAL EXAMINED: **MEXICO: Michoacán:** *Municipio de La Huacana*: El Vado, 18°48'51"N 101°54'57"N, 248 m, 30.vii.2008, 2 juv. (AMNH [LP 9517]).

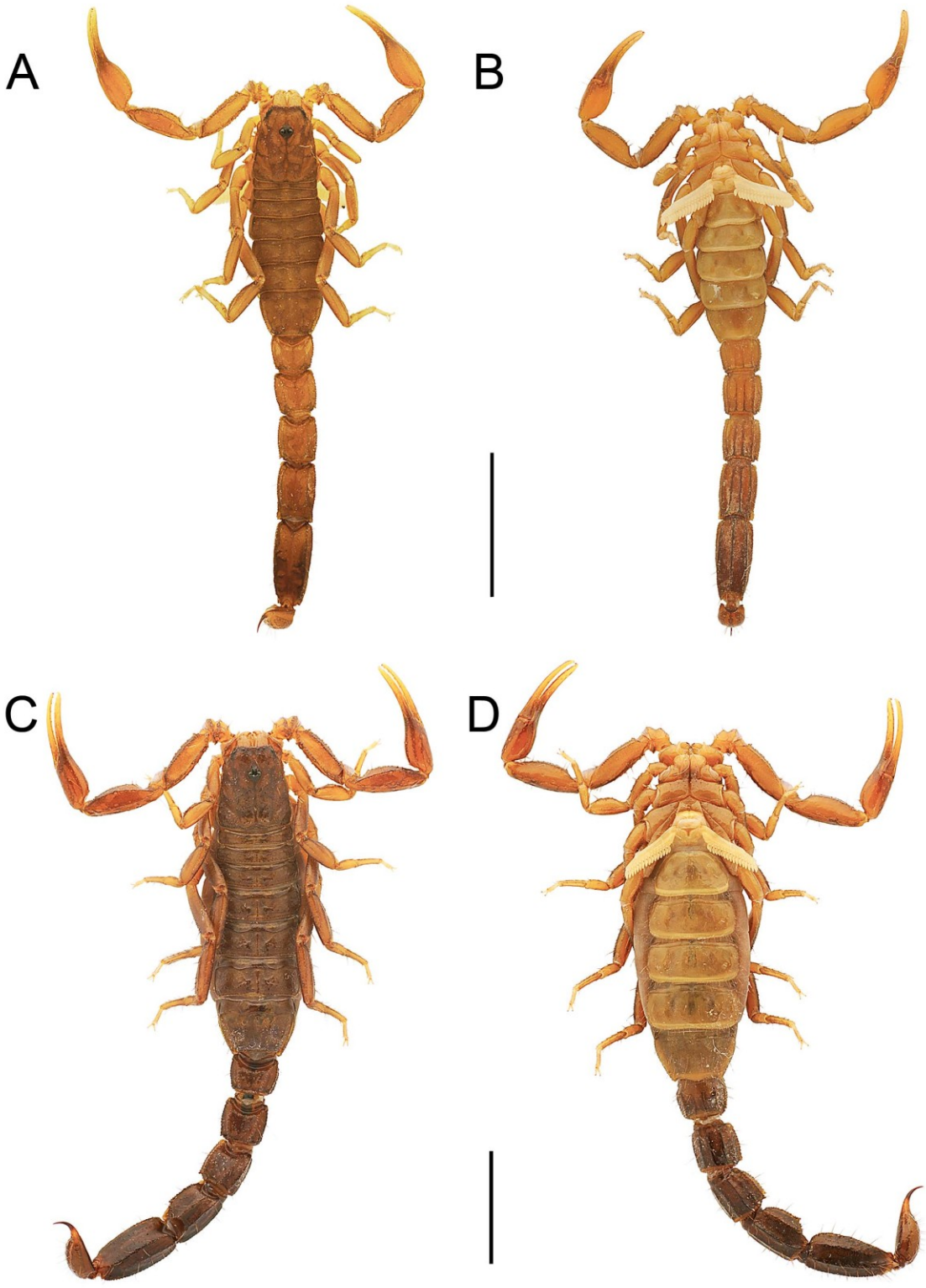


Figure 119. *Kuarapu purhepecha* Francke and Ponce-Saavedra, 2010, habitus. **A**, **B**. Paratype ♂ (AMNH). **C**, **D**. ♀ (AMNH). **A**, **C**. Dorsal aspect. **B**, **D**. Ventral aspect. Scale bars = 5 mm.

Figure 120. *Kuarapu purhepecha* Francke and Ponce-Saavedra, 2010, paratype ♂ (AMNH), dextral pedipalp chela. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

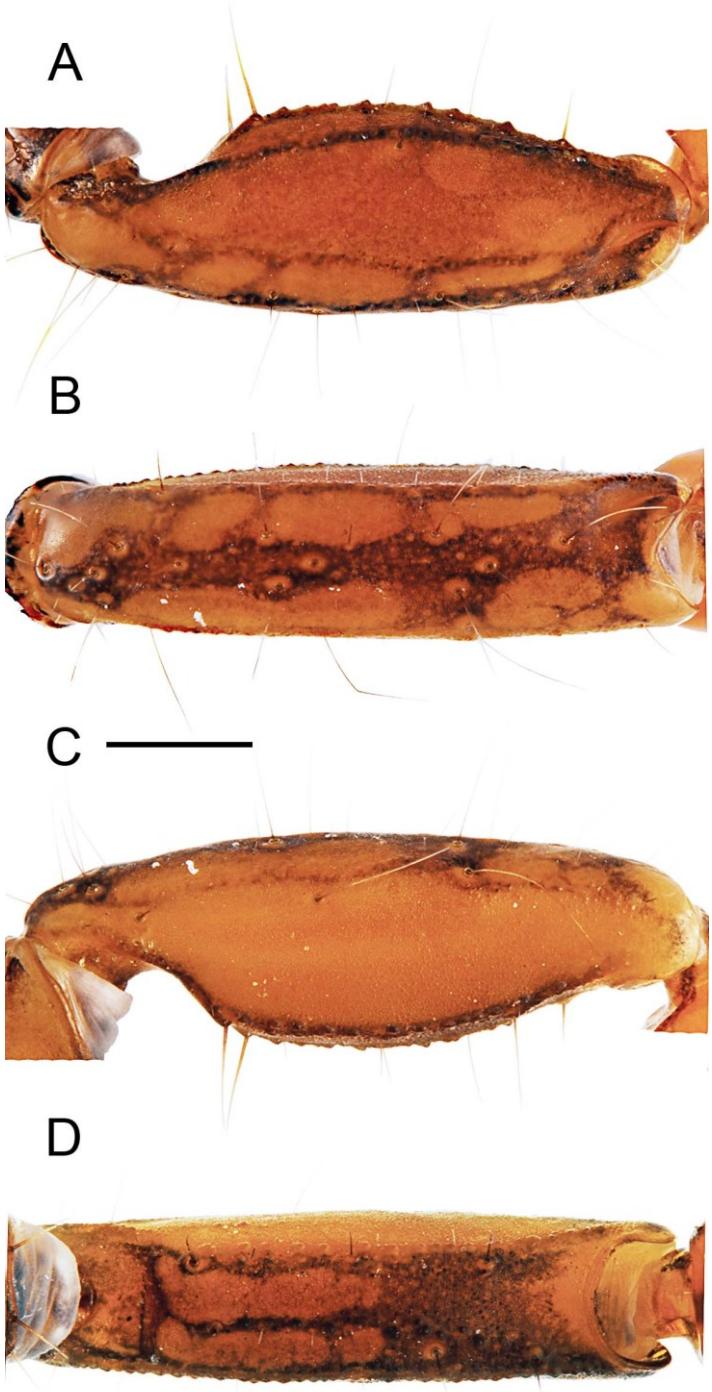


Figure 121. *Kuarapu purhepecha* Francke and Ponce-Saavedra, 2010, paratype ♂ (AMNH), dextral pedipalp patella. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 0.5 mm.

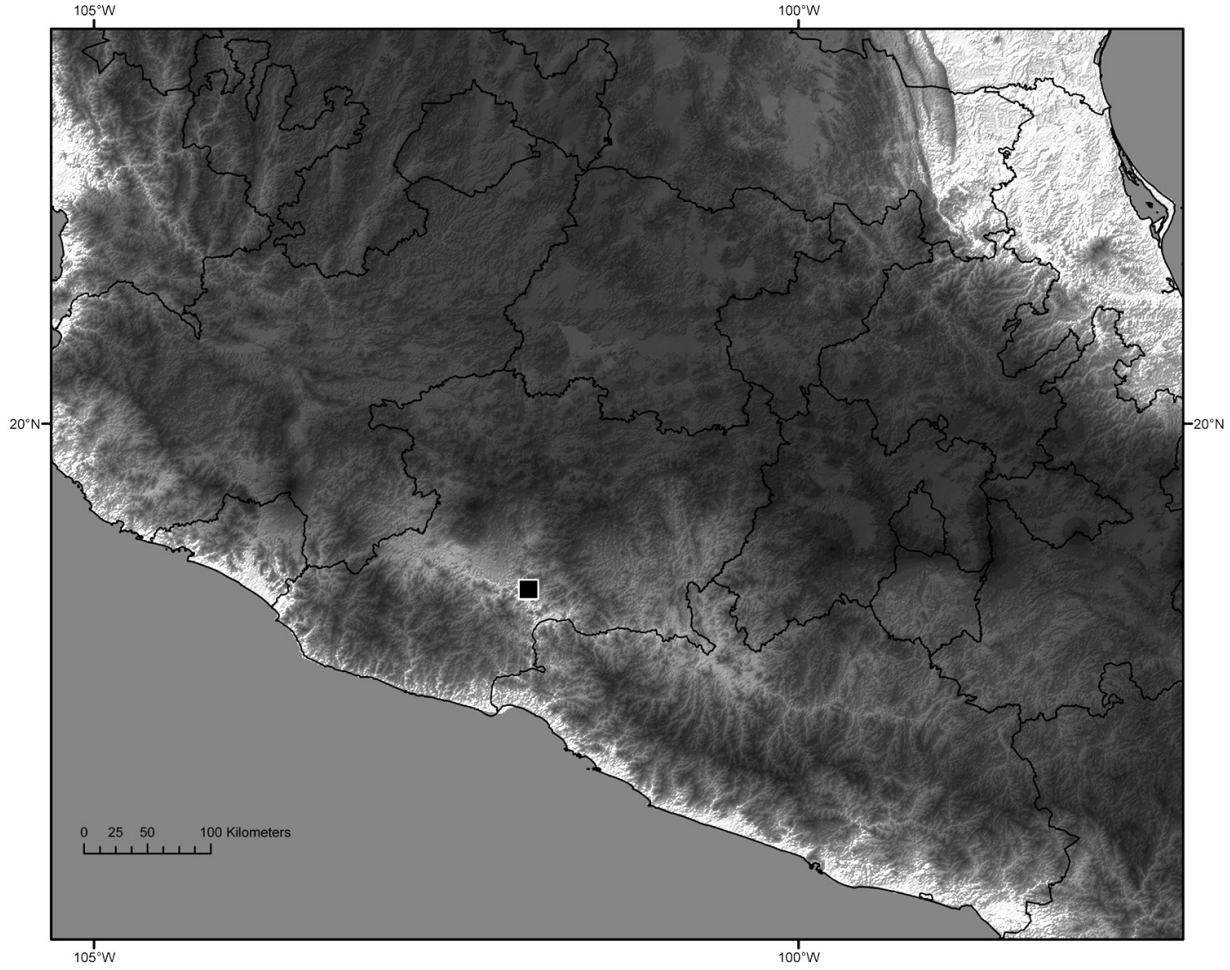


Figure 122. Map of Mexico, plotting known locality records for the monotypic vaejovid scorpion *Kuarapu purhepecha* Francke and Ponce-Saavedra, 2010, based on data collected in the present study, darker contour indicates increase of altitudinal gradient.

BALSATERES (Ponce-Saavedra and Sissom, 2004)

Balsateres cisnerosi (Ponce-Saavedra and Sissom, 2004)

Figures 123–126, 198B, 204B, 208F, 212F, 216F, 219F, 224B

Vaejovis cisnerosi Ponce-Saavedra and Sissom, 2004: 540–544, figs. 1–14.

Thorellius cisnerosi: Soleglad and Fet, 2008: 26, 31, 53, 67, 73, 94, 95.

TYPE MATERIAL: **MEXICO: Michoacán:** Holotype ♂ (IBUNAM), Churumuco, 18°40'15"N 101°38'39"W, i.2007, J. Ponce. Paratypes: 1 ♂, 1 ♀, 1 subad. ♂, 1 juv. ♂ (UMICH), same locality as holotype; 1 ♂, 1 ♀ (UMICH), Cerro de Turitzio, 18°31'41"N 100°55'27"W; 1 ♀ (UMICH), El Carrizal, 19°09'00"N 101°06'19"W.

DIAGNOSIS: As for genus (González-Santillán and Prendini, in prep.)

DESCRIPTION: The following redescription supplements Ponce-Saavedra and Sissom' (2004) original description. It is based on freshly collected material deposit the museums indicated in the material examined.

Color and infuscation (in alcohol): Carapace, tergites, sternites, legs, metasoma, telson and uniformly yellow. Carapace and tergites with diffuse dusky infuscation. Base of pedipalp fingers lightly orange to reddish, manus immaculate.

Carapace: Carapace weakly emarginated anteriorly, sublinear, with a shallow median notch. Surface almost completely smooth with scattered moderated granules on the proximal third, frontal lobes completely glabrous. Anteromedian and posteromedian sulcus moderated to deep. Median ocular tubercle moderately raised, superciliary carina obsolete and lower than median ocular tubercle.

Sternum and coxal region: Sternum pentagonal subequilateral with three pairs of anterior setae, one distal pair, one median pair and one pair on the lobes, median notch deep. Proximal margin of coxal endite II with a depression each. Anterior margin of coxa II smooth, sub-basally with three oblique slit-like structures, adjacent to a strong, smooth protuberance. Coxa IV 1.6 times longer than coxa II.

Chelicerae: Dentition of fixed and movable fingers as in typical vaejovids. Distal margin of manus with two pairs of setae. Serrula with 14 tines.

Pedipalps: Trichobothrial pattern Type C, orthobothriotaxic. All intercarinal surfaces glabrous and smooth. Femur dorsal retrolateral and dorsal prolateral carinae moderate irregularly granular, ventral prolateral stronger with larger granules, retrolateral retrosubmedian with few large crenulations predominantly smooth with two macrosetae, prolateral submedian vestigial, with a proximal tubercle and six scattered enlarged irregular granules, and two median macrosetae on top of the larger ones, prolateral ventral obsolete, expressed by one lower basal tubercle and three macrosetae distributed from the basal to the mid part of the segment, ventromedian and retrolateral ventral vestigial expressed by basal enlarged scattered serrated granules, ventral retrosubmedian vestigial expressed by scattered irregular cluster of moderated granules.

Patella: All intercarinal surfaces smooth. Carinae: Dorsal prolateral and ventral prolateral feebly crenulated becoming smooth on distal extreme; dorsal retrolateral and ventral retrosubmedian costate and smooth; ventral median vestigial expressed as a basal short row of low granules, all retrolateral carinae obsolete, prolateral median partial, extending from a basal tubercle to trichobothrium d_2 with two or three low granules and two spiniform macrosetae,

being the basal one larger than the terminal, prolateral ventral carina obsolete expressed by a low proximal tubercle and two macrosetae, being the basal one larger than the terminal.

Chelae with all carinae obsolete, moderately costate and smooth. Pedipalp manus relatively incrassate, trichobothrium *Db* subbasal on dorsal retrolateral and *Dt* at mid manus.

Fingers: Pedipalp fixed finger dentition: PD = 6, RD = 5, MD rows = 5; movable finger PD = 8, RD = 6, MD rows = 6, basal pair of prolateral denticles adjacent, distal row with one median denticle. Trichobothrium *ib* between PD = 6 and PD = 7, PD = 7 lacking granule; trichobothrium *it* at PD: 6. Fingers weakly scalloped, fixed finger with proximal notch and movable finger with proximal lobe weakly developed. Fingers with vestigial gap, when close.

Legs: Basitarsi I–II retrolateral ventral and retrolateral dorsal carinae with complete rows of spinules, retrolateral ventral in III complete but retrolateral dorsal vestigial with a distal few spinules, retrolateral and prolateral ventral rows in I–IV vestigial expressed as few terminal spinules, IV retrolateral dorsal vestigial with few terminal spinules. Telotarsi I–IV with two pairs of ventrodistal spinules. Setae: Prolateral ventral, 3:5:5:5, distal small and delicate; retrolateral ventral, 4:8:9:9; retrolateral dorsal, 4:4:4:4, dorsal, 3:3:3:3. Retrolateral dorsal and dorsal series arranged in two independent rows.

Tergites: Pretergites smooth, posttergites medial surface smooth, lateral surface feebly granular. Dorsal median and dorsal submedian carinae weak predominantly smooth with few low granules. Tergite VII with dorsal median carina vestigial on proximal third strongly costate with few low granules.

Sternites: Dorsal submedian vestigial expressed as a pair of proximal blobs. Dorsal lateral and lateral supramedian strong and weakly crenular. All intercarinal surfaces smooth except dorsal lateral and lateral supramedian intercarinal surface with proximal cluster of low granules.

Sternites III–VI acarinated completely smooth, V with distomedian glandular spot moderated. Spiracle relatively large, slit-like.

Genital operculum: Male genital operculum: wider than long, with three pairs of macrosetae. Sclerites free on longitudinal edge moving independently but unable to open more than 45°. Genital papillae protruding posteriorly.

Pectines: Basal piece with three pairs of macrosetae. Marginal lamella consists of three sclerites, proximal median lamella fuse, and distal progressively forming 15 conspicuous beads. Fulcra with 21–22 in ♂ and 19–20 in ♀.beads. Pectinal tooth count 20–23 in ♂ and 20–21 in ♀.

Hemispermatophore: Lamina 1.2 longer than trunk. Dorsal through margin long, narrow, curving proximally, and removed from ventral trough. Hemimating plug developed from the inner lobe, distal barb margin with 25 elongated spinules. Primary and secondary hook positioned on the apex of lateral margin extension of the lamina (flange). Both hooks rounded low, separated slightly, forming a shallow notch. Median lobe ental terminus moderated and rounded. Basal plate of inner lobe removed from ventral trough. Spine of inner lobe relatively long and strongly sclerotized, secondary spine on ventromedian aspect of neck moderate. Neck relatively short (0.4 times longer than basal plate). Measurements, lamina, 3.33; trunk, 2.67; dorsal trough/laminar hooks, 3.67; ventral trough/laminar hook, 0.97; neck, 0.33; basal plate, 0.76.

Metasoma: All intercarinal surfaces smooth. Dorsal lateral and lateral median carinae of segments I–III costate smooth with two to three basal and vestigial crenulations, dorsal lateral I–IV distal terminus spiniform, lateral median I–IV basal and distal terminus spiniform, being distal terminus IV expanded or flared, dorsal lateral V obsolete. Lateral inframedian, ventral lateral and ventral submedian I–V obsolete, surface completely smooth lacking angular

protrusion, except ventral lateral V with distal third increasingly granulation distally. Setae: after Ponce-Saavedra and Sissom, 2004: dorsal lateral, 0:0:1:1:4, lateral median, 0:1:1:1, lateral inframedian, 0:0:0:0:2, ventral lateral, 1:1:1:1:3, ventral submedian, 1:1:1:1:3, ventral sublateral V, 2.

Telson: Telson 2.61 times longer than wider. Metasomal segment V 1.56 times wider than vesicle. Ventral and dorsal surfaces smooth, two pairs of setae per carinae. Laterobasal microserration of aculeus with 4–6 tines. Subaculear tubercle vestigial expressed as a low broad granule.

DISTRIBUTION: *Balsateres cisnerosi* is endemic to the Balsas Depression in the states of Michoacán and Estado de México, Mexico.

ECOLOGY: Ponce-Saavedra and Sissom (2004) reported that this monotypic genus inhabits various textures of sandy soils. They collected most of the specimens in open areas close to their burrows. The burrows were approximately 15–20 cm deep with a circular entrance. The genus coexisted with *D. churumuco* Francke and Ponce Saavedra, 2005 and *Centruroides limpidus* (Karsch, 1879), of which the latter was observed preying on *Balsateres*. The localities where this genus has been recorded are dominated by deciduous tropical scrub forest at altitudes ranging from 195–575 m. In Estado de Mexico, it was collected together with *Mesomexovis variegatus* (Pocock, 1898); *Thorellius tekuani* **n. sp.**; *Centruroides limpidus* (Karsch, 1879); *Centruroides balsasensis* Ponce and Francke, 2004 and *Diplocentrus silanesi* (Armas and Martín-Frías, 2000).

REMARKS: *Balsateres cisnerosi* was described within the genus *Vaejovis*, although Ponce-Saavedra y Sissom (2004) discussed its position in respect to the defined species groups at that time, they declined to assign it to any of those groups. Soleglad and Fet (2008) asserted that this

species belongs in the *intrepidus* group, which they in turn redefined as *Thorellius.* The creation of this new genus is justified by numerous apomorphies and the basal position of this clade.

MATERIAL EXAMINED: **MEXICO: Estado de México:** *Municipio de Tejupilco*: Pungaracho, 3 km E, 19°01.775'N 100°28.406'W, 17.iii.2006, E. González, O. Francke and S. Reynaud, tropical dry forest, 1 ♀ (IBUNAM). **Michoacán:** *Municipio de Carácuaro*: Las Cocinas, Hwy Nocupetaro-Carácuaro, 19°01.880'N 101°14.067'W, 672 m, 14.vii.2005, O. Francke, J. Ponce, M. Córdova, A. Jaimes, G. Francke, and V. Capovilla, 1 subad. ♂ (AMNH [LP 5269]). *Municipio de Churumuco de Morelos*: Churumuco de Morelos, [18°39'23.56"N 101°39'7.41"W], J. Ponce, 2.vii.2004, 1 ♂ (IBUNAM), 8.ix.2005, 1 ♂ (IBUNAM), E. Hernandéz, 1.ix.2005, 1 ♂ (IBUNAM), E. González and J. Ponce, 1.ix.2005, 2 ♀, 1 juv. (IBUNAM), R. Cancino, 1.ix.2005, 1 subad. ♂ (IBUNAM), 8.ix.2005, 1 ♂ (IBUNAM), 9.ix.2005, 1 ♂ (IBUNAM), 27.vii.2006, 1 ♂ (IBUNAM); Churumuco, [18°39.3927'N 101°39.1235'W], 8.ix.2001, J. Ponce, 1 ♀ (AMNH [LP 2019]), 8.ix.2001, R. Cancino, 1 ♂ (AMNH [LP 2018]). *Municipio de Huetamo*: Arua-Huetamo, [18°35'N 100°53'W], 10.ix.2004, R. Moreno, 2 ♀ (IBUNAM), 24.viii.2005, 1 ♂ (IBUNAM). *Municipio de La Huacana*: El Chauz, [18°52'50.14"N 102°0'27.55"W], 20.ii.2008, R. Lano and Cardenas, 1 juv. (IBUNAM); El Vado, 18°48.9078'N 101°54.9762'W, 198 m, 20.v.2007, O. Francke, J. Ponce, M. Villaseñor, and A. Quijano, 3 ex. (AMNH). *Municipio de Parácuaro*: La Berea, 19°08.173'N 102°13.195'W, 445 m, 11.vii.2005, O. Francke, J. Ponce, M. Córdova, A. Jaimes, G. Francke, and V. Capovilla, 1 juv. (AMNH [LP 5320]). *Municipio de Zingangio*: Las Juntas Ranch, 24 km W of Capeo, 18°32.2698'N 101°11.6034'W, 195 m, 8.iv.2012, O. Francke et al., 3 ex. (IBUNAM).

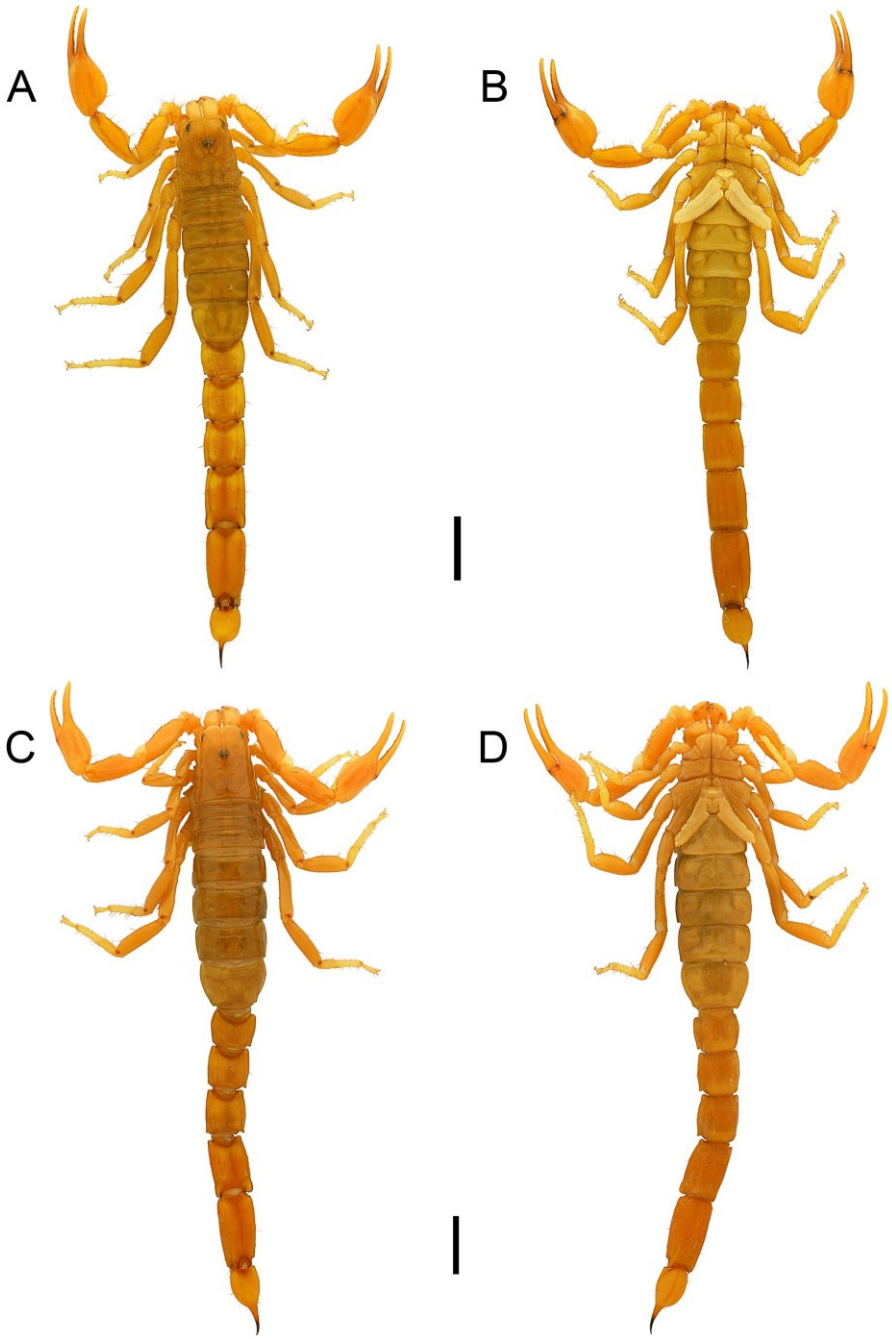


Figure 123. *Balsateres cisnerosi* (Ponce-Saavedra and Sissom, 2004), habitus. **A**, **B**. Paratype ♂ (AMNH). **C**, **D**. ♀ (AMNH). **A**, **C**. Dorsal aspect. **B**, **D**. Ventral aspect. Scale bars = 5 mm.

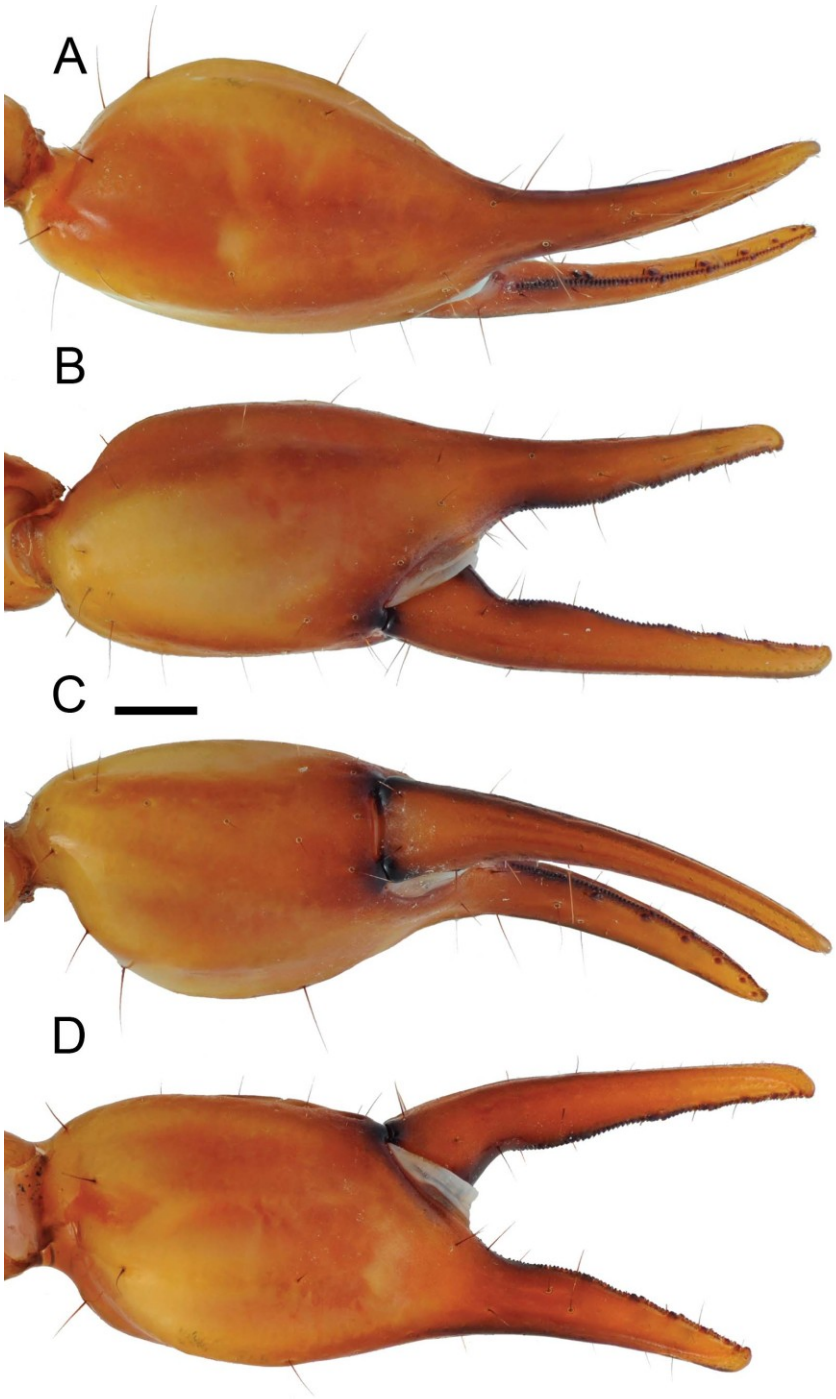


Figure 124. *Balsateres cisnerosi* (Ponce-Saavedra and Sissom, 2004), paratype ♂ (AMNH), dextral pedipalp chela. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

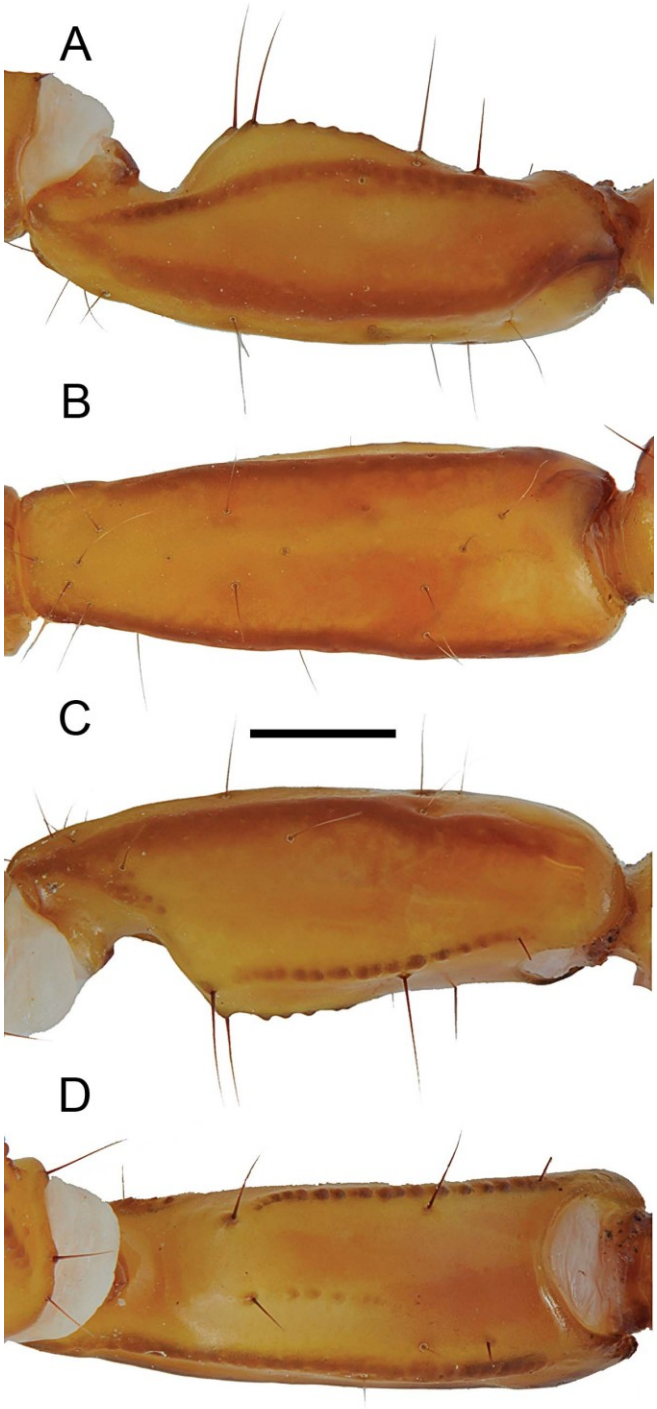


Figure 125. *Balsateres cisnerosi* (Ponce-Saavedra and Sissom, 2004), paratype ♂ (AMNH), dextral pedipalp patella. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

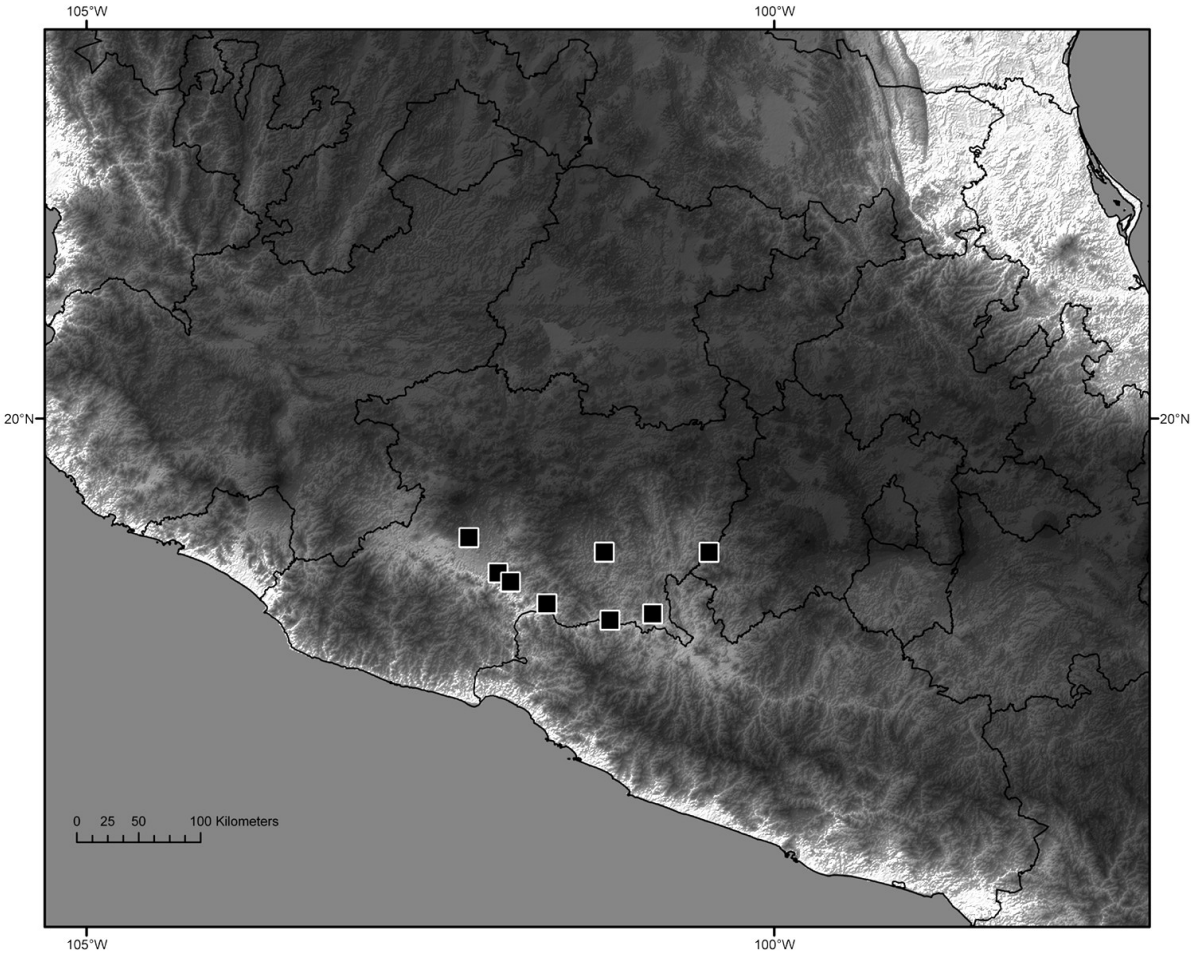


Figure 126. Map of Mexico, plotting known locality records for the monotypic vaejovid scorpion genus *Balsateres cisnerosi* (Ponce-Saavedra and Sissom, 2004), based on data collected in the present study, darker contour indicates increase of altitudinal gradient.

THORELLIUS Soleglad and Fet, 2008

KEY TO IDENTIFICATION OF THE SPECIES OF *Thorellius*

1. Pedipalp chelae carinae granular to crenulated and diffusely infuscated to immaculate, proximal notch and medial lobe of fixed finger and basal notch of movable finger moderate to strong……..…..……..…2

- Pedipalp chelae carinae smooth and heavily infuscated, proximal notch and medial lobe of fixed finger and basal notch of movable finger weak.....*T. yuyuawi*, **n. sp.**

2. Base color medium yellowish-brown, retrolateral dorsosubmedian and retrolateral median of pedipalp patella weakly granular…….…...…….3

- Base color dark brown, retrolateral dorsosubmedian and retrolateral median of pedipalp patella strongly granular.... ……..…*T. wixarika*, **n. sp.**

3. Ventral submedian carinae on metasomal segment I and II granular, ventral and dorsal intercarinal surfaces of metasomal segments I–V immaculate…….....*T. tekuani*, **n. sp.**

- Ventral submedian carinae on metasomal segments I and II smooth and costate, ventral and dorsal intercarinal surfaces of metasomal segments I–V diffusely infuscated..…….....….4

4. Number of prolateral denticles of pedipalp fixed finger eight, basal pair adjacent, pedipalp chelae incrassate with carinae strongly costate and granular…….*T. intrepidus*

- Number of prolateral denticles of pedipalp fixed finger seven, basal pair separated, pedipalp carinae moderated with carinae moderately costate and crenular……..*T. cristimanus*

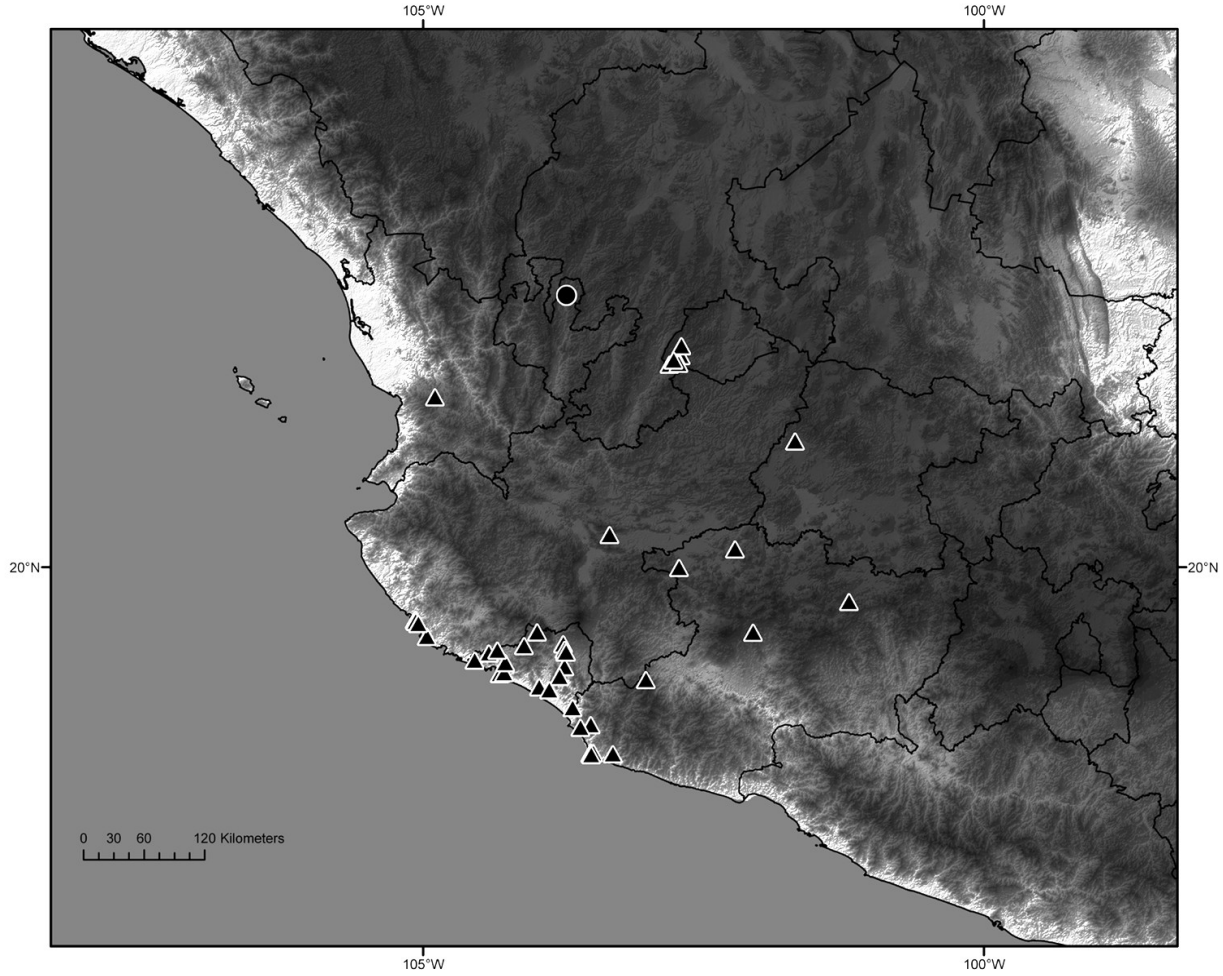


Figure 127. Map of Mexico, plotting known locality records for two species in the vaejovid scorpion genus *Thorellius* Soleglad and Fet, 2008, based on data collected in the present study: *Thorellius intrepidus* (Thorell, 1876) (triangles), *Thorellius yuyuawi*, **n. sp.** (circle), darker contour indicates increase of altitudinal gradient.

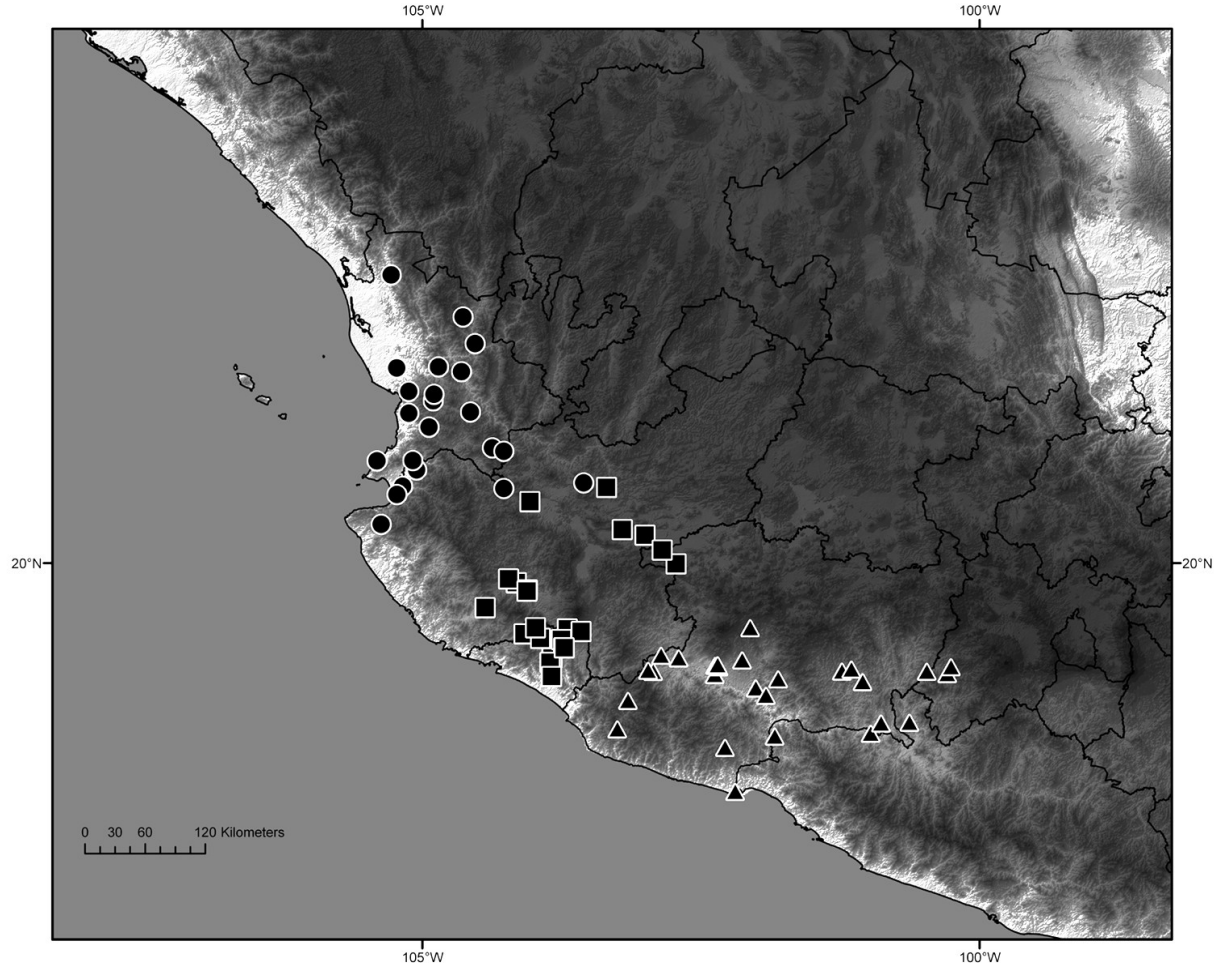


Figure 128. Map of Mexico, plotting known locality records for three species in the vaejovid scorpion genus *Thorellius* Soleglad and Fet, 2008, based on data collected in the present study: *Thorellius tekuani*, **n. sp.** (triangles), *Thorellius cristimanus* (Pocock, 1898) (squares), *Thorellius wixarika*, **n. sp.** (circle), darker contour indicates increase of altitudinal gradient.

Thorellius cristimanus (Pocock, 1898)

Figures 128, 129–131, 197B, 203B, 208B, 212B, 216B, 219B, 223B

Vaejovis cristimanus Pocock, 1898: 397, 1902: 11, fig. 1 a-d.

Vejovis cristimanus: Kraepelin, 1899: 184, 186; 1901: 274; Pocock, 1902: 11pl. III, fig. 1, 1a–d; Pavlovsky, 1925: 198; Bücherl, 1964: 61; 1971: 328.

Vejovis intrepidus cristimanus: Hoffmann, 1931: 378–381, figs. 33, 34; 1938: 318.

Vejovis intrepidus atrox Hoffmann, 1931: 382–385, fig. 35. NEW SYNONYM.

Vejovis nitidulus intermedius: Díaz-Nájera, 1964: 25 (misidentification).

Vaejovis intrepidus cristimanus: Díaz-Nájera, 1975: 7, 8, 26; Kovařík, 1998: 147; Beutelspacher, 2000: 92, 136, 140, 141, 145, map. 68; Sissom, 2000: 538; Ponce-Saavedra and Beutelspacher, 2001: 46, 48, 49, 76, 101, map. 21; Soleglad and Fet, 2003b: 8, 16, fig. 8, 17, 38, fig. 68, 59, tab. 2; González-Santillán, 2004: 26, tab. 2; Kamenz et al., 2005: 102, tab. 1, 105; Kamenz and Prendini, 2008: 6, tab. 1; Volschenk and Prendini, 2008: 655, tab. 1; McWest, 2009: 20, tab. 1, 69, 70, figs. 209–213, 119; Ponce-Saavedra and Francke, 2011: 466, tab. 1.

Vaejovis intrepidus atrox: Díaz-Nájera, 1975: 7, 21; Kovařík, 1998: 147; Beutelspacher, 2000: 92, 139, 143, 153, map 68 (in part); Ponce-Saavedra and Beutelspacher, 2001: 46, 48, 49, 76, 101, map 20; Sissom, 2000: 538; González-Santillán, 2004: 26, tab. 2; McWest, 2009: 20, tab. 1, 66, 68–70, figs. 204, 208, 119; Ponce-Saavedra and Francke, 2011: 466, tab. 1.

Thorellius cristimanus: Soleglad and Fet, 2008: 1, 5, 23, 26, 28, 29, 23, 37, figs. 74, 75, 39, 45, fig. 104, 50, tab. 3, 53, 55, fig. 135, 57, fig. 158, 61, fig. 179, 67, 73, 94, 95.

Thorellius atrox: Soleglad and Fet, 2008: 1, 14, 23, 26, fig. 25, 28, tab. 1, 45, fig. 108, 46, 53, 55, fig. 134, 56, fig. 145, 57, fig. 159, 61, 67, 73, 94–96.

TYPE MATERIAL: *Vaejovis cristimanus*: **MEXICO: Zacatecas:** Holotype ♀ (BMNH 85.40), Zacatecas.

Vejovis intrepidus atrox: **MEXICO: Colima:** Syntypes 3 ♀, 3 juv. Colima, Colima (AMNH) (Sissom, 2000). The AMNH contains 1 ♀ labeled: "Colección de Alacranes Mexicanos (in handwriting, presumably by Carlos C. Hoffmann). *Vaejovis intrepidus atrox* Hoffmann. Localidad: Colima, Col. en casas. Notas: ♀ grande = tipo, (scratched with in grey ink) el resto paratipos. Clasificó Carlos C. Hoffmann" [Collection of Mexican scorpions. *Vaejovis intrepidus atrox* Hoffmann. Locality: Colima, Colima in houses. Notes: ♀ large = type, the rest paratypes. Identified Carlos C. Hoffmann]. A second specimen with the following information in typed characters, reads: '*Vaejovis intrepidus atrox* Hoffmann, Colima, Colima, in house Paratypes'. No other specimen there or at IBUNAM was located.

DIAGNOSIS: The following redescription supplements Pocock's (1898) original description. It is based on freshly collected material deposit in the museums indicated in the material examined.

T. cristimanus is closely related to *T. tekuani*, **n. sp.**, *T. wixarika*, **n. sp.**, *T. yuyuawi*, **n. sp.**, and *T. intrepidus*, with which forms a monophyletic group (see *T. tekuani*, **n. sp.** for details). *T. cristimanus* may be distinguished from *T. tekuani*, **n. sp.**, *T. wixarika*, **n. sp.**, and *T. intrepidus* by having metasomal segments more robust, wider and shorter, furthermore *T. cristimanus* has pedipalp chelae carinae weaker and crenulate to smooth, instead of having carinae strong, densely granular or finely granular or crenular. From *T. yuyuawi*, **n. sp.** differs by having pedipalp chela carinae crenular to smooth, instead of moderate to weakly costate and smooth,

and by having ventral submedian carinae of metasomal segments III and IV finely crenular, instead of having them costate and smooth.

DESCRIPTION: The following redescription supplements Hoffmann's (1931) reassessment of the subspecies. It is based on freshly collected material deposit in the museums indicated in the material examined.

Color and infuscation (in alcohol): Base color yellowish to brown reddish. Carinae of pedipalp femur patella and manus moderate reddish contrasting with paler base color. Carapace, tergites, legs, with diffuse to moderate dusky markings. Legs and chelicerae yellow to orange. Ventral lateral and ventral submedian carinae reddish, finely infuscate. Coxal region slightly darker than carapace and tergites. Pectines and genital operculum pale whitish to yellowish. Aculeus reddish to brownish.

Carapace: Carapace anterior margin emarginated with a weak to moderated median notch and three pairs of major macrosetae. Surface shagreened with dense moderated rounded and minute granules. Anteromedian sulcus with an anterior deep depression, posterolateral and posteromedian deep and narrow; posterior transverse obsolete. Median ocular tubercle moderately raised, superciliary carina smooth higher than median eyes. Median eyes relatively small approximately double size of anterior lateral pair. Three lateral eyes, distal first pair slightly larger than second and third smaller than second.

Sternum and coxal region: Sternum pentagonal subequilateral with five pairs of macrosetae, two distal, one median pair and two pair on the lobes, median notch deep, surface matte. Anterior margin of coxa II with three oblique slit-like structures, adjacent to an enlarge triangular protuberance with moderate scatter granules. Base of coxal endite II with a deep

depression each, median margin with fine granulation on proximal half, becoming smooth distally. Coxa IV 2.08 times longer than coxa II.

Chelicerae: Dorsal surface smooth, dentition of fixed and movable fingers as in typical syntropine. Subdistal margin of manus with one median macrosetae and distal manus outlined with broad carinae with fine crenulations at the base of fixed finger. Serrula with 22–25 tines.

Pedipalps: Trichobothrial pattern Type C, orthobothriotaxic. Chelae wider than patella and patella wider than femur. Femur: Retrolateral and prolateral intercarinal surfaces matte, dorsal and ventral surface with moderate median granules. Dorsal retrolateral, dorsal prolateral, and ventral prolateral carinae moderately granular with rounded and moderate granules; retrolateral dorsosubmedian complete, with a row of scattered crenatoserrate granules, and six to seven major macrosetae, decreasing is size distally; prolateral ventrosubmedian vestigial with a proximal enlarged bicuspid tubercle followed by an irregular row of five or six sharp, conical, and enlarged granules, basal and distal enlarged granules with a macroseta at base, starting at mid surface slanting gently towards distal end of dorsal prolateral carinae; prolateral ventral vestigial, expressed by two proximal tubercles, ventral one with a macroseta on top and two or three additional sparse tubercles, one subproximal, one distal each with a macroseta at base, distributed from the proximal to the mid aspect of the segment; ventral median vestigial expressed by a row of serrated enlarged granules, retrolateral ventral, vestigial expressed by few crenatoserrate proximal granules; ventral retrosubmedian vestigial expressed by few scatter crenatoserrate granules.

Patella: All intercarinal surfaces matte. Dorsal prolateral and dorsal retrolateral, strongly granular to crenular; ventral prolateral and ventral retrosubmedian strongly crenular and costate; ventral median vestigial expressed as a short proximal row of minute granules, occasionally with

median row of moderate and minute granules extending to proximal two thirds; retrolateral dorsosubmedian and retrolateral median vestigial, expressed by two low, weakly crenulated and broken costas; prolateral median on a vaulted projection, protruding strongly medially, extending from a proximal tubercle with a major macroseta on top and a row of four of six subserrate granules reducing in size terminating at the level of trichobothrium d_2, followed by flat surface slanting gently towards dorsal prolateral carinae, median granule with a macroseta on top, followed by a gap of smooth surface and ending on at one distal major macrosetae on the top of a moderate granule positioned at the level of distal fifth of dorsal prolateral carinae; prolateral ventral obsolete expressed by three major macrosetae on the top of a moderate granule, one basal and median and one distal. These two carinae, adjacent to ventral prolateral carinae.

Chelae: Pedipalp manus incrassate (manus 1.4 times longer than fixed finger). Intercarinal surfaces weakly matte. Dorsal prolateral, dorsal median, dorsal retrolateral, dorsal retrosubmedian accessory, ventral prolateral, and prolateral median moderate to strongly costate, with clusters of irregular moderate crenulations and scatter enlarged, moderate and minute granules; dorsal prosubmedian and prolateral dorsal vestigial expressed by scattered crenulations flanking dorsal lateral carina; retrolateral median complete, moderately costate and scattered crenulated; retrolateral subventral accessory and retrolateral subventral vestigial expressed by two distal weak costas; retrolateral ventral vestigial expressed by few proximal tubercles; ventral retrolateral and ventral retrosubmedian partial expressed proximally strongly granular, becoming crenular distally broad costa, ending at the level of trichobothrium *Est* slanting gently to the prolateral side, pointing to trichobothrium Et_1; ventral prosubmedian and ventral median complete expressed by a broad costa with strong reticular to smooth irregular crenulation; ventral prolateral and prolateral diverging distally. Trichobothria *Dt* and *Db* dorsal to dorsal retrolateral

carinae. Trichobothrium *Dt* positioned subbasal on manus. Trichobothrium *Dt* positioned at mid manus.

Fingers: Fixed finger dentition: PD = 6, RD = 5, MD rows = 5, all denticles subserrated, retrolateral denticles comparatively smaller than prolateral denticles, proximal retrolateral denticle positioned on median half. Movable finger PD = 7, RD = 6, MD rows = 6, distal row with one denticle, prolateral and retrolateral denticles subpaired, proximal retrolateral denticle positioned on median half. Trichobothrium *ib* and *it* positioned by median third of fixed finger, *ib* positioned between PD6 and PD7, adjacent to PD6, PD7 lacking tubercle; *it* positioned between PD5 and PD6, adjacent to PD6. Fingers with moderate to strong scalloped, proximal notch and median lobe of pedipalp fixed strong; proximal notch and median lobe of movable finger moderate, gap created when fingers close strong, fingers fit unevenly in ♂, in ♀ scallop moderate to weak, proximal notch and median lobe of pedipalp fixed moderate; proximal notch and median lobe of movable finger weak to moderate, gap created when fingers close weak, fingers fit unevenly.

Legs: Spinules: Basitarsi I–II prolateral ventral, retrolateral ventral and retrolateral dorsal carinae with complete rows of spinules, prolateral ventral in III partial expressed on two distal thirds by a row of scatter spinules, in IV absent; retrolateral ventral in III complete, VI absent; retrolateral dorsal in III and IV partial expressed by a scatter row of spinules on distal two thirds, distal spinules becoming into spiniform granules; retrolateral median rows in I–IV vestigial expressed as few terminal spinules. Telotarsi I–IV with two or three pairs of ventrodistal spinules in I–IV. Setae: Prolateral ventral, 4:5:5:6, distal three and four in II and IV slightly stout; retrolateral ventral, 5:8:9:9, intersperse minor and major macrosetae; retrolateral dorsal, 3:3:4:4; dorsal, 4:4:4:4; retrolateral dorsal and dorsal series arranged in two independent rows.

Tergites: Pretergites matte, posttergites shagreened with scattered moderated and minute granules. Dorsal median and dorsal submedian of tergites I–VI carinae weak to moderate expressed on distal half of postergite. Tergite VII with intercarinal surfaces with scatter moderate granules; dorsal median carina partial expressed on proximal third, moderately costate with strong granules; dorsal submedian vestigial expressed as a pair of oblique proximal costas cover with crenatoserrate granules, directly fusing with dorsal prolateral; dorsal lateral and lateral supramedian strong with moderate to enlarge granules; dorsal lateral projecting and curving laterally almost reaching lateral supramedian distal margin, creating a semi ring of strong serrated granulation.

Genital operculum: Male genital operculum: wider than long, with three pairs of major macrosetae. Sclerites free on longitudinal edge moving independently but unable to open more than 45°. Genital papillae protruding posteriorly. Female genital operculum: Wider than long, with three macrosetae. Sclerites fuse longitudinal.

Sternites: Sternites III–VII with all carinae obsolete and surface matte in ♂ and in ♀ finely punctuated, V in ♂ with distomedian glandular spot weak, whitish, slightly protruding from adjacent surfaces and contrasting with darker base color, in ♀ obsolete. Sternite VII with ventral lateral carinae moderate weakly crenulate, ventral submedian obsolete expressed by three pairs of macrosetae; distomedian glandular spot obsolete in ♀. Spiracle elongated, slit-like, elongated approximately four times longer than wide.

Pectines: Pectines in ♂ longer than distal margin of coxa VI, in ♀ at or slightly longer than coxa IV. Basal piece with four major macrosetae. Marginal lamella consist of three sclerites, medial lamella proximally fuse distally progressively forming conspicuous 13 beads. Fulcra with 20–23 in ♂, in ♀ 17–19 beads. Pectinal tooth count 21–24 in ♂, in ♀ 18–20.

Hemispermatophore: Lamina 1.84 longer than trunk. Dorsal through margin long, narrow, curving proximally, and removed from ventral trough. Hemimating plug developed from the inner lobe, distal barb margin with 15 elongated spinules. Primary and secondary hook positioned on the apex of lateral margin extension of the lamina (flange). Both hooks rounded low, separated slightly, forming a shallow notch. Median lobe ental terminus moderated and rounded. Basal plate of inner lobe adjacent to ventral trough. Spine of inner lobe relatively long and strongly sclerotized. Neck relatively short (0.43 times longer than basal plate). Measurements, lamina, 5.10; trunk, 2.76; dorsal trough/laminar hooks, 2.28; ventral trough/laminar hook, 1.44; neck, 0.36; basal plate, 0.84.

Metasoma: All intercarinal surfaces weakly matter with few moderate scatter median granules. Carinae: Dorsal lateral and lateral median carinae in I–IV strongly crenatoserrated terminating in elongate spiniform granule pointing backwards; except lateral median in IV distal terminus strongly expanded laterally forming a rounded triangular projection; dorsal lateral in V proximal third scattered and strongly crenatoserrated, becoming finely granular to weakly crenular distally; lateral inframedian in I complete strongly crenatoserrate; in II partial moderately crenatoserrate, present in distal third; in III partial weakly crenular, expressed on distal fourth, in VI absent, in V partial, expressed on proximal two thirds irregular crenatoserrate granules becoming weaker distally; ventral lateral in I and II smooth to weakly crenular strongly costate, in III and IV strongly crenular; ventral submedian in I obsolete, weakly costate, in II proximal half moderately costate and smooth, distal half weakly crenular; in III proximal half strongly costate and smooth, distal half weakly crenular and strongly costate; in IV finely crenular; ventral lateral and ventral median in V finely crenatoserrate. Setae: Dorsal lateral,

1:3:3:3:7; lateral median, 1:3:3:4; lateral inframedian, 2:1:1:0:4; ventral lateral, 2:2:2:4:8; ventral submedian, 3:3:3:3:3, ventral sublateral, 2.

Telson: Telson 2.4 times longer than wide. Metasomal segment V 1.12 times wider than telson. Vesicle 3.56 times longer than aculeus. Dorsal and ventral surface smooth, ventral third of ventral carinae weakly to moderately crenular. Ventral surface with three or four macrosetae in each carina. Ventral median carinae with subaculear tubercle vestigial, with two minute granules positioned longitudinally. Microserration on laterobasal aculeus numbering 5–6.

DISTRIBUTION: Colima, Jalisco and northeast of Michoacán (the type locality of *T. cristimanus* is Zacatecas, see remarks for a discussion).

ECOLOGY: *Thorellius cristimanus* was collected most often in tropical deciduous forest and in the state of Colima inside of a cave in Coquimatlán Municipality. Although a few specimens were found inside the cave, no troglomorphism was observed in these specimens and thus threir presence there is hypothesize to be incidental. The other specimens were taken by rock turning and at night using ultraviolet detection. The recorded localities varied from 50 to 1550 m altitude. This species is most likely lapidicolous, because it has relatively weak leg armature and was commonly found resting under rocks. Hoffmann (1931) reported that this species is synanthropic in the city of Colima, along with *T. intrepidus*.

REMARKS: Besides Pocock's type specimens from Zacatecas, to date no specimens have been recorded from that state. Although further sampling is necessary, it is likely that these specimens, as occurred with *T. intrepidus* for the Veracruz records, were mislabeled.

Hoffmann (1931) recorded a female of *Vaejovis intrepidus cristimanus* =[*Thorellius cristimanus*] from Calvillo, Aguascalientes, Mexico. It was not foun in the IBUNAM or AMNH

collections. Nevertheless, abundant material (from INDRE) from that locality was found to be conspecific with *T. intrepidus*.

Although Hoffmann's intention of designate a holotype is obvious, as he labeled as such one specimen and the others as paratypes, he did fail to state clearly in his description which specimen was the holotype, and according to the ICZN, (article 73.2) the definition used by Sissom (2000), agrees with Hoffmann's use of the type series to designate the name-bearing specimens. Thus, Hoffmann's specimens found at the AMNH were correctly treated as syntypes by Sissom (2000).

Sissom (2000) noted that Beutelspacher (2000) listed several times, even in the same page, both *V. cristimanus* and *V. intrepidus cristimanus*. It is clear that Beutelspacher intended to recognize *cristimanus* as a subspecies of *intrepidus*, as appears in the main body of his catalog. Beutelspacher's records of *V. intrepidus atrox*=[*T. cristimanus*] in San Luis Potosí (page 145), and records of *V. intrepidus cristimanus*=[*T. cristimanus*] from Hidalgo (page 141) are based on misidentifications (Sissom, 2000). The records of these species from Nayarit (page 143) and Michoacán (page 92) most likely correspond to *T. tekuani*, **n. sp.** and *T. wixarika*, **n. sp.**, respectively.

Soleglad and Fet (2008) proposed the recognition of *T. atrox* as a valid species, based on the study of one female specimen from Autlan, Jalisco. They compared ratios of metasomal segments and pedipalp chelae, base color, and pectinal counts to the other two subspecies. They failed to consider the variability of these characters in this and other species especially in *T. crisitmanus*, which is very similar, casting serious doubts on the delimitation of these species.

The synonymy of *T. atrox* and *T. cristimanus* proposed here is based on direct comparison of the type material of these species and abundant material of other museums.

Having compared the type females directly it is concluded that there is not enough significant variation of characters to justify separating these species. Males and females from throughout the distributional range did not differ significantly morphologically or genetically, according to the results obtained in the phylogenetic analyses.

MATERIAL EXAMINED: **MEXICO: Colima:** Mixcoate, 1 km N, 19°19.6740'N 103°56.3058'W, 590 m, 30.viii.2011, O. Francke et al., 3 juv. (IBUNAM). *Municipio de Colima*: Colima, 22.i.1951, 2 juv. (IBUNAM), 31.i.1970, staff, 1 ♂ (IBUNAM), 19°14'37"N 103°43'51"W, 500 m, viii.2000, R. Aandala, 1 ♂, 3 ♀ (IBUNAM); Colima, in house, 1 ♀ (AMNH); Hacienda San Antonio, 19°14'35"N 103°43'50"W, 500 m, viii.2000, R. Aandala, 2 ♀, 1 juv. (IBUNAM); Cofradía de Suchitlan, 19°24.7950'N 103°41.8146'W, 1344 m, 26.v.2006, O. Francke, A. Valdez, H. Montaño, and J. Ballesteros, forest, under rock, 2 juv. (AMNH), 1 juv. (IBUNAM); Comala, [19°19'N 103°45'W], 22.iii.1982, 1 ♀ 56 juv. (IBUNAM), A. Montaudon, 2.iii, 1 ♂ (IBUNAM), P. Berea, 10.iv.2008, 1 subad. ♂ (IBUNAM), W. López-Forment, 30.viii.1996, 1 juv. (IBUNAM); El Jabalí Ranch, [19°19'0.0"N 103°45'0.00"W], 27–28.v.1992, W. López-Forment, 1 juv. (IBUNAM). *Municipio de Coquimatlán*: Cave, 8 km S Coquimatlán, 19°9.1080'N 103°50.1522'W, 280 m, 29–30.viii.2011, O. Francke, H. Montaño, A. Valdez, C. Santibáñez, and A. Ballesteros, 1 subad. ♀, 2 juv. (IBUNAM), inside cave, 1 juv. (AMNH [LP 7671]), outside of the cave, 1 ♀ (IBUNAM), 19°09.061'N 103°50.080'W, 277 m, O. Francke, H. Montaño, N. Perez, and A. Valdez, 1 ♂, 1 ♀ (IBUNAM); Road to Coquimatlán marker km 71, 19°6.7746'N 103°51.1848'W, 336 m, 26.v.2006, O. Francke, A. Valdez, H. Montaño, and A. Ballesteros, 1 juv. (AMNH [LP 6551]), tropical deciduous forest, under rock, 1 juv. (AMNH), 1 juv. (IBUNAM). *Municipio de Minatitlán*: Balneario 'El Salto', Minatitlán, 19°22.0866'N 104°5.1276'W, 650 m, 26.v.2006, O. Francke, A. Valdez, H. Montaño, and J. Ballesteros, forest,

in burrow, 2 ♀ (AMNH); road to Minatitlán, junction to Saus, 19°25.3788'N 103°58.9998'W, 1006 m, 26.v.2006, O. Francke, A. Valdez, H. Montaño, and J. Ballesteros, forest, under rock, 1 ♀ (AMNH). *Municipio de Tecolapa*: Tecolapa, 18°59'14"N 103°50'18"W, 94 m, 14.ix.1975, 1 ♀ (IBUNAM). *Municipio de Tonila*: Tonila, 3.2 km S, [19°23.37533'N 103°34.44366667'W], 28.viii.1965, W.J. Gertsch and R. Hastings, 3 ♂, 3 ♀ (AMNH). **Jalisco:** *Municipio de Ameca*: Ameca, [20°33'N 104°2'W], Laboratorios Mand NSA, 1 ♂ (IBUNAM). *Municipio de Casimiro Castillo*: Casimiro Castillo, 19°36'08"N 104°26'07"W, 360 m, 7.xi.2003, M.E. Eloi, 1 ♀ (IBUNAM). *Municipio de Chapala*: Chapala [20°17'58.32"N 103°12'16.52"W], 20 m, 18.viii.2005, 1 ♂ (IBUNAM); Lago de Chapala, S side, [20°15'N 103°0'W], 28.vii.1954, W.J. Gertsch, 1 ♀ (AMNH). *Municipio de El Grullo*: Puerta de Barro, 2 km N, 19°51.509'N 104°13.420'W, 1059 m, 10.vii.2009, O. Francke, J. Ponce, M. Córdova, A. Jaimes, G. Francke, and V. Capovilla, 5 ♂, 6 ♀, 1 subad. ♀ (IBUNAM); Puerta de Barro, 2 km N, La Grulla, 19°51.509'N 104°13.420'W, 1059 m, 9.vii.2005, O. Francke, J. Ponce, M. Córdova, A. Jaimes, G. Francke, and V. Capovilla, 1 ♂ (AMNH [LP 5323]), 1 juv. (AMNH [LP 5328]). *Municipio de El Limón*: El Grullo, 7.5 km, 19°49'24"N 104°09'18"W, 840 m, 3.iii.2001, 1 subad. ♀ (IBUNAM), 1.iv.2001, 1 subad. ♀ (IBUNAM), 8.xi.2001, 1 subad. ♀ (IBUNAM), F. Álvarez and J.L. Castelo; El Limón, 19°49'26"N 104°09'22"W, F. Álvarez and J.L. Castelo, 2–7.ii.2000, 1 ♂, 1 ♀, 1 subad. ♂, 3 subad. ♀, 7 juv. (IBUNAM), J.L. Castelo, 4.iii.2001, 1 subad. ♂ (IBUNAM); Los Yesos, [19°49'31.29"N 104°9'18.73"W], 4.xii.1996, F. Álvarez and J.L. Castelo, 1 ♀, 3 juv. (IBUNAM); San Buenaventura, 19°45.6168'N 104°3.3168'W, 840 m, 2.ii.2000, 2 juv. (IBUNAM), 3.iii.2001, 1 ♂ (IBUNAM), F. Álvarez and J.L. Castelo; San Buenavista, 6.6 km SW, 19°45.006'N 104°03.555'W, 840 m, 2.ix.2001, F. Álvarez and J.L. Castelo, 2 ♂, 2 ♀, 1 subad. ♀ (IBUNAM). *Municipio de Guadalajara*: Guadalajara, 10 km NW,

20°40'35"N 103°20'46"W, 1550 m, 24.ix.1973, A. Flores and P. Reandes, 1 ♀ (IBUNAM). **Michoacán:** *Municipio de Alvaro Obregón*: Alvaro Obregón, 19°02.310'N 102°58.405'W, 462 m, 11.vii.2005, O. Francke, J. Ponce, M. Córdova, A. Jaimes, G. Francke, and V. Capovilla, 4 juv. (AMNH [LP 5325]). *Municipio de Cojumatlán de Régules*: Cojumatlán, 8 km E, [20°7.03400'N 102°50.781333'W], 2.viii.1954, W.J. Gertsch, 1 ♂ (AMNH). *Municipio de Jiquilpán*: Jiquilpán, [19°59'38.52"N 102°43'16.94"W], I. García, 5 ♂, 2 ♀, 2 juv. (IBUNAM).

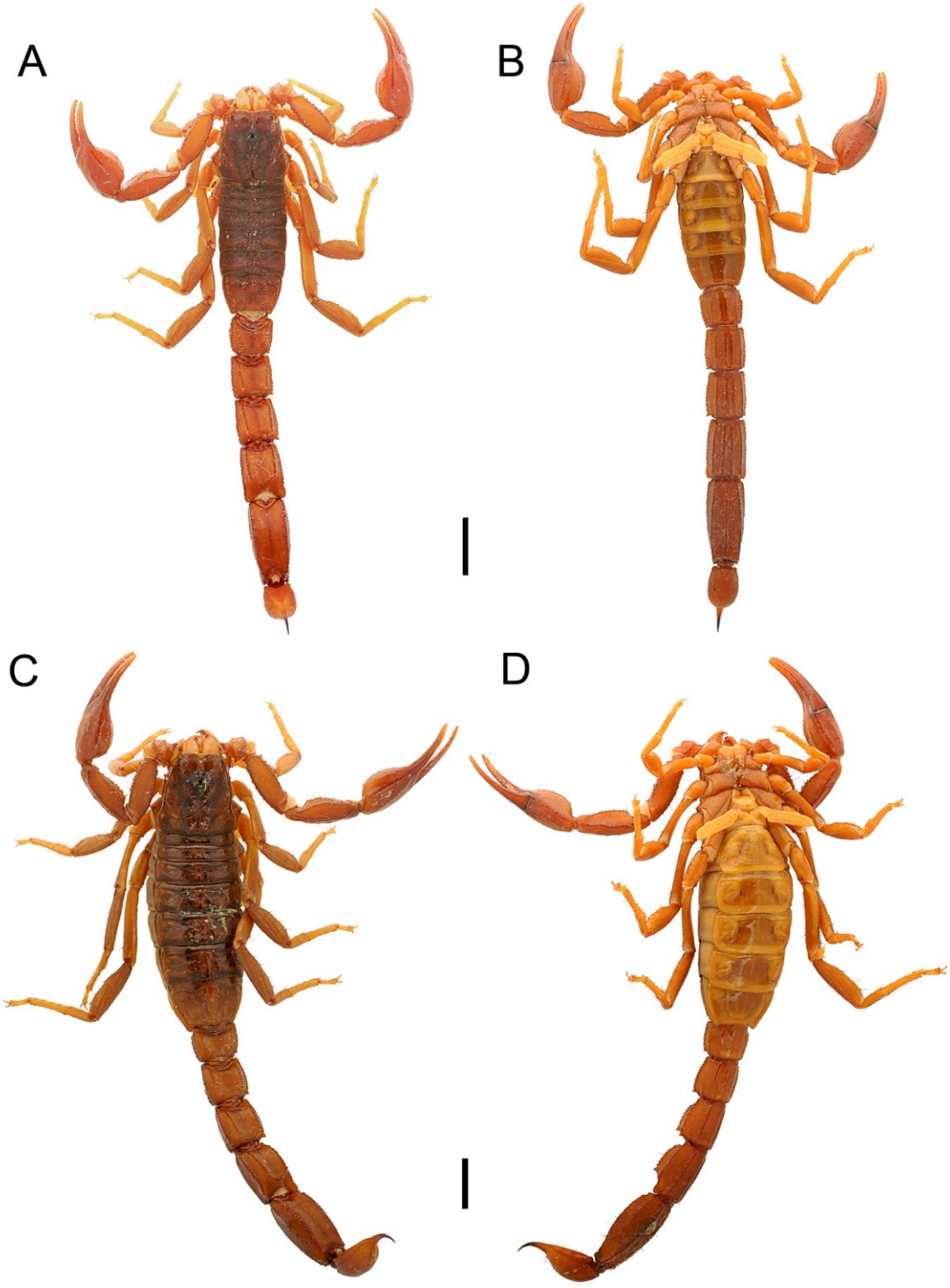


Figure 129. *Thorellius cristimanus* (Pocock, 1898), habitus. **A**, **B**. ♂ (AMNH). **C**, **D**. ♀ (AMNH). **A**, **C**. Dorsal aspect. **B**, **D**. Ventral aspect. Scale bars = 10 mm.

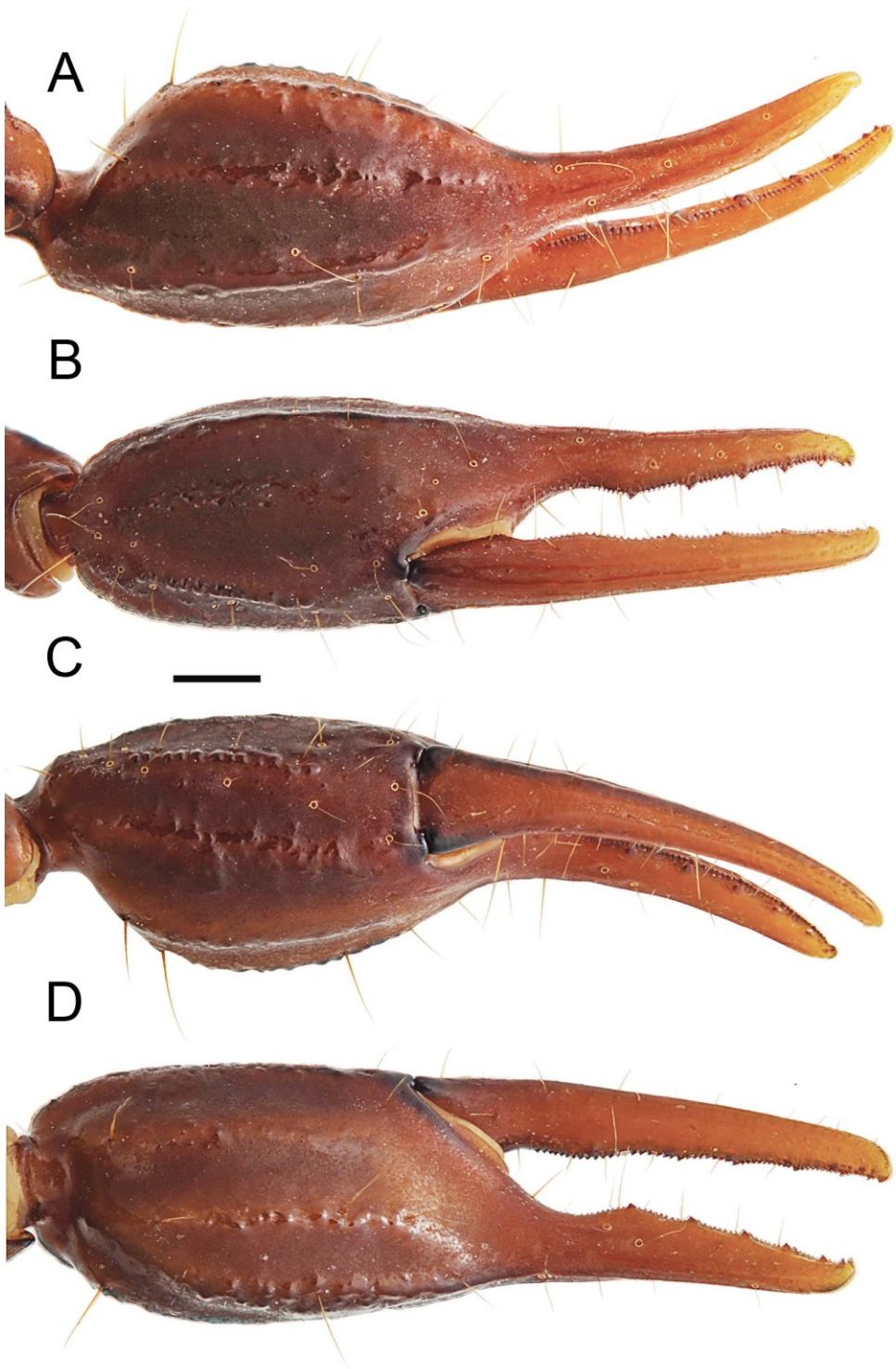


Figure 130. *Thorellius cristimanus* (Pocock, 1898), ♂ (AMNH), dextral pedipalp chela. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

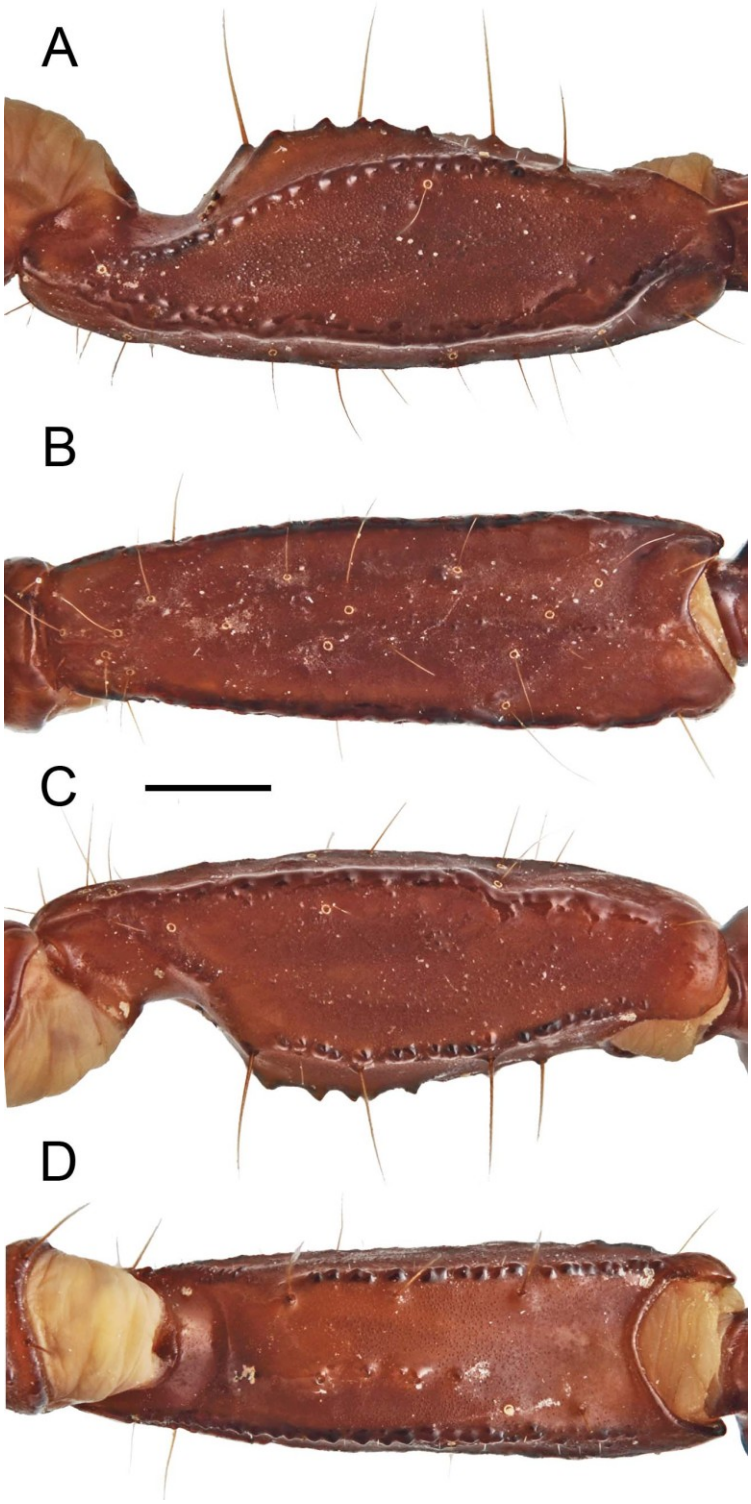


Figure 131. *Thorellius cristimanus* (Pocock, 1898), ♂ (AMNH), dextral pedipalp patella. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

Thorellius intrepidus (Thorell, 1876)

Figures 127, 132–134, 197C, 203C, 207C, 212C, 2160C, 219C, 223C

Vejovis intrepidus Thorell, 1876: 10 (erroneously indicated as type species of *Vaejovis*).

Vejovis intrepidus: Thorell, 1876: 183; Bücherl, 1971: 329.

Vaejovis mexicanus: Kraepelin, 1894: 199; 1899: 185 (misidentification, in part).

Vaejovis intrepidus: Pocock, 1902: 13; Hoffmann, 1931: 373–385, figs. 30–35; Kovařík, 1998: 147; Beutelspacher, 2000: 89, 139, 140, 142, 143, 153, map 68; Sissom, 2000: 537; Ponce-Saavedra and Sissom, 2004: 539, 541.

Thorellius intrepidus: Soleglad and Fet, 2008: 5, 18, fig. 12, 23, 26, fig. 23, 33, fig. 49, 50, tab. 3, 51, 53, 56, fig. 144, 57, fig. 157, 67, 73, 94, 95.

Vejovis intrepidus intrepidus: Hoffmann, 1931: 374–378, figs. 30–32; Williams and Hadley, 1967: 112.

Vaejovis intrepidus intrepidus: Díaz-Nájera, 1975: 7, 21, 33; Ponce-Saavedra and Beutelspacher, 2001: 46, 48, 49, 100, map 19; Sissom, 2000: 538; González-Santillán, 2004: 25, 26, tab. 2; Kamenz and Prendini, 2008: 6, tab. 1; McWest, 2009: 20, tab. 1, 53, 66, figs. 197–203, 68, 119; Ponce-Saavedra and Francke, 2011: 466, tab. 1.

Vaejovis increpidus increpidus: Williams, 1986: 355, 358 (lapsus).

TYPE MATERIAL: **MEXICO:** Holotype ♀ (NRS) [not examined], "México".

DIAGNOSIS: *Thorellius intrepidus* is closely related to *T. tekuani*, **n. sp.**, *T. wixarika*, **n. sp.**, *T. yuyuawi*, **n. sp.**, and *T. intrepidus*, with which from a monophyletic group (see *T. tekuani*, **n. sp.** for details). *T. intrepidus* is distinguished from the other species by having the largest total size with males at 72 mm., in *T. cristimanus*, *T. tekuani*, **n. sp.**, *T. wixarika*, **n. sp.**, and *T.*

yuyuawi, **n. sp.** less than 60 mm; and females at 80 mm, in *T. cristimanus*, *T. tekuani*, **n. sp.**, *T. wixarika*, **n. sp.**, and *T. yuyuawi*, **n. sp.** less than 70 mm. Furthermore, *T. intrepidus* has the most developed pedipalp chela carinae with strong and broad costa, protruding notably from adjacent surfaces and moderately to densely cover with crenulation, instead of having moderately costate and finely or coarsely granular or crenular surface. *T. intrepidus* is further separated by having pedipalp movable finger position PD7 with a double granule, instead of having a single granule at this position. From *T. wixarika*, **n. sp.**, and *T. yuyuawi*, **n. sp.**, *T. cristimanus* differs by having light base color, instead of having dark brownish base color. From *T. yuyuawi*, **n. sp.** and *T. cristimanus* differs by having relatively elongate metasomal segments I–IV, instead of having robust metasomal segments slightly more wider and shorter. *T. intrepidus* has the strong pedipalp fingers scalloping, *T. cristimanus*, *T. tekuani*, **n. sp.**, and *T. wixarika*, **n. sp.** has it moderate to strong and *T. yuyuawi*, **n. sp.** moderate to weak. From *T. tekuani*, **n. sp.** and *T. wixarika*, **n. sp.** differs by having ventral submedian carinae of metasomal segments II and III finely costate and smooth, instead of having them finely crenulate.

DESCRIPTION: The following redescription supplements Hoffmann's (1931) reassessment of the original description. It is based on freshly collected material deposit in the museums indicated in the material examined.

Color and infuscation (in alcohol): Base color yellowish to brown reddish. Chelicerae and pedipalp fingers reddish. Carinae of pedipalp femur patella and manus intensely reddish contrasting strongly with paler base color. Carapace, tergites, legs, with diffuse to moderate dusky markings. Ventral lateral and ventral submedian carinae reddish, finely infuscate. Coxal region slightly darker than carapace and tergites. Pectines and genital operculum pale whitish to yellowish. Aculeus reddish to brownish.

Carapace: Carapace anterior margin emarginated with a weak to moderated median notch and three pairs of major macrosetae. Surface shagreened, scattered moderated rounded and dense minute granules. Anteromedian, and posterolateral sulci moderated and narrow, posteromedian deep, posterior transverse obsolete. Median ocular tubercle moderately raised, superciliary carina smooth to weakly crenular higher than median eyes. Median eyes relatively small approximately double size of anterior lateral pair. Three lateral eyes, two anterior pairs same size and posterior reduced approximately in half.

Sternum and coxal region: Sternum pentagonal subequilateral with four pairs of setae, two distal, one median pair and one pair on the lobes, median notch deep. Anterior margin of coxa II with three oblique slit-like structures, adjacent to an enlarge protuberance with fine scatter granules. Base of coxal endite II with a moderated depression each, median margin with fine granulation on proximal half, becoming smooth distally. Coxa IV 2.42 times longer than coxa II.

Chelicerae: Dorsal surface smooth, dentition of fixed and movable fingers as in typical syntropine. Subdistal margin of manus with one median macrosetae and distal manus outlined with broad carinae with fine crenulations at the base of fixed finger. Serrula with 22–24 tines.

Pedipalps: Trichobothrial pattern Type C, orthobothriotaxic. Chelae wider than patella and patella wider than femur. Femur: retro and prolateral intercarinal surfaces matte. Dorsal retrolateral, dorsal prolateral, and ventral prolateral carinae moderately granular with conical and moderate granules; retrolateral dorsosubmedian complete, with a moderated proximal spinoid tubercle, a gap of smooth surface and moderately and scattered crenatoserrate, and five major macrosetae; prolateral ventrosubmedian complete and strong with a proximal enlarged tubercle followed by an oblique, scatter, and irregular row of sharp, conical, and enlarged granules,

starting at mid surface slanting gently towards distal end of dorsal prolateral carinae, with two macrosetae at the base of two median granules; prolateral ventral vestigial, expressed by two proximal tubercles, ventral one with a macroseta on top and two or three additional sparse tubercles, one subproximal, one distal each with a macroseta at base, distributed from the proximal to the mid aspect of the segment; ventral median, retrolateral ventral, and ventral retrosubmedian vestigial expressed by a row of serrated enlarged granules.

Patella: All intercarinal surfaces matte, except retrolateral smooth. Dorsal prolateral, dorsal retrolateral, moderately granular; ventral prolateral and ventral retrolateral strongly crenular; ventral median vestigial expressed as a short proximal row of minute granules; retrolateral dorsosubmedian and retrolateral median vestigial, expressed by a broad moderate; prolateral median on a vaulted projection, extending from a proximal tubercle with a major macroseta on top and a row of four of six subserrated granules reducing in size terminating in few distal minute serrations at the level of trichobothrium d_2, followed by flat surface slanting gently towards dorsal prolateral carinae median granule with a macroseta at base, followed by a gap of smooth surface and ending on at one distal major macrosetae on the top of a moderate granule positioned on the distal fifth of dorsal prolateral carinae; prolateral ventral obsolete expressed by two major macrosetae, one basal and one distal. These two carinae, adjacent to ventral prolateral carinae.

Chelae: Pedipalp manus incrassate. Intercarinal surfaces weakly matte. Dorsal prolateral, dorsal median, dorsal retrolateral, dorsal retrosubmedian accessory, ventral prolateral, and prolateral median strongly costate, protruding strongly with clusters of irregular moderate crenulations; dorsal prosubmedian and prolateral dorsal vestigial expressed by scattered crenulations flanking dorsal lateral carina; retrolateral median partial, expressed on median third,

moderately costate and finely crenulated; retrolateral subventral accessory and retrolateral subventral vestigial expressed by two distal and broad costa; retrolateral ventral vestigial expressed by a proximal tubercle; ventral retrolateral and ventral retrosubmedian partial expressed as a broad costa with strong irregular crenulation, ending at the level of trichobothrium *Est*; ventral prosubmedian and ventral median complete expressed by a broad costa with strong irregular crenulation; ventral prolateral and prolateral parallel. Trichobothria *Dt* and *Db* dorsal to dorsal retrolateral carinae. Trichobothrium *Dt* positioned subbasal on manus. Trichobothrium *Dt* positioned at mid manus.

Fingers: Fixed finger dentition: PD = 6, RD = 5, MD rows = 5, all denticles subserrated, retrolateral denticles comparatively smaller than prolateral denticles, basal prolateral denticle positioned on median third. Movable finger PD = 8, RD = 6, MD rows = 6, distal row with one denticle, prolateral and retrolateral denticles subpaired. Basal two prolateral denticles paired adjacent to each other. Trichobothrium *ib* and *it* positioned by mid fixed finger, *ib* positioned adjacent to PD6; *it* positioned between PD6 and. Fingers with strong scalloped, proximal notch and median lobe of pedipalp fixed and movable fingers strong in both sexes. Gap created when fingers close strong, fingers fit unevenly.

Legs: Spinules: Basitarsi I–III prolateral ventral, retrolateral ventral and retrolateral dorsal carinae with complete rows of spinules, prolateral ventral and retrolateral ventral in VI absent; retrolateral dorsal in IV partial expressed by a scatter row of spinules on distal two thirds; retrolateral median rows in I–IV vestigial expressed as few terminal spinules. Telotarsi I–IV with three or four pairs of ventrodistal spinules in I–IV. Setae: Prolateral ventral, 5:5:5:5, distal three and four in II and IV slightly stout; retrolateral ventral, 4:8:9:9; retrolateral dorsal, 2:3:4:2; dorsal, 3:4:4:4; retrolateral dorsal and dorsal series arranged in two independent rows.

Tergites: Pretergites matte, posttergites shagreened with scattered moderated and minute granules. Dorsal median and dorsal submedian carinae weak, finely granular or smooth weakly costate. Tergite VII with intercarinal surfaces smooth; dorsal median carina partial and strong expressed on proximal third, strongly costate weakly crenular; dorsal submedian vestigial expressed as a pair of oblique proximal crenulations strongly costate; dorsal lateral and lateral supramedian strong with moderate to enlarge granules; dorsal lateral projecting and curving laterally almost reaching lateral supramedian distal margin, creating a semi ring of strong serrated granulation.

Genital operculum: Male genital operculum: wider than long, with three pairs of major macrosetae. Sclerites free on longitudinal edge moving independently but unable to open more than 45°. Genital papillae protruding posteriorly. Female genital operculum: Wider than long, with three macrosetae. Sclerites fuse longitudinal.

Sternites: Sternites III–VI with all carinae obsolete and surface finely punctuated, V in ♂ with distomedian glandular spot weak, whitish, not protruding from adjacent surfaces but strongly contrasting with darker base color, in ♀ obsolete. Sternite VII with ventral lateral carinae vestigial weakly crenulate, ventral submedian obsolete expressed by two pairs of setae; distomedian glandular spot obsolete in both sexes. Spiracle elongated, slit-like, elongated approximately four times longer than wide.

Pectines: Pectines in ♂ longer than distal margin of coxa VI, in ♀ at or slightly longer than coxa IV. Basal piece with four major macrosetae. Marginal lamella consist of three sclerites, medial lamella proximally fuse distally progressively forming conspicuous 14–16 beads. Fulcra with 22–24 in ♂, in ♀ 19–21 beads. Pectinal tooth count 23–25 in ♂, in ♀ 20–22.

Hemispermatophore: Lamina 1.89 longer than trunk. Dorsal through margin long, narrow, curving proximally, and removed from ventral trough. Hemimating plug developed from the inner lobe, distal barb margin with 15 moderate spinules. Primary and secondary hook positioned on the apex of lateral margin extension of the lamina (flange). Both hooks rounded forming lobes, secondary hook dislocated ventrally from primary hook, forming a shallow notch. Median lobe ental terminus moderated and rounded. Basal plate of inner lobe adjacent to ventral trough. Spine of inner lobe moderate, secondary spine on ventromedian aspect of neck absent. Neck relatively short (0.67 times longer than basal plate). Measurements, lamina, 5.10; trunk, 2.70; dorsal trough/laminar hooks, 1.74; ventral trough/laminar hook, 1.14; neck, 0.48; basal plate, 0.72.

Metasoma: All intercarinal surfaces weakly matter. Carinae: Dorsal lateral and lateral median carinae in I–IV strongly crenatoserrated terminating in elongate spiniform granule pointing backwards; except lateral median in IV distal terminus moderate expanded or flared laterally forming a rounded triangular projection; dorsal lateral in V proximal third scattered and strongly crenatoserrated, becoming finely granular at mid segment and more weakly crenular distally; lateral inframedian in I complete moderately crenatoserrate; in II partial moderately crenatoserrate, present in distal third; in III partial weakly crenular, expressed on distal fourth, in VI absent, in V partial, expressed on proximal two thirds by irregular crenatoserrate granules becoming weaker distally; ventral lateral in I–III smooth to weakly crenular, in IV and V weak to moderately crenatoserrate; ventral submedian in I–III strongly costate but smooth, in IV proximal two thirds smooth, distal third weakly crenular; ventral median in V moderately crenatoserrate. Setae: Dorsal lateral, 0:0:1:1:3; lateral median, 0:1:1:2; lateral inframedian, 1:0:0:0:2; ventral lateral, 2:2:2:2:4; ventral submedian, 2:2:2:2:1; ventral sublateral, 2.

Telson: Dorsal and ventral surface smooth, all ventral carinae weakly crenular. Ventral surface with two or three macrosetae in each carina. Ventral median carinae with subaculear tubercle obsolete. Microserration on laterobasal aculeus numbering 5–8.

DISTRIBUTION: *Thorellius intrepidus* is distributed in central Mexico, in the states of Aguascalientes, Colima, Guanajuato, Jalisco, Michoacán and Nayarit.

ECOLOGY: *Thorellius intrepidus* is commonly found in tropical dry forest, including deciduous and broadleaf forest. The localities where this species was recorded vary from 5 to 1760 m altitude. Hoffmann (1931) reported that this species is synanthropic in the city of Colima, and numerous specimens have been collected inside houses. At the Biological Station of Chamela in Jalisco, it is sympatric with *Centruroides elegans* (Thorell, 1876), *C. chamela* Ponce-Saavedra and Francke, 2011, *Mesomexovis caxcan*, **n. sp.**, and *Konetontli chamelaensis*. This species appears to be lapidicolous because it has weak leg armature and occasionally was collected under rocks, has never been spotted at the entrance of burrows, and also lacks any adaptations for a lithophilous habitat.

REMARKS: Hoffmann (1931) recognized three 'forms' within *Vaejovis intrepidus*, which were diagnosed based on morphometric differences, pedipalp development, granulation and trichobothrial number on retrolateral surface of pedipalp femur. This last character has never been revisited. My observations indicate that the number of trichobothria, in these species is constant, following the trichobothrial pattern Type C, orthobothriotaxic and suggest that Hoffmann (page 347) probably confounded large macrosetae with trichobothria. He reported 14 trichobothria for *T. intrepidus*, 19 for *T. cristimanus*, and 20 for *T. atrox*. These counts reflect the hirsute nature of *T. cristimanus* and its relatives, except for *T. intrepidus*, which tends to hava minor macrosetae or microsetae instead.

Thorellius intrepidus was consider polytypic since Hoffmann (1931) reviewed the scorpions of Mexico. Sissom (2000) further followed that assessment and formalized the *intrepidus* group of *Vaejovis*. Subsequently Soleglad and Fet (2008) created *Thorellius* to accommodate the *intrepidus* group and elevated the three subspecies to specific level based on observation of a few specimens. As demonstrated in the analyses conducted here, the *intrepidus* group had two misplaced species, now part of *Mesomexovis* (*M. subcristatus* and *M. occidentalis*) and *T. atrox* is synonymized here.

The distribution of *T. intrepidus* includes Jalapa in the state of Veracruz, based on material used by Hoffmann for his monograph. Although not subsequent mentioned in the literature, Hoffmann also indicated that this species extends south to the coast of Guerrero, including Michoacán. The revision of abundant material indicates that the presence of this species in Veracruz is result of mislabeled specimens, which is not rare in Hoffmann's monograph (see also *T. cristimanus*). Furthermore, the presence of this species on the coast of Michoacán was corroborated, but the record from Guerrero, most likely represent to *T. tekuani*, **n. sp**.

MATERIAL EXAMINED: **MEXICO: Aguascalientes:** *Municipio de Calvillo*: Chiquihuetero, 21°52'27"N 102°42'09"W, 1680 m, 29.vi.2007, A. Valle Colis, 1 ♂ (IBUNAM); El Rodeo, 21°52'09"N 102°44'50"W, 1620 m, 25.vi.2007, A. Valle Colis, 1 ♀ (IBUNAM); La Labor, 21°57'43"N 102°41'46"W, 1740 m, 15–18.vi.2007, I. Escalante Piña, 1 ♂, 1 ♀ (IBUNAM); Media Luna Ranch, 21°47'56"N 102°48'05"W, 1560 m, 9.xi.2008, I. Franchini, 1 ♀ (IBUNAM); Mesa Grande, 21°48'18"N 102°43'18"W, 1760 m, 24.vi.2003, G. Vargas, 1 ♀ (IBUNAM), 24.vi.2007, M. Sema, 1 ♂ (IBUNAM); Tepalcate de Arriba, 21°50.0833'N 102°46'W, 24.vi.2007, R.C. Jorge, 1 ♂ (IBUNAM). **Colima:** *Municipio de Armería*: Armería,

18°56'03"N 103°57'52"W, 40 m, 2.i.2003, H. Rodríguez, 1 ♂, 1 ♀ (IBUNAM); Mine La Salada NW Ixtlahuacán, 19°01.680'N 103°47.036'W, 275 m, 2005, Mine staff, 8 ex. (AMNH); At mine headquarters, 11 ♀ (AMNH). *Municipio de Camotlán*: Punta de Agua, 19°9'N 104°16'W, 2.ix.2003, E. González, 1 ♀ (IBUNAM). *Municipio de Colima*: Colima [19°14.60'N 103°43.4833'W], 30.xii.1927, J.C. Chamberlin, 1 ♂ (AMNH); Colima, 16 km S, [19°14'37"N 103°43'51"W], 30.vii.1954, W.J. Gertsch, 1 ♂ (AMNH); Los Ortices, 19°6'46.8"N 103°44'22.6"W, 343 m, 9.iv.2004, P. Berea, 1 ♂ (AMNH [LP 6379]). *Municipio de Comala*: Comala, [19°19.00'N 103°45.00'W], 9.iv.2004, P. Berea, 1 subad. ♀ (AMNH [LP 6377]). *Municipio de Coquimatlán*: Around Coquimatlán, [19°18'N 104°6'W], 2008, L.L. Valdez, 1 ♂ (IBUNAM). *Municipio de Manzanillo*: Los Parajes, 19°14'07"N 104°24'52"W, 230 m, 3.ii.2008, 1 ♂ (IBUNAM); Manzanillo, [19°03'08"N 104°18'57"W], 5 m, 18.i.1947, 1 ♀ (AMNH), 2 ♂, 4 ♀, 1 subad. ♂ (IBUNAM); Manzanillo, 10 km of El Colomo, [19°03'08"N 104°18'57"W], 16.iv.2008, P. Berea, 1 ♀ (IBUNAM); Manzanillo, Colonia Valle de Las Garzas, 19°03'08"N 104°18'57"W, 5 m, 29.ix.2008, 1 ♀ (IBUNAM); Manzanillo, Sector 7, 19°03'08"N 104°18'57"W, 5 m, 6.ii.2004, 1 ♂ (IBUNAM); Nuevo Petatero Ranch, [19°3.64867'N 104°16.60233'W], 4.ii.2008, 1 ♀ (IBUNAM); Potrero Grande, 19°10'19"N 104°32'27"W, 6 m, 27.xi.2008, 1 ♀ (IBUNAM); Veladero de Otates, 19°15'38"N 104°20'14"W, 280 m, 4.ii.2008, 1 ♀ (IBUNAM). *Municipio de Minatitlán*: Junction to Saus, on the way to Minatitlán, 19°25.3788'N 103°58.9998'W, 1006 m, 26.v.2006, O. Francke, A. Valdez, H. Montaño, and A. Ballesteros, 1 ♂ (AMNH [LP 6469]). *Municipio de Tecomán*: Tecomán, [18°54'30"N 103°52'28"W], R.G. Orozco, iii.1992, 1 ♂ (IBUNAM), R. Lezama, 30 m, 9.iii.1992, 3 ♂, 6 ♀ (IBUNAM), E. López, 17.iii.1992, around village, 1 ♀ 1 subad. ♂ (IBUNAM), M. González, 29.xi.1995, 1 ♀ (IBUNAM), H. Arredondo, 12.i.1996, 1 ♀ (IBUNAM), 18.ii.1996, 1 ♀

(IBUNAM), 19.vi.1996, 1 ♀ (IBUNAM), E. López, 8.v.1961, subad. ♀ (IBUNAM). *Municipio de Villa de Álvarez*: Villa de Álvarez, 19°16'00"N 103°44'15"W, 530 m, 11.ii.1995, E. Polanco, 1 ♀ (IBUNAM). **Guanajuato:** *Municipio de León*: Hacienda de Arriba, NE of León, 2008, L. Olguín, in house, 2 ♀ (IBUNAM); León, [21°7'N 101°41'W], 2.vi.2006, 1 ♂ (IBUNAM). **Jalisco:** *Municipio de Jocotepec*: San Juan Cosola, 1.6 km E, [20°17.20'N 103°20.216666'W], 10.vii.1959, C.M. Bogert, 1 ♀ (AMNH). *Municipio de La Huerta*: Bahía de Chamela, [19°32'N 105°4'W], 22.x.2005, L. Olguín, O. Reynaud, and E. González, (IBUNAM); Ejido E. Zapata, 19°22'58"N 104°57'55"W, 10 m, 9.vii.1994, I. Ramirez, 1 ♀ (IBUNAM); Estación Biológica Chamela: 27.x.1978, 1 ♂ (IBUNAM), M.V. Julia, 5.iv.1981, 1 ♀ (IBUNAM), A. Pescador, 20 m, 19.v.1985, 1 subad. ♀ (IBUNAM), E. Ramírez, 26.iv.1993, 1 ♂ (IBUNAM), 6.ix.1994, 1 ♀ (IBUNAM), S.H. Bullock, 25.iii.1998, 1 ♀ (IBUNAM), 31.iii.1999, A.M. Corona and C.A. Uribe, 1 ♂ (IBUNAM), A.M. Corona and R. Andala, 14.ix.1999, 1 ♀ (IBUNAM), A.M. Corona, 19.ix.1999, 1 ♀ (IBUNAM), 28.x.2002, 1 ♂ (IBUNAM), A. Rodríguez, 12.xi.2002, 1 ♀ (IBUNAM), 19°29.8752'N 105°2.6082'W, 1.ix.2011, O. Francke, A. Valdez, H. Montaño, A. Ballesteros, and C. Santibáñez, 3 ♂, 1 ♀ (IBUNAM), Cutzmala, 19°29.875'N 105°02.608'W, 97 m, 30.viii.2007, O. Francke et al., 1 ♀ (AMNH [LP 7670]), El Tejon Trail, 19°29.836'N 105°02.491'W, 18.viii.2005, J.L. Castelo, collected at night with UV light, 1 ♀ (AMNH [LP 5309]). **Michoacán:** *Municipio de Aquila*: Aquila, 18°35'57"N 103°30'15"W, 180 m, 21.ii.1992, R. Mares, 1 ♀ (IBUNAM); Arroyo de la Cruz, 5 km NE of Maquili, 18°34'33.5"N 103°35'47.8"W, 24.i.2004, 1 ♂, 2 ♀, 1 subad. ♂, 1 subad. ♀ (IBUNAM); El Faro de Bucerías, [18°21.00'N 103°29.00'W], 13–14.i.2002, E. González, tropical dry forest, 1 ♀ (AMNH [LP 2022]); El Faro de Bucerías, near La Llorona, [18°20'40.74"N 103°30'32.04"W], M. Victor, 16.vi.2004, 1 ♀ (IBUNAM), G. Suarez, 17.i.2006, 1 ♀ (IBUNAM); El Faro, 20 m, 16.vi.2004, 1

♂ (IBUNAM); Pomaro, 18°20'28"N 103°18'29"W, 380 m, 18.ii.1992, R. Álvarez, 1 ♂ (IBUNAM). *Municipio de Coahuayana*: Coahuayana, [18°45'N 103°40'W], 24.vi.1991, M.J. Nereanda, 1 ♀ (IBUNAM). *Municipio de Ecuandureo*: Las Fuentes, 20°09'33"N 102°13'06"W, 1550 m, 13.x.2006, 1 ♀ (IBUNAM). *Municipio de Jiquilpán*: Jiquilpán, 19°59'37"N 102°43'02"W, 1560 m, G. Ignacio, 1 ♂, 1 ♀ (IBUNAM); *Municipio de Morelia*: Los Pirules, [19°53.12083'N 100°26.077'W], 8.xi.1996, Chavez, 1 ♀ (IBUNAM); Universidad de Michoacán, [19°41.46600'N 101°12.162666'W], 1 ♂ (IBUNAM). *Municipio de Uruapan*: Uruapan, 19°25'10"N 102°03'30"W, 1620 m, J. Julia, 1 ♂ (IBUNAM). **Nayarit:** *Municipio de Tepic*: Tepic, Motel La Loma, [21°30.500'N 104°53.5833'W], C.M. Bogert, 1 ♀ (AMNH).

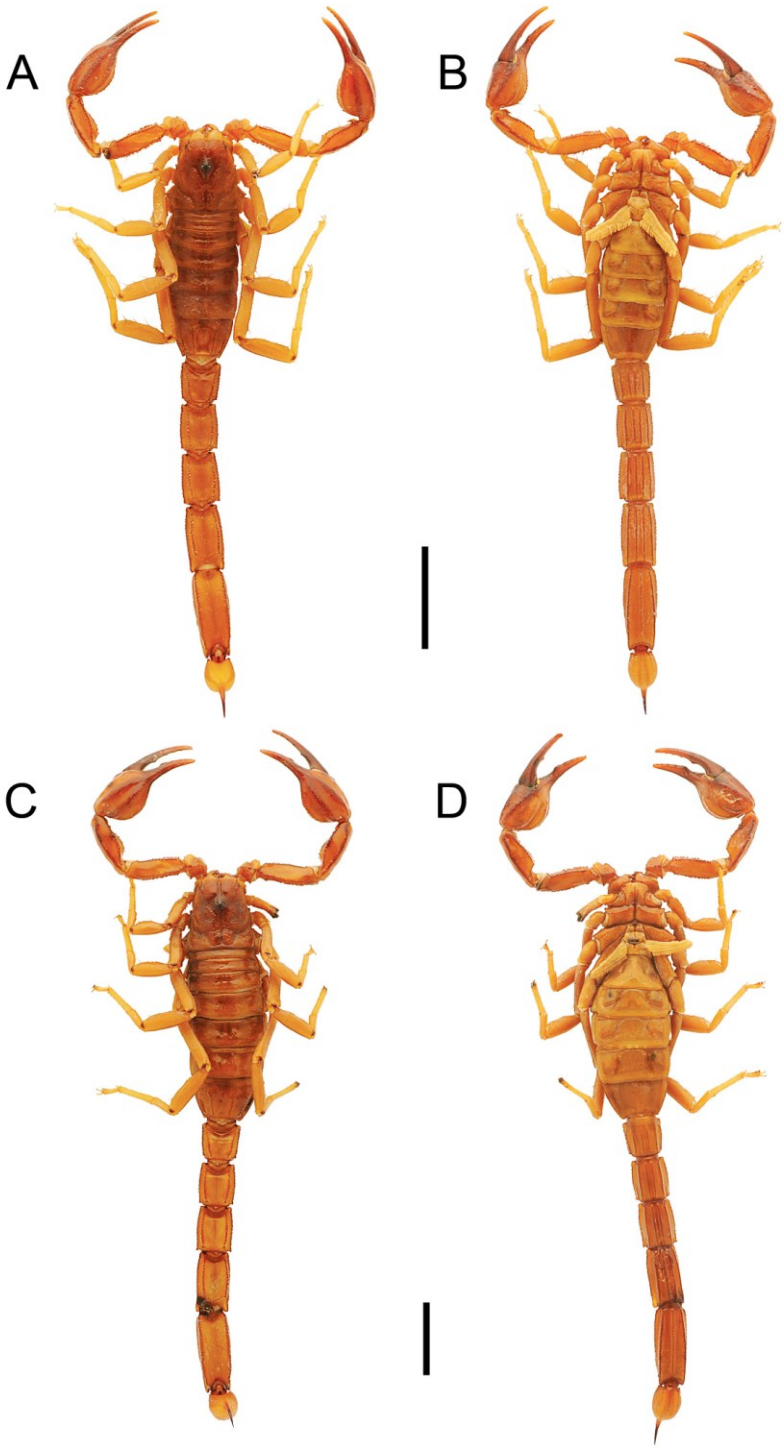


Figure 132. *Thorellius intrepidus* (Thorell, 1876), habitus. **A**, **B**. ♂ (AMNH). **C**, **D**. ♀ (AMNH). **A**, **C**. Dorsal aspect. **B**, **D**. Ventral aspect. Scale bars = 10 mm.

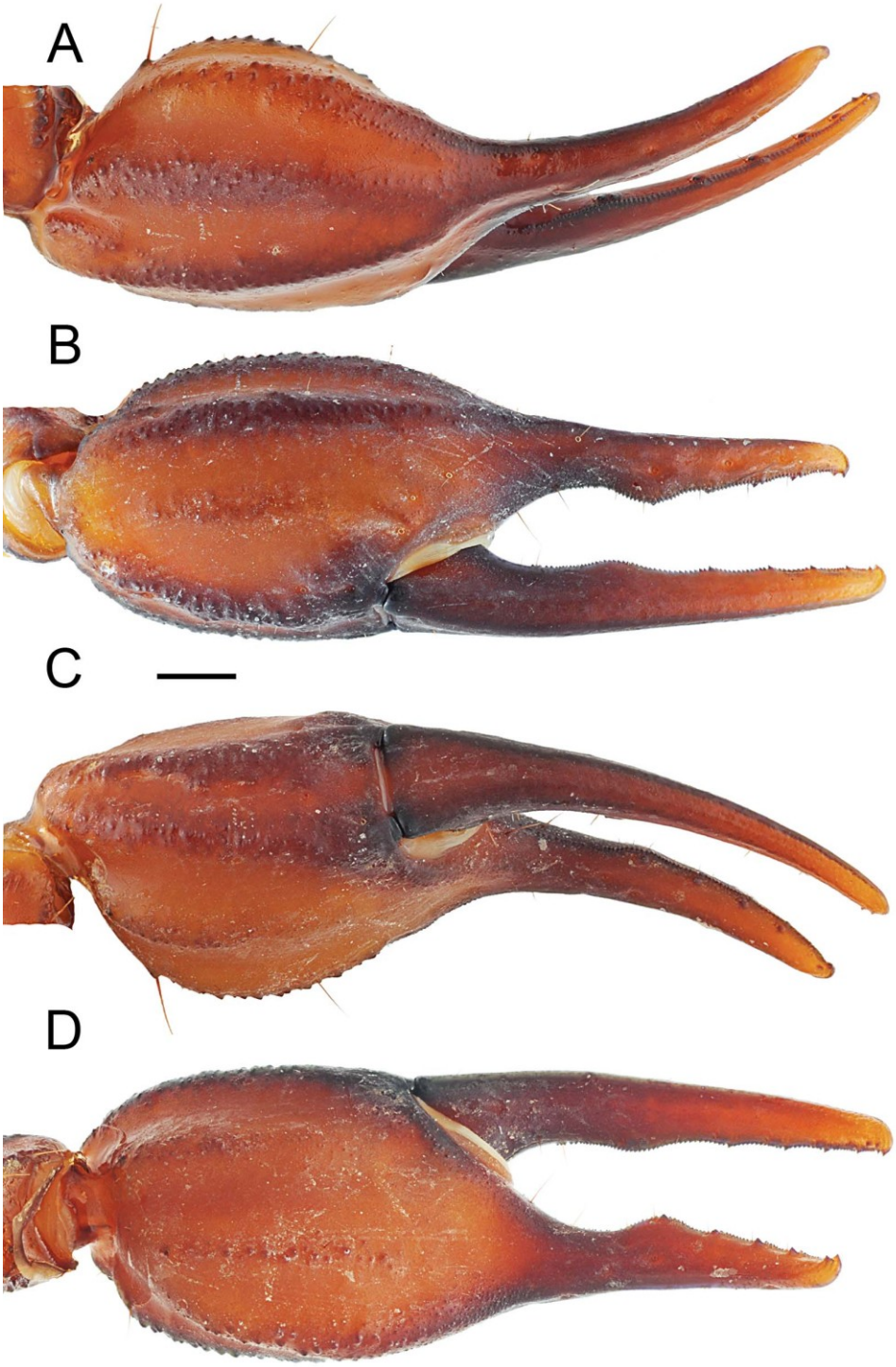


Figure 133. *Thorellius intrepidus* (Thorell, 1876), ♂ (AMNH), dextral pedipalp chela. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

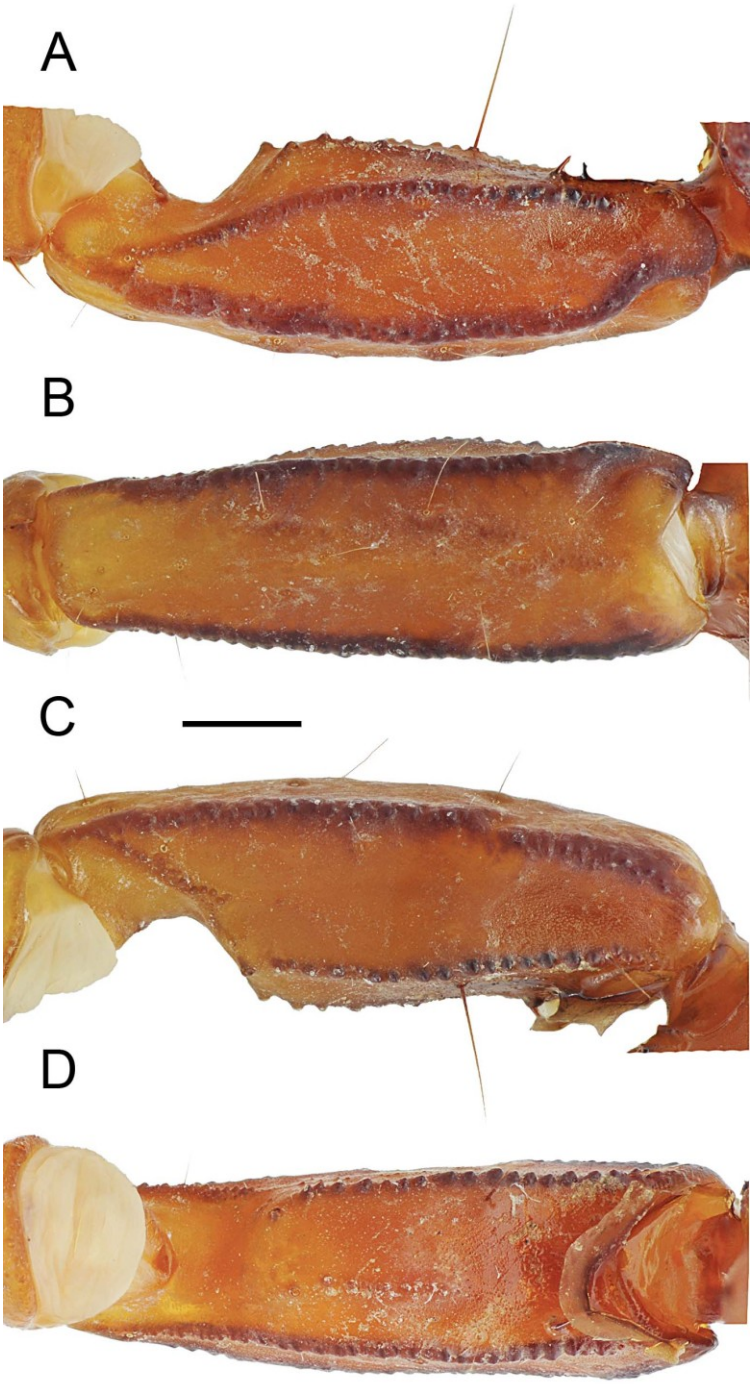


Figure 134. *Thorellius intrepidus* (Thorell, 1876), syntype ♂ (AMNH), dextral pedipalp patella. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

Thorellius tekuani, **n. sp.**

Figures 128, 135–1137, 197A, 203A, 208A, 212A, 216A, 219A, 223A; Table 12

TYPE MATERIAL: **MEXICO: Michoacán:** *Municipio de Tejupilco*: Holotype ♂ (IBUNAM), Pungaracho, 3 km E, 19°01.775'N 100°28.406'W, 574 m, 1.xi.2002, E. González, C. Durán and R. Paredes. Paratypes: 2 ♀ (AMNH).

ETYMOLOGY: The species name *tekuani* is an adjective in the Nahuatl language that means ferocious or bestial, referring to the size and impressive appearance of this large scorpion.

DIAGNOSIS: *Thorellius tekuani*, **n. sp.** is closely related to *T. cristimanus*, *T. wixarika*, **n. sp.**, *T. yuyuawi*, **n. sp.**, and *T. intrepidus*, with which forms a monophyletic group. The following scheme of relationships was retrieved among the species: (*T. tekuani* (*T. cristimanus* ((*T. wixarika* + *T. yuyuawi*)(*T. intrepidus*)))). *T. tekuani*, **n. sp.** may be separated from the other species by having the lighter base color, instead of having brownish reddish to dark brown; ventral submedian carinae of metasomal segments I and II finely crenulated to granular, instead of having them smooth or obsolete. From *T. wixarika*, **n. sp.** differs by having manus incrassate, instead of having relatively slender manus. *T. tekuani*, **n. sp.** has pedipalp chela carinae scatter and finely granular, in *T. cristimanus* these carinae have coarse crenulation to smooth costa, in *T. intrepidus* these carinae are notably developed as broad and strong costas with abundant crenulation, in *T. yuyuawi*, **n. sp.** these carinae are weak to moderate and smooth, in *T. wixarika*, **n. sp.** these carinae are densely cover with moderate granules. From *T. yuyuawi*, **n. sp.** and *T. wixarika*, **n. sp.** differs by having pedipalp femur, patella, and chelae carinae immaculate, instead of having strong infuscation. *T. tekuani*, **n. sp.** has moderate to strong pedipalp fingers scalloping, in *T. intrepidus* the scalloping is very strong and in *T. yuyuawi*, **n. sp.** the scalloping

is weak. From *T. wixarika*, **n. sp.** differs by having retrolateral median and retrolateral dorsosubmedian carinae of pedipalp patella vestigial with few scatter fine granules, instead of having them partially developed with abundant moderate granules. From *T. yuyuawi*, **n. sp.** differs by having ventral submedian carinae of metasomal segments I–IV costate and smooth, instead of having them costate and finely crenular.

DESCRIPTION: The following description is based on the paratypes and the specimens listed in material examined.

Color and infuscation (in alcohol): Base color yellowish to light orange. Pedipalp fingers reddish. Carinae of pedipalp femur patella and manus reddish contrasting with paler base color. Carapace, tergites, legs, with vestigial diffuse dusky markings. Ventral lateral and ventral submedian carinae reddish. Coxal region slightly darker than carapace and tergites. Pectines and genital operculum pale whitish. Aculeus reddish to brownish.

Carapace: Carapace anterior margin emarginated with a weak to moderated median notch and three pairs of major macrosetae. Surface shagreened, scattered moderated rounded and dense minute granules. Anteromedian, posteromedian, and posterolateral sulci deep and narrow, posterior transverse obsolete. Median ocular tubercle moderately raised, superciliary carina crenular higher than median eyes. Median eyes relatively small approximately double size of anterior lateral pair. Three lateral eyes, first distal pair slightly larger than second pair and posterior reduced approximately in half size of first distal pair.

Sternum and coxal region: Sternum pentagonal subequilateral, as long as wide, with three pairs of setae, one distal, one median pair and one pair on the lobes, median notch deep. Anterior margin of coxa II with three oblique slit-like structures, adjacent to an enlarge protuberance with fine scatter granules. Base of coxal endite II with a moderated depression each, median margin

with fine granulation on proximal half, becoming smooth distally. Coxa IV 2.07 times longer than coxa II.

Chelicerae: Dorsal surface smooth, dentition of fixed and movable fingers as in typical syntropine. Subdistal margin of manus with one median macrosetae and distal manus outlined with broad carinae with vestigial rounded crenulations at the base of fixed finger. Serrula with 22–24 tines.

Pedipalps: Trichobothrial pattern Type C, orthobothriotaxic. Chelae wider than patella and patella wider than femur. Femur: All Intercarinal surface matte, dorsal and ventral intercarinal surfaces with scattered moderate granules. Dorsal retrolateral, dorsal prolateral, and ventral prolateral carinae moderately granular with conical moderate granules; retrolateral dorsosubmedian complete, with a row of scattered and moderated crenatoserrate granules, and three major macrosetae, one subdistal, one median and one distal on the top of a granule; prolateral ventrosubmedian complete and strong expressed as a row of scatter granules, with a proximal enlarged tubercle followed by a subparallel, irregular row of sharp, conical, and enlarged granules, with two macrosetae at the base of two enlarged granules; prolateral ventral vestigial, expressed by two proximal tubercles or bicuspid granule, ventral one with a macroseta on top and few minute sparse tubercles, followed by one subproximal and one distal low tubercle, each with a macroseta at top, distributed from the proximal to the mid aspect of the segment; ventral median, retrolateral ventral, and ventral retrosubmedian vestigial expressed by a row of serrated enlarged granules.

Patella: All intercarinal surfaces matte. Dorsal prolateral and ventral prolateral moderately granular, dorsal retrolateral and ventral retrosubmedian crenular; ventral median vestigial expressed as a proximal row of minute granules, expressed occasionally on proximal

third; retrolateral dorsosubmedian vestigial, expressed by few crenulations ventral to *esb*$_1$ and *est*, retrolateral median partial, expressed by a broken costa positioned medially; prolateral median on a vaulted projection, extending from a proximal tubercle with a major macroseta on top and a row of subserrate granules with median granule with a macroseta at base, ending at the level of trichobothrium d_2, followed by flat surface slanting gently towards dorsal prolateral carinae, ending at one distal major macrosetae on the top of a moderate granule positioned on the distal fifth of dorsal prolateral carinae; prolateral ventral obsolete expressed by three major macrosetae, one basal and one distal, adjacent to ventral prolateral carinae.

Chelae: Pedipalp manus incrassate (manus 1.30 times longer than fixed finger). Intercarinal surface weakly matte. Dorsal prolateral, dorsal median, dorsal retrolateral, dorsal retrosubmedian accessory, ventral prolateral, and prolateral median moderately costate with clusters of irregular moderate crenulations; dorsal prosubmedian and prolateral dorsal vestigial expressed by scattered crenulations flanking dorsal lateral carina; retrolateral median partial, expressed on median two thirds, weakly costate and crenulated; retrolateral subventral accessory and retrolateral subventral vestigial expressed by two distal short rows of fine crenulation; retrolateral ventral obsolete expressed by a proximal cluster of fine crenulations; ventral retrolateral and ventral retrosubmedian partial expressed as a broad costa with strong irregular crenulation, ending at the level of trichobothrium *Est*; ventral prosubmedian and ventral median complete expressed by a broad costa with strong irregular crenulation; ventral prolateral and prolateral median parallel. Trichobothria *Db* on dorsal retrolateral carinae, *Dt* dorsal to dorsal retrolateral carinae. Trichobothrium *Db* positioned subbasal on manus. Trichobothrium *Dt* positioned at mid manus.

Fingers: Fixed finger dentition: PD = 6, RD = 5, MD rows = 5, all denticles subserrate, retrolateral denticles comparatively smaller than prolateral denticles, basal prolateral denticle positioned on median half. Movable finger PD = 7, RD = 7, MD rows = 7, distal row with one denticle, prolateral and retrolateral denticles subpaired. Trichobothrium *ib* and *it* positioned subbasal of fixed finger, *ib* positioned at the level of PD6; *it* positioned between PD5 and PD5, closer to PD6 in ♂, in ♀ away from PD6. Trichobothria series *db–dt* and *eb–et* distributed along the entire length of fixed finger. Trichobothrium *db* basal on fixed finger and *eb* subbasal on fixed finger. Fingers with strong scalloped, proximal notch and median lobe of pedipalp fixed and movable fingers strong in both sexes. Gap created when fingers close strong, fingers fit unevenly.

Legs: Spinules: Basitarsi I–II prolateral ventral, retrolateral ventral and retrolateral dorsal carinae with complete rows of spinules, prolateral ventral in III partial, expressed by a scatter row of spinules on distal two thirds, in VI absent; retrolateral ventral in III complete, in VI absent; retrolateral dorsal in III and IV partial expressed on distal three fourths and proximally spinules becoming into spiniform fine granules; retrolateral median rows in I–IV vestigial expressed as few terminal minute spinules. Telotarsi I–IV with two or three pairs of ventrodistal spinules in I–IV. Setae: Prolateral ventral, 3:4:5:6, subdistal two in II and subdistal III in IV stout; retrolateral ventral 5:8:9:9; intersperse major and minor macrosetae; retrolateral dorsal 3:3:3:4; dorsal, 3:4:4:4; retrolateral dorsal and dorsal series arranged in two independent rows, dorsal median may be reduced into a minor macrosetae.

Tergites: Pretergites matte, posttergites shagreened with scattered moderated and minute granules. Tergite I–VI dorsal median and dorsal submedian carinae granular moderate complete expressed on distal half of postergite. Tergite VII with intercarinal surfaces moderately granular;

dorsal median carina partial expressed on proximal third, strongly costate with two pairs and two distal enlarged granules; dorsal submedian vestigial expressed as a pair of oblique proximal crenulations moderately costate; dorsal lateral and lateral supramedian strong with moderate to enlarge granules; dorsal lateral projecting and curving laterally almost reaching lateral supramedian distal margin, creating a semi ring of strong serrated granulation.

Genital operculum: Male genital operculum: wider than long, with three pairs of major macrosetae. Sclerites free on longitudinal edge moving independently but unable to open more than 45°. Genital papillae protruding posteriorly. Female genital operculum: Wider than long, with three macrosetae. Sclerites fuse longitudinal.

Sternites: Sternites III–VI with all carinae obsolete and surface finely punctuated medially and matte laterally, V in ♂ with distomedian glandular spot weak, whitish, not protruding from adjacent surfaces but moderately contrasting with paler base color, in ♀ obsolete. Sternite VII with ventral lateral carinae moderate, weakly crenulate, ventral submedian obsolete expressed by two pairs of setae; distomedian glandular spot vestigial, protruding weakly from adjacent surfaces and not difference in, in ♂, in ♀ obsolete. Intercarinal surface between ventral lateral carinae with a lustrous and smooth spot occupying completely the longitudinal surface in both sexes Spiracle elongated, slit-like, elongated approximately two times longer than wide, increasing wide in distal sternite.

Pectines: Pectines in ♂ longer than distal margin of coxa VI, in ♀ at or slightly longer than coxa IV. Basal piece with three major macrosetae. Marginal lamella consist of three sclerites, medial lamella proximally fuse distally progressively forming conspicuous 12–15 beads. Fulcra with 21 in ♂, 18–19 ♀. Pectinal tooth count 22 in ♂, 19–20♀.

Hemispermatophore: Lamina 1.78 longer than trunk. Dorsal through margin long, narrow, straight, and removed from ventral trough. Hemimating plug developed from the inner lobe, distal barb margin with 12 elongated spinules. Primary and secondary hook positioned on the apex of lateral margin extension of the lamina (flange). Both hooks rounded low, separated slightly, forming a shallow notch. Median lobe ental terminus protruding slightly towards the ental margin, rounded and with a distal projection. Basal plate of inner lobe removed from ventral trough. Spine of inner lobe relatively long and strongly sclerotized. Neck moderately short (0.70 times longer than basal plate). Measurements, lamina, 4.80; trunk, 2.70; dorsal trough/laminar hooks, 2.1; ventral trough/laminar hook, 1.50; neck, 0.54; basal plate, 0.78.

Metasoma: All intercarinal surfaces weakly matter. Dorsal surface of metasomal segments I–III with few moderate granules. Carinae: Dorsal lateral and lateral median carinae in I–IV strongly crenatoserrated terminating in elongate spiniform granule pointing backwards; except lateral median in IV distal terminus moderate expanded or flared laterally forming a rounded triangular projection; dorsal lateral in V proximal third scattered and strongly crenatoserrated, becoming finely crenulate distally with cluster of crenulations medially, ending on a elongate protuberance; lateral inframedian in I complete moderately crenatoserrate; in II partial moderately crenatoserrate, present in distal third; in III partial weakly crenular, expressed on distal fourth, in VI absent, in V partial, expressed on proximal two thirds by irregular crenatoserrate granules becoming weaker distally; ventral lateral and ventral submedian, in I–IV and ventral median in V moderately crenatoserrate. Setae: Dorsal lateral carinae, 2:2:2:3:5; lateral median; 1:1:1:2; lateral inframedian, 2:2:2:2:6; ventral lateral, 2:3:3:3:2; ventral submedian, 2:2:2:2:1; ventral sublateral, 2.

Telson: Telson 3.43 times longer than wide. Metasomal segment V 1.43 times wider than telson. Vesicle 1.88 times longer than aculeus. Dorsal surface smooth and ventral surface with scatter low granules. Ventral surface with two or three macrosetae in each carina. Ventral median carinae with subaculear tubercle moderate with a minute granule on top. Microserration on laterobasal aculeus numbering 3–5.

DISTRIBUTION: *Thorellius tekuani*, **n. sp.** is endemic to the Balsas Depression, in the states of Guerrero, México and Michoacán, Mexico.

ECOLOGY: *Thorellius tekuani*, **n. sp.** has been collected in Estado de México by turning large rocks. Although it has moderate leg armature, this species constructs burrows around the rocks, apparently to aestivate. *T. tekuani*, **n. sp.** has morphological and behavioral features common in lapidicolous species. During the rainy season, specimens are found under smaller and loose rocks. The type of vegetation in which this species has been collected is tropical deciduous forest and tropical thorn forest. The localities where the species was collected range from 10 to 1620 m altitude.

MATERIAL EXAMINED: **MEXICO: Estado de México:** *Municipio de Luvianos*: San Juan Acatitlán, 5 km E, 19°00'33"N 100°17'20"W, 925 m, 3.xi.2006, E. González, R. Paredes, and C. Durán, under rocks, 1 ♀ (IBUNAM). *Municipio de Tejupilco*: El Salitre, 3 km S, 21.vi.2002, E. González, 1 ♂ (AMNH [LP 2017]). *Municipio de Zacazonapan*: Zacazonapan, 3 km N, 19°4.1982'N 100°15.3288'W, 1360 m, 17.ii.2005, O. Francke, E. González, M. Martínez, and O. Martínez, 3 ♀ (IBUNAM). **Guerrero:** *Municipio de Cutzamala de Pinzón*: Ixtapilla, 3 km N, 18°34.4190'N 100°37.70'W, 297 m, 22.v.2006, O. Francke, A. Valdez, H. Montaño, and A. Ballesteros, 1 ♀ (AMNH [LP 6609]), forest, collected at night with UV light, 1 juv. (AMNH). *Municipio de Coahuayutla*: Matamoros, [18°27'1.61"N 101°50'12.86"W], 377 m, 13.v.2004, J.

Baldazo, 1 ♀ (IBUNAM). **Michoacán:** Los Cerritos, 19°05'19"N 102°21'03"W, 320 m, 10.viii.1994, 1 ♀ (IBUNAM), 19°04'09.1"N 102°20'31.2"W, 12.x.2006, J. Ponce, 1 ♀ (IBUNAM). *Municipio de Aquila*: La Peña, 18°30'51"N 103°14'58"W, 1500 m, 3.v.2004, 1 ♀ (IBUNAM). *Municipio de Arteaga*: Arteaga, [18°21'0.59"N 102°17'25.70"W], 840 m, 15.iv.2006, 1 ♂ (IBUNAM). *Municipio de Apatzingán*: Apatzingán de la Constitución, 19°05'19"N 102°21'03"W, 320 m, 21.iv.1947, M. Cardenas and H. Correa, 1 ♀ 1 subad. ♀, 1 juv. (IBUNAM); Apatzingán, 19°05'19"N 102°21'03"W, 320 m, 2 ♀ (IBUNAM), 366 m, 30.viii.1941, M. Hoogstroll, 1 ♂. (AMNH); E of Ciencias Agropecuarias, 19°04'59"N 102°22'18"W, 300 m, 20.i.2007, N.A. Avila and A. Aguirre, 1 ♂. (IBUNAM); El Tesorero, 19°00'03"N 102°22'31"W, 240 m, 26.viii.2002, A. Mingucha, 1 ♀ (IBUNAM). *Municipio de Carácuaro*: Hwy Carácuaro-Huetamo, marker km 125, 18°56.231'N 101°02.906'W, 724 m, 14.vii.2005, O. Francke, J. Ponce, M. Córdova, A. Jaimes, G. Francke, and V. Capovilla, 1 juv. (AMNH [LP 5322]); Las Cocinas, Hwy Nocupetaro-Carácuaro, 19°01.880'N 101°14.067'W, 672 m, 14.vii.2005, O. Francke, J. Ponce, M. Córdova, A. Jaimes, G. Francke, and V. Capovilla, 1 juv. (AMNH [LP 5331]); Nocupetaro, [19°3'N 101°9'W], 24.ix.2004, 1 ♀ (IBUNAM). *Municipio de Huetamo*: Arua, [18°34'57.12"N 100°53'1.23"W], 1 ♂ (IBUNAM). *Municipio de La Huacana*: El Chauz, [18°52'50.14"N 102°0'27.55"W], 20.ii.2008, R. Lano and Cardenas, 5 juv. (IBUNAM); El Vado, 18°48.90'N 101°54.976'W, 198 m, 21.v.2011, O. Francke, J. Ponce, A. Quijano, M. Villaseñor, and A. Ballestros, 1 ♀ (IBUNAM); La Huacana, 18°57'44"N 101°48'23"W, 480 m, 18.vi.1993, 1 ♀ (IBUNAM). *Municipio de Lázaro Cárdenas*: Lázaro Cárdenas, 17°57'22"N 102°11'32"W, 10 m, 11.xi.2002, F. Camacho, 1 ♀ (IBUNAM). *Municipio de Parácuaro*: Ejido La Batea, 19°07'54"N 102°07'49"W, 650 m, 2.viii.2002, J. Jesus Orozco, 1 ♀ (IBUNAM). *Municipio de Tepalcatepec*: El Taixtan, 1 km SW, 19°01.719'N 102°55.706'W,

980 m, 18.v.2007, 1 ♂ (AMNH [LP 7069]), 480 m, 19.v.2011, 1 ♂, 1 ♀, 1 subad. ♀ (IBUNAM), O. Francke, J. Ponce, M. Villaseñor, A. Quijano, and A. Ballesteros; Valle Verde Ranch, [19°10'21.58"N 102°51'29.00"W], 270 m, 14.v.2005, A. Valdez, 5 ♂ (IBUNAM); Valle Verde Ranch, Las Colonias, road Apatzingan-La Ruana, 14.v.2005, C. Tena, 2 ♂ (IBUNAM). *Municipio de Tzirandaro de los Chávez*: Cupuan, [18°28'31.14"N 100°58'36.86"W], 20.vi.2004, Micaela, 1 ♂ (IBUNAM). *Municipio de Uruapan*: Uruapan, 19°25'10"N 102°03'30"W, 1620 m, 1 subad. ♀ (IBUNAM).

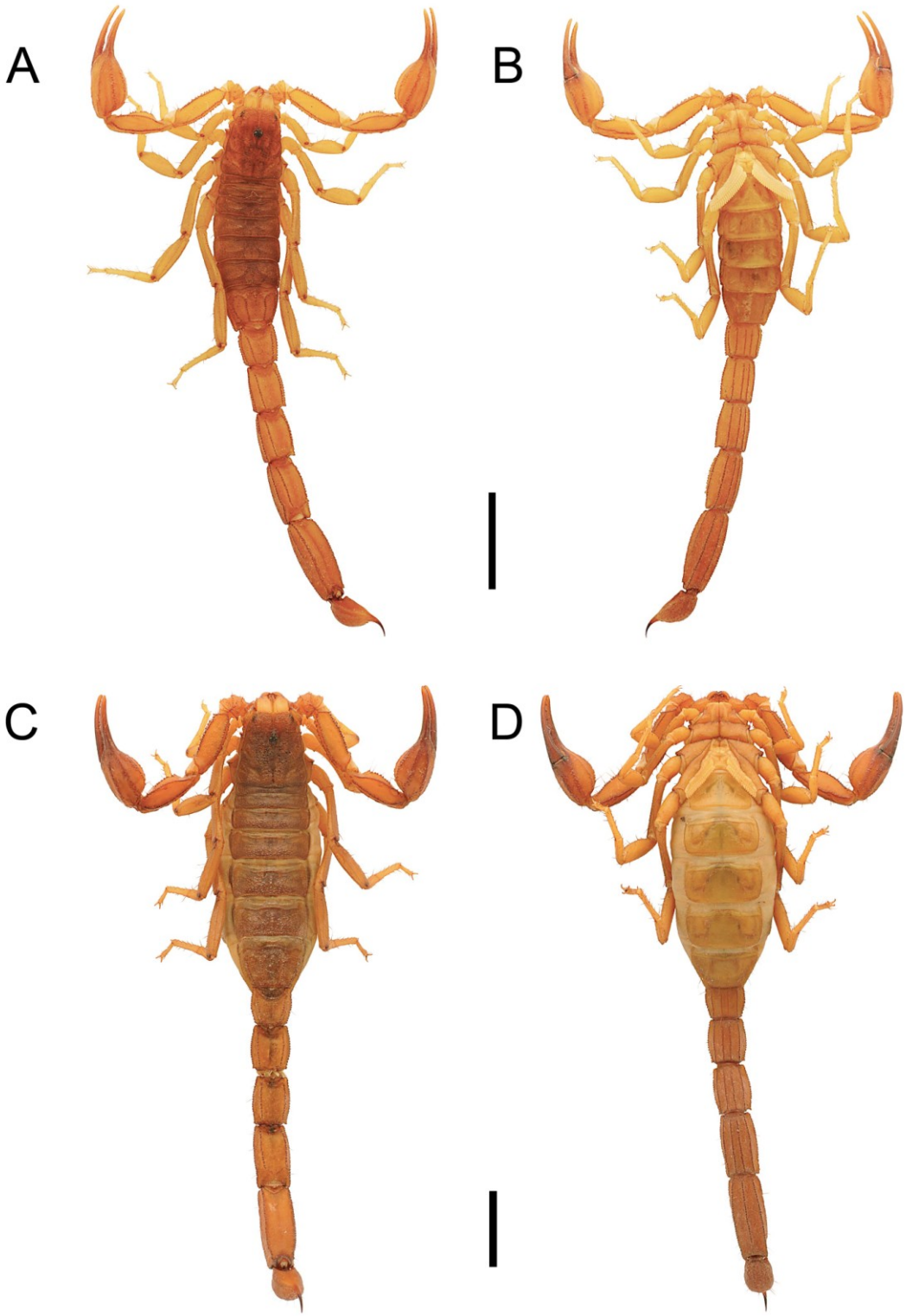


Figure 135. *Thorellius tekuani*, **n. sp.**, habitus. **A**, **B**. Holotype ♂ (IBUNAM). **C**, **D**. Paratype ♀ (IBUNAM). **A**, **C**. Dorsal aspect. **B**, **D**. Ventral aspect. Scale bars = 10 mm.

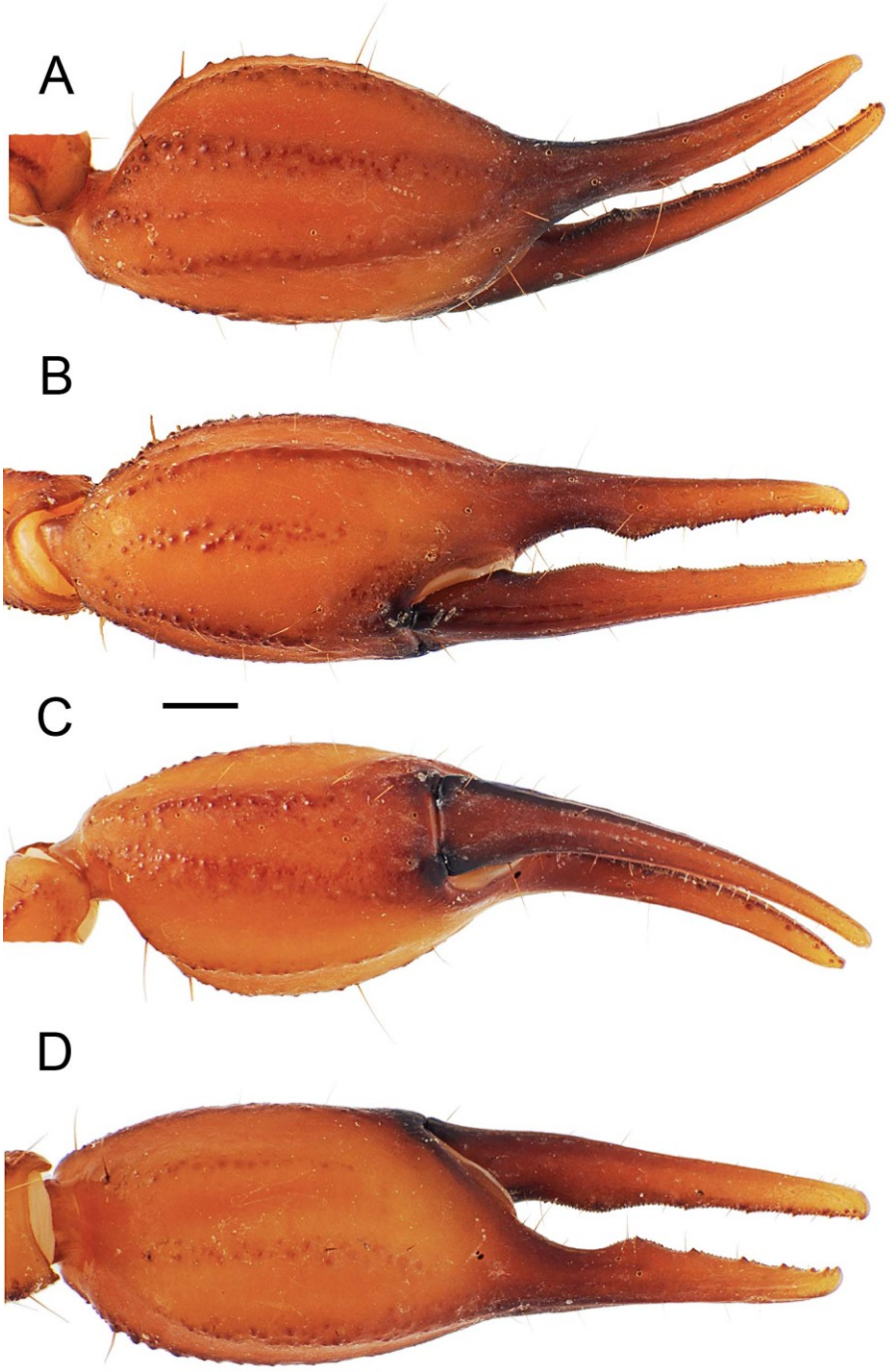


Figure 136. *Thorellius tekuani*, **n. sp.**, holotype ♂ (IBUNAM), dextral pedipalp chela. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

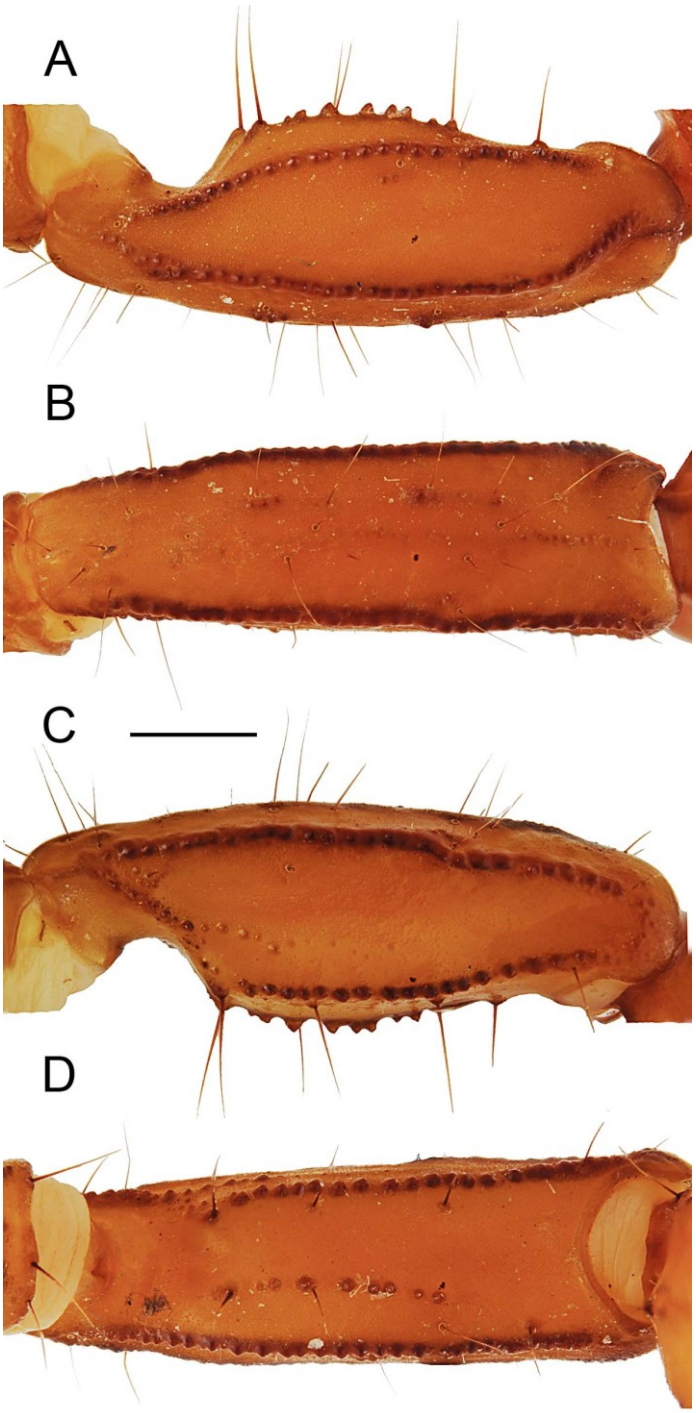


Figure 137. *Thorellius tekuani*, **n. sp.,** holotype ♂ (IBUNAM), dextral pedipalp patella. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

Thorellius wixarika, **n. sp.**

Figures 128, 138–140, 197D, 203D, 208D, 212D, 216D, 219D, 223D; Table 12

TYPE MATERIAL: **MEXICO: Nayarit:** *Municipio de Tepic*: Holotype ♂ (IBUNAM) Jesus María Corte, 4 km N, 2 km along gravel E of main paved road, ca. 30 km N of Tepic, 21°45.203'N 104°51.213'W, 126 m, 29.vii.2005, E. González and R. Mercurio. Paratypes: 2 ♀ (AMNH), **Jalisco:** *Municipio de Puerto Vallarta*: Puerto Vallarta, 8 km S, 20°20'48"N 105°22'05"W, 8.vii.1996, C.R. West.

ETYMOLOGY: The species name *wixarika* (also known as Huichol people in the Nahuatl language) is the self-denomination of the aboriginal people inhabiting the western and central Sierra Madre Occidental, including the states of Nayarit, Jalisco, Durango, and Zacatecas. The name refers to the distribution of the species in part of the territory where the Wixarika people are established.

DIAGNOSIS: *Thorellius wixarika*, **n. sp.** is closely related to *T. cristimanus*, *T. intrepidus*, *T. tekuani*, **n. sp.**, and *T. yuyuawi*, **n. sp.** with which forms a monophyletic group (see details in *T. tekuani*, **n. sp.**). *T. wixarika*, **n. sp.** may be distinguished from the other species by having the strongest granular carinae of the pedipalp chelae carinae, the other species have them crenular to smooth; the granulation is specially stronger on the ventral surface, where ventral retrolateral, ventral retrosubmedian, ventral median and ventral prosubmedian are densely granular. Furthermore, *T. wixarika*, **n. sp.** has the strongest retrolateral dorsosubmedian and retrolateral median carinae of pedipalp patella densely granular, instead of having vestigial carinae with few scatter crenulations or smooth costa. From *T. cristimanus* and *T. yuyuawi*, **n. sp.** differs by having by having relatively elongate metasomal segments I–IV, instead of having robust

metasomal segments slightly more wider and shorter. From *T. intrepidus* and *T. tekuani*, **n. sp.** differs by having dark brownish base color, instead of having pale yellowish to reddish.

DESCRIPTION: The following description is based on the paratypes and the specimens listed in material examined.

Color and infuscation (in alcohol): Base color orange to dark brownish. Chelicerae yellowish-orange with teeth amber. Legs and pedipalps orange brownish. Carinae of pedipalp femur patella and metasomal segments dark brownish contrasting with paler base color. Carapace, tergites, legs, with dusky markings. Coxal region slightly darker than carapace and tergites. Sternum with distal surface brown, proximal lobes orange-yellowish. Pectines and genital operculum pale whitish. Telson reddish-brown. Aculeus reddish to brownish.

Carapace: Carapace anterior margin emarginated with a moderated median notch and five pairs of intersperse major and minor macrosetae. Surface shagreened, scattered moderated rounded and dense minute granules. Anteromedian, posteromedian, and posterolateral sulci deep and narrow, posterior transverse moderate to weak. Median ocular tubercle moderately raised, superciliary carina smooth to weakly crenular on distal aspect, higher than median eyes. Median eyes relatively small approximately double size of anterior lateral pair. Three lateral eyes, first distal pair slightly larger than second pair and posterior reduced approximately in half size of first distal pair.

Sternum and coxal region: Sternum pentagonal subequilateral, longer than wide, with three four pairs of macrosetae, one distal, two median pair and one pair on the lobes, median notch deep. Coxal surface matte with spots of smooth surface. Anterior margin of coxa II with three oblique slit-like structures, adjacent to a moderate protuberance with fine granules. Base of

coxal endite II with a deep depression each, median margin with scatter fine granulation on proximal half, becoming smooth distally. Coxa IV 2.17 times longer than coxa II.

Chelicerae: Dorsal surface smooth, with subdistal margin weakly crenulate, dentition of fixed and movable fingers as in typical syntropine. Subdistal margin of manus with three median macrosetae and distal manus outlined with broad carinae and with vestigial rounded crenulations at the base of fixed finger. Serrula with 21–22 tines.

Pedipalps: Trichobothrial pattern Type C, orthobothriotaxic. Chelae wider than patella and patella wider than femur. Femur: All Intercarinal surface matte, ventral and prolateral intercarinal surfaces with scattered moderate granules. Dorsal retrolateral and dorsal prolateral, carinae moderately and irregularly granular with rounded moderate granules; ventral prolateral moderately granular moniliform; retrolateral dorsosubmedian complete, with a row moderated continuous crenatoserrate granules, and three major macrosetae, one subdistal, one median and one distal on the top of a granule; prolateral ventrosubmedian partial expressed as a row of scatter irregular granules, with a proximal enlarged tubercle followed by a subparallel, irregular row of sharp, conical, and enlarged granules, with two macrosetae at the base of two enlarged granules; prolateral ventral vestigial, expressed by two proximal tubercles or bicuspid granule, ventral one with a macroseta on top and few minute sparse enlarge granules, followed by one subproximal and one distal moderate tubercles, each with a macroseta at base, distributed from the proximal to the mid aspect of the segment; ventral median, retrolateral ventral, and ventral retrosubmedian vestigial expressed by a row of serrated enlarged granules.

Patella: All intercarinal surfaces matte. Dorsal prolateral and ventral prolateral moderately granular, dorsal retrolateral and ventral retrosubmedian crenular; ventral median vestigial expressed as a proximal row of minute granules, occasionally extending to proximal

half by a row of sparse granules; retrolateral dorsosubmedian partial, expressed by a row of crenulations on median third; retrolateral median complete, expressed by a row or irregular crenatoserrations slanting gently from a ventral to a median position on the retrolateral surface; prolateral median on a vaulted projection, extending from a proximal tubercle with a major macroseta on top and a row of subserrate granules with median granule with a macroseta at base, ending at the level of trichobothrium d_2, followed by flat surface slanting gently towards dorsal prolateral carinae, ending at one distal major macrosetae on the top of a moderate granule positioned on the distal fifth of dorsal prolateral carinae; prolateral ventral obsolete expressed by three major macrosetae, one basal and one distal, adjacent to ventral prolateral carinae.

Chelae: Pedipalp manus relatively slender (manus 1.11 times longer than fixed finger). Intercarinal surfaces weakly matte. Dorsal prolateral, dorsal median, dorsal retrolateral, dorsal retrosubmedian accessory, ventral prolateral, and prolateral median moderately costate with clusters of irregular moderate crenulations; dorsal prosubmedian and prolateral dorsal vestigial expressed by scattered crenulations flanking dorsal lateral carina; retrolateral median partial, expressed on proximal two thirds, weakly costate and crenulated; retrolateral subventral vestigial expressed by a distal short rows of crenulation; retrolateral subventral accessory partial expressed by a distal rows of fine granules extending to mid segment; retrolateral ventral obsolete expressed by a proximal cluster of fine crenulations; ventral retrolateral partial, expressed by irregular strong granules, ending at the level of trichobothrium *Est*; ventral retrosubmedian partial expressed as a broken irregular row of crenulation aside ventral retrosubmedian; ventral prosubmedian and ventral median complete expressed by a broad field of irregular crenulation; ventral prolateral and prolateral median parallel. Trichobothria *Db* on

dorsal retrolateral carinae, *Dt* dorsal to dorsal retrolateral carinae. Trichobothrium *Db* positioned subbasal on manus. Trichobothrium *Dt* positioned at mid manus.

Fingers: Fixed finger dentition: PD = 6, RD = 5, MD rows = 5, all denticles subserrate, retrolateral denticles comparatively smaller than prolateral denticles, basal prolateral denticle positioned on median half. Movable finger PD = 7, RD = 6, MD rows = 6, distal row with one denticle, prolateral and retrolateral denticles subpaired. Basal prolateral denticle positioned on median half. Trichobothrium *ib* and *it* positioned subbasal of fixed finger, *ib* positioned at the level of PD6; *it* positioned between PD5 and PD5, closer to PD6 in ♂, in ♀ away from PD6. Fingers with moderate to strong scalloped, proximal notch and median lobe of pedipalp fixed and movable fingers moderate to strong in both sexes, slightly moderate in ♀. Gap created when fingers close moderate, fingers fit unevenly.

Legs: Spinules: Basitarsi I–II prolateral ventral, retrolateral ventral and retrolateral dorsal carinae with complete rows of spinules, prolateral ventral in III partial, expressed by a scatter row of spinules on distal two thirds, in VI absent; retrolateral ventral in III complete, in VI absent; retrolateral dorsal in III and IV partial expressed on distal three fourths and proximally spinules becoming into spiniform fine granules; retrolateral median rows in I–IV vestigial expressed as few terminal minute spinules. Telotarsi I–IV with two or three pairs of ventrodistal spinules in I–IV. Setae: Prolateral ventral, 3:5:5:6, subdistal two in II and subdistal III in IV stout; retrolateral ventral, 4:8:9:9, intersperse major and minor macrosetae; retrolateral dorsal, 3:3:3:4; dorsal, 4:4:4:4; retrolateral dorsal and dorsal series arranged in two independent rows.

Tergites: Pretergites matte, posttergites shagreened with scattered moderated and minute granules. Tergite I–VI dorsal median and dorsal submedian carinae granular moderate complete expressed on distal half of postergite. Tergite VII with intercarinal surfaces moderately granular;

dorsal median carina partial expressed on proximal third, strongly costate with two pairs and two distal enlarged granules; dorsal submedian vestigial expressed as a pair of oblique proximal crenulations moderately costate; dorsal lateral and lateral supramedian strong with moderate to enlarge granules; dorsal lateral projecting and curving laterally almost reaching lateral supramedian distal margin, creating a semi ring of strong serrated granulation.

Genital operculum: Male genital operculum: wider than long, with three pairs of major macrosetae. Sclerites free on longitudinal edge moving independently but unable to open more than 45°. Genital papillae protruding posteriorly. Female genital operculum: Wider than long, with three macrosetae. Sclerites fuse longitudinal.

Sternites: Sternites III–VI with all carinae obsolete and surface matte, IV with distomedian glandular spot vestigial, whitish, not protruding from adjacent surfaces but visibly contrasting with darker base color and V in moderate, whitish, not protruding from adjacent surfaces, visibly contrasting with darker base color and longer and wider than in IV in ♂, in ♀ obsolete. Sternite VII with ventral lateral carinae moderate, crenulate; ventral submedian obsolete expressed by two pairs of setae; distomedian glandular spot vestigial, protruding weakly from adjacent surfaces and not difference in color in ♂, in ♀ obsolete. Intercarinal surface between ventral lateral carinae with a lustrous and smooth spot occupying completely the longitudinal surface in both sexes. Spiracle elongated, slit-like, elongated approximately two to four times longer than wide, increasing wide in distal sternites.

Pectines: Pectines in ♂ longer than distal margin of coxa VI, in ♀ at or slightly longer than coxa IV. Basal piece with three major macrosetae. Marginal lamella consist of three sclerites, medial lamella proximally fuse distally progressively forming conspicuous 14 beads. Fulcra with 19–22 in ♂, 19–20 ♀. Pectinal tooth count 20–23 in ♂, 20–21♀.

Hemispermatophore: Lamina 1.6 longer than trunk. Distal margin of the lamina expanded and curved, tapering to the end forming a conical cap. Dorsal through margin long, narrow, curving proximally, and removed from ventral trough. Hemimating plug developed from the inner lobe, distal barb margin with 18 elongated spinules. Primary and secondary hook positioned on the apex of lateral margin extension of the lamina (flange). Distal margin of lateral margin extension of the lamina broad, and comparatively more sclerotized than the rest of the hemispermatophore. Both hooks rounded low, separated slightly, forming a shallow notch. Median lobe ental terminus protruding towards ental margin strongly with two distal rims forming a funnel. Basal plate of inner lobe removed from ventral trough. Spine of inner lobe relatively long and strongly sclerotized, secondary spine on ventromedian aspect of neck weaker. Neck moderate (0.66 times longer than basal plate). Measurements, lamina, 4.80; trunk, 3.00; dorsal trough/laminar hooks, 1.98; ventral trough/laminar hook, 1.26; neck, 0.48; basal plate, 0.72.

Metasoma: All intercarinal surfaces smooth. Carinae: Dorsal lateral and lateral median carinae in I–IV strongly crenatoserrated terminating in elongate spiniform granule pointing backwards; except lateral median in IV distal terminus moderate expanded or flared laterally forming a rounded triangular projection; dorsal lateral in V proximal third scattered and strongly crenatoserrated, becoming finely granular distally with cluster of crenulations medially, ending on a moderate tubercle; lateral inframedian in I complete moderately crenatoserrate; in II partial moderately crenatoserrate, present in distal third; in III partial weakly crenular, expressed on distal fourth, in VI absent, in V partial, expressed on proximal two thirds by irregular crenatoserrate granules becoming weaker distally; ventral lateral in I and III proximal two thirds smooth and distal third weakly crenulate, in III weakly and finely crenulate; in V ventral

submedian in I smooth costate; in II and III proximal two thirds smooth and distal third weakly crenular; in IV finely crenulate; ventral lateral and ventral median in V moderately crenatoserrate. Setae: Dorsal lateral carinae, 1:2:3:3:6; lateral median, 1:3:3:3; lateral inframedian, 1:3:3:2:4, ventral lateral, 3:4:4:4:13, macrosetae on both sides of the carinae; ventral submedian, 3:3:3:4:4; ventral sublateral, 2.

Telson: Telson vesicle 2.59 times longer than wide. Metasomal segment V 1.15 times wider than telson. Vesicle 2.8 times longer than aculeus. Dorsal surface smooth and ventral surface with scatter moderate granules, proximal margin with strong granulation. Ventral surface with three or four macrosetae in each carina. Ventral median carinae with subaculear tubercle moderate with a three or four minute granule on top. Microserration on laterobasal aculeus numbering 3–5.

DISTRIBUTION: *Thorellius wixarika*, **n. sp.** is distributed in the lowlands facing the Pacific coast of the contact zone between the Transver Mexican Volcanic Belt (TMVB) and the Sierra Madre Occidental, in the states of Jalisco and Nayarit, Mexico

ECOLOGY: *Thorellius wixarika*, **n. sp.** typically inhabits tropical deciduous forest with altitudes ranging from 126 to 977 m. Like the other *Thorellius*, this species is lapidicolous, as it has been commonly collected under rocks.

MATERIAL EXAMINED: **MEXICO: Jalisco:** *Municipio de Puerto Vallarta*: Las Palmas, 8 km E, [20°49'58.48"N 105°2'55.04"W], 14.ix, F. Cupul, tropical dry forest, 1 ♂ (IBUNAM); Puerto Vallarta, near La Palapa, 20°41.1738'N 105°10.54'W, 173 m, 18.ii.2004, F. Cupul, 1 ♀ (IBUNAM); Puerto Vallarta, road to Veladero, [20°36'47.67"N 105°13'34.77"W], 8.ii.2004, F. Cupul, under rocks, 1 subad. ♀ (IBUNAM); road to La Palapa town, [20°55'N 105°5'W], 16.ix, F. Cupul, tropical dry forest, 2 juv. (IBUNAM). *Municipio de Zapopan*: La Primavera Forest,

[20°43'N 103°33'W], 21.viii.2004, J. Mendoza, 1 ♀ (IBUNAM). **Nayarit:** Sierra de San Juan, km 22, El Izato-El Cora, [20°54.80400'N 105°24.282'W], 12.vi.1993, A. Cadena, 2 ♂ (IBUNAM). *Municipio de Compostela*: Compostela, 21°12'51"N 104°56'19"W, 1.vii.2008, R.C. West, 2 juv. (AMNH), 1.iv.1933, 1 juv. (AMNH); Compostela, 3.2 km N, 11.viii.1958, 1 ♀ (AMNH), 21°12'59.78"N 104°56'19.09"W, 977 m, 1.vii.2008, R.C. West, 2 juv. (AMNH [LP 8678]). *Municipio de El Nayar*: La Mesa del Nayar, [22°12'51.19"N 104°38'58.13"W], 16–21.vii.1955, E. Malkin, 1 ♀ (AMNH); Río Santiago, Las Adjuntas, 21°57'41"N 104°31'29"W, 245 m, 6.vi.1995, 1 ♂ (IBUNAM). *Municipio de Ixtlán del Río*: Ixtlán del Río, [21°1.800'N 104°22.2'W], 22.ix.1953, B. Malkin, 1 ♀ (AMNH). *Municipio de Jalisco*: Jalisco, [21°27'N 104°54'W], 1956, Keef, 1 ♀ (AMNH). *Municipio de Nayarit*: Nayarit, [21°44.633'N 105°13.7'W], 5.vi.1935, Maas, 5 juv. (AMNH). *Municipio de San Blas*: Jose María Mercado, El Infiernillo, [22°34'33.74"N 105°16'39.23"W], 320 m, J. Ponce, 1 ♀ (IBUNAM); Mecatán, [21°32.13600'N 105°7.174833'W], 244 m, 23.v.1949, G.M. Bradt, 1 ♂ (AMNH); San Blas, [21°20.4'N 105°7.2'W], 6.viii.1964, C. and M. Goodnight, 1 ♀ (AMNH); San Blas, 8 km NE, 21°20.4'N 105°7.2'W, 14.v.1963, W.J. Gertsch and W. Ivie, 1 ♀ (AMNH). *Municipio de Santa María del Oro*: La Laguna, [21°21'N 104°34'W], 21.viii.2006, P. Berea, 2 juv. (IBUNAM). *Municipio de Tepic*: El Colorado de La Mora, 21°42'39"N 104°38'51"W, 280 m, 29.xi.1995, E. Barrera, 1 subad. ♂, 1 subad. ♀ (IBUNAM), 26.viii.1995, W. López-Forment, 1 ♂ (IBUNAM); Jesus María Corte, 4 km N, 2 km along gravel E of main paved road, ca. 30 km N of Tepic, 21°45.2028'N 104°51.21'W, 126 m, 29.vii.2005, E. González and R. Mercurio, tropical deciduous forest, collected at night with UV light, 2 subad. ♂ (AMNH [LP 4721]); Jesus María, [20°40.00017'N 104°16.002'W], 22–30.vi.1955, B. Malkin, 1 subad. ♀ (AMNH); Las Adjuntas, 21°57'41"N 104°31'29"W, 245 m, 22.xi.1995, E. Barrera, 1 subad. ♂ (IBUNAM); Loma del

Toro, [21°0'N 104°16'W], 22.ix.1967, A. Villalobos, 1 ♀ (IBUNAM); Tepic, 14.5 km S, [21°30.500'N 104°53.5833'W], 28.vii.1964, W.J. Gertsch and J. Woods, 1 ♀ (AMNH); Tepic, 24 km N, 25.vii.1954, W.J. Gertsch, (AMNH); Tepic, 44 km S, 27.vii.1964, W.J. Gertsch and J. Woods, 1 ♂ (AMNH).

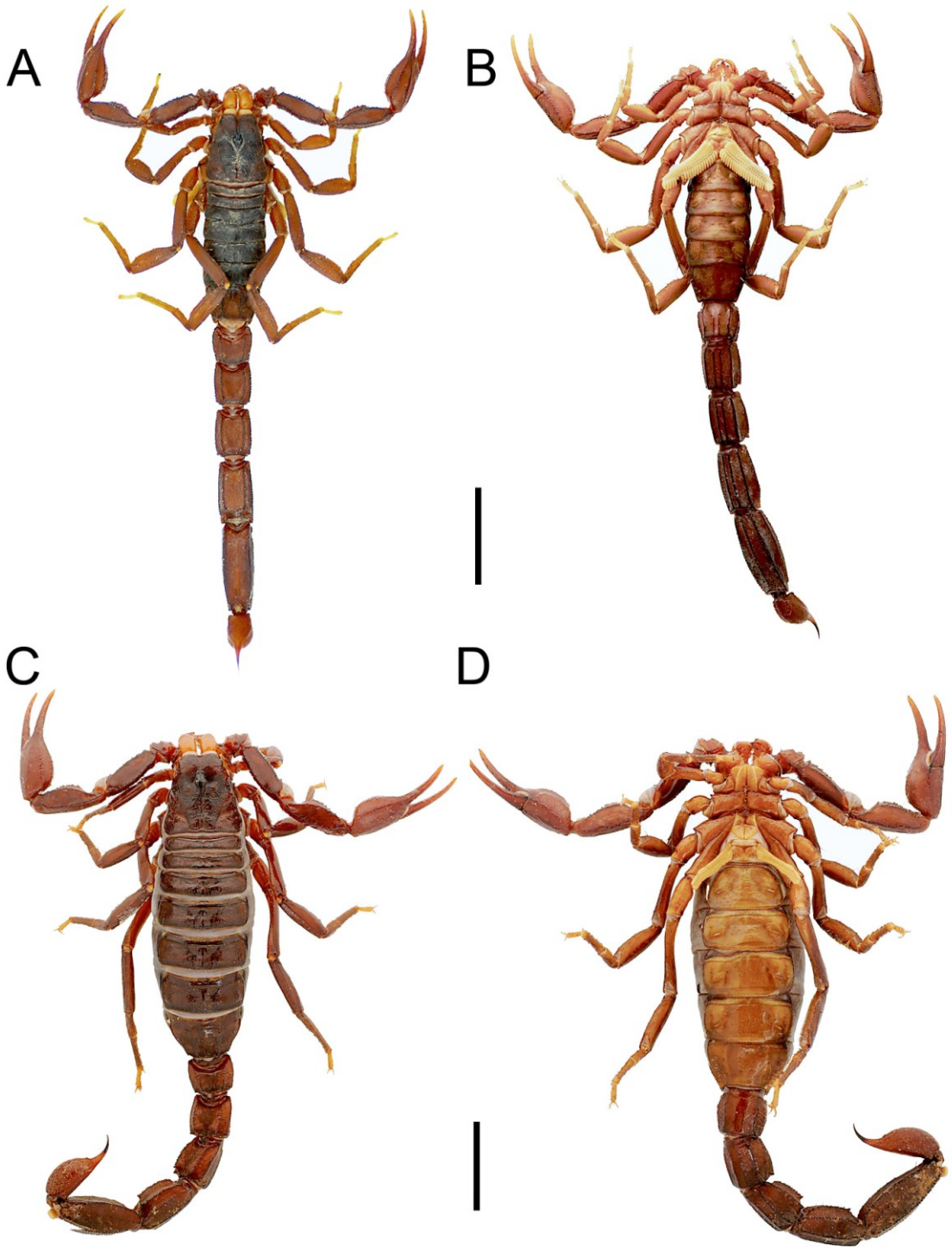


Figure 138. *Thorellius wixarika*, **n. sp.**, habitus. **A**, **B**. Type ♂ (IBUNAM). **C**, **D**. Paratype ♀ (IBUNAM). **A**, **C**. Dorsal aspect. **B**, **D**. Ventral aspect. Scale bars = 10 mm.

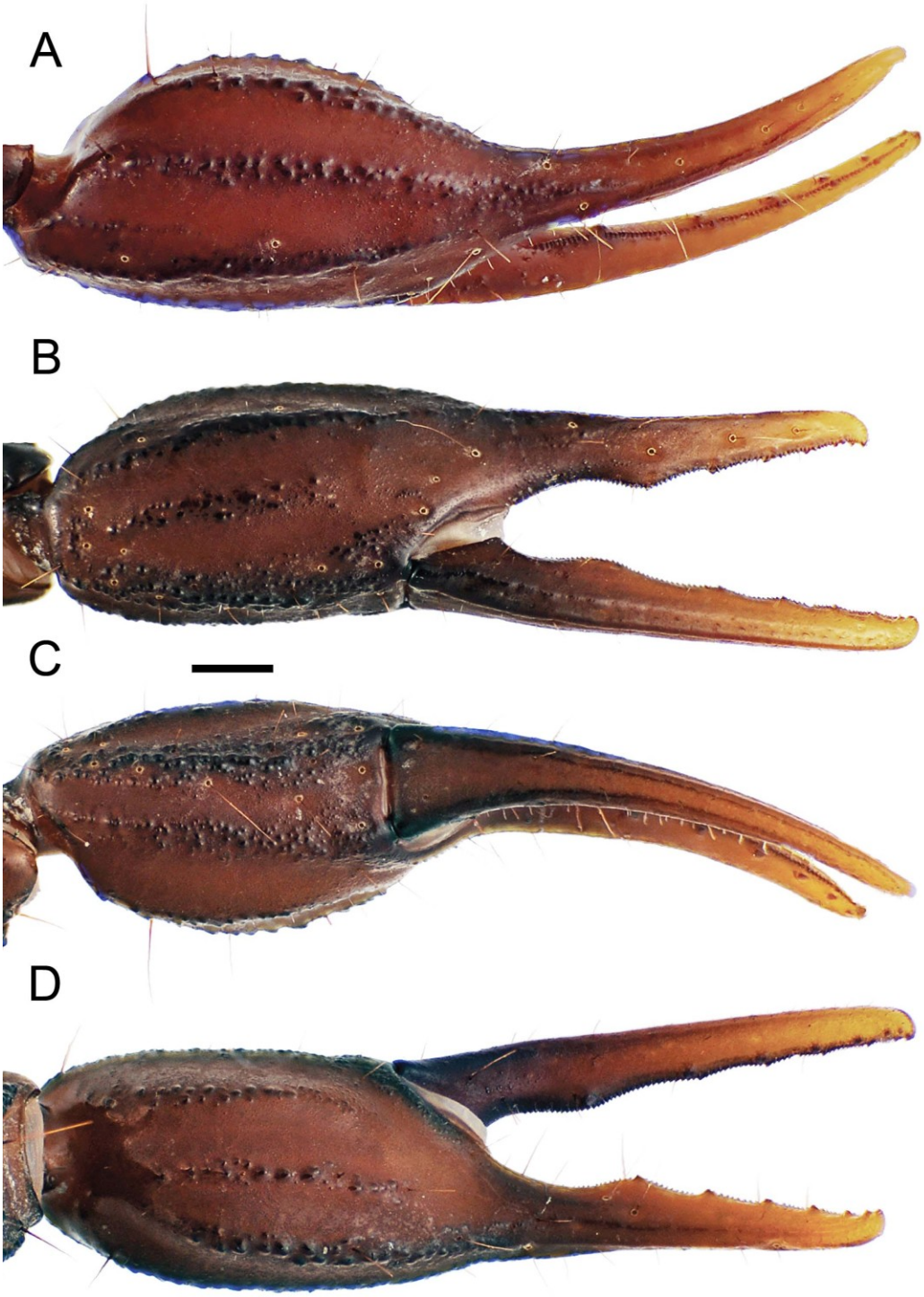


Figure 139. *Thorellius wixarika*, **n. sp.**, type ♂ (IBUNAM), dextral pedipalp chela. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

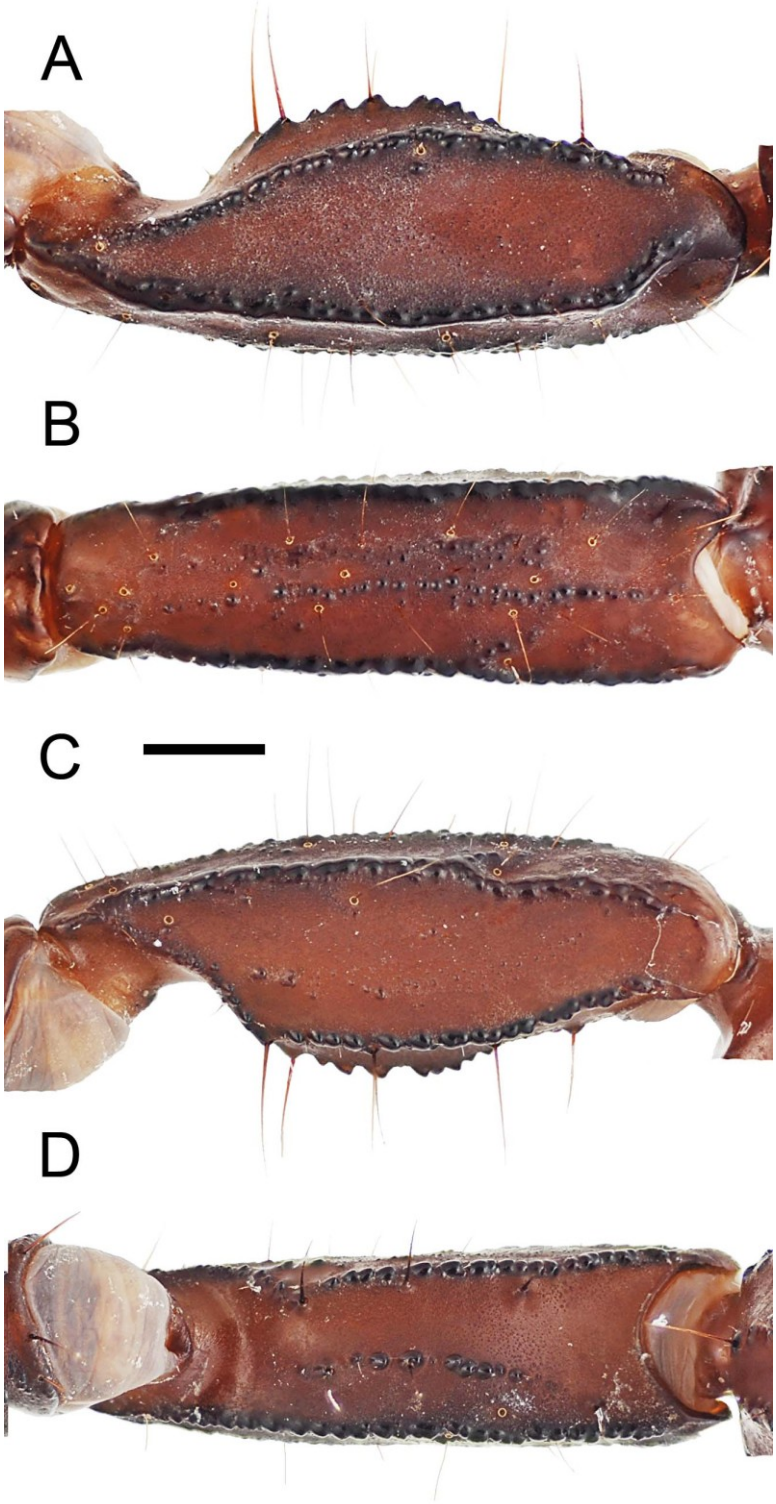


Figure 140. *Thorellius wixarika*, **n. sp.**, type ♂ (IBUNAM), dextral pedipalp patella. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

Thorellius yuyuawi, **n. sp.**

Figures 127, 141–143, 198A, 204A, 208E, 212E, 216E, 219E, 224A; Table 12

TYPE MATERIAL: **MEXICO: Jalisco:** *Municipio de Mezquitic*: Holotype ♂ (IBUNAM), Mezquitic, 4 km N, 22°24.732'N 103°43.222'W, 1388 m, 6.vii.2005, O. Francke, J. Ponce, M. Córdova, A. Jaimes, G. Francke, and V. Capovilla. Paratypes: 4 ♂, 1 ♀, 3 juv. (AMNH [ARA1172]), 1 subad. ♂, 2 subad. ♀ (AMNH [ARA1849]), 3 ♂, 1 ♀, 3 juv. (IBUNAM [ARA2009]), same locality as holotype.

ETYMOLOGY: The species name *yuyuawi* is the name for grains of black maize in the language of the Wixarika people. The name refers to the smoothness and dark color of the surface of this species, especially the chelae, and its resemblance to that of black maize.

DIAGNOSIS: *Thorellius yuyuawi*, **n. sp.** is closely related to *T. cristimanus*, *T. intrepidus*, *T. tekuani*, **n. sp.**, and *T. wixarika*, **n. sp.** with which forms a monophyletic group (see details in *T. tekuani*, **n. sp.**). *T. yuyuawi*, **n. sp.** is distinguished from the other species by having pedipalp chela carinae and ventral submedian carinae of metasomal segments III and IV weakly to moderately costate and smooth, instead of having them crenular to granular. *T. yuyuawi*, **n. sp.** further distinguishes from the other species by having dorsal lateral and ventral lateral carinae of metasomal segment V hirsute with 14 and 23 macrosetae correspondently, in *T. cristimanus* 7 and 7, in *T. intrepidus* 3 and 4, *T. tekuani*, **n. sp.** 5 and 3, and in *T. wixarika*, **n. sp.** 6 and 13. *T. yuyuawi*, **n. sp.** is also the only species with relatively smooth interocular surface, instead of having a shagreened surface. *T. yuyuawi*, **n. sp.** has pedipalp fingers scalloping weak to moderate, instead of having them moderate to strong. From *T. intrepidus*, *T. tekuani*, **n. sp.**, and *T. wixarika*, **n. sp.** differs by having metasomal segments I–IV robust, slightly wider, and

shorter, instead of having them slightly elongate. From *T. intrepidus* and *T. tekuani*, **n. sp.** differs by having dark brownish to blackish base color, instead of having it pale yellow to reddish.

DESCRIPTION: The following description is based on the paratypes and the specimens listed in material examined.

Color and infuscation (in alcohol): Base color orange to dark brownish. Chelicerae yellowish-orange with teeth amber, distal margin and movable finger diffusely infuscate. Legs orange brownish. Carinae of pedipalp femur, patella, chelae, and metasomal segments dark brownish contrasting with slightly less intense base color. Carapace, tergites, legs, distal dorsal, lateral and ventral surface of metasomal segments, dorsal and retrolateral surfaces of pedipalp femur and patella with dusky markings. Coxal region and sternum slightly darker than carapace and tergites. Proximal and lateral margin of tergites weakly infuscate. Pectines whitish to yellowish. Genital operculum pale whitish to moderately orange. Telson reddish-brown, ventral surface of telson infuscate with three longitudinal lateral bands of infuscation, two broad lateral bands and one submedian broad diffuse bands, dorsal surface completely infuscate. Aculeus reddish to brownish.

Carapace: Carapace anterior margin emarginated with a moderated median notch and five pairs of intersperse major and minor macrosetae. Anteromedian surface finely to matte to smooth, the rest of the surface shagreened, dense moderated rounded and dense minute granules, posteromedian surface and posterior lobes with enlarged conical granules. Anteromedian and posterolateral sulci moderate, posteromedian deep and narrow, posterior transverse weak. Median ocular tubercle moderately raised, superciliary carina moderately, smooth, crenular on distal aspect, higher than median eyes. Median eyes approximately double size of first anterior

pair. Three lateral eyes, first distal pair slightly larger than second pair and posterior reduced approximately in half size of first distal pair.

Sternum and coxal region: Sternum pentagonal subequilateral, longer than wide, with three four pairs of macrosetae, one distal, two median pair and one pair on the lobes, median notch deep. Coxal surface matte with spots of smooth surface. Anterior margin of coxa II with three oblique slit-like structures, adjacent to a strong protuberance with fine granules. Base of coxal endite II with a deep depression each, median margin with scatter fine granulation on proximal half, becoming smooth distally. Coxa IV 2.09 times longer than coxa II.

Chelicerae: Dorsal surface smooth, dentition of fixed and movable fingers as in typical syntropine. Subdistal margin of manus with three median macrosetae and distal manus outlined with broad carinae striate at the base of fixed finger. Serrula with 21–23 tines.

Pedipalps: Trichobothrial pattern Type C, orthobothriotaxic. Chelae wider than patella and patella wider than femur. Femur: All Intercarinal surface matte. Dorsal retrolateral, dorsal prolateral, and ventral prolateral, carinae moderately and irregularly granular with rounded to conical moderate granules; retrolateral dorsosubmedian complete, with a row moderated continuous crenatoserrate granules, and four major macrosetae on the top of a granule, distributed on distal two thirds reducing in size distally; prolateral ventrosubmedian partially expressed by a proximal enlarged bicuspid tubercle followed by a subparallel row of five or six pairs of conical enlarged and irregular granules with three macrosetae at the base of each enlarged granules; prolateral ventral vestigial, expressed by two proximal tubercles or bicuspid granule, ventral one with a macroseta on top and three enlarge granules with a macroseta at top, distributed from the proximal to the median aspect of the segment; ventral median, vestigial expressed by a strong proximal row of enlarged rounded granules, retrolateral ventral vestigial

expressed by a fine row of proximal granules, and ventral retrosubmedian vestigial expressed by few proximal of subserrate enlarged granules.

Patella: All intercarinal surfaces matte, except retrolateral surface smooth. Dorsal retrolateral and ventral prolateral strongly crenular; ventral retrosubmedian and dorsal retrolateral weakly crenular but strongly costate; ventral median vestigial expressed as a proximal row of fine granules; retrolateral dorsosubmedian and retrolateral median vestigial expressed by a pair of smooth narrow costas; prolateral median on a vaulted projection, extending from a proximal moderate tubercle with a major macroseta on top and a row of subserrate granules with three macrosetae at base, ending at the level of trichobothrium d_2, followed by flat surface slanting gently towards dorsal prolateral carinae, ending on at one distal major macrosetae on the top of a moderate granule positioned on the distal fifth of dorsal prolateral carinae; prolateral ventral obsolete expressed by three major macrosetae, one basal and one distal, adjacent to ventral prolateral carinae.

Chelae: Pedipalp manus relatively incrassate (manus 1.17 times longer than fixed finger). Intercarinal surfaces matte. Dorsal prolateral, dorsal median, dorsal retrolateral, ventral prolateral, prolateral median, and ventral retrosubmedian vestigial weakly to moderately costate; dorsal retrosubmedian accessory vestigial, weakly costate; retrolateral median obsolete; ventral retrolateral partial, expressed by a moderate costa ending at the level of trichobothrium *Est*. Trichobothria *Dt* and *Db* dorsal to dorsal retrolateral carinae. Trichobothrium *Db* positioned subbasal on manus. Trichobothrium *Dt* positioned at mid manus.

Fingers: Fixed finger dentition: PD = 6, RD = 5, MD rows = 5, all denticles subserrate, retrolateral denticles comparatively smaller than prolateral denticles, basal prolateral denticle positioned on median half. Movable finger PD = 7, RD = 6, MD rows = 6, distal row with one

denticle, prolateral and retrolateral denticles subpaired. Basal prolateral denticle positioned on median half. Trichobothrium *ib* and *it* positioned subbasal of fixed finger, *ib* positioned between PD6 and PD7, PD7 lacking granule; *it* positioned at the level of PD6. Fingers with weak to moderate scallop, proximal notch and median lobe of pedipalp fixed and weak fingers weak in both sexes. Gap created when fingers close moderate in ♂, in ♀ weak, fingers fit unevenly.

Legs: Spinules: Basitarsi I–II prolateral ventral, retrolateral ventral and retrolateral dorsal carinae with complete rows of spinules, prolateral ventral in III partial, expressed by a scatter row of spinules on distal third, in VI absent; retrolateral ventral in III complete, in VI absent; retrolateral dorsal in III complete, in IV partial expressed on distal two thirds and proximally spinules becoming into spiniform fine granules; retrolateral median rows in I–IV vestigial expressed as few terminal minute spinules. Telotarsi I–IV with two or three pairs of ventrodistal spinules in I–IV. Setae: Prolateral ventral, 2:5:5:6, subdistal two in II and subdistal III in IV stout; retrolateral ventral, 4:8:9:9, intersperse major and minor macrosetae; retrolateral dorsal, 2:3:4:4; dorsal, 4:4:4:4; retrolateral dorsal and dorsal series arranged in two independent rows.

Tergites: Pretergites matte, posttergites shagreened with scattered moderated and minute granules. Tergite I–VI dorsal median and dorsal submedian carinae granular moderate complete expressed on distal half of postergite. Tergite VII with intercarinal surfaces moderately granular; dorsal median carina partial expressed on proximal third, strongly costate with few moderate granules; dorsal submedian vestigial expressed as a pair of oblique proximal crenulations weakly costate; dorsal lateral and lateral supramedian strong with enlarge conical granules; dorsal lateral projecting and curving laterally almost reaching lateral supramedian distal margin, creating a semi ring of strong serrated granulation.

Genital operculum: Male genital operculum: wider than long, with six pairs of major macrosetae. Sclerites free on longitudinal edge moving independently but unable to open more than 45°. Genital papillae protruding posteriorly. Female genital operculum: Wider than long, with three macrosetae. Sclerites fuse longitudinal.

Sternites: Sternites III–VI with all carinae obsolete and surface matte and matte, III with a proximal median whitish to colorless projection outlined by pairs of macrosetae, forming a triangular surface, protruding weakly from adjacent surfaces but visibly contrasting with darker base color and V with distomedian glandular spot moderate, whitish, protruding weakly from adjacent surfaces, visibly contrasting with darker base color in ♂, in ♀ obsolete. Sternite VII with ventral lateral carinae weakly crenulate in ♂, in ♀ obsolete; ventral submedian obsolete expressed by two pairs of setae; distomedian glandular spot obsolete, protruding weakly from adjacent surfaces and not difference in color in ♂, in ♀ obsolete. Spiracle elongated, slit-like, elongated approximately two to four times longer than wide, increasing width in distal sternites.

Pectines: Pectines in ♂ longer than distal margin of coxa VI, in ♀ at or slightly longer than coxa IV. Basal piece with three major macrosetae. Marginal lamella consist of three sclerites, medial lamella proximally fuse distally progressively forming conspicuous 14 beads. Fulcra with 19–21 in ♂, 17–19 ♀. Pectinal tooth count 20–22 in ♂, 18–20♀.

Hemispermatophore: Lamina 1.75 longer than trunk. Dorsal through margin long, narrow, curving proximally, and removed from ventral trough. Hemimating plug developed from the inner lobe, distal barb margin with 18 short spinules. Primary and secondary hook positioned on the apex of lateral margin extension of the lamina (flange). Both hooks rounded low, separated slightly, forming a shallow notch. Primary hook slightly rotated to the ventral aspect. Median lobe ental terminus protruding towards ental margin strongly with two distal rims

forming a funnel. Basal plate of inner lobe removed from ventral trough. Spine of inner lobe relatively short and moderately sclerotized, secondary spine on ventromedian aspect of neck shorter and weaker. Neck moderate (0.75 times longer than basal plate). Measurements, lamina, 4.20; trunk, 2.40; dorsal trough/laminar hooks, 2.10; ventral trough/laminar hook, 1,80; neck, 0.54; basal plate, 0.72.

Metasoma: All intercarinal surfaces smooth. Carinae: Dorsal lateral and lateral median carinae in I–IV strongly crenatoserrated terminating in elongate spiniform granule pointing upwards; except lateral median in IV distal terminus moderate expanded or flared laterally forming a rounded triangular projection; dorsal lateral in V proximal third scattered and strongly crenatoserrated, becoming finely granular to crenulations medially, ending on a moderate tubercle; lateral inframedian in I complete strongly crenatoserrate; in II partial strongly crenatoserrate, present in distal third; in III partial weakly crenular, expressed on distal fourth, in VI absent, in V partial, expressed on proximal two thirds by irregular crenatoserrate granules becoming weaker distally; ventral lateral in I–IV smooth strongly costate; ventral submedian in I smooth moderate to weakly costate; in II IV smooth strongly costate; ventral lateral and ventral median in V strongly crenatoserrate. Setae: Dorsal lateral, 2:3:5:7:14, intersperse minor and macrosetae, in V macrosetae in both sides of the carina; lateral median, 1:3:3:4; lateral inframedian, 2:2:2:1:8; ventral lateral, 3:4:5:6:23, macrosetae on both sides of the carinae; ventral submedian, 3:5:5:5:4; ventral sublateral, 3.

Telson: Telson vesicle 1.73 times longer than wide. Metasomal segment V 1.43 times wider than telson. Vesicle 1.73 times longer than aculeus. Dorsal surface smooth and ventral surface with scatter moderate granules on proximal third, proximal margin with strong

granulation. Ventral surface with eight or nine macrosetae in each carina. Ventral median carinae with subaculear tubercle obsolete. Microserration on laterobasal aculeus numbering 3–5.

DISTRIBUTION: *Thorellius yuyuawi*, **n. sp.** is known from one locality in Jalisco, Mexico. It is probable that this species extends to Zacatecas, due the proximity of the locality to the border of these two states.

ECOLOGY: The locality where this species was recorded is in the bottom of a canyon that runs north-south in the contact zone between the TMVB and the Sierra Madre Occidental, but contrary to *T. wixarika*, **n. sp.**, this area faces the continental side, instead of facing the Pacific coast. This area has a variety of vegetation from the lower parts of tropical thorn forest, chaparral in the transitional zone and pine forest on the mountains. The only specimens known were collected by ultraviolet detection at an altitude of 1388 m. Morphologically, they present the same type of adaptations foun in other *Thorellius*, which makes it is also a probably lapidicolous species.

MATERIAL EXAMINED: **MEXICO: Jalisco:** *Municipio de Mezquitic*: Mezquitic, 4 km N, 22°24.732'N 103°43.222'W, 1388 m, 6.vii.2005, O. Francke, J. Ponce, M. Córdova, A. Jaimes, G. Francke, and V. Capovilla. 1 ♀ (AMNH [LP 5266]).

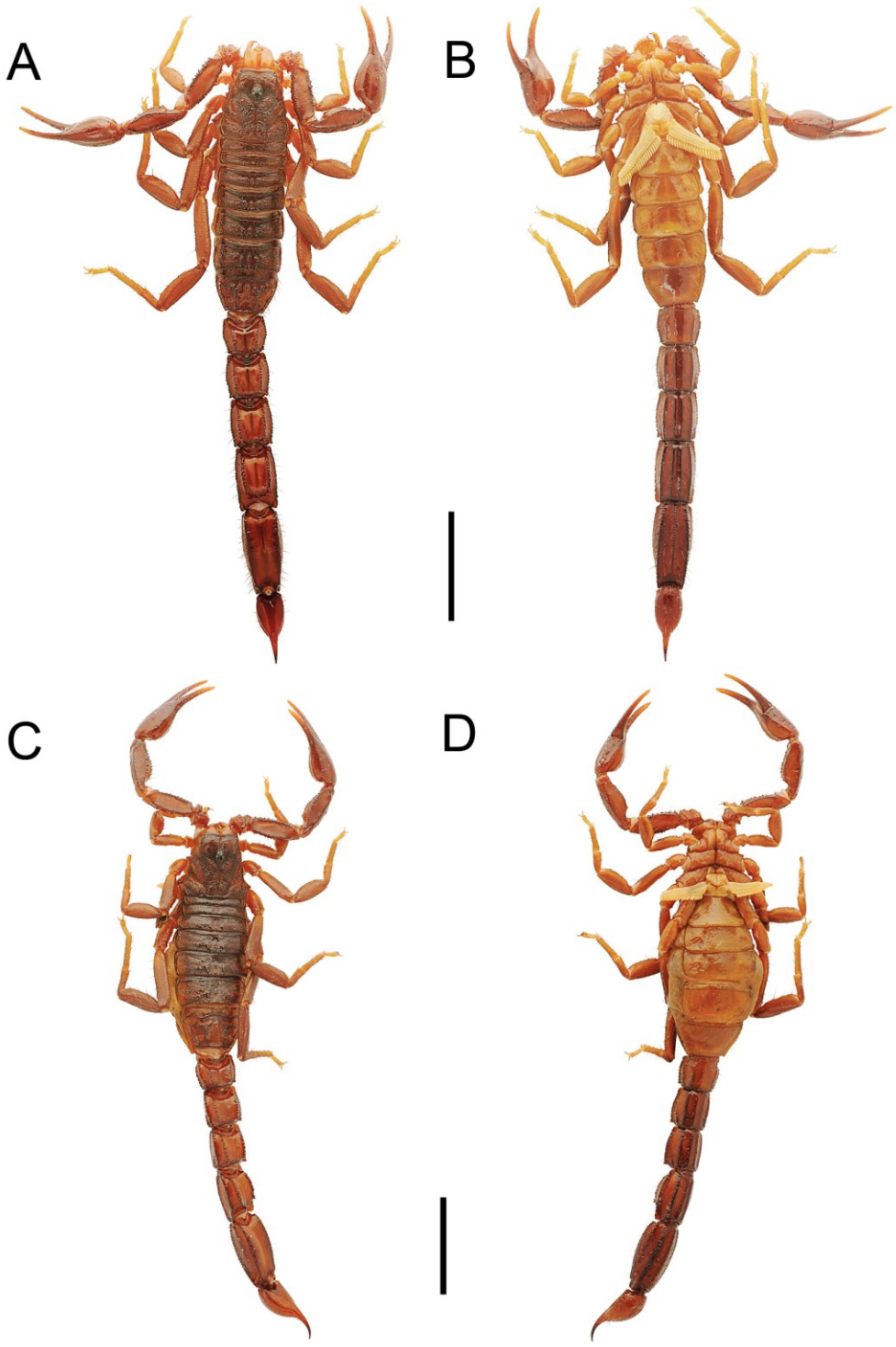


Figure 141. *Thorellius yuyuawi*, **n. sp.**, habitus. **A**, **B**. Type ♂ (IBUNAM). **C**, **D**. Paratype ♀ (IBUNAM). **A**, **C**. Dorsal aspect. **B**, **D**. Ventral aspect. Scale bars = 5 mm.

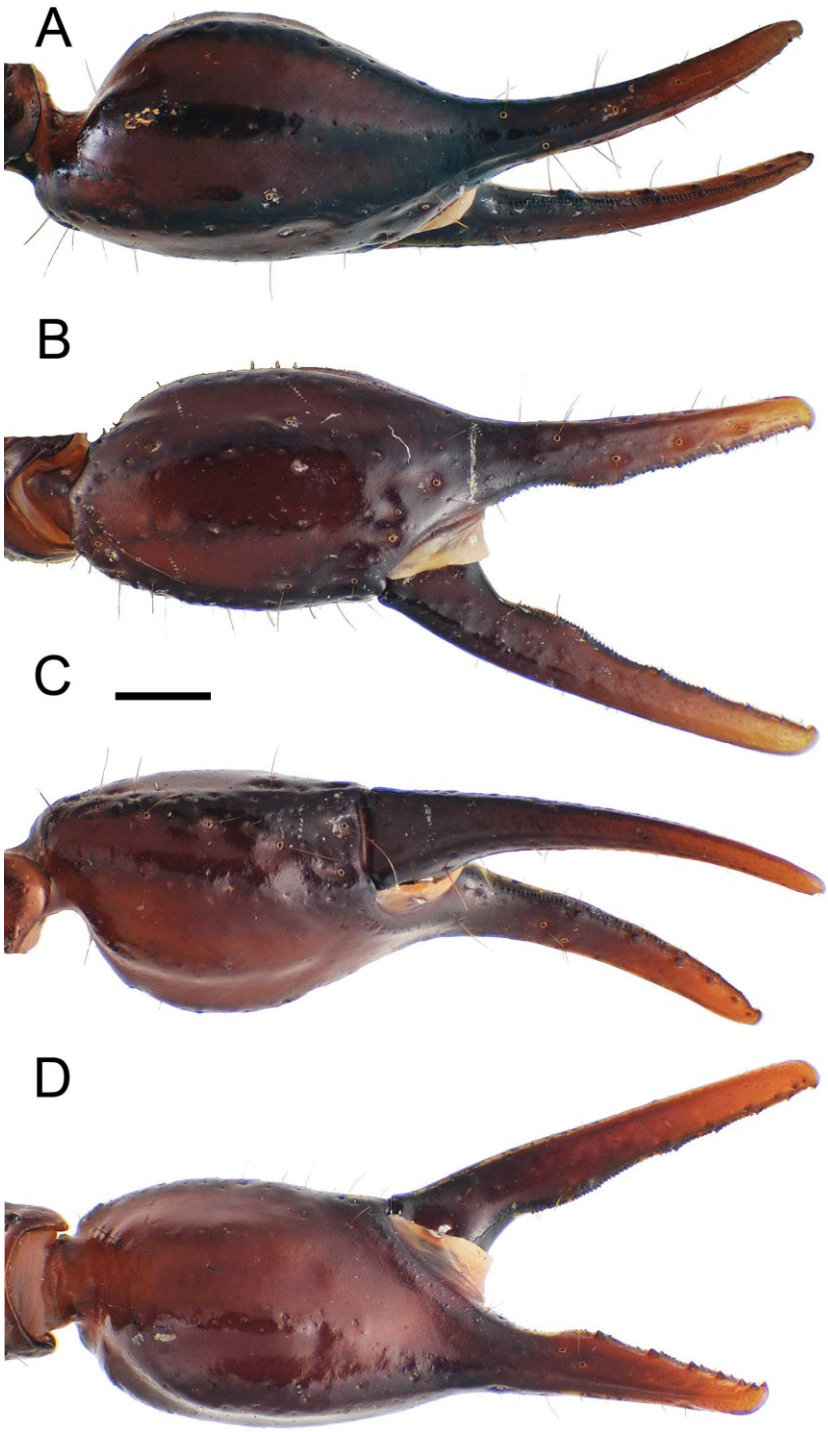


Figure 142. *Thorellius yuyuawi*, **n. sp.**, type ♂ (IBUNAM), dextral pedipalp chela. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

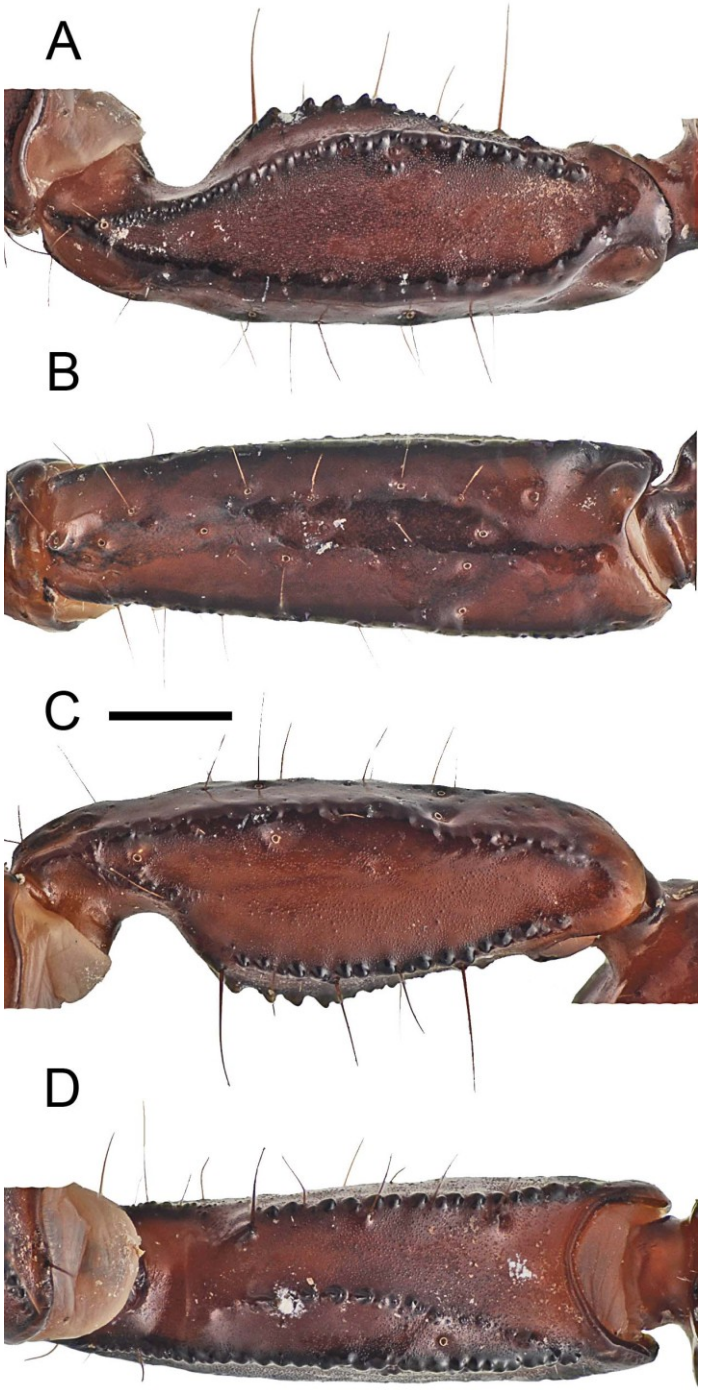


Figure 143. *Thorellius yuyuawi*, **n. sp.**, type ♂ (IBUNAM), dextral pedipalp patella. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

Table 18. Measurements (mm) of adult *Thorellius tekuani*, **n. sp.**, *Thorellius wixarika*, **n. sp.**, *Thorellius yuyuawi*, **n. sp.** Abbreviation: H, holotype.

Table 12. Measurements (mm) of adult *Thorellius tekuani*, **n. sp.**, *Thorellius wixarika*, **n. sp.**, *Thorellius yuyuawi*, **n. sp.** Abbreviation: H, holotype.

	T. tekuani ♂, H, IBUNAM	*T. wixarika* ♂, H, IBUNAM	*T. yuyuawi* ♂, H, IBUNAM
Length			
Carapace	6.60	6.30	6.18
Pedipalp: femur	5.70	5.50	4.90
Pedipalp: patella	6.10	6.00	5.50
Pedipalp: chela	10.60	9.70	8.90
Fixed finger	4.60	4.60	4.10
Movable finger	6.20	6.20	5.60
Mesosoma	12.60	25.50	11.00
Metasoma	26.30	12.40	22.30
Metasomal segment I	3.50	3.20	2.90
Metasomal segment II	4.20	4.00	3.60
Metasomal segment III	4.60	4.40	3.90
Metasomal segment IV	6.00	5.90	5.20
Metasomal segment V	8.00	8.00	6.70
Telson	7.20	7.00	6.30
Telson: vesicle	4.70	4.50	4.00
Telson: aculeus	2.50	2.50	2.30
Total	52.70	51.20	45.78
Width			
Pedipalp: femur	1.80	1.90	1.70
Pedipalp: patella	2.00	2.20	2.00
Pedipalp: chela	3.00	2.90	2.80
Metasomal segment I	3.50	3.60	3.50
Metasomal segment II	3.40	3.50	3.50
Metasomal segment III	3.30	3.40	3.40
Metasomal segment IV	3.10	3.20	3.40
Metasomal segment V	3.00	3.10	3.30
Telson: vesicle	2.10	2.70	2.30
Height			
Pedipalp: chela	3.30	2.60	2.70
Metasomal segment I	3.00	2.80	3.00
Metasomal segment II	2.80	2.80	3.00
Metasomal segment III	2.70	2.80	3.00
Metasomal segment IV	2.60	2.90	3.00
Metasomal segment V	2.50	2.90	3.00
Telson: vesicle	2.50	2.10	1.90

KOCHIUS Soleglad and Fet, 2008

KEY TO IDENTIFICATION OF THE SPECIES OF *Kochius*

1. Proximal notch and median lobe of chela fixed and movable fingers moderately to strongly developed in ♂ and moderate in ♀, chela finger closure with distinct gap, fingers fit unevenly in ♂.....2

- Proximal notch and median lobe of chela fixed and movable fingers absent in ♂ and in ♀, chela finger closure lacking gap, fingers fit evenly in ♂ and in ♀……...……5

2. Proximal notch and median lobe of chela fixed and movable fingers strong in ♂, chela finger closure with distinct gap in ♀ ……..……..…...3

- Proximal notch and median lobe of chela fixed and movable fingers moderate in ♂, chela finger closure lacking distinct gap in ♀……..4

3. Telson vesicle relatively hirsute with six or seven major macrosetae per carinae, macrosetae as long as aculeus in ♂, base of aculeus relatively short……...……*K. cerralvensis*

- Telson vesicle relatively bald with three minor macrosetae per carinae, macrosetae shorter than aculeus in ♂, base of aculeus relatively long…….....*K. punctipalpi*

4. Telson vesicle relatively hirsute, lateral and ventral carinae with four macrosetae as long as telson and with a distal cluster of more than five macrosetae longer than aculeus in ♀, base of aculeus relatively elongated……..……..……*K. barbatus*

- Telson vesicle bald, lateral and ventral carinae with two macrosetae shorter than telson and lacking distal cluster of more than five macrosetae longer than aculeus in ♀, base of aculeus relatively short……..……*K. magdalensis*

5. Color base dark brownish to orange...……..……6

- Color base pale yellow…….……..……..…11

6. Pedipalp chela movable finger with six rows of median denticles and six retrolateral dorsal denticles……7

- Pedipalp chela movable finger with seven rows of median denticles and seven retrolateral dorsal denticles……9

7. Ventral submedian carinae of sternite VII obsolete……..*K. insularis*

- Ventral submedian carinae of sternite VII granular……8

8. Telson vesicle relatively bald, with three or four major macrosetae per carinae, carapace and tergites infuscate……*K. sonorae*

- Telson vesicle relatively hirsute, with six or more major macrosetae per carinae, carapace and tergites immaculate…….....*K. jatay*, **n. sp.**

9. Intercarinal surfaces of metasomal segments I−V shagreened, covered with dense minute and scattered granules more evident on lateral surface of segments I−III and ventral surface of segment V……..*K. moosni*, **n. sp.**

-Intercarinal surfaces of metasomal segments I−V matte, covered with dense minute granulation.....10

10. Telson vesicle relatively hirsute with five or six major macrosetae per carinae longer or as long as aculeus.....*K. catavina*, **n. sp.**

- Telson vesicle densely hirsute with more than 10 major macrosetae per carinae longer or as long as aculeus……*K. hirsuticauda*

11. Pedipalp chela fixed finger with six rows of median denticles and six retrolateral denticles.....*K. maroma*, **n. sp.**

- Pedipalp chela fixed finger with five rows of median denticles and five retrolateral denticles…..12

12. Telson vesicle densely hirsute with more than eight major macrosetae per carinae longer or as long as aculeus……..……..……..13

- Telson vesicle relatively bald, with three or four major macrosetae per carinae……...*K. bruneus*

13. Base color dark brownish, carinae of patella and femur heavily infuscated.....

…….…….....*K danzante*, **n. sp.**

- Base color medium orange-yellowish, carinae of patella and femur diffusely infuscated to immaculate…….……...14

14. Base color orange, telson vesicle relatively globose, aculeus relatively elongated, sternite V and VII posterior median glandular spot strong.....*K. kiliwa*, **n. sp.**

- Base color brownish, telson vesicle relatively elongated, aculeus relatively short, sternite V and VII posterior median glandular spot weak…….....*K. villosus*

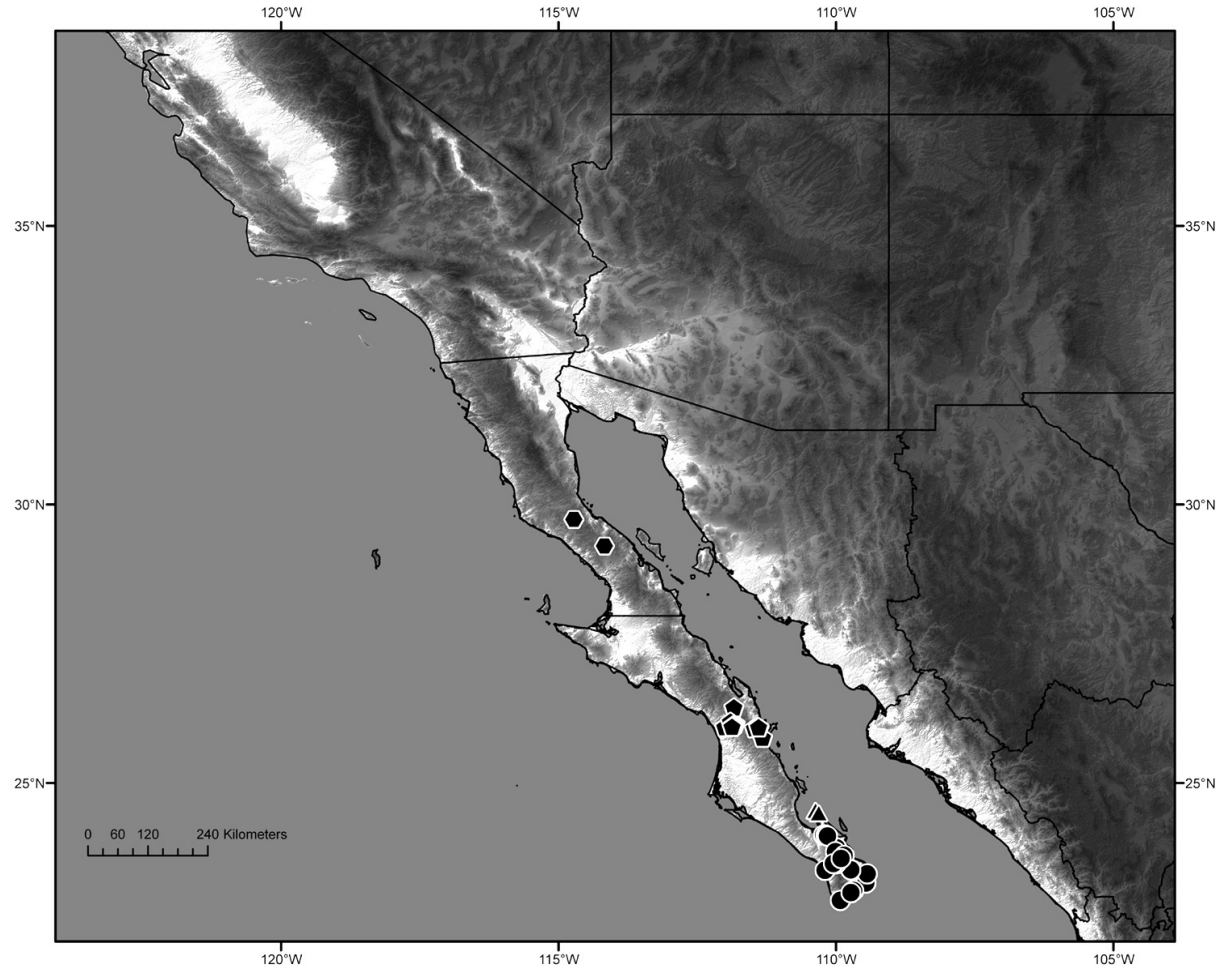


Figure 144. Map of southwestern North America, plotting known locality records for four species in the vaejovid scorpion genus *Kochius* Soleglad and Fet, 2008, based on data collected in the present study: *Kochius bruneus* (Williams, 1971) (pentagons), *Kochius catavina*, **n. sp.** (hexagons), *Kochius insularis* (Williams, 1971) (triangles), and *Kochius punctipalpi* (Wood, 1863) (circles), darker contour indicates increase of altitudinal gradient.

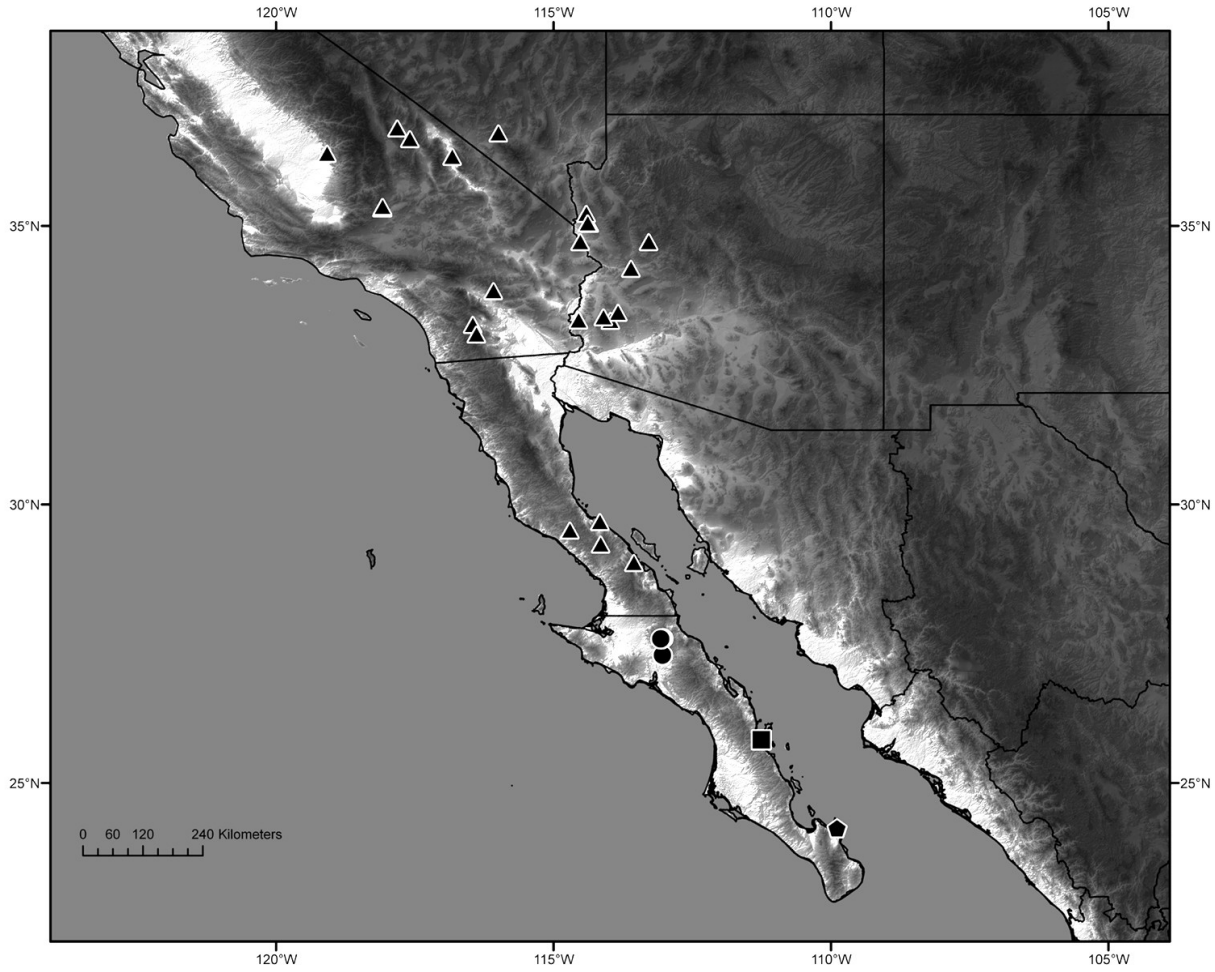


Figure 145. Map of southwestern North America, plotting known locality records for four species in the vaejovid scorpion genus *Kochius* Soleglad and Fet, 2008, based on data collected in the present study: *Kochius danzante*, **n. sp.** (squares), *Kochius cerralvensis* (Williams, 1971) (pentagons), *Kochius hirsuticauda* (Banks, 1910) (triangles), and *Kochius maroma*, **n. sp.** (circles), darker contour indicates increase of altitudinal gradient.

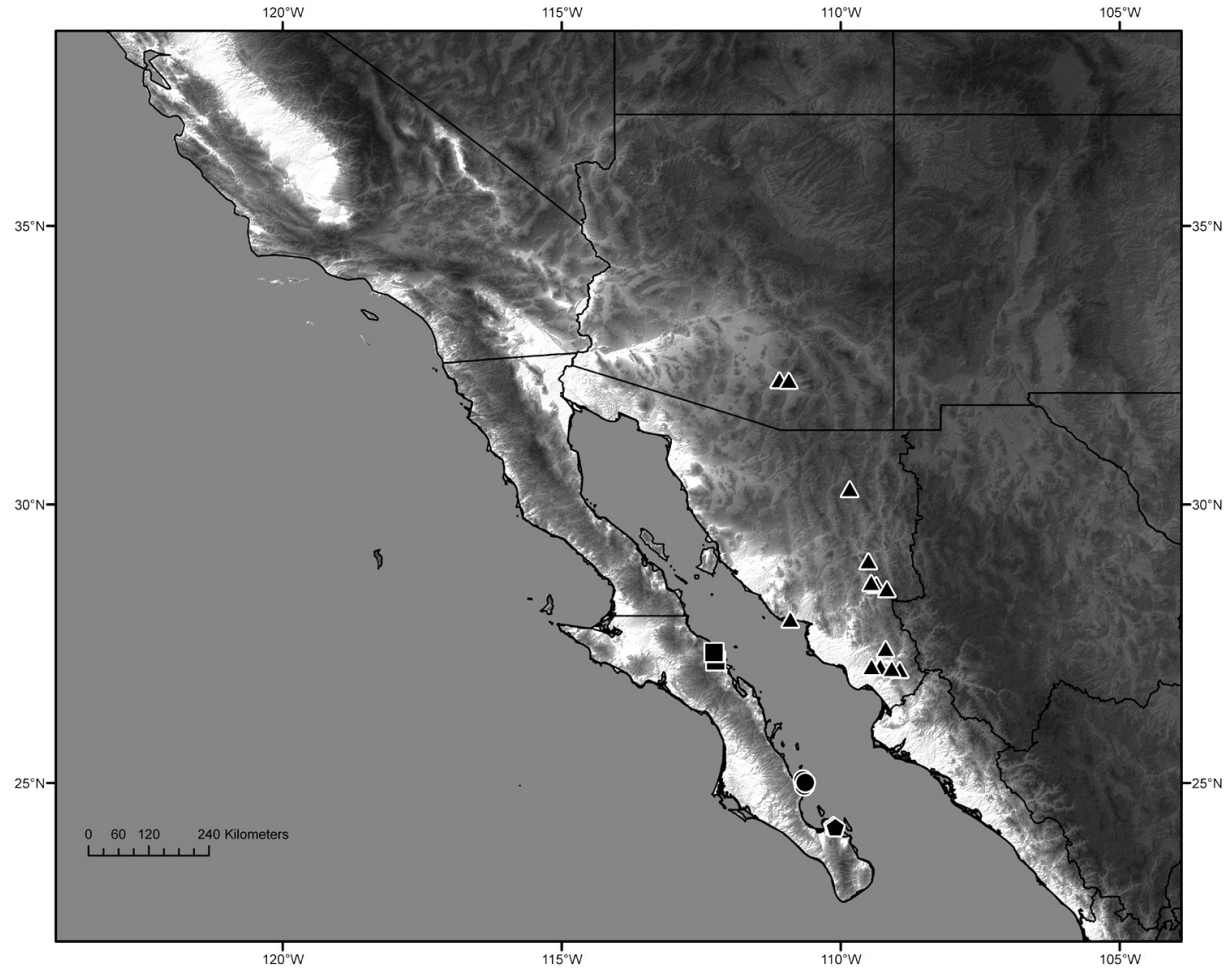


Figure 146. Map of southwestern North America, plotting known locality records for four species in the vaejovid scorpion genus *Kochius* Soleglad and Fet, 2008, based on data collected in the present study: *Kochius barbatus* (Williams, 1971) (pentagons), *Kochius jatay*, **n. sp.** (circles), *Kochius kiliwa*, **n. sp.** (squares) and *Kochius sonorae* (Williams, 1971) (triangles), darker contour indicates increase of altitudinal gradient.

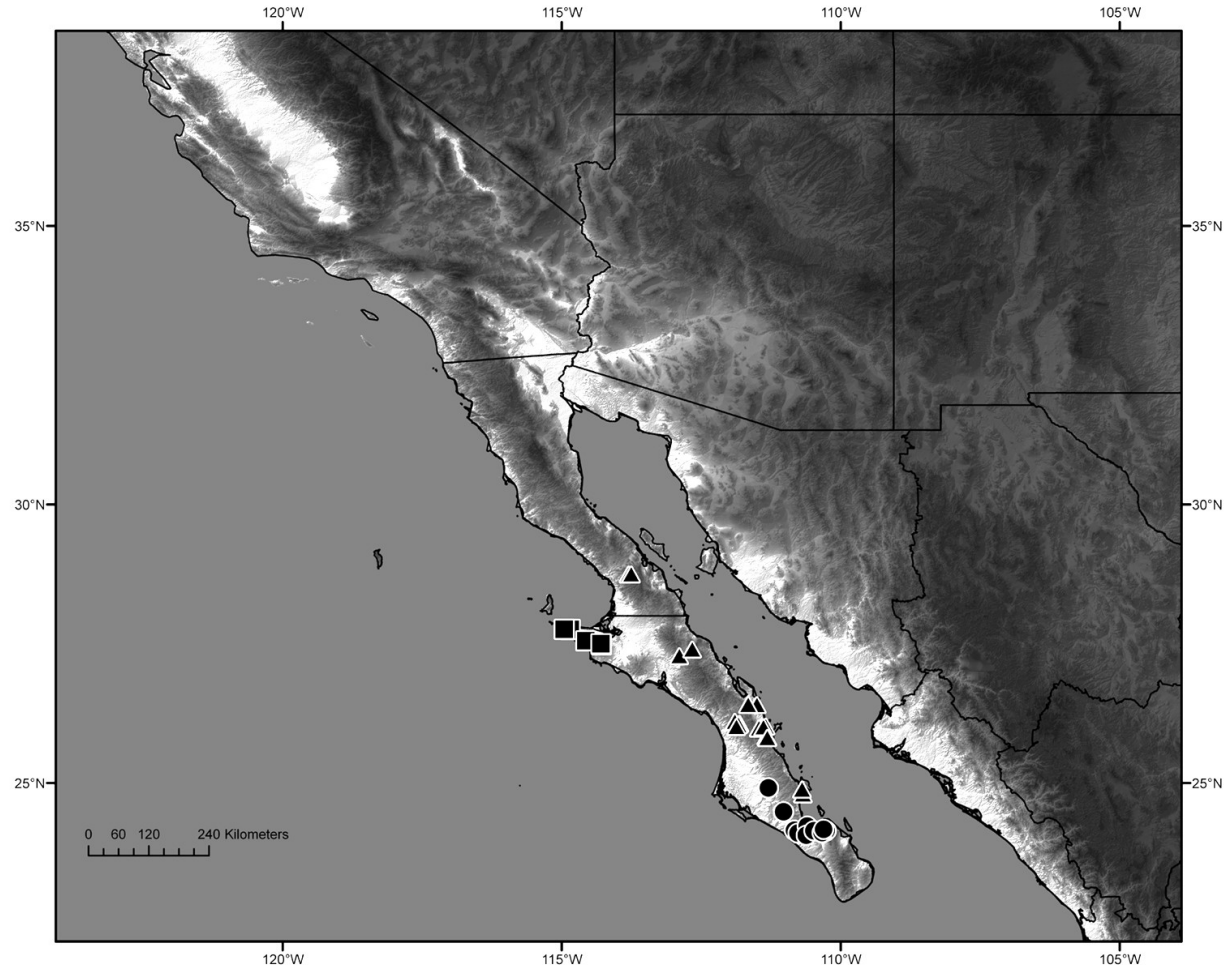


Figure 147. Map of southwestern North America, plotting known locality records for three species in the syntropine scorpion genus *Kochius* Soleglad and Fet, 2008, based on data collected in the present study: *Kochius magdalensis* (Williams, 1971) (circles), *Kochius moosni*, **n. sp.** (squares), *Kochius villosus* (Williams, 1971) (triangles), darker contour indicates increase of altitudinal gradient.

Kochius barbatus (Williams, 1971)

Figures 146, 148–150, 193A, 199A, 205A, 209A, 213A, 217A, 220A

Vaejovis punctipalpi barbatus Williams, 1971a: 45–47, fig. 1; 1980: 53, 88, fig. 57C, 88; Kovařík, 1998: 148; Sissom, 2000: 550; McWest, 2009: 21, tab. 1, 125.

Vaejovis punctipalpi form *barbatus*: Beutelspacher, 2000: 103, 138, 154, map 86.

Kochius punctipalpi barbatus: Soleglad and Fet, 2008: 92.

TYPE MATERIAL: **MEXICO: Baja California Sur:** [*Municipio de La Paz*]: Holotype ♀ (CAS, Type No. 11469), Las Cruces, 29.vii.1968, 25 ft [7.6 m], S.C. Williams, M.A. Cazier and party. Paratypes: 15 ♂, 10 ♀ (CAS, including ♂ allotype), same locality as holotype.

DIAGNOSIS: *Kochius barbatus* is closely related to *K. cerralvensis*, *K. magdalensis* and *K. punctipalpi*, with which forms a monophyletic group. The scheme of relation recovered from the phylogenetic analysis is as follow: ((*K. barbatus* + *K. cerralvensis*) (*K. magdalensis* (*K. punctipalpi*))). These species can be separated from the other species in the genus by having the proximal notch and median lobe of chela fixed and movable fingers moderately to strongly developed in ♂ and moderate in ♀, and chela finger closure with distinct gap, fingers fit unevenly in ♂; instead of having proximal notch and median lobe of chela fixed and movable fingers absent in ♂ and in ♀, and chela finger closure lacking gap, fingers fit evenly in ♂ and in ♀. *K. barbatus* may be distinguished from *K. cerralvensis* and *K. punctipalpi* by having proximal notch and median lobe of chela fixed and movable fingers moderate in ♂, and chela finger closure lacking gap in ♀, instead of having proximal notch and median lobe strong, and chela finger closure with distinct gap in ♀. From *K. magdalensis* differs by having telson relatively hirsute, lateral and ventral carinae with four macrosetae as long as aculeus and with a distal

cluster of more than five macrosetae in each carinae longer than aculeus, instead of having telson bald, lateral and ventral carinae with two macrosetae shorter than telson and lacking distal cluster of macrosetae. *K. magdalensis* and *K. cerralvensis* differs by having aculeus relatively elongated instead of having aculeus relatively short.

DESCRIPTION: The following redescription supplements Williams' (1971a) original description. It is based on adult ♂ and ♀ paratypes and the material examined.

Color and infuscation (in alcohol): Base color pale yellow, carapace, tergites, sternites, legs, metasoma, and telson uniformly yellow straw lacking infuscation. Base of pedipalp fingers light orange to reddish, manus immaculate. Aculeus brownish.

Carapace: Carapace anterior margin emarginated with a moderate median notch and three pairs of minor macrosetae. Surface completely shagreened with scattered moderate granules. Anteromedian, posteromedian, and posterolateral sulci moderately deep and broad, posterior transverse obsolete. Ocular tubercle moderately arose, superciliary carina granular higher than ocular tubercle. Median eyes approximately double size of lateral frontal pair. Three lateral eyes, two frontal pairs same size and posterior reduced approximately in half.

Sternum and coxal region: Sternum pentagonal subequilateral with three pairs of setae, one distal, one median pair and one pair on the lobes, median notch very deep. Anterior margin of coxa II with three oblique slit-like structures, adjacent to a broad protuberance with four or five enlarged granules. Base of coxal endite II with a depression each. Coxa IV 2.25 times longer than coxa II.

Chelicerae: Dorsal surface smooth, dentition of fixed and movable fingers as in typical syntropine. Distal margin of manus with one median macrosetae. Serrula with 17/17 tines.

Pedipalps: Trichobothrial pattern Type C, orthobothriotaxic. Femur: All intercarinal surfaces matte, except dorsal surface with few scattered median moderate granules. Dorsal retrolateral, dorsal prolateral, and ventral prolateral carinae strongly serrated, retrolateral dorsosubmedian with strong crenulations and two minor macrosetae, prolateral ventrosubmedian strongly serrated with a proximal tubercle, lacking macrosetae, prolateral ventral obsolete, expressed by one lower proximal tubercle and three macrosetae distributed from the basal to the mid aspect of the segment, ventral median and retrolateral ventral vestigial expressed by scattered serrated granules, ventral retrosubmedian vestigial expressed by few scattered irregular serrated proximal granules.

Patella: All intercarinal surfaces matte. Carinae: Dorsal prolateral, dorsal retrolateral, ventral prolateral, and ventral retrosubmedian strongly serrated, ventral median vestigial expressed as a basal short row of low granules, retrolateral dorsosubmedian and retrolateral median complete and moderately crenatoserrated. Prolateral median vestigial, extending from a basal tubercle with two or three large granules to mid segments, never reaching trichobothrium d_2 and two spiniform minor macrosetae. Prolateral ventral obsolete expressed by two minor macrosetae, one basal and one distal.

Chelae: Pedipalp manus incrassate. Carinae: Dorsal prolateral, dorsal median, dorsal retrosubmedian accessory, and dorsal retrolateral carinae strongly crenatoserrated. Dorsal prosubmedian and prolateral dorsal vestigial expressed by scattered crenatoserrations flanking dorsal lateral carina. Retrolateral median moderately crenatoserrated. Retrolateral subventral accessory and retrolateral subventral vestigial expressed by few distal low granulation. Ventral retrolateral strongly crenatoserrated and partial, ending right before retrolateral subventral starts, but never connected. Ventral prosubmedian moderately crenatoserrated, ventral prolateral and

prolateral median moderately crenatoserrated and parallel. Trichobothria *Dt* and *Db* dorsal to dorsal retrolateral carinae. Trichobothrium *Db* positioned subbasal on manus. Trichobothrium *Dt* positioned at mid manus.

Fingers: Fixed finger denticles: PD = 6, RD = 5, MD rows = 5, retrolateral denticles comparatively smaller than prolateral denticles. Movable finger PD = 7, RD = 6, MD rows = 6, distal row with one denticle. Prolateral and retrolateral denticles subpaired. Trichobothrium *ib* positioned between PD6 and PD7, but closer to PD6 and PD7 lacking granule; trichobothrium *it* between PD6 and PD5 but closer to PD6. Fingers strongly scalloped, proximal notch and median lobe of fixed finger and median lobe of movable finger strongly develop. Gap created when fingers close moderate.

Legs: Spinules: Basitarsi I–II with prolateral ventral and retrolateral ventral carinae with complete rows of spinules; retrolateral ventral in III complete, in IV absent; retrolateral dorsal in III vestigial distal few spinules, in IV absent; retrolateral median rows in I–IV vestigial expressed as few terminal spinules, retrolateral dorsal in I–IV vestigial distal few terminal spinules. Telotarsi I–IV with two pairs of ventrodistal spinules in I–IV. Setae: Prolateral ventral 3:3:5:5, being medians stout; retrolateral ventral 4:7:7:7 retrolateral dorsal 2:4:4:4; dorsal 3:3:3:3; retrolateral dorsal and dorsal series arranged in two independent rows.

Tergites: Pretergites matte, posttergites medial surface shagreened, all surface with scattered coarse granules. Dorsal median and dorsal submedian carinae strong with a short row of distal serrations on proximal half. Tergite VII with intercarinal surfaces scattered with serrated granules. Dorsal median carina partial and strong expressed on proximal half, strongly costate and few crenatoserrations. Dorsal submedian vestigial expressed as a pair of distal irregular serrations strongly costate. Dorsal lateral and lateral supramedian comparatively stronger than

prior carinae, ending in an enlarged spiniform tubercle projecting backwards, Dorsal lateral projecting and curving laterally almost reaching lateral supramedian distal margin, creating a semi ring of granulation.

Genital operculum: Male genital operculum: wider than long, with two pairs of macrosetae. Sclerites free on longitudinal edge moving independently but unable to open more than 45°. Genital papillae protrude posteriorly. Female genital operculum: Wider than long, with three macrosetae. Sclerites fuse longitudinal.

Sternites: Sternites III–VI with all carinae obsolete and surface matte, V in ♂ with distomedian glandular spot moderate protruding slightly from adjacent surfaces, in ♀ vestigial. Sternite VII with ventral lateral carinae moderately crenatoserrated and distomedian glandular spot strongly developed shaped as truncated triangle. Ventral submedian carinae obsolete expressed by three minor macrosetae. Spiracle elongated, slit-like, approximately three times longer than wide.

Pectines: Pectines in ♂ longer than distal margin of coxa VI, in ♀ at the level of distal margin of coxa VI . Basal piece in ♂ devoid of macrosetae, in ♀ three pairs of macrosetae. Marginal lamella consist of three sclerites, medial lamella proximally fuse distally progressively forming conspicuous 11 beads. Fulcra with 17–19 in ♂ and 16–17 beads in ♀. Pectinal tooth count 19–21 in males and 17–18 in females.

Hemispermatophore: Lamina 1.91 longer than trunk. Dorsal through margin long, narrow, curving proximally, and removed from ventral trough. Hemimating plug developed from the inner lobe, distal barb margin with 13 elongated spinules. Primary and secondary hook positioned on the apex of lateral margin extension of the lamina (flange). Both hooks rounded almost completely fuse, forming a vestigial notch. Median lobe ental terminus moderate and

rounded. Basal plate of inner lobe removed from ventral trough. Spine of inner lobe moderate and strongly sclerotized, secondary spine on ventromedian aspect of neck shorter and weaker. Neck moderate (0.6 times longer than basal plate). Measurements, lamina, 4.02; trunk, 2.10; dorsal trough/laminar hooks, 1.50; ventral trough/laminar hook, 1.02; neck, 0.36; basal plate, 0.60.

Metasoma: All intercarinal surfaces matter, except ventral surface of metasomal segment V with scattered moderate granules. Dorsal lateral carinae of metasomal segments I–V and lateral median carinae of segments I–III strongly serrated, proximally terminating in elongated spiniform tubercle pointing backwards. Lateral median in IV proximal terminus moderately expanded or flared. Lateral inframedian in I complete serrated, in II irregularly serrated expressed in proximal third, in III comparatively weaker crenatoserrated expressed in proximal third, in absent, in V partial, crenatoserrated and expressed in distal half. IV. Ventral lateral I–V, ventral submedian I–IV and ventral median in V finely crenatoserrated. Setae: In ♀ dorsal lateral, 0:1:1:2:4, lateral median, 0:1:1:2, lateral inframedian, 0:0:0:0:2, ventral lateral, 2:2:2:2:4, ventral submedian, 3:3:3:3, ventral sublateral, 2; all carinae major, in ♂ all macrosetae absent or reduced to microsetae.

Telson: Ventral and dorsal surfaces smooth, five pairs of macrosetae per carinae in both sexes, but female has them major and male minor or microsetae. Laterobasal microserration of aculeus 3–6 sharp tines. Subaculear tubercle absent. Vesicle 1.07 times longer than aculeus in ♀; 1.50 in ♂.

DISTRIBUTION: *Kochius barbatus* seems to be endemic to the coastal zone north to the extreme of Sierra el Novillo, east of La Paz in the Sea of Cortez, Baja California Sur, Mexico.

ECOLOGY: *Kochius barbatus* was collected in an area covered with columnar cacti, thorn scrub and other arid-adapted plants at 30 m altitude. All the specimens were collected using ultraviolet light detection at night.

REMARKS: According to Williams (1971a, 1980) this species is distributed from Santa Rita [ca. 125 km northwest La Paz on road MEXICO 1], to San Bartolo, including La Paz, and he reported this species from the Islands Partida and Espiritu Santo. Recent collection in the vicinities of San Bartolo, did not yield *K. barbatus* and collections 30 to 150 km northern La Paz, yielded specimens conspecific with *K. magdalensis*. William's distribution warrants further investigation. Thus, I restrict the distribution of *K. barbatus* to the Las Cruces area and consider Santa Rita, La Paz, San Bartolo dubious localities.

MATERIAL EXAMINED: **MEXICO: Baja California Sur:** *Municipio de La Paz*: Las Cruces, [24°12.1833'N 110°5.45'W], 29.vii.1968, S.C. Williams and M.A. Cazier, 1 ♂ (AMNH); Las Cruces, 4 km NW, 31 m, 24.vi.2008, 24°13.5108'N 110°7.41'W, desert, collected at night with UV light, 1 ♂ (AMNH [ARA2884]), 1 ♂, 1 ♀ (IBUNAM [ARA2274]); 24°13.511'N 110°07.410'W, 1 ♂ (AMNH [LP 8803]), H. Montaño and E. González.

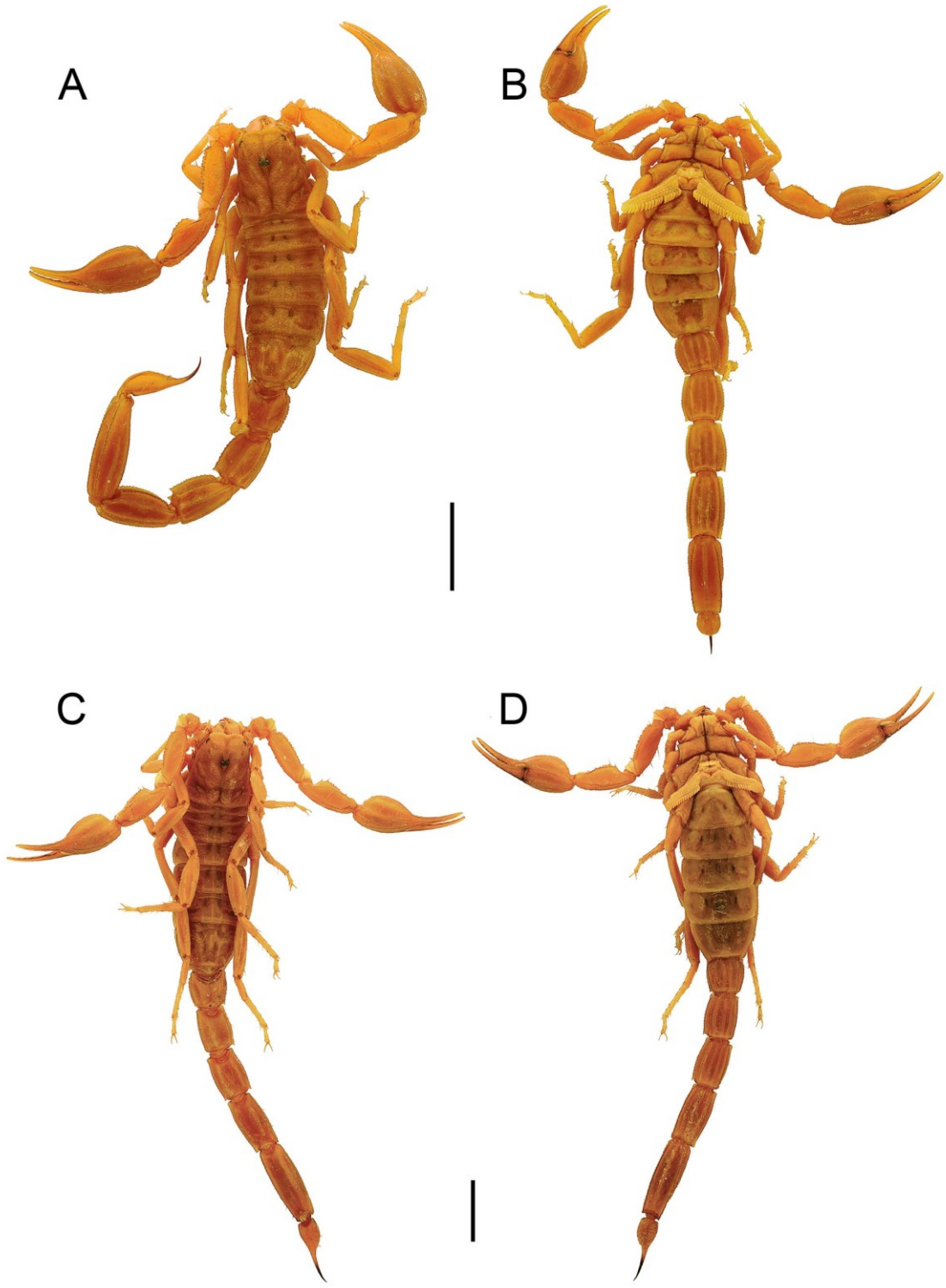


Figure 148. *Kochius barbatus* (Williams, 1971), habitus. **A**, **B**. ♂. **C**, **D**. ♀ (AMNH). **A**, **C**. Dorsal aspect. **B**, **D**. Ventral aspect. Scale bars = 5 mm.

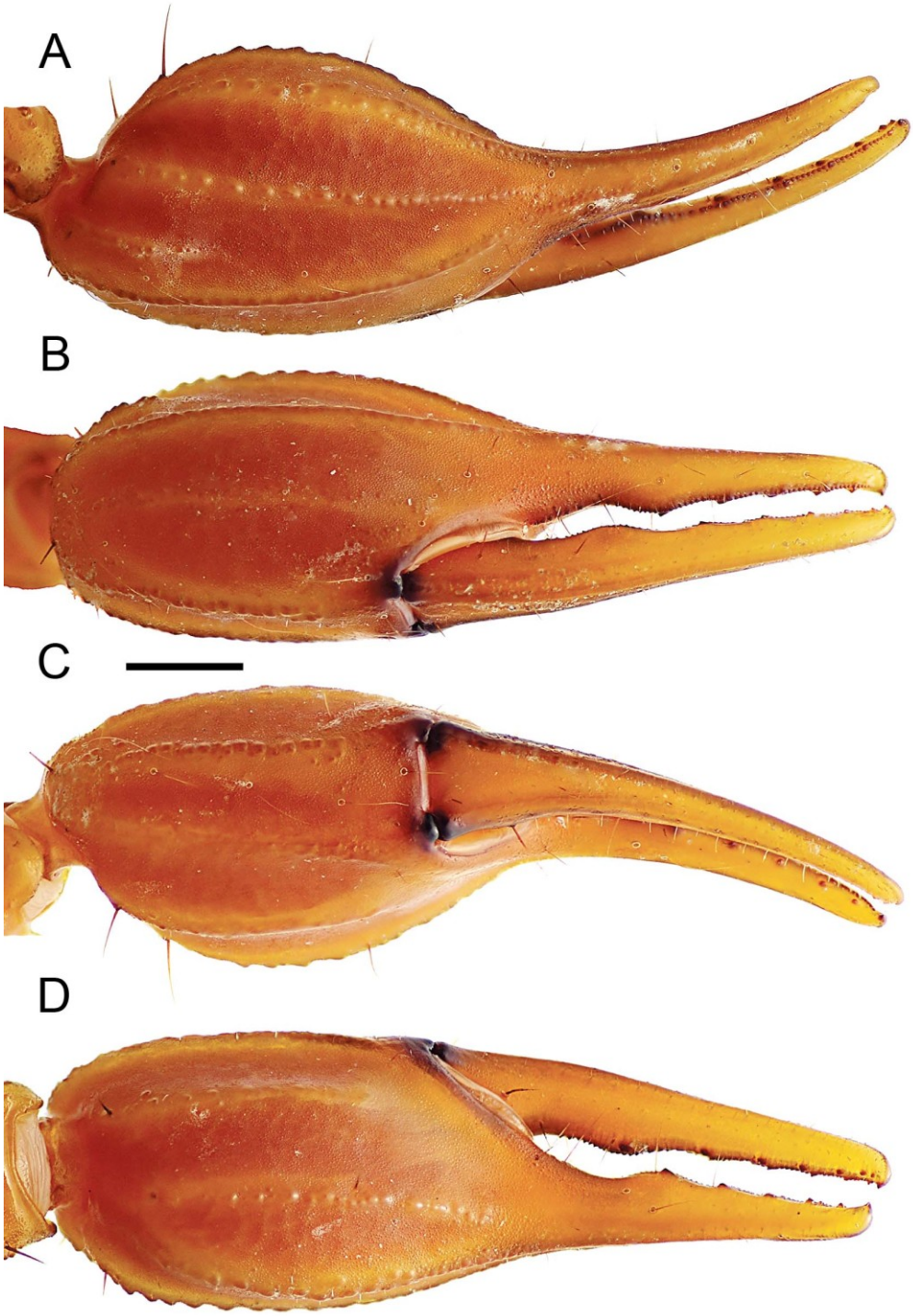


Figure 149. *Kochius barbatus* (Williams, 1971), ♂, dextral pedipalp chela. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

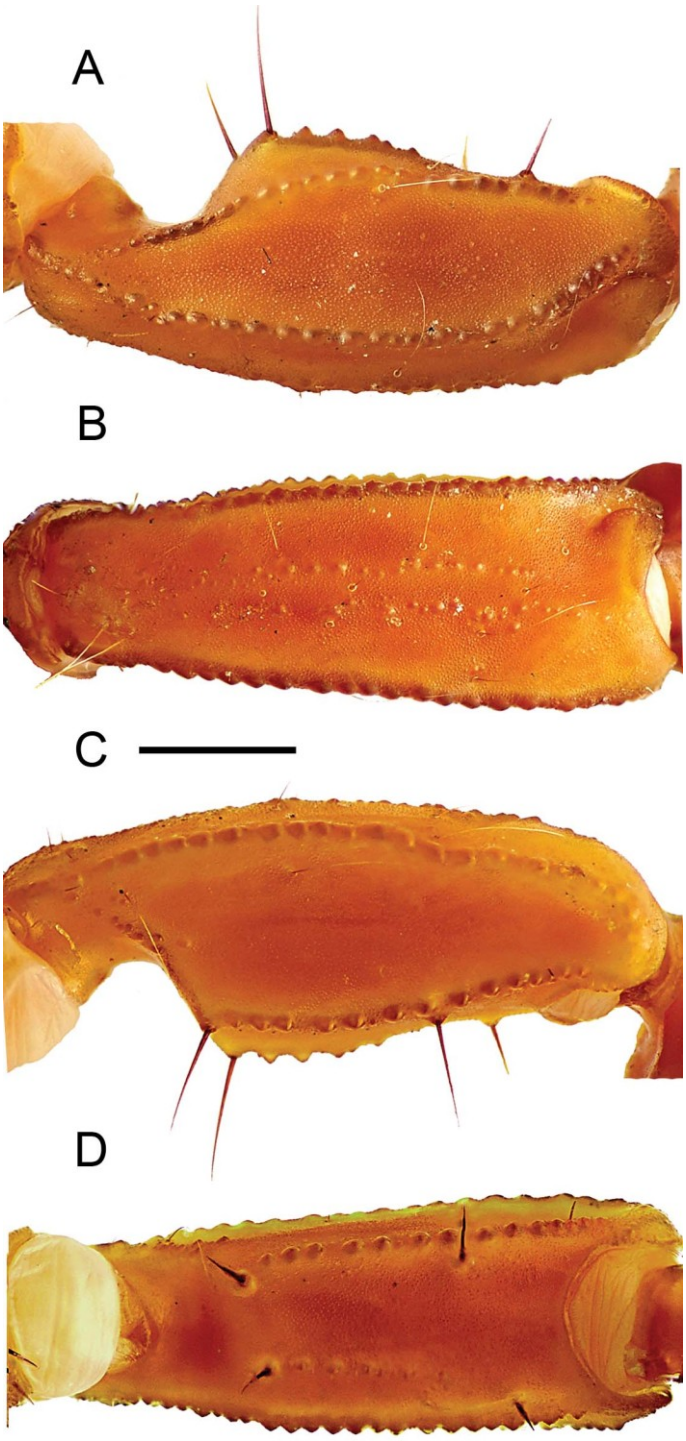


Figure 150. *Kochius barbatus* (Williams, 1971), ♂, dextral pedipalp patella. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

Kochius bruneus (Williams, 1971)

Figs. 144, 151–153, 193B, 199D, 205B, 209B, 213B, 217B, 220B

Vejovis bruneus Williams, 1970c: 317–322, figs. 24, 25; Soleglad, 1973: 357.

Vaejovis bruneus: Williams, 1971a: 57; Díaz-Nájera, 1975: 6; Williams, 1980: 54, 80–84, fig. 57E, F; Kovařík, 1998: 146; Beutelspacher, 2000: 74, 137, 152, map 49; Sissom, 2000: 548; Soleglad and Fet, 2003b: 8, fig. 68, Sissom and Hendrixson, 2005a: 128, tab. 6.2.

Vaejovis broneus: Díaz-Nájera, 1975: 13 (incorrect subsequent spelling).

Kochius bruneus: Soleglad and Fet, 2008: 66, 73, 92.

Vaejovis bruneus bruneus: Williams, 1971a: 51, 54; 1980: 54, 81, figs. 82, 83; Sissom, 2000: 548; McWest, 2009: 20, tab. 1, 90, 124; Jiménez-Jiménez and Palacios-Cardiel, 2010: 70, 72, tab. 1, 73, 74 (in part).

Kochius bruneus bruneus: Soleglad and Fet, 2008: 92–94.

TYPE MATERIAL: **MEXICO: Baja California Sur:** [*Municipio de Comondús*]: *Vaejovis bruneus*: Holotype ♂, allotype ♀ and 173 paratopotypes (CAS, Type No. 10410), 5 miles southwest San Miguel de Comondú, 1000 ft [305 m], 2.vii.1968, S.C. Williams, M.A. Cazier and party. Paratypes: 23 ♂ 3 ♀8, miles northwest of San Raymundo, 500 ft [152.4 m], 30.vi.1968, S.C. Williams, M.A. Cazier and party; 117 ♂ 30 ♀, 5 to 10 miles southwest of San Miguel Comundú, 1000 ft [305 m], 3.vii.1968, S.C. Williams, M.A. Cazier and party.

DIAGNOSIS: *Kochius bruneus* is closely related to *K. danzante*, **n. sp.** *K. hirsuticauda*, and *K. kiliwa*, **n. sp.**, with which forms a monophyletic group (see *K. hirsuticauda* for details). *K. bruneus* may be separated from these species by having the most relatively bald ventral surface of telson with only three macrosetae in each carinae, instead of having between seven and 12

macrosetae. From *K. hirsuticauda* differs by having base color brownish to orange dark and weak fuscous markings on carapace and tergites, instead of having base color yellow pale and immaculate surface. Furthermore, differs from *K. hirsuticauda* by having metasomal segment I wider than long, instead of having it longer than wide. From *K. danzante*, **n. sp.** and *K. kiliwa*, **n. sp.** may be separated by having carinae of pedipalp femur and patella weakly infuscate, instead of having these carinae outlined with intense infuscation. From *K. danzante*, **n. sp.** differs by having base color from yellow yellowish to moderate orange to brownish, instead of having base color brownish dark.

DESCRIPTION: The following redescription supplements Williams' (1970c) original description. It is based on adult ♂ and ♀ paratypes and the material examined.

Color and infuscation (in alcohol): Base color from medium brown to golden-yellowish, carapace, tergites, legs, dorsal metasoma, and uniformly yellowish-brown lacking infuscation. Chelicerae, coxal region, sternites, and telson pale yellowish. Pectines, basal piece and genital operculum paler whitish. Base of pedipalp fingers lightly slightly darker than manus, manus immaculate. Aculeus base reddish turning brownish-red distally.

Carapace: Carapace anterior margin emarginated with a moderate median notch and three pairs of minor macrosetae. Surface completely shagreened with scattered moderate and minute granules. Anteromedian, posteromedian, and posterolateral sulci deep, posterior transverse obsolete. Ocular tubercle moderately arose, superciliary carina granular higher than ocular tubercle. Median eyes approximately double size of lateral frontal pair. Three lateral eyes, two frontal pairs same size and posterior reduced approximately in half.

Sternum and coxal region: Sternum pentagonal subequilateral with three pairs of setae, one distal, one median pair and one pair on the lobes, median notch very deep. Anterior margin

of coxa II with three oblique slit-like structures, adjacent to a broad protuberance with four or five enlarged granules. Base coxal endite II with a moderate depression each. Coxa IV 2.14 times longer than coxa II.

Chelicerae: Dorsal surface smooth, dentition of fixed and movable fingers as in typical vaejovids. Distal margin of manus with one median pair of macrosetae. Serrula with 13/13 tines.

Pedipalps: Trichobothrial pattern Type C, orthobothriotaxic. Chelae wider than patella and patella wider than femur. Femur: retro and prolateral intercarinal surfaces matte, dorsal and ventral with few scattered median moderate granules. Dorsal retrolateral, dorsal prolateral, and ventral prolateral carinae strongly granular, granules conical and enlarged, retrolateral dorsosubmedian with strong crenatoserrated and two minor macrosetae, prolateral ventrosubmedian strongly serrated with a proximal spiniform tubercle, lacking macrosetae, prolateral ventral vestigial, expressed by one lower proximal tubercle and adjacent setae, three to four moderate granules and two macrosetae distributed from the basal to the mid aspect of the segment, macrosetae minor, ventral median and retrolateral ventral vestigial expressed by scattered serrated granules, ventral retrosubmedian vestigial expressed by few scattered irregular serrated proximal granules.

Patella: All intercarinal surfaces matte. Carinae: Dorsal prolateral, dorsal retrolateral, ventral prolateral, and ventral retrosubmedian strongly granular; ventral median vestigial expressed as a basal short row of low granules; retrolateral dorsosubmedian and retrolateral median complete and moderately granular with irregular and scattered moderate and minute granules; prolateral median on a vaulted projection, extending from a proximal tubercle with a minor macroseta on top, and a row of serrated enlarged granules, becoming weaker and smaller

distally, extending to trichobothrium d_2 and one distal minor macrosetae; prolateral ventral obsolete expressed by two minor macrosetae, one basal and one distal.

Chelae: Pedipalp manus incrassate. Carinae: Dorsal prolateral, dorsal median, dorsal retrosubmedian accessory, and dorsal retrolateral carinae moderately granular; dorsal prosubmedian and prolateral dorsal vestigial expressed by scattered crenatoserrations flanking dorsal lateral carina; retrolateral median moderately granular; retrolateral subventral accessory and retrolateral subventral vestigial expressed by few minute distal granulation; ventral retrolateral strongly granular and partial, ending right before retrolateral subventral starts, but never connected; ventral prosubmedian moderately crenulated and ventral median vestigial expressed proximally as irregular row of crenulations fusing medially with ventral prosubmedian; ventral prolateral and prolateral median moderately crenatoserrated and parallel. Trichobothria *Dt* and *Db* dorsal to dorsal retrolateral carinae. Trichobothrium *Dt* positioned at mid manus.

Fingers: Fixed finger dentition: PD = 6, RD = 6, MD rows = 6, all denticles subserrate, retrolateral denticles comparatively smaller than prolateral denticles. Movable finger PD = 7, RD = 7, MD rows = 7, distal row with one denticle, prolateral and retrolateral denticles subpaired. Trichobothrium *ib* and *it* positioned between PD6 and PD7, PD7 lacking granule. Fingers lacking scalloped. Gap created when fingers close small.

Legs: Spinules: Basitarsi I–II with prolateral ventral and retrolateral ventral carinae with complete rows of spinules; prolateral ventral in III vestigial with a distal few spinules, in IV absent; retrolateral ventral in III complete, in IV absent; retrolateral median rows in I–IV vestigial expressed as few terminal spinules. Retrolateral dorsal in I−IV partial expressed on the distal third, prolateral ventral absent in I–IV. Telotarsi I–IV with two pairs of ventrodistal

spinules in I–IV. Setae: Prolateral ventral 3:3:3:3, being medians stout; retrolateral ventral 3:7:7:7, retrolateral dorsal 2:3:3:3; dorsal 3:3:3:3, retrolateral dorsal and dorsal series arranged in two independent rows.

Tergites: Pretergites matte, posttergites with scattered moderate and coarse conical granules. Dorsal median and dorsal submedian carinae strong with a short row of distal crenatoserrations on proximal half. Tergite VII with intercarinal surfaces scattered with serrated granules. Dorsal median carina partial and strong expressed on proximal half, strongly costate and irregular serrations. Dorsal submedian vestigial expressed as a pair of distal irregular row of serrations strongly costated. Dorsal lateral and lateral supramedian comparatively stronger than prior carinae, proximal extreme with an enlarged spiniform tubercle projecting backwards, Dorsal lateral projecting and curving laterally almost reaching lateral supramedian distal margin, creating a semi ring of strong serrated granulation.

Genital operculum: Male genital operculum: wider than long, with three pairs of macrosetae. Sclerites free on longitudinal edge moving independently but unable to open more than 45°. Genital papillae protrude posteriorly. Female genital operculum: Wider than long, with three macrosetae. Sclerites fuse longitudinal.

Sternites: Sternites III–VI with all carinae obsolete and surface matte, V in ♂ with distomedian glandular spot moderate, protrude slightly from adjacent surfaces, in ♀ absent. Sternite VII with ventral lateral carinae moderately crenatoserrated; ventral submedian carinae obsolete expressed by three minor macrosetae. Distomedian glandular spot strongly developed shaped as truncated triangle, Spiracle elongated, slit-like, approximately two times longer than wide.

Pectines: Pectines in ♂ longer than distal margin of coxa VI, in ♀ at the level of distal margin of coxa VI. Basal piece in ♂ with one macrosetae, in ♀ with three pairs of macrosetae. Marginal lamella consist of three sclerites, medial lamella proximally fuse distally progressively forming conspicuous 10 beads. Fulcra with 16–18 in ♂ and 14–16 beads in ♀. Pectinal tooth count 17–19 in ♂and 15–17 in ♀.

Hemispermatophore: Lamina 1.80 longer than trunk. Dorsal through margin long, narrow, curving proximally, and removed from ventral trough. Hemimating plug developed from the inner lobe, distal barb margin with 12 elongated spinules. Primary and secondary hook positioned on the apex of lateral margin extension of the lamina (flange). Both hooks rounded low, separated slightly, forming a shallow notch. Median lobe ental terminus moderate and rounded. Basal plate of inner lobe adjacent to ventral trough. Spine of inner lobe moderate, secondary spine on ventromedian aspect of neck shorter. Neck relatively short (0.50 times longer than basal plate). Measurements, lamina 2.70; trunk, 1.50; dorsal trough/laminar hooks, 0.90; ventral trough/laminar hook, 0.48; neck, 0.24; basal plate, 0.48.

Metasoma: All intercarinal surfaces matter, except ventral surface of metasomal segment I–V with scattered moderate granules. Dorsal lateral carinae of metasomal segments I–V and lateral median carinae of segments I–III strongly serrated, proximally end with an elongated spiniform tubercle pointing backwards, except in V. Lateral median in IV proximal terminus moderately expanded or flared. Lateral inframedian in I complete serrated, in II irregularly serrated expressed in proximal third, in III comparatively weaker serrated expressed in proximal fourth, in IV absent, in V partial, moderately crenatoserrated and expressed in distal half. Ventral lateral I–V, ventral submedian I–IV and ventral median in V strongly costated and finely crenatoserrated. Setae: in ♀ dorsal lateral, 0:0:1:1:2, lateral median, 0:1:1:2, lateral inframedian,

0:0:0:0:2, ventral lateral, 2:2:2:2:4, ventral submedian, 2:2:3:3, ventral sublateral, 2; all carinae minor, in ♂ all macrosetae absent or reduced to microsetae.

Telson: Ventral and dorsal surfaces smooth, tree pairs of macrosetae per carinae situated distally in ventral submedian and ventral lateral carinae, in lateral carinae distributed equidistant, in both sexes. Laterobasal microserration of aculeus 3–6 sharp tines. Subaculear tubercle absent. Vesicle 1.66 times longer than aculeus in ♂, 1.22 in ♀.

DISTRIBUTION: This species is endemic to the mountainous area from San Isidro-La Purísima to Loreto, in the foothills of Sierra de la Giganta.

ECOLOGY: *Kochius bruneus* is adapted to volcanic soils, predominantly of extrusive origin, where a mix of rocks, gravel, and fine textured volcanic ash has accumulated. All the specimens were collected using ultraviolet light at night. According to Williams (1970c), this species is a burrower, but its weak leg armature lacks the usual stout spiniform macrosetae that burrowers possess, so instead it seems that *K. bruneus* is a lapidicolous species. Williams (1980) presumed that the dark coloration of this species is an adaptation to dark volcanic habitats. It is common in more mesic environments found in canyons of the main drainages of this volcanic mountain range. According to Jiménez-Jiménez and Palacios-Cardiel (2010) this species and *K. villosus* (identified as *Vaejovis bruneus loretoensis* by those authors) are the most abundant species and more commonly found in mesic habitats within a community of 13 species.

REMARKS: After the publication of this species, Williams deposited one ♂ and one ♀ paratypes in the AMNH and CNAN collections from 5–10 mi SW San Miguel de Comondú. Williams (1980) extended the original distribution of this species from San Ignacio to 82 km N El Crucero [Ciudad Constitución], in Baja California Sur. Recent collection events in the vicinities of San Ignacio and north of Ciudad Constitución, failed to generate material of this

species. Further collection and revision of Williams' material may confirm the restricted distribution proposed here.

MATERIAL EXAMINED: **MEXICO: Baja California Sur:** *Municipio de Comondú*: San José Comondú, [25°59'59.57"N 111°59'59.75"W], 15.ii.1966, V. Roth, 1 ♀ (AMNH); San José de Comondú, 26°03.542'N 111°48.985'W, 293 m, 7.vii.2005, L. Prendini, R. Mercurio, E. González, and W.E. Savary, collected at night with UV light, 1 ♀ (AMNH [LP 4543]); San José de Comondú, 30 km N, between Rosarito and San Isidro, 26°21.252'N 111°50.109'W, 258 m, 27.vi.2008, H. Montaño and E. González, bottom of a canyon, sandy area, collected at night with UV light, 1 ♂ (AMNH [LP 8794]), desert, collected at night with UV light, 9 ♂, 2 ♀ (AMNH [ARA2854]), 10 ♂, 2 ♀ (IBUNAM [ARA2250]); San José de Comondú, 9 km NW, Cerro el Pabellón, 26°05.949'N 111°53.688'W, 742 m, 9.vii.2008, H. Montaño and E. González, basalt rocks, collected at night with UV light, 1 ♂ (AMNH [LP 8823]), 1 juv. (AMNH [LP 8824]); San Miguel de Comondú, 26°2'26.7"N 111°49'55.3"W, 220 m, 12.vii.2004, E. González, O. Francke, W.E. Savary, and A. Valdez, collected at night with UV light, 22 ♂, 10 ♀, 4 juv. (AMNH); San Miguel de Comondú, 2 km SW, 26°0.3'N 111°52.0164'W, 169 m, 12.vii.2004, desert, collected at night with UV light, 6 ♂, 1 ♀, 1 juv. (AMNH [ARA1494]), 4 ♂, 1 subad. ♀ (AMNH [ARA1527]), 5 ♂, 1 ♀, 5 subad. ♂ (IBUNAM [ARA2069]), 26°0'18.5"N 111°52'1.3"W, collected at night with UV light, 18 ♂, 2 ♀, 4 juv. (AMNH), 26°01'48.3"N 111°50'57"W, 199 m, 12.vii.2004, collected at night with UV light, 2 juv. (AMNH [LP 3153]), E. González, O. Francke, W.E. Savary, and A. Valdez. *Municipio de Loreto*: Loreto, 13 km W to San Javier, provisional dirty road, 25°59.733'N 111°25.116'W, 176 m, 26.vi.2008, H. Montaño and E. González, arroyo wash, sandy area, collected at night with UV light, 1 ♂ (AMNH [LP 8787]); Loreto, 15 km W, 25°58'38.5"N 111°27'53.1"W, 213 m, 13.vii.2004, O. Francke, W.E. Savary,

E. González and A. Valdez, collected at night with UV light, 2 ♂, 1 juv. (AMNH [LP 3154]); Loreto, 25 km S, on gravel road just off Route 1, 25°48.666'N 111°19.266'W, 6 m, 7.vii.2005, E. González, W.E. Savary, L. Prendini and R. Mercurio, collected at night with UV light, 1 ♂ (AMNH [LP 4556]); Loreto, ca. 3 km S along gravel road to San Javier, from junction with Route 1, [25°59'48.14"N 111°23'3.88"W], 38 m, 8.vii.2005, E. González, R. Mercurio, W.E. Savary, and L. Prendini, collected at night with UV light, 1 ♂ (AMNH [LP 4555]); Loreto, ca. 8 km S along gravel road to San Javier, from junction with Route 1, [25°59'48.97"N 111°23'21.43"W], 120 m, 8.vii.2005, L. Prendini, E. González, R. Mercurio, and W.E. Savary, collected at night with UV light, 1 ♂ (AMNH [LP 4547]).

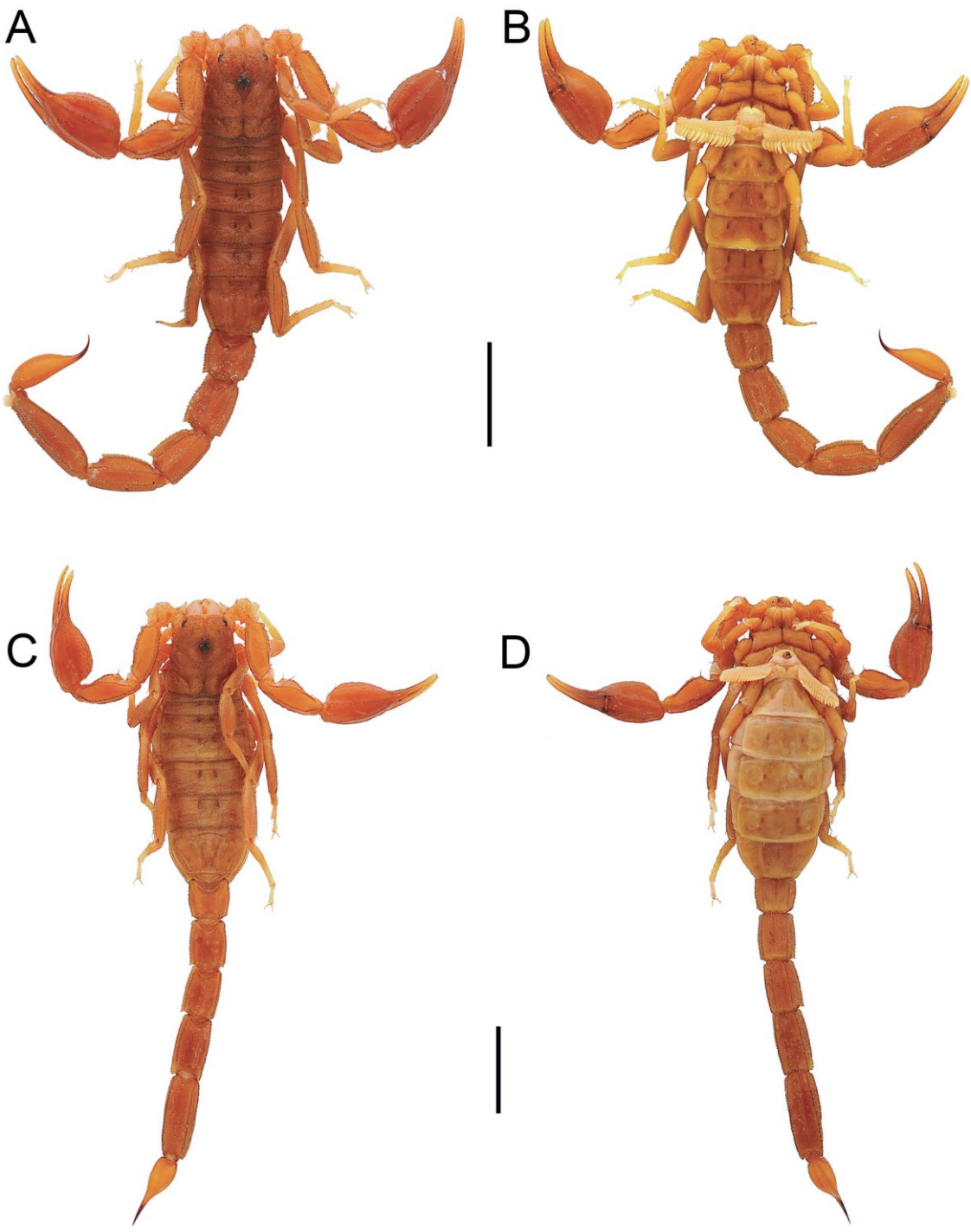


Figure 151. *Kochius bruneus* (Williams, 1971), habitus. **A**, **B**. ♂ (AMNH). **C**, **D**. ♀ (AMNH). **A**, **C**. Dorsal aspect. **B**, **D**. Ventral aspect. Scale bars = 5 mm.

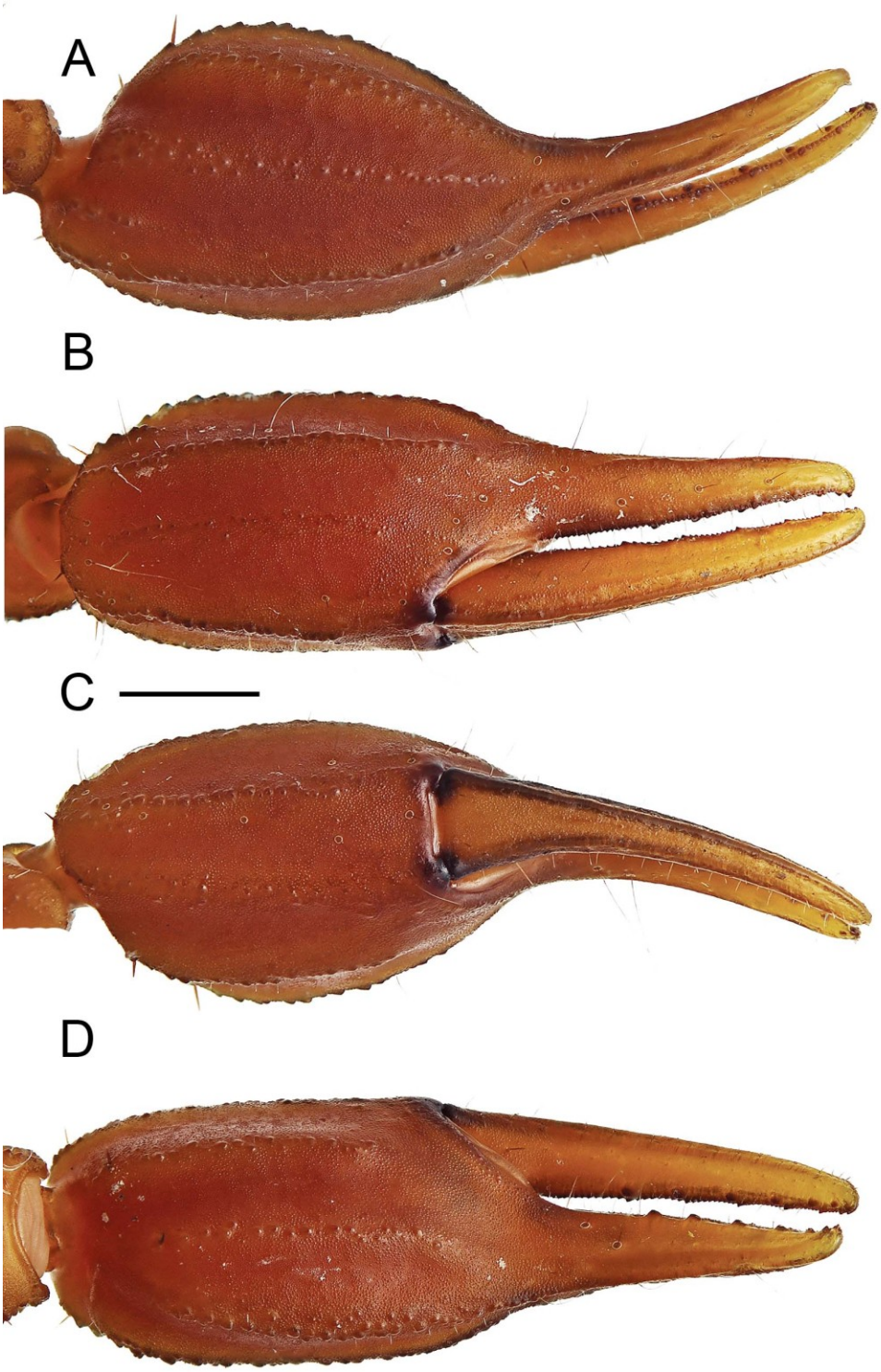


Figure 152. *Kochius bruneus* (Williams, 1971), ♂ (AMNH), dextral pedipalp chela. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

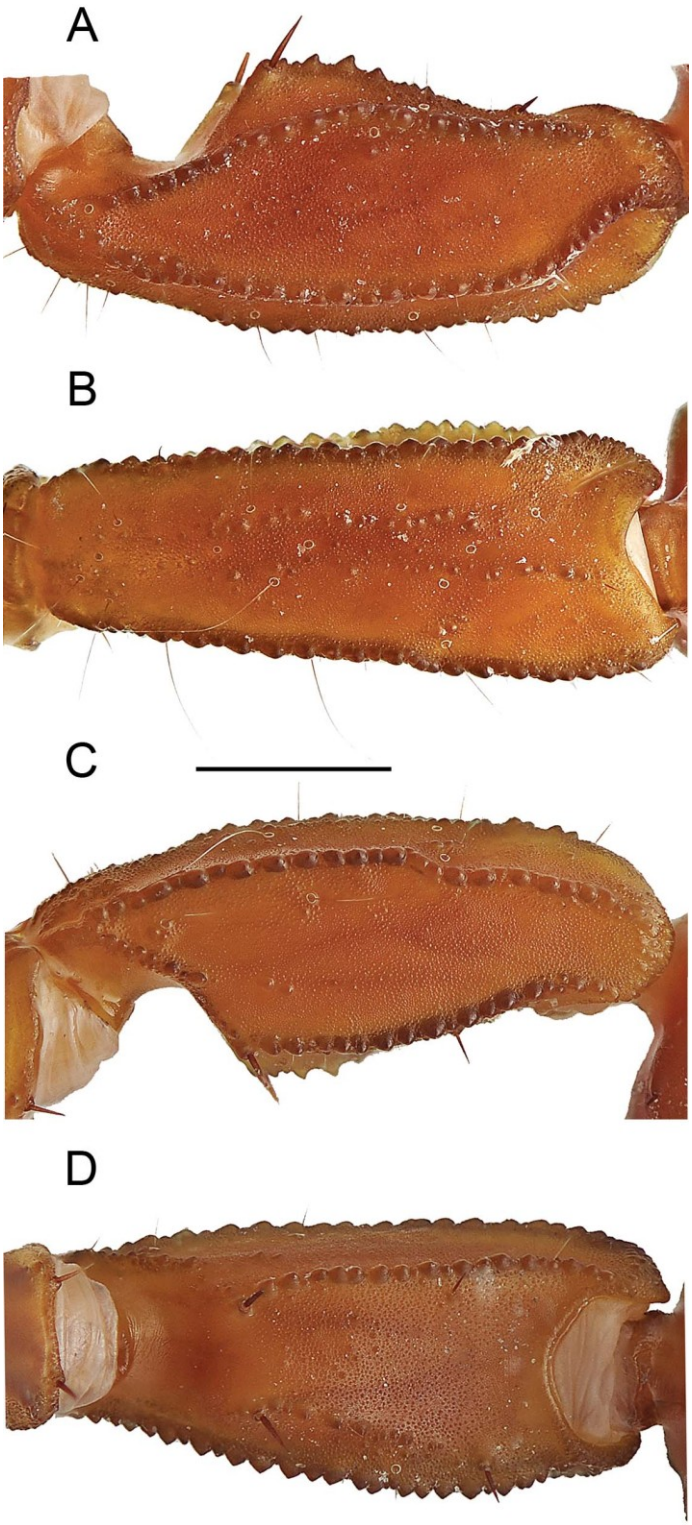


Figure 153. *Kochius bruneus* (Williams, 1971), ♂ (AMNH), dextral pedipalp patella. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

Kochius catavina, **n. sp.**

Figures 144, 155–156, 193C, 199C, 205C, 209C, 213C, 217C, 220C; Table 13

TYPE MATERIAL: **MEXICO: Baja California:** *Municipio de Ensenada*: Holotype ♂ Cataviña, 1–2 km S, Hotel Desert Inn (former Hotel La Pinta), Blue Palm Canyon [La Bocana canyon], 556 m, 2.vii.2008, desert, collected at night with UV light, H. Montaño and E. González. Paratype: 1 ♂ (AMNH), Punta Prieta, 24 km W, [29°15.1158'N 114°10.0998'W], 2.i.1980, N.V. Horner, under stones.

ETYMOLOGY: The specific name *catavina* refers to the type locality Cataviña, an emblematic site in the Central Desert of Baja California Peninsula. The name is a noun in apposition.

DIAGNOSIS: *Kochius catavina*, **n. sp.** is closely related to *K. moosni*, **n. sp.** and *K. maroma*, **n. sp.** with which forms a monophyletic group. The scheme of relation obtained from the phylogenetic analyses conducted earlier is as follow: (*K. catavina* (*K. moosni* + *K. maroma*)). *K. catavina*, **n. sp.** may be separated from these species by having relatively hirsute ventral surface of the telson, with seven to nine major macrosetae in each carinae, restricted to distal surface, instead of having relatively bald surface, with three to five minor macrosetae. *K. catavina*, **n. sp.** has five retrolateral denticles and five median denticles on pedipalp fixed finger, instead of having six retrolateral denticles and six median rows. From *K. maroma*, **n. sp.** differs by having metasomal segment I as long as wide, instead of having it wider than long, and by having base color pale yellow, instead of having base color brownish to orange. Whereas *K. catavina*, **n. sp.** has distomedian glandular spot of sternite VII shaped as a truncated triangle, *K. maroma*, **n. sp.** has distomedian glandular spot piriform. From *K. moosni*, **n. sp.** differs by

having higher pectinal counts: 18 in ♂, in *K. moosni*, **n. sp.** 15–17 in ♂. *Kochius catavina*, **n. sp.** has ventral surface of metasomal segment V weakly granular with minute granules, but *K. moosni*, **n. sp.** has that surface moderately granular with moderately enlarge conical granules.

DESCRIPTION: The following description is based on the paratypes and the specimens listed in material examined.

Color and infuscation (in alcohol): Base color of chelicerae, carapace, tergites, legs, metasoma, coxal region, sternites, and telson homogeneously from medium brown to golden-yellowish, lacking infuscation. Pectines pale whitish. Aculeus base reddish turning brownish-red distally.

Carapace: Carapace anterior margin emarginated with a moderate median notch and three pairs of minor macrosetae. Surface completely shagreened with scattered moderate and minute granules. Anteromedian, posteromedian, and posterolateral sulci deep, posterior transverse obsolete. Ocular tubercle moderately raised, superciliary carina granular higher than ocular tubercle. Median eyes approximately double size of lateral frontal pair. Three lateral eyes, two frontal pairs same size and posterior reduced approximately in half.

Sternum and coxal region: Sternum pentagonal subequilateral with three pairs of setae, one distal, one median pair and one pair on the lobes, median notch deep. Anterior margin of coxa II with three oblique slit-like structures, adjacent to a moderate protuberance with fine granulation enlarged granules. Base coxal endite II with a moderate depression each. Coxa IV 2.14 times longer than coxa II.

Chelicerae: Dorsal surface smooth, dentition of fixed and movable fingers as in typical vaejovids. Distal margin of manus with one median macrosetae. Serrula with 14/14 tines.

Pedipalps: Trichobothrial pattern Type C, orthobothriotaxic. Chela wider than patella and patella wider than femur. Femur: retro and prolateral intercarinal surfaces matte, dorsal and ventral with few scattered median moderate granules. Dorsal retrolateral, dorsal prolateral, and ventral prolateral carinae strongly granular, granules conical, sharp, and enlarged; retrolateral dorsosubmedian with strong crenatoserrated and two minor macrosetae, prolateral ventrosubmedian complete and strong, lacking macrosetae, with conical, sharp, and enlarged granules and a proximal spiniform tubercle, prolateral ventral vestigial, expressed by one lower proximal tubercle and adjacent setae, two to three moderate granules and two minor macrosetae distributed from the basal to the mid aspect of the segment; ventral median and retrolateral ventral vestigial expressed by scattered serrated granules, ventral retrosubmedian vestigial expressed by few scattered irregular serrated proximal granules.

Patella: All intercarinal surfaces matte. Carinae: dorsal prolateral, dorsal retrolateral, ventral prolateral, and ventral retrosubmedian strongly granular; ventral median vestigial expressed as a basal short row of low granules; retrolateral dorsosubmedian and retrolateral median complete and moderately granular with irregular and scattered moderate and minute granules; prolateral median on a vaulted projection, extending from a proximal tubercle with a minor macroseta on top, and a row of serrated enlarged granules, becoming weaker and smaller distally, extending to trichobothrium d_2 and one distal minor macrosetae; prolateral ventral obsolete expressed by two minor macrosetae, one basal and one distal.

Chelae: Pedipalp manus incrassate. Intercarinal surface matte. Carinae: Dorsal prolateral, dorsal median, dorsal retrosubmedian accessory, and dorsal retrolateral carinae moderately granular; dorsal prosubmedian and prolateral dorsal vestigial expressed by scattered crenatoserrations flanking dorsal lateral carina; retrolateral median moderately granular;

retrolateral subventral accessory and retrolateral subventral vestigial expressed by few minute distal granulation; ventral retrolateral strongly granular and partial, ending right before retrolateral subventral starts, but never connected; ventral prosubmedian moderately crenulated and ventral median vestigial expressed proximally as irregular row of crenulations fusing medially with ventral prosubmedian; ventral prolateral and prolateral median moderately crenatoserrated and parallel. Trichobothria *Dt* and *Db* dorsal to dorsal retrolateral carinae. Trichobothrium *Dt* positioned at mid manus.

Fingers: Fixed finger dentition: PD = 6, RD = 5, MD rows = 5, all denticles subserrate, retrolateral denticles comparatively smaller than prolateral denticles. Movable finger PD = 7, RD = 7, MD rows = 7, distal row with one denticle, prolateral and retrolateral denticles subpaired. Trichobothrium *ib* positioned between PD6 and PD7, PD7 lacking granule, and *it* positioned at the level of PD6. Fingers lacking scalloped. Gap created when fingers close vestigial.

Legs: Spinules: Basitarsi I–II with prolateral ventral and retrolateral ventral carinae with complete rows of spinules, in III the retrolateral ventral row expressed on distal half and prolateral ventral absent, in IV lacking spinules. Telotarsi I–IV with two pairs of ventrodistal spinules in I–IV. Retrolateral median rows in I–IV vestigial expressed as few terminal spinules. Retrolateral dorsal in I–III partial expressed on the distal third, in IV absent, prolateral ventral absent in I–IV. Setae: Prolateral ventral 3:4:5:5, being medians stout; retrolateral ventral 4:8:8:6, retrolateral dorsal 2:3:3:4 retrolateral ventral and retrolateral dorsal series arranged in two independent rows.

Tergites: Pretergites matte, posttergites with scattered moderate and coarse conical granules. Dorsal median and dorsal submedian carinae strong with a short row of distal crenatoserrations on proximal half. Tergite VII with intercarinal surfaces scattered with serrated

granules. Dorsal median carina partial and strong expressed on proximal half, strongly costate and irregular serrations. Dorsal submedian vestigial expressed as a pair of distal irregular row of serrations strongly costated. Dorsal lateral and lateral supramedian comparatively stronger than prior carinae, proximal extreme with an enlarged spiniform tubercle projecting backwards, Dorsal lateral projecting and curving laterally almost reaching lateral supramedian distal margin, creating a semi ring of strong serrated granulation.

Genital operculum: Male genital operculum: wider than long, with three pairs of macrosetae. Sclerites free on longitudinal edge moving independently but unable to open more than 45°. Genital papillae protrude posteriorly.

Sternites: Sternites III–VI with all carinae obsolete and surface punctuated, V in ♂ with distomedian glandular spot weak, not protruding from adjacent surfaces. Sternite VII with ventral lateral carinae moderately crenatoserrated and distomedian glandular spot moderate and broad, shaped as truncated triangle. Ventral submedian carinae obsolete expressed by three minor macrosetae. Spiracle elongated, slit-like, approximately two times longer than wide.

Pectines: Pectines in ♂ longer than distal margin of coxa VI. Basal piece in ♂ with three macrosetae. Marginal lamella consist of three sclerites, medial lamella proximally fuse distally progressively forming conspicuous 12 beads. Fulcra with 17 beads. Pectinal tooth count 18.

Hemispermatophore: Lamina 2.00 longer than trunk. Dorsal through margin long, narrow, curving proximally, and removed from ventral trough. Hemimating plug developed from the inner lobe, distal barb margin with 13 elongated spinules. Primary and secondary hook positioned on the apex of lateral margin extension of the lamina (flange). Both hooks rounded low, separated slightly, forming a shallow notch. Lateral margin of hooks broadened making the tip of the apex of lateral margin extension of the lamina broader than base. Median lobe ental

terminus moderate and rounded, with a moderate lobe on distal-ental margin. Basal plate of inner lobe removed from ventral trough. Spine of inner lobe moderate. Neck relatively short (0.44 times longer than basal plate). Measurements, lamina, 3.00; trunk, 1.50; dorsal trough/laminar hooks, 1.38; ventral trough/laminar hook, 0.96; neck, 0.24; basal plate, 0.54.

Metasoma: All intercarinal surfaces matter, except ventral surface of metasomal segment I–V with scattered moderate granules. Dorsal lateral carinae of metasomal segments I–V and lateral median carinae of segments I–III finely serrated, proximally end with an elongated spiniform tubercle pointing backwards, except in V. Lateral median in IV distal terminus moderately expanded or flared. Lateral inframedian in I complete serrated, in II irregularly serrated expressed in proximal third becoming weaker proximally, in III comparatively weaker serrated expressed in proximal fourth, in IV absent, in V partial, moderately crenatoserrated and expressed in distal half. Ventral lateral I–V, ventral submedian I–IV and ventral median in V finely crenatoserrated. Setae: in ♀ dorsal lateral, 0:0: 0:1:2, lateral median, 0:0:0:0, lateral inframedian, 0:0:0:0:0, ventral lateral, 2:2:2:2:4, ventral submedian, 3:3:3:3, ventral sublateral, 2; all carinae minor.

Telson: Ventral and dorsal surfaces smooth, nine to seven pairs of macrosetae in each carinae situated distally and additional macrosetae positioned in intercarinal surfaces. Laterobasal microserration of aculeus 6–9 sharp tines. Subaculear tubercle absent. Vesicle 1.2 times longer than aculeus in ♂.

DISTRIBUTION: *Kochius catavina*, **n. sp.** is endemic to the Central Desert of Baja California in the state of Baja California, Mexico.

ECOLOGY: *Kochius catavina*, **n. sp.** inhabits an area characterized by a landscape dominated by boulders and unique vegetation including several endemic cacti and the boojum

tree, *Fouqueria columnaris* Kellogg. The type of soil where the specimens were collected had a mix of compacted sand and gravel with an average of 500 m altitude.

MATERIAL EXAMINED: **MEXICO: Baja California:** *Municipio de Ensenada*: Cataviña, 1–2 km S, Hotel Desert Inn (former Hotel La Pinta), Blue Palm Canyon [La Bocana canyon], 556 m, 2.vii.2008, 29°43.664'N 114°43.114'W, sand banks, 1 ♂ (AMNH [LP 8825]), 29°43.6638'N 114°43.1136'W, desert, collected at night with UV light, H. Montaño and E. González.

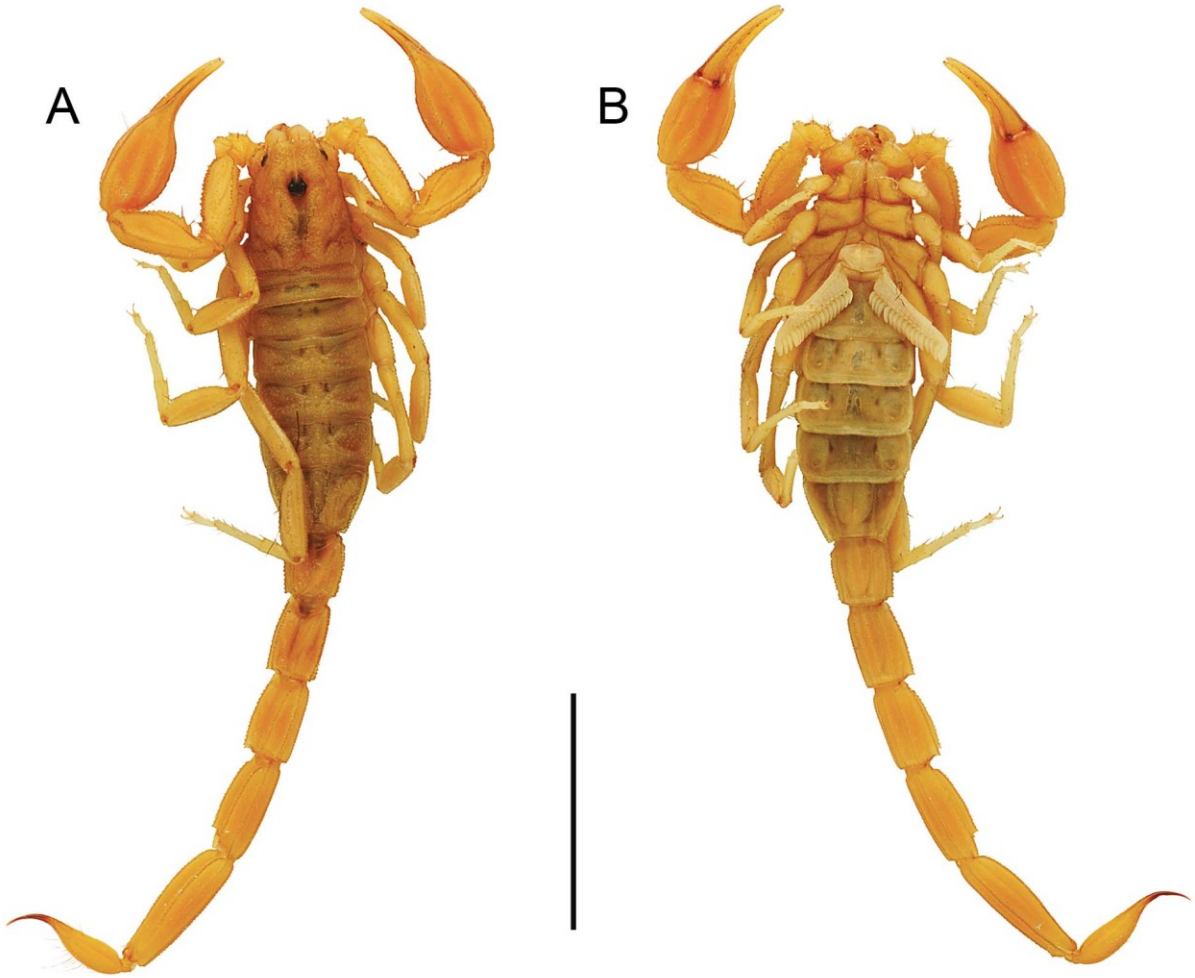


Figure 154. *Kochius catavina*, **n. sp.**, paratype ♂ (AMNH), habitus. **A**. Dorsal aspect. **B**. Ventral aspect. Scale bars = 5 mm.

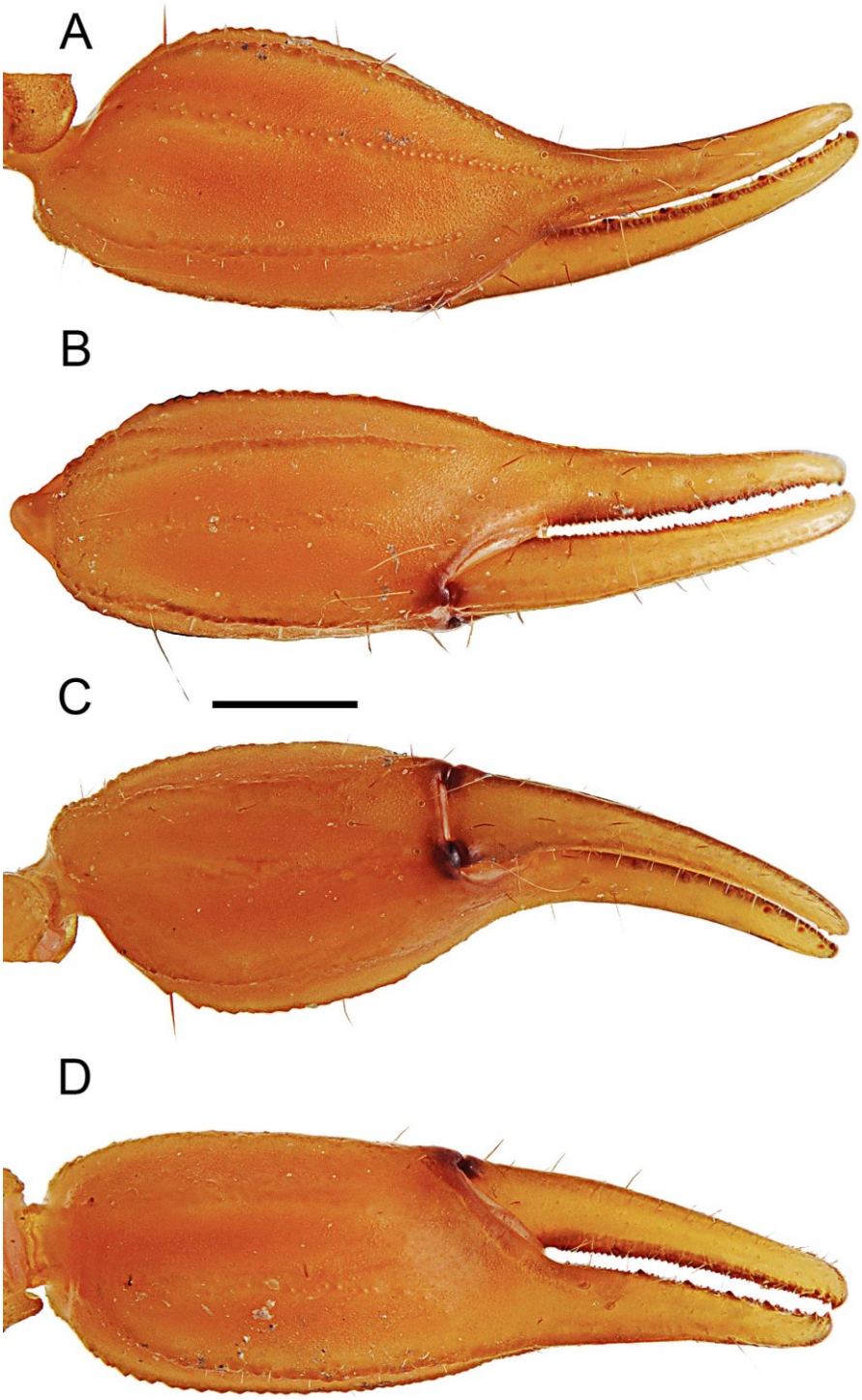


Figure 155. *Kochius catavina*, **n. sp.**, paratype ♂ (AMNH), dextral pedipalp chela. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

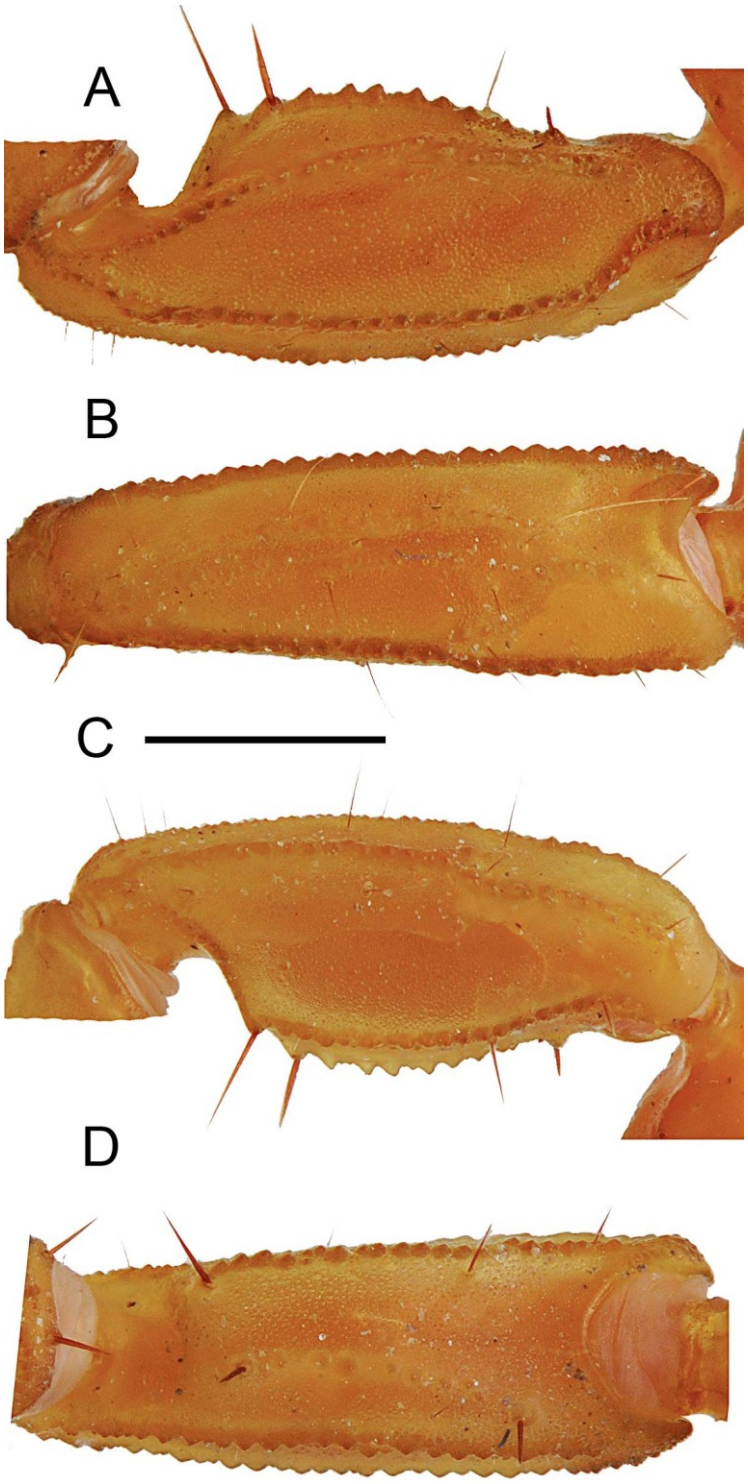


Figure 156. *Kochius catavina*, **n. sp.**, paratype ♂ (AMNH), dextral pedipalp patella. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

Kochius cerralvensis (Williams, 1971)

Figures 145, 157–159, 193D, 199B, 205D, 209D, 213D, 217D, 220D

Vaejovis punctipalpi cerralvensis Williams, 1971a: 47; Díaz-Nájera, 1975: 7, 16; Williams, 1980: 53, 88, fig. 88; Kovařík, 1998: 148; Beutelspacher, 2000: 103, 138, 154, map 86; Sissom, 2000: 550, 551.

Kochius punctipalpi cerralvensis: Soleglad and Fet, 2008: 92.

TYPE MATERIAL: **MEXICO: Baja California Sur:** *Municipio de La Paz*: Holotype ♂ (CAS, Type No. 11470), Cerralvo Island, Bahía Limona, 31.v.1969, S.C. Williams. Paratypes: 12 ♂, 8 ♀ (CAS, including ♀ allotype), same locality as holotype; 1 ♂ (CAS), Cerralvo Island, SW end of Island; 8 ♂, 6 ♀ (CAS), Cerralvo Island, Piedras Gordas.

DIAGNOSIS: *Kochius cerralvensis* is closely related to *K. barbatus*, *K. magdalensis* and *K. punctipalpi*, with which forms a monophyletic group (see *K. barbatus* for details). These species can be separated from the other species in the genus by having the proximal notch and median lobe of chela fixed and movable fingers moderately to strongly developed in ♂ and moderate in ♀, and chela finger closure with distinct gap, fingers fit unevenly in ♂; instead of having proximal notch and median lobe of chela fixed and movable fingers absent in ♂ and in ♀, and chela finger closure lacking gap, fingers fit evenly in ♂ and in ♀. *K. cerralvensis* may be distinguished from *K. barbatus* and *K. magdalensis* by having proximal notch and median lobe of chela fixed and movable fingers strong in ♂, and chela finger closure with distinct gap in ♀, instead of having proximal notch and median lobe moderate, and chela finger closure lacking gap in ♀. From *K. magdalensis* and *K. punctipalpi* differs by having telson hirsute, with three to seven major macrosetae in each carina in both sexes, instead of having telson relatively bald,

with two or three minor macrosetae in both sexes. From *K. barbatus* and *K. punctipalpi* differs by having aculeus relatively short instead of having aculeus relatively elongated.

DESCRIPTION: The following supplements Williams' (1971a) original description. It based on the paratype and the specimens listed in material examined.

Color and infuscation (in alcohol): Base color of chelicerae, carapace, tergites, legs, metasoma, coxal region, sternites, and telson homogeneously ferruginous to light brown, lacking infuscation. Pectines pale whitish. Aculeus base reddish turning dark brown.

Carapace: Carapace anterior margin emarginated with a moderate median notch and three pairs of minor macrosetae. Surface completely shagreened with scattered moderate and minute granules. Anteromedian, posteromedian, and posterolateral sulci broad and deep, posterior transverse obsolete. Ocular tubercle raised, superciliary carina finely granular higher than ocular tubercle. Median eyes approximately one and a half the size of lateral frontal pair. Three lateral eyes, two frontal pairs same size and posterior reduced approximately in half.

Sternum and coxal region: Sternum pentagonal subequilateral with three pairs of setae, one distal, one median pair and one pair on the lobes, median notch deep. Anterior margin of coxa II with three oblique slit-like structures, adjacent to a moderate protuberance with three or four fine granules. Base coxal endite II with a deep broad depression each. Coxa IV 2.22 times longer than coxa II.

Chelicerae: Dorsal surface smooth, dentition of fixed and movable fingers as in typical vaejovids. Distal margin of manus with one median macrosetae. Serrula with 16/15 tines.

Pedipalps: Trichobothrial pattern Type C, orthobothriotaxic. Chelae wider than patella and patella wider than femur. Femur: retro and prolateral intercarinal surfaces matte, dorsal and shagreened, with moderately dense median large granules, ventral surface moderately cover with

scattered moderate granules. Dorsal retrolateral, dorsal prolateral, and ventral prolateral carinae strongly granular, granules conical, sharp, and enlarged; retrolateral dorsosubmedian strongly crenatoserrated with two major macrosetae, prolateral ventrosubmedian complete and strong, with one median minor macrosetae, a proximal large spiniform tubercle followed by conical, sharp, and enlarged granules; prolateral ventral vestigial, expressed on proximal half by one proximal large spiniform tubercle with a major macroseta at base, an two moderate granules, each with a major macroseta at base; ventral median expressed by a row of serrated granules; retrolateral ventral vestigial, expressed by scattered serrated granules; ventral retrosubmedian vestigial expressed by few scattered irregular large serrated proximal granules.

Patella: All intercarinal surfaces matte. Carinae: Dorsal prolateral, dorsal retrolateral, ventral prolateral, and ventral retrosubmedian strong with large conical granules; ventral median vestigial expressed as a basal short row of enlarged granules; retrolateral dorsosubmedian and retrolateral median complete and moderately granular with irregular and scattered moderate and minute granules; prolateral median on a vaulted projection, extending from a proximal tubercle with a major macroseta on top, and three or four serrated moderate granules, becoming weaker and smaller distally only on proximal half, second half lacking ornamentation, the end of second half marked by a distal major macrosetae, trichobothrium d_2 positioned beyond the row of granules; prolateral ventral obsolete expressed by two major macrosetae, one basal and one distal.

Chelae: Pedipalp manus incrassate. Intercarinal surface matte. Carinae: Dorsal prolateral, dorsal median, dorsal retrosubmedian accessory, and dorsal retrolateral carinae moderately granular. Dorsal prosubmedian and prolateral dorsal vestigial expressed by scattered crenatoserrations flanking dorsal lateral carina medially. Retrolateral median moderately

granular. Retrolateral subventral accessory and retrolateral subventral vestigial expressed by few minute distal granulation. Ventral retrolateral strongly granular and partial, ending right before retrolateral subventral starts, but never connected. Ventral prosubmedian moderately crenulated and strongly costated; ventral median vestigial expressed proximally as irregular row of crenulations fusing medially with ventral prosubmedian. Ventral prolateral and prolateral median weakly crenatoserrated, strongly costated and parallel. Prolateral median curving dorsally almost fusing with dorsal prolateral. Trichobothria *Dt* and *Db* dorsal to dorsal retrolateral carinae. Trichobothrium *Db* positioned subbasal on dorsal surface and *Dt* positioned at mid manus.

Fingers: Fixed finger dentition: PD = 6, RD = 5, MD rows = 5, all denticles subserrate, retrolateral denticles comparatively smaller than prolateral denticles. Movable finger PD = 7, RD = 6, MD rows = 6, distal row with one denticle, prolateral and retrolateral denticles subpaired. Trichobothrium *ib* positioned between PD6 and PD7, PD7 lacking granule, and *it* positioned at the level of PD6. Fingers strongly scalloped, basal notch and median lobe of pedipalp fixed finger strong, basal notch and median lobe of movable finger moderate, gap created when fingers close strong.

Legs: Spinules: Basitarsi I–II with prolateral ventral and retrolateral ventral carinae with complete rows of spinules, in III the retrolateral ventral row complete and prolateral ventral expressed on distal half, in IV lacking spinules. Telotarsi I–IV with two pairs of ventrodistal spinules. Retrolateral median rows in I–IV vestigial expressed as few terminal spinules. Retrolateral dorsal in I–III partial expressed on the distal third, in IV absent, prolateral ventral absent in I–IV. Setae: Prolateral ventral 3:4:5:5, being medians two or three stout; retrolateral ventral 4:8:8:7, retrolateral dorsal 3:3:3:4; dorsal 3:3:3:3 retrolateral dorsal and dorsal series arranged in two independent rows.

Tergites: Pretergites matte, posttergites with scattered moderate and coarse conical granules. Dorsal median and dorsal submedian carinae strong with a short row of distal crenatoserrations on proximal half. Tergite VII with intercarinal surfaces scattered with moderate and minute granules. Dorsal median carina partial and strong expressed on proximal half, strongly costate and irregular strong serrations. Dorsal submedian vestigial expressed as a pair of distal irregular row of crenatoserrations strongly costated. Dorsal lateral and lateral supramedian strong, distal extreme with an enlarged spiniform tubercle projecting backwards. Dorsal lateral projecting and curving laterally almost reaching lateral supramedian distal margin, creating a semi ring of strong serrated granulation.

Genital operculum: Male genital operculum: wider than long, with two pairs of macrosetae. Sclerites free on longitudinal edge moving independently but unable to open more than 45°. Genital papillae protrude posteriorly.

Sternites: Sternites III–VI with all carinae obsolete and surface matte in ♂, punctuated in ♀, V with distomedian glandular spot weak in ♂, vestigial in ♀. Sternite VII with ventral lateral carinae strongly crenatoserrated and distomedian glandular spot strong, shaped as truncated triangle in ♂, moderate in ♀. Ventral submedian carinae vestigial with three minor macrosetae. Spiracle elongated, slit-like, approximately two times longer than wide.

Pectines: Pectines longer than distal margin of coxa VI in ♂, as long or slightly longer than coxa VI in ♀. Basal piece with two macrosetae. Marginal lamella consist of three sclerites, medial lamella proximally fuse distally progressively forming conspicuous 10–12 beads. Fulcra with 16–19 in ♂, 15–17 in ♀. Pectinal tooth count 17–20 in ♂, 16–18 in ♀.

Hemispermatophore: Lamina 3.6 longer than trunk. Dorsal through margin long, narrow, curving proximally, and removed from ventral trough. Hemimating plug developed from the

inner lobe, distal barb margin with 7 elongated spinules. Primary and secondary hook positioned on the apex of lateral margin extension of the lamina (flange). Both hooks rounded low, separated slightly, forming a shallow notch. Median lobe ental terminus moderate and rounded. Basal plate of inner lobe removed from ventral trough. Spine of inner lobe relatively long and strongly sclerotized. Neck moderate (0.70 times longer than basal plate). Measurements, lamina, 3.60; trunk, 2.16; dorsal trough/laminar hooks, 1.2; ventral trough/laminar hook, 0.90; neck, 0.42; basal plate, 0.60.

Metasoma: All intercarinal surfaces matter, except dorsal surface of metasomal segment I–IV with scattered moderate granules. Dorsal lateral carinae of metasomal segments I–V and lateral median carinae of segments I–IV moderately crenatoserrated, distal end with an elongated spiniform tubercle pointing backwards, except dorsal lateral in V and lateral median in IV. Lateral median in IV distal terminus moderately expanded or flared. Lateral inframedian in I complete serrated, in II irregularly serrated expressed in proximal half becoming weaker proximally, in III comparatively weaker serrated expressed in proximal third, in IV absent, in V partial, moderately crenatoserrated and expressed in distal half. Ventral lateral I–V, ventral submedian I–IV and ventral median in V finely crenatoserrated. Setae: dorsal lateral, 0:1:2:2:4, lateral median, 0:1:1:2, lateral inframedian, 2:2:2:3:2, ventral lateral, 3:3:3:3:7, ventral submedian, 3:3:3:3, ventral sublateral, 2; all carinae mayor.

Telson: Ventral and dorsal surfaces smooth, five to seven pairs of macrosetae per carinae situated medially in both sex. Laterobasal microserration of aculeus 5–7 sharp tines. Subaculear tubercle absent. Vesicle 1.45 times longer than aculeus in ♂, 1.27 in ♀.

DISTRIBUTION: *Kochius cerralvensis* is endemic to the Cerralvo Island in the Sea of Cortéz, Baja California Sur, Mexico.

ECOLOGY: *Kohius cerralvensis* was collected in an area covered by scattered vegetation with columnar cacti and typical adapted-vegetation of the La Paz Area. The type of soil was compacted gravel with scattered rocks surrounded by granitic outcrops. The area was a few meters above sea level up to approximately 50 m altitude.

REMARKS: *Kochius cerralvensis* originally was a subspecies of *K. punctipalpi* (Williams, 1971c). Here it is recognized as a valid species based on the separated relationships between these taxa retrieved in the phylogenetic analyses.

MATERIAL EXAMINED: **MEXICO: Baja California Sur:** *Municipio de La Paz*: Cerralvo Island, SW side, 24°10.9332'N 109°53.2332'W, 0–50 m, 27.v.2008, E. González and I.G. Nieto, desert, collected at night with UV light, 1 ♂ (AMNH [LP 8779]), 13 ♂, 1 ♀, 1 juv. (AMNH [ARA2880]), 14 ♂, 1 ♀ (IBUNAM [ARA 2261]); Cerralvo Island, Piedras Gordas, 17.v.1970, S.C. Williams and V.F. Lee, 2 ♂ (AMNH); Cerralvo Island, 6.vi.1921, 2 ♀ (AMNH).

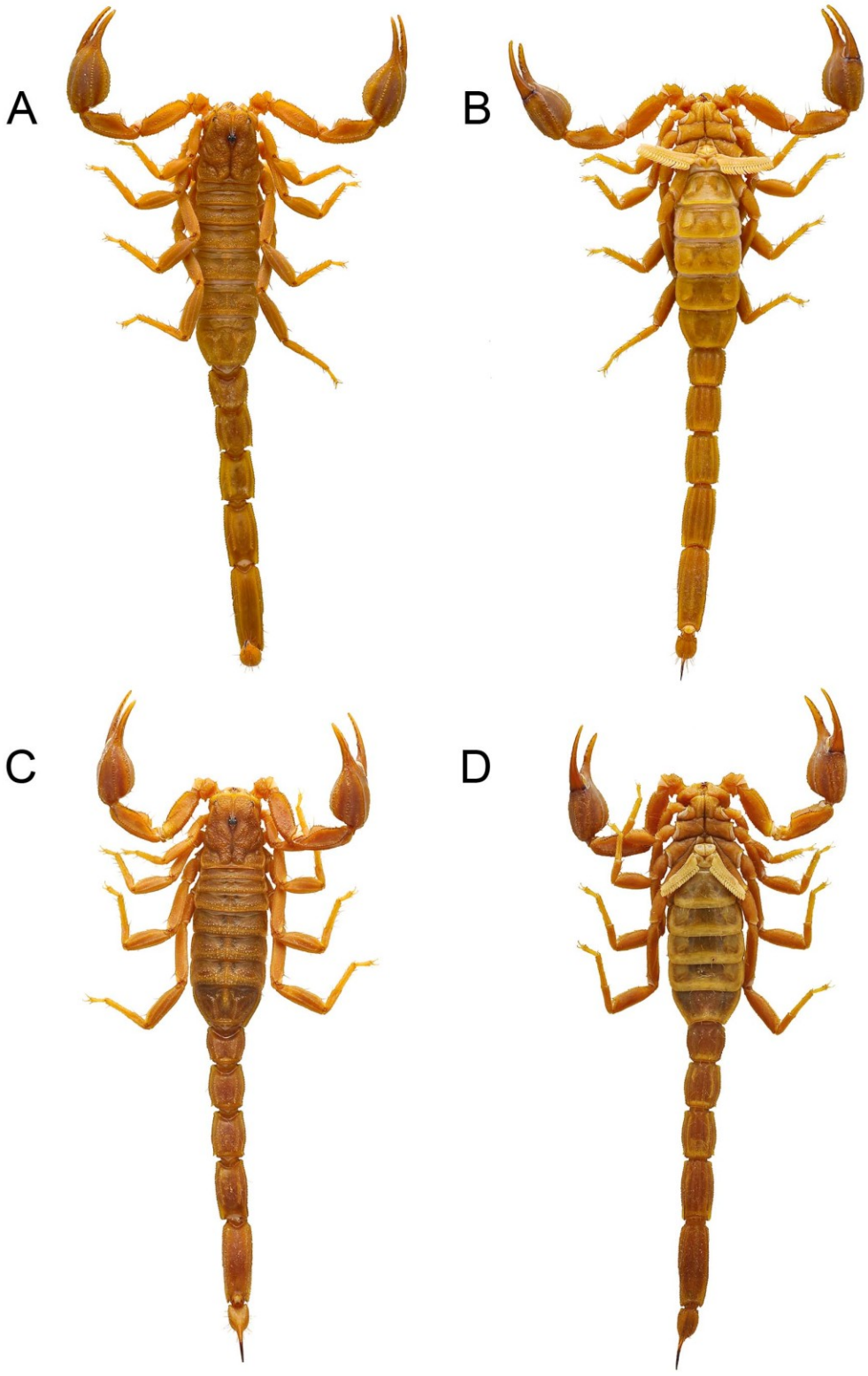


Figure 157. *Kochius cerralvensis* (Williams, 1971), **n. stat.**, habitus. **A**, **B**. Paratype ♂ (AMNH). **C**, **D**. ♀ (AMNH). **A**, **C**. Dorsal aspect. **B**, **D**. Ventral aspect. Scale bars = 5 mm.

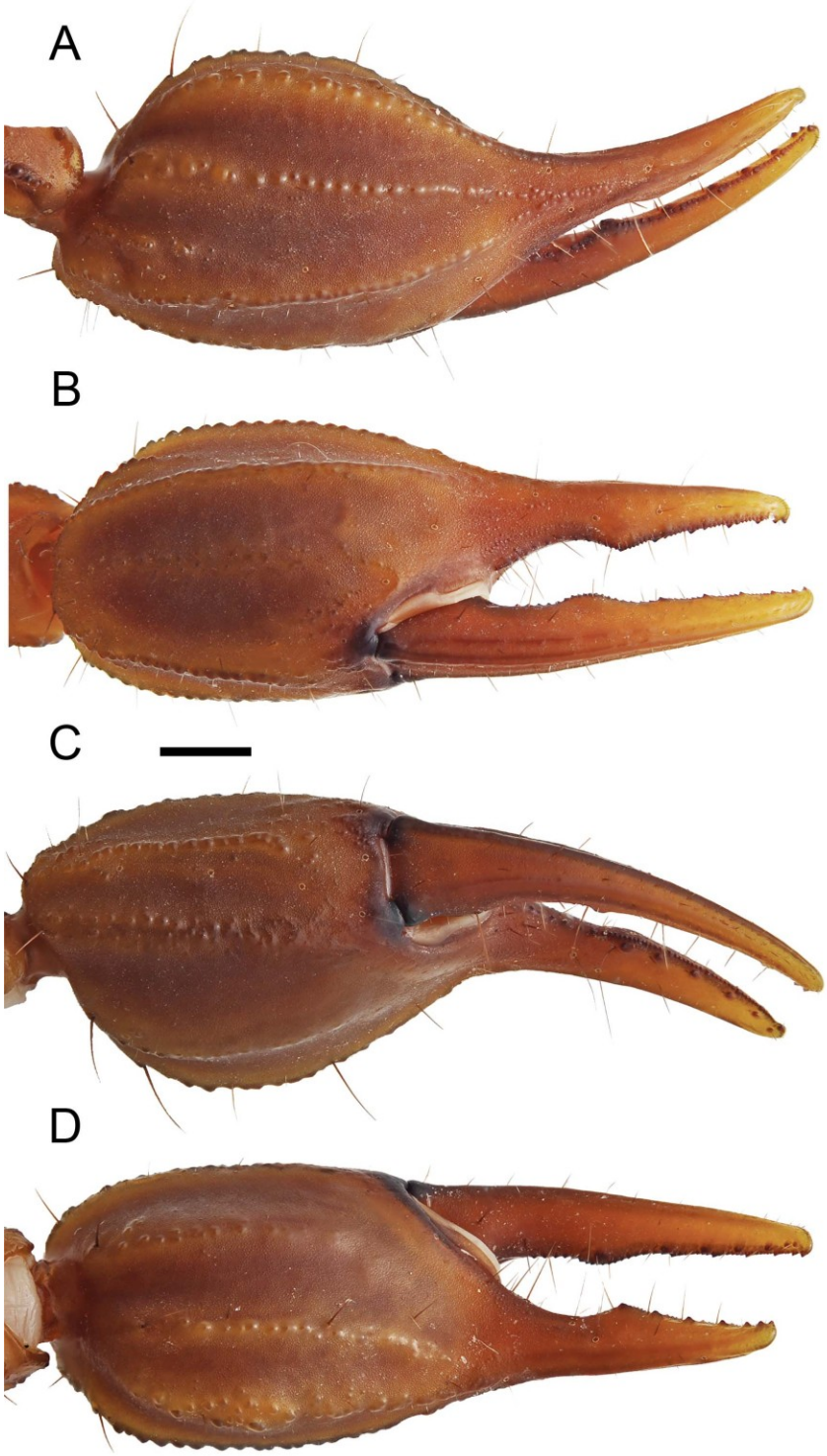


Figure 158. *Kochius cerralvensis* (Williams, 1971), **n. stat.**, paratype ♂ (AMNH), dextral pedipalp chela. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

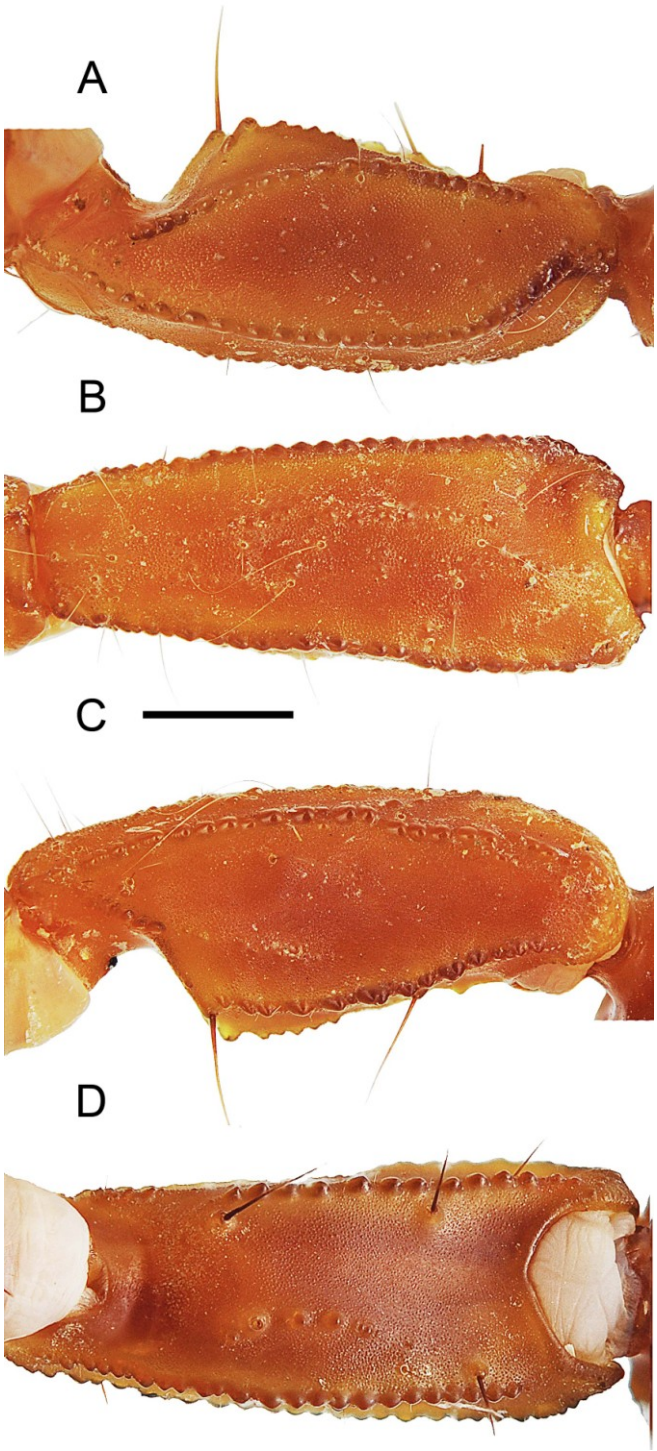


Figure 159. *Kochius cerralvensis* (Williams, 1971), **n. stat.**, paratype ♂ (AMNH), dextral pedipalp patella. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

Table 13. Measurements (mm) of adult holotype of *Kochius catavina*, **n. sp.**, *Kochius danzante*, **n. sp.**, *Kochius jatay*, **n. sp.**, *Kochius kiliwa*, **n. sp.**, *Kochius maroma*, **n. sp.**, and *Kochius moosni*, **n. sp.** All specimens are deposited at IBUNAM.

	K. catavina	*K. danzante*	*K. jatay*	*K. kiliwa*	*K. moosni*	*K. maroma*
Length						
Carapace	3.40	4.80	4.30	4.00	3.70	4.50
Pedipalp: femur	2.70	3.60	3.30	3.20	2.80	3.50
Pedipalp: patella	3.00	3.80	3.50	3.30	2.90	3.80
Pedipalp: chela	5.30	6.80	6.70	6.20	5.40	6.80
Fixed finger	2.00	2.80	2.60	2.30	2.20	2.80
Movable finger	2.70	3.90	3.70	3.30	3.00	3.80
Mesosoma	7.60	9.30	8.60	7.70	8.00	8.30
Metasoma	12.60	17.30	15.60	15.10	13.40	15.90
Metasomal segment I	1.60	2.40	2.10	2.00	1.80	2.00
Metasomal segment II	2.10	2.90	2.60	2.50	2.20	2.60
Metasomal segment III	2.20	3.10	2.80	2.70	2.40	2.90
Metasomal segment IV	2.90	3.90	3.40	3.40	3.00	3.60
Metasomal segment V	3.80	5.00	4.70	4.50	4.00	4.80
Telson	3.40	4.70	4.00	4.10	3.50	4.20
Telson: vesicle	1.90	2.60	2.30	2.20	2.00	2.60
Telson: aculeus	1.50	2.10	1.70	1.90	1.50	1.60
Total L	27.00	36.10	32.50	30.90	28.60	32.09
Width						
Pedipalp: femur	1.00	1.30	1.30	1.10	1.00	1.30
Pedipalp: patella	1.20	1.70	1.60	1.40	1.20	1.60
Pedipalp: chela	1.70	2.70	2.60	2.40	1.90	2.70
Metasomal segment I	1.60	2.40	2.40	2.10	1.80	2.40
Metasomal segment II	1.50	2.20	2.20	1.90	1.80	2.30
Metasomal segment III	1.40	2.00	2.20	1.80	1.60	2.20
Metasomal segment IV	1.30	1.90	1.90	1.70	1.40	2.00
Metasomal segment V	1.20	1.70	1.80	1.50	1.40	1.80
Telson: vesicle	0.90	1.30	1.40	1.20	1.00	1.50
Depth						
Pedipalp: chela	1.50	2.40	2.40	2.10	1.70	2.30
Metasomal segment I	1.40	2.00	2.00	1.70	1.50	2.00
Metasomal segment II	1.20	1.90	2.00	1.50	1.30	2.00
Metasomal segment III	1.30	1.80	1.90	1.50	1.40	1.90
Metasomal segment IV	1.20	1.80	1.80	1.50	1.30	1.80
Metasomal segment V	1.10	1.60	1.60	1.40	1.10	1.60
Telson: vesicle	0.80	1.10	1.10	1.00	0.90	1.10

Kochius danzante, **n. sp.**

Figures 145, 160–162, 194A, 200A, 205E, 209E, 213E, 217E, 220E; Table 13

TYPE MATERIAL: **MEXICO: Baja California Sur:** *Municipio de Loreto*: Holotype ♂ (IBUNAM), Isla Danzante, S of Punta Faro, 0–50 m, 12–13.vi.2008, 25°46.2948'N 111°15.0006'W, desert, collected at night with UV light, E. González and I.G. Nieto. Paratypes: 4 ♂, 1 ♀ (AMNH [ARA2871]), 6 ♂, 1 ♀ (IBUNAM [ARA2256]), 25°46.295'N 111°15.001'W.

ETYMOLOGY: The specific name *danzante* refers to the name of the island where this species is endemic. The name is a noun in apposition.

DIAGNOSIS: *Kochius danzante*, **n. sp.**, is closely related to *K. bruneus*, *K. hirsuticauda*, and *K. kiliwa*, **n. sp.**, with which forms a monophyletic group (see *K. hirsuticauda* for details). *K. danzante*, **n. sp.**, may be separated from these species by having the darker brownish base color, instead of having yellow pale to medium orange or brownish. Furthermore, differs by having relatively hirsute ventral surface of telson with 12 macrosetae in each carinae, instead of having three in *K. bruneus*, seven to nine in *K. kiliwa*, **n. sp.**, and 12 plus accessory macrosetae in intercarinal surface in *K. hirsuticauda.* From *K. bruneus* and *K. hirsuticauda* differs by having aculeus relatively elongate, instead of having it relatively short. Furthermore, differs by having carinae of pedipalp femur and patella outlined with intense infuscation and these two species have these carinae immaculate or weakly infuscate. From *K. hirsuticauda* differs by having metasomal segment I wider than long, instead of having it longer than wide.

DESCRIPTION: The following description is based on the types and the specimens listed in material examined.

Color and infuscation (in alcohol): Base color of carapace, pedipalps, tergites, metasoma, coxal region, and telson brownish to dark orange, carapace and prolateral surface of legs infuscated with dusky markings. Chelicerae, legs, and sternite paler yellowish to medium orange contrasting with the rest of the body Pectines, basal piece, and genital operculum pale whitish. Aculeus base reddish to brownish-red. Base of pedipalp fingers reddish.

Carapace: Carapace anterior margin emarginated with a moderated median notch and three pairs of minor macrosetae. Surface completely shagreened with scattered moderated conical and minute granules. Anteromedian, posteromedian, and posterolateral sulci moderated, posterior transverse obsolete. Ocular tubercle moderately rose, superciliary carina weakly crenulated higher than median eyes. Median eyes approximately double size of lateral frontal pair. Three lateral eyes, two frontal pairs same size and posterior reduced approximately in half.

Sternum and coxal region: Sternum pentagonal subequilateral with three pairs of setae, one distal, one median pair and one pair on the lobes, median notch deep. Anterior margin of coxa II with three oblique slit-like structures, adjacent to a moderate protuberance with fine crenulations. Base coxal endite II with a shallow depression each. Coxa IV 1.93 times longer than coxa II.

Chelicerae: Dorsal surface smooth, dentition of fixed and movable fingers as in typical vaejovids. Distal margin of manus with one median macrosetae. Serrula with 12/12 tines.

Pedipalps: Trichobothrial pattern Type C, orthobothriotaxic. Chelae wider than patella and patella wider than femur. Femur: Retrolateral and prolateral intercarinal surfaces matte, dorsal and ventral shagreened, with denser coarse granules on median surface. Carinae: Dorsal retrolateral, dorsal prolateral, and ventral prolateral carinae strongly granular with conical and sharp enlarged granules; retrolateral dorsosubmedian complete, with a moderated proximal

spinoid tubercle, moderately crenatoserrated, and two minor macrosetae medially; prolateral ventrosubmedian complete and strong, oblique row of sharp, conical, and moderate granules, starting at mid surface slanting gently towards distal end of dorsal prolateral carinae, lacking macrosetae; prolateral ventral vestigial, expressed by two proximal tubercles, with intersperse macrosetae and three additional granules, one median and one distal with a macroseta on base, distributed from the basal to the mid aspect of the segment; ventral median and retrolateral ventral vestigial expressed by serrated granules; ventral retrosubmedian partial, expressed by scattered irregular serrated granules, reaching proximal third.

Patella: All intercarinal surfaces matte. Carinae: Dorsal prolateral, dorsal retrolateral, ventral prolateral, and ventral retrosubmedian strongly granular with sharp, conical and enlarge granules; ventral median vestigial expressed as a short basal row of scattered granules, reaching proximal third; retrolateral dorsosubmedian and retrolateral median partial, expressed as broken irregular rows of moderate and minute granules; prolateral median on a vaulted projection, extending from a proximal tubercle with a minor macroseta on top, and three to five subserrate granules reducing in size ending in few distal minute serrations, reaching trichobothrium d_2 and beyond demarcated by a flat surface ending on one distal minor macrosetae. Prolateral ventral obsolete expressed by two minor macrosetae, one basal and one distal.

Chelae: Pedipalp manus moderate (manus 1.4 times longer than fixed finger). Intercarinal surface matte. Carinae: Dorsal prolateral and dorsal median, dorsal retrosubmedian accessory carinae strong with scattered granules; dorsal retrolateral strongly crenular; dorsal prosubmedian and prolateral dorsal vestigial expressed by scattered crenulations flanking dorsal lateral carina; retrolateral median complete proximally with few moderate granules, medially and distally weakly crenulated but strongly costated; retrolateral subventral accessory and retrolateral

subventral vestigial expressed by few distal crenulations; ventral retrolateral partial, strongly granular, ending at the level of trichobothrium *Est*. Ventral prosubmedian moderately crenulated and costated; ventral median vestigial expressed as crenulations flanking ventral prosubmedian reaching proximal half; ventral prolateral with proximal scattered granules becoming crenular medially and distally smooth, but moderately costated; prolateral median basally with scattered enlarge granules, becoming crenulated medially to distally, slanting genteelly towards dorsal prolateral carinae as a fine costa. Trichobothria *Dt* and *Db* dorsal to dorsal retrolateral carinae. Trichobothrium *Dt* positioned subbasal on manus. Trichobothrium *Dt* positioned at mid manus.

Fingers: Fixed finger dentition: PD = 6, RD = 5, MD rows = 5, all denticles subserrate, retrolateral denticles comparatively smaller than prolateral denticles. Movable finger PD = 7, RD = 7, MD rows = 7, distal row with one denticle, prolateral and retrolateral denticles subpaired. Trichobothrium *ib* positioned between PD6 and PD7, PD7 lacking granule, and *it* positioned adjacent to PD6. Fingers lacking scalloped. Gap created when fingers close absent, fingers fit evenly.

Legs: Spinules: Basitarsi I and II with prolateral ventral and retrolateral ventral carinae with complete rows of spinules, in III and IV absent; retrolateral median rows in I–IV absent; retrolateral dorsal in I–III, partial expressed in distal half, IV absent. Telotarsi I–IV with two pairs of ventrodistal spinules in I–IV. Setae: Prolateral ventral 3:4:5:5; medians in III and IV stout, retrolateral ventral 4:7:7:7; retrolateral dorsal 2:4:4:4; dorsal 3: 3:3:3 retrolateral dorsal and dorsal series arranged in two independent rows.

Tergites: Pretergites matte, posttergites with scattered moderated and coarse conical granules. Dorsal median and dorsal submedian carinae strong with a row of distal crenatoserrations expressed on proximal half. Tergite VII with intercarinal surfaces scattered

with few large conical granules; dorsal median carina partial and strong expressed on proximal third, strongly costate and irregularly serrated; dorsal submedian vestigial expressed as a short distal row of irregular serrations strongly costated; dorsal lateral and lateral supramedian strong, distal extreme with an enlarged spiniform tubercle projecting backwards; Dorsal lateral projecting and curving laterally almost reaching lateral supramedian distal margin, creating a semi ring of strong serrated granulation.

Genital operculum: Male genital operculum: wider than long, with three pairs of macrosetae. Sclerites free on longitudinal edge moving independently but unable to open more than 45°. Genital papillae protrude posteriorly. Female genital operculum: Wider than long, with three macrosetae. Sclerites fuse longitudinal.

Sternites: Sternites III–VI with all carinae obsolete and surface matte in ♂, punctuated in ♀, V in ♂ with distomedian glandular spot moderated distinctly contrasting with the darker base color of the tergites, protruding slightly from adjacent surfaces, in ♀ obsolete. Sternite VII with ventral lateral carinae moderately crenulated and strongly costated; ventral submedian carinae partial strongly granular with conical enlarge granules expressed medially in ♂, absent in ♀. Distomedian glandular spot strong in ♂, shaped as a truncated triangle, strongly protruding from adjacent surface, in ♀ lower and less developed. Spiracle elongated, slit-like, approximately two times longer than wide.

Pectines: Pectines in ♂ longer than distal margin of coxa VI, in ♀ at or slightly longer than coxa IV. Basal piece with two minor macrosetae. Marginal lamella consist of three sclerites, medial lamella proximally fuse distally progressively forming conspicuous 10–13 beads. Fulcra with 18–19 beads in ♂, and 16–17 beads in ♀. Pectinal tooth count 19–20 in ♂, and 17–18 in ♀.

Hemispermatophore: Lamina 2.00 longer than trunk. Dorsal through margin long, narrow, curving proximally, and removed from ventral trough. Hemimating plug developed from the inner lobe, distal barb margin with 13 elongated spinules. Primary and secondary hook positioned on the apex of lateral margin extension of the lamina (flange). Both hooks rounded, low, separated slightly, forming a shallow notch. Median lobe ental terminus moderated and rounded. Basal plate of inner lobe removed from ventral trough. Spine of inner lobe relatively long and strongly sclerotized, secondary spine on ventromedian aspect of neck absent. Neck relatively short (0.38 times longer than basal plate). Measurements, lamina, 4.08; trunk, 2.04; dorsal trough/laminar hooks, 3.84; ventral trough/laminar hook, 1.02; neck, 0.30; basal plate, 0.78.

Metasoma: All intercarinal surfaces matter, except dorsal surface of metasomal segment I–III with few scattered moderated granules. Dorsal lateral carinae of metasomal segments I–V and lateral median carinae of segments I–III crenatoserrated, proximally end with an elongated spiniform tubercle pointing backwards, except in V. Lateral median in IV distal terminus weakly expanded or flared laterally. Lateral inframedian in I complete crenatoserrated, in II vestigial irregularly expressed on distal third, in III irregularly serrated expressed in distal fourth becoming weaker proximally, in IV absent, in V partial, moderate crenatoserrated and strongly costated, expressed in distal two thirds. Ventral lateral I–V, ventral submedian I–IV and ventral median in V finely crenatoserrated. Setae: in ♀ dorsal lateral, 0:0:0:1:3, lateral median, 0:1:1:2, lateral inframedian, 0:0:0:0:2, ventral lateral, 2:2:2:2:6, ventral submedian, 3:3:3:3, ventral sublateral, 2; all carinae minor; in ♂ all macrosetae absent or reduced to microsetae.

Telson: Ventral and dorsal surfaces smooth, hirsute with 12 or more macrosetae in each carinae, lateral and dorsal carinae with three pairs of macrosetae on each carinae in both sexes.

Laterobasal microserration of aculeus with 7 sharp tines. Subaculear tubercle absent.

DISTRIBUTION: *Kochius danzante*, **n. sp.**, is endemic to Danzante Island in the California Gulf, Baja California Sur, Mexico.

ECOLOGY: *Kochius danzante*, **n. sp.**, inhabits vegetation similar to the Loreto area, which is thorn scrub with several endemic plants. The type of soil of the island is of volcanic origin and is dominated by ashes and basaltic material.

REMARKS: This species was initially described as *K. bruneus villosus* (Williams, 1971). The analyses presented here indicate that this particular population represent a valid species, supported by several diagnostic characters.

MATERIAL EXAMINED: **MEXICO: Baja California Sur:** *Municipio de Loreto*: Isla Danzante, S of Punta Faro, 0–50 m, 12–13.vi.2008, 25°46.295'N 111°15.001'W, 1 juv. (AMNH [LP 8792]), desert, collected at night with UV light, E. González and I.G. Nieto.

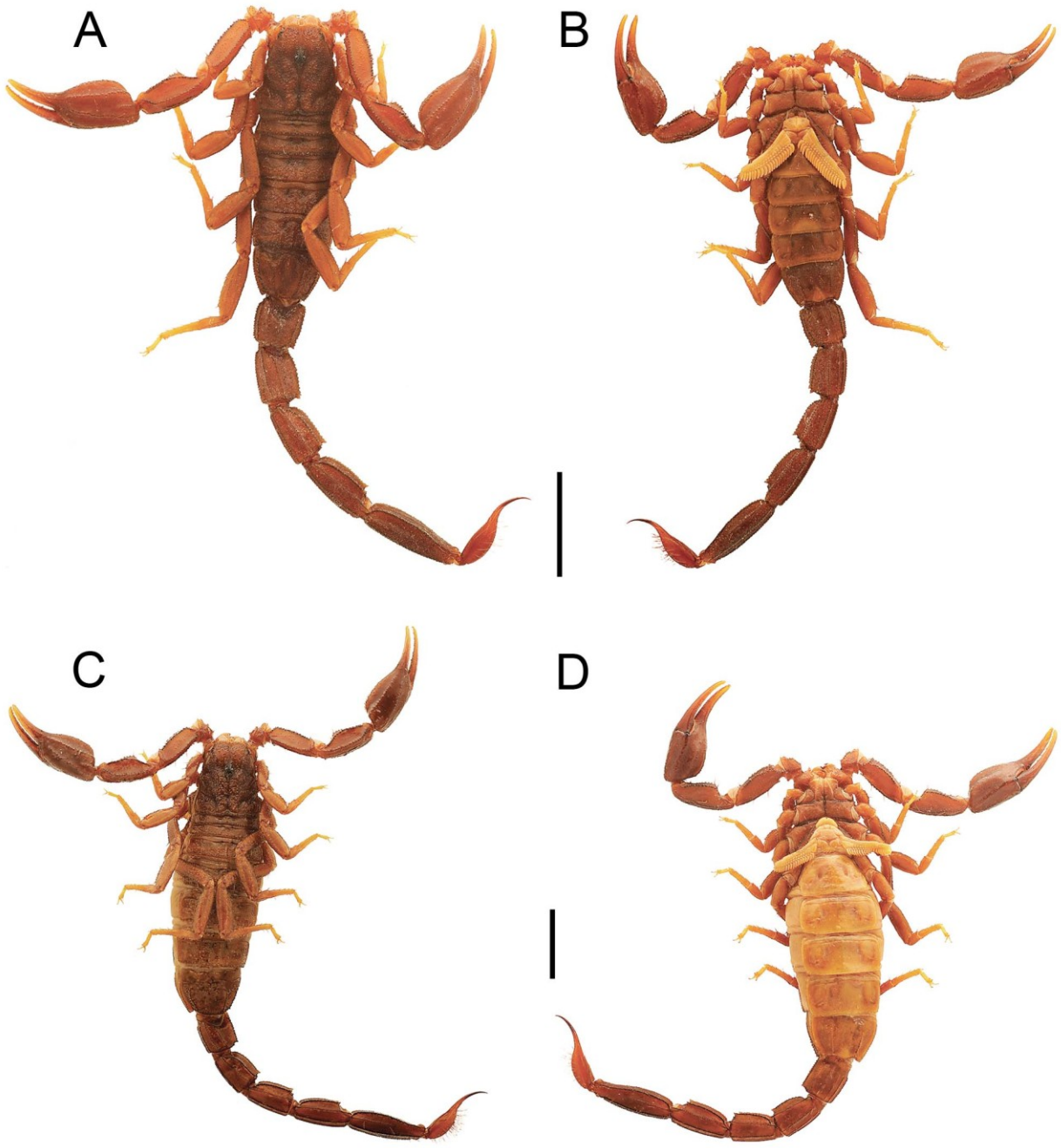


Figure 160. *Kochius danzante*, **n. sp.**, habitus. **A**, **B**. Paratype ♂ (AMNH). **C**, **D**. ♀ (AMNH). **A**, **C**. Dorsal aspect. **B**, **D**. Ventral aspect. Scale bars = 5 mm.

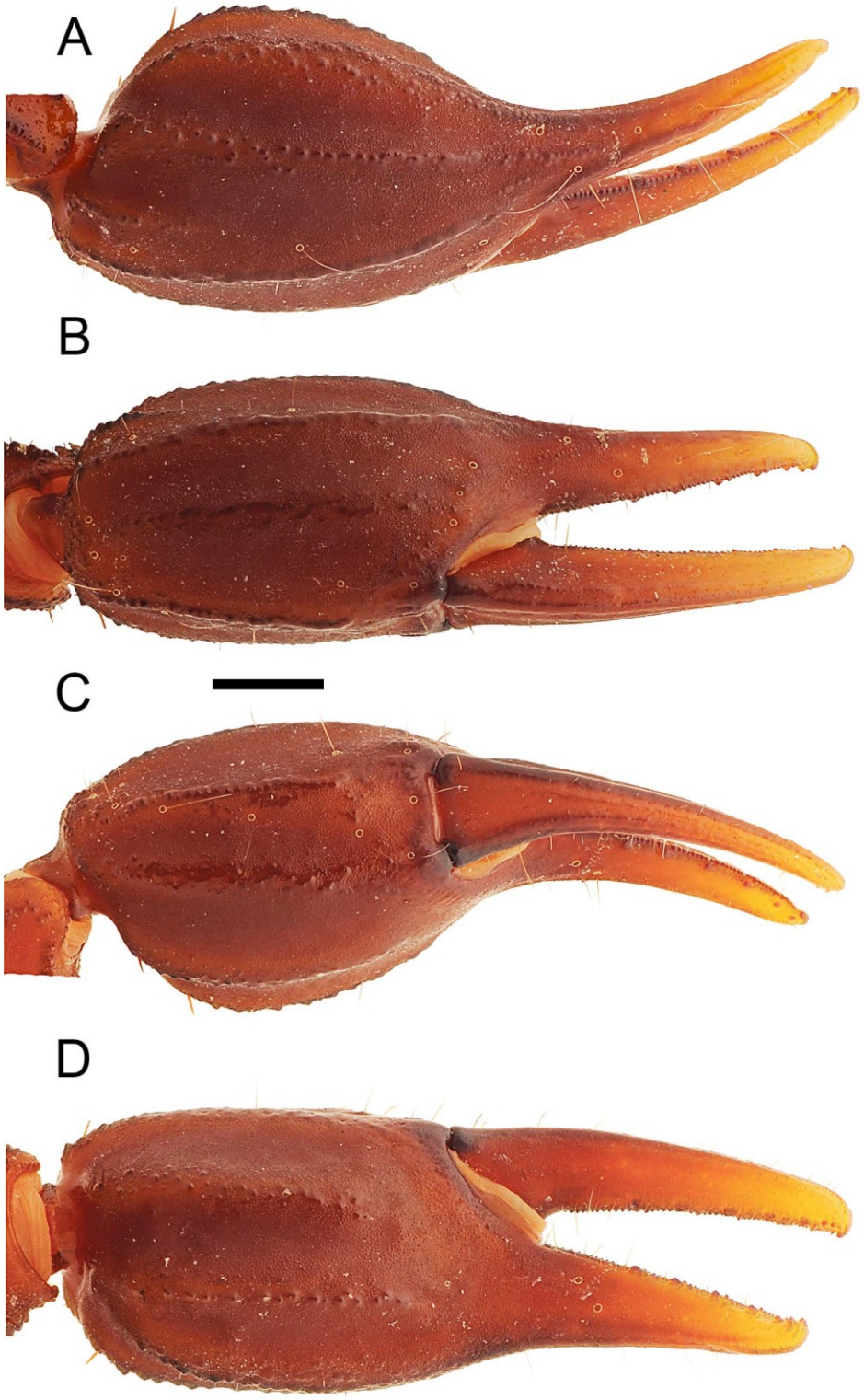


Figure 161. *Kochius danzante*, **n. sp.**, paratype ♂ (AMNH), dextral pedipalp chela. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

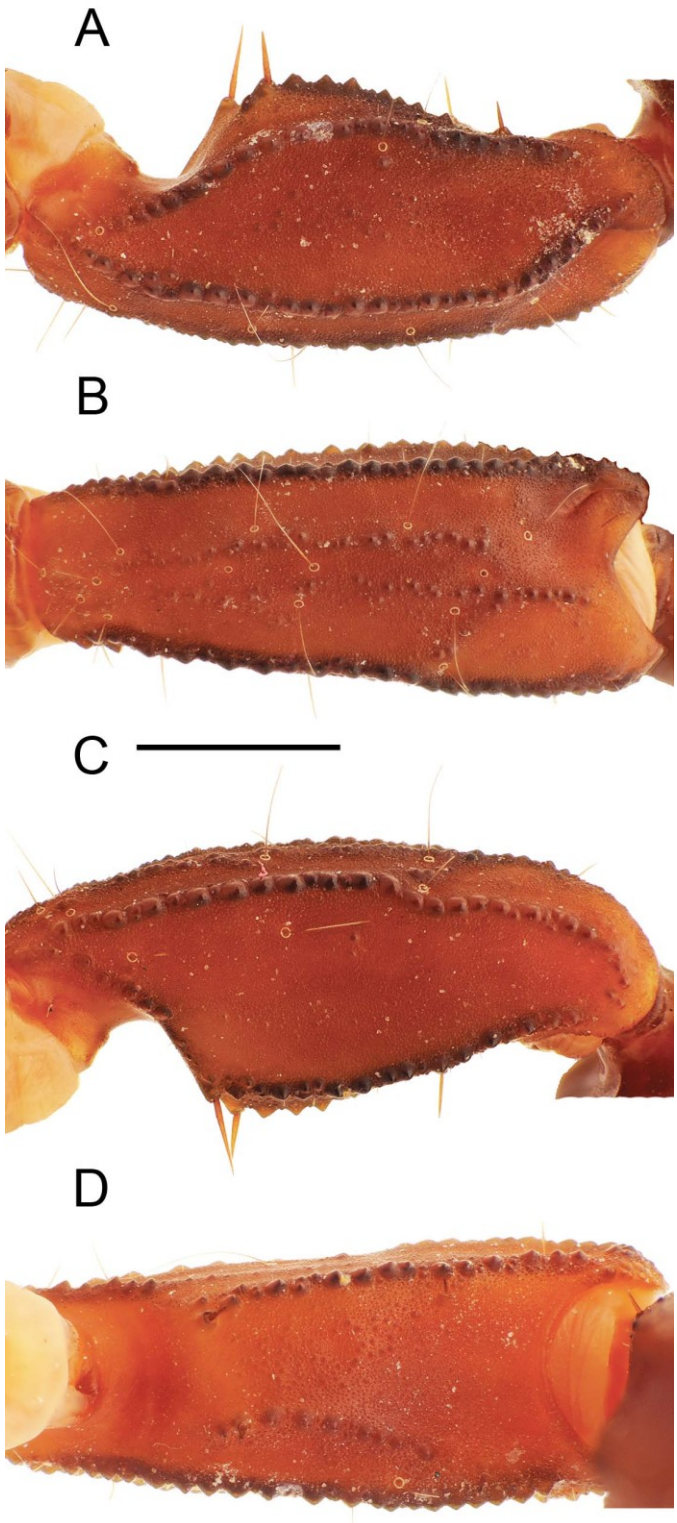


Figure 162. *Kochius danzante*, **n. sp.**, paratype ♂ (AMNH), dextral pedipalp patella. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

Kochius hirsuticauda (Banks, 1910)

Figures 145, 163–165, 194B, 200B, 206A, 210, 214A, 218F, 221A

Vejovis hirsuticauda Banks, 1910: 187, 189, fig. J; Cox, 1921: 13; Gertsch and Allred, 1965: 8; Soleglad, 1973b: 357; Stahnke, 1974: 135.

Vaejovis hirsuticauda: Ewing, 1928: 10; Williams, 1976: 2; 1980: 53, 83, 84, fig. 56D, 83, 85; Sissom, 1991b: 221 (key), 222; Kovařík, 1998: 147; Beutelspacher, 2000: 88, 137, 153, map 64; Sissom, 2000: 549; Soleglad and Fet, 2003b: 8, 150, 151, B-1; Sissom and Hendrixson, 2005a: 128, tab. 6.2; Graham and Fet, 2006, 8; Francke and González-Santillán, 2007: 591; McWest, 2009: 20, tab. 1, 91, figs. 322–326, 92, 125.

Kochius hirsuticauda: Soleglad and Fet, 2008: 4, 32, 33, fig. 47, 39, fig. 77, 50, tab. 3, 51, 55–57, figs. 130, 141, 154, 61, fig. 170, 66, 67, 69, 93.

TYPE MATERIAL: **U.S.A.: California:** *San Bernardino Co.*: Holotype ♀ (MCZ), [http://mczbase.mcz.harvard.edu/guid/MCZ:IZ:89270] [not examined].

DIAGNOSIS: *Kochius hirsuticauda* is closely related to *K. bruneus*, *K. danzante*, **n. sp.** and *K. kiliwa*, **n. sp.**, with which forms a monophyletic group. The scheme of relationship obtained from the phylogenetic analyses conducted earlier is as follows: (*K. hirsuticauda* (*K. kiliwa* (*K. danzante* + *K. bruneus*)))). *K. hirsuticauda* may be separated from these species by having the most hirsute ventral surface of telson with 12 or more macrosetae in each carinae plus accessory macrosetae in intercarinal surfaces, forming a dense tuft of macrosetae and dorsal carinae with five or more macrosetae in each carinae, instead of having from three to 12 macrosetae in each carinae, appearing as a relatively bald surface or forming a moderate tuft of macrosetae and in ventral surface three or less macrosetae in each carinae of dorsal surface. The carapace and

tergites of *K. hirsuticauda* has base color yellow pale and immaculate surface, instead of having base color brownish to orange dark and moderate to weak fuscous markings. *K. hirsuticauda* has aculeus short, almost two times shorter than vesicle, instead of having approximately one and a half or less times aculeus shorter than vesicle. *K. hirsuticauda* has metasomal segment I longer than wide, instead of having it as long as wide or slightly wider than long. From *K. danzante*, **n. sp.** and *K. kiliwa*, **n. sp.** may be separated by having carinae of pedipalp femur and patella immaculate, instead of having these carinae outlined with intense infuscation.

DESCRIPTION: The following redescription supplements Banks' (1910) original description. It is based on ♂, ♀ freshly collected material, and the museums indicated in the material examined.

Color and infuscation (in alcohol): Base color of chelicerae, carapace, tergites, legs, metasoma, coxal region, sternites, and telson homogeneously pale yellow to golden-yellowish, lacking infuscation, except carapace and tergite granulation with fine and diffuse infuscation. Ocular tubercle intensely infuscated. Pectines pale whitish. Aculeus base reddish turning brownish-red distally. Base of pedipalp fingers reddish.

Carapace: Carapace anterior margin emarginated with a moderated median notch and three pairs of minor macrosetae. Surface completely shagreened with scattered moderated conical and minute granules. Anteromedian, posteromedian, and posterolateral sulci moderated, posterior transverse obsolete. Ocular tubercle moderately rose, superciliary carina crenulated higher than median eyes. Median eyes approximately double size of lateral frontal pair. Three lateral eyes, two frontal pairs same size and posterior reduced approximately in half.

Sternum and coxal region: Sternum pentagonal subequilateral with three pairs of setae, one distal, one median pair and one pair on the lobes, median notch deep. Anterior margin of

coxa II with three oblique slit-like structures, adjacent to a enlarge protuberance with fine crenulations. Base coxal endite II with a moderated depression each. Coxa IV 2.46 times longer than coxa II.

Chelicerae: Dorsal surface smooth, dentition of fixed and movable fingers as in typical vaejovids. Distal margin of manus with one median macrosetae. Serrula with 12/12 tines.

Pedipalps: Trichobothrial pattern Type C, orthobothriotaxic. Chelae wider than patella and patella wider than femur. Femur: Retro and prolateral intercarinal surfaces matte, dorsal and ventral with shagreened. Carinae: Dorsal retrolateral, dorsal prolateral, and ventral prolateral carinae strongly granular, granules conical, sharp, and enlarged; retrolateral dorsosubmedian strongly crenatoserrated and with two minor macrosetae medially, prolateral ventrosubmedian complete and strong, with a proximal spinoid tubercle and a oblique row of conical, sharp, and enlarged granules, starting at mid surface slanting gently towards distal end of dorsal prolateral carinae, lacking macrosetae; prolateral ventral vestigial, expressed by one proximal tubercle and adjacent setae and two moderated granules with two minor macrosetae on base, one medial and one distal, distributed from the basal to the mid aspect of the segment; ventral median and retrolateral ventral vestigial expressed by scattered serrated granules; ventral retrosubmedian vestigial expressed by scattered irregular serrated proximal granules.

Patella: All intercarinal surfaces matte. Carinae: Dorsal prolateral, dorsal retrolateral, ventral prolateral, and ventral retrosubmedian strongly granular; ventral median vestigial expressed as few basal small granules; retrolateral dorsosubmedian and retrolateral median complete, strongly granular with irregular moderated granules; prolateral median on a vaulted projection, extending from a proximal tubercle with a minor macroseta on top, and a strong row of enlarge crenatoserrated granules, becoming weaker and smaller distally, extending to

trichobothrium d_2 and beyond demarcated by a flat surface ending on one distal minor macrosetae; prolateral ventral obsolete expressed by two minor macrosetae, one basal and one distal.

Chelae: Pedipalp manus incrassate and relatively elongated (manus 1.4 times longer than fixed finger). Intercarinal surface matte. Carinae: Dorsal prolateral, dorsal median, dorsal retrosubmedian accessory, and dorsal retrolateral carinae finely granular; dorsal prosubmedian and prolateral dorsal vestigial expressed by scattered crenulations flanking dorsal lateral carina; retrolateral complete median finely crenulated; retrolateral subventral accessory vestigial expressed by few minute distal granulation; retrolateral subventral vestigial but considerably more developed than retrolateral subventral accessory, expressed by a row of irregular minute granules extending to distal third of manus, running parallel to ventral retrolateral carinae for half of the length of the same retrolateral subventral; ventral retrolateral strongly granular and partial, ending half way of retrolateral subventral, these two never connected but parallel; ventral prosubmedian weakly crenulated and ventral median vestigial expressed proximally as irregular row of crenulations fusing medially with ventral prosubmedian; ventral prolateral weak with few irregular crenulations; prolateral median moderately crenatoserrated, distally, slanting towards dorsal prolateral carinae as a fine row of crenulations. Trichobothria *Dt* and *Db* dorsal to dorsal retrolateral carinae. Trichobothrium *Dt* positioned subbasal on manus. Trichobothrium *Dt* positioned at mid manus.

Fingers: Fixed finger dentition: PD = 6, RD = 6, MD rows = 6, all denticles subserrate, retrolateral denticles comparatively smaller than prolateral denticles. Movable finger PD = 7, RD = 7, MD rows = 7, distal row with one denticle, prolateral and retrolateral denticles subpaired. Trichobothrium *ib* positioned between PD6 and PD7, PD7 lacking granule, and *it* positioned

adjacent to PD6. Fingers lacking scalloped. Gap created when fingers close absent, fingers fit evenly.

Legs: Spinules: Basitarsi I–II with prolateral ventral and retrolateral ventral carinae with complete rows of spinules; retrolateral median rows in I–IV vestigial expressed as few terminal spinules; retrolateral dorsal in I–IV absent, prolateral ventral absent in I–IV. Telotarsi I–IV with two pairs of ventrodistal spinules in I–IV. Setae: Prolateral ventral 3:3:5:5; retrolateral ventral 4:7:7:7; retrolateral dorsal 2:3:3:4; dorsal 3:3:3:3 retrolateral dorsal and dorsal series arranged in two independent rows.

Tergites: Pretergites matte, posttergites with scattered moderated and coarse conical granules. Dorsal median carinae strong with a short row of distal crenatoserrations on proximal half; dorsal submedian strong complete, expressed along the entire postergite. Tergite VII with intercarinal surfaces scattered with large conical granules; dorsal median carina partial and strong expressed on proximal third, strongly costate and irregularly serrated; dorsal submedian vestigial expressed as a pair of distal irregular serrations strongly costated; dorsal lateral and lateral supramedian strong, proximal extreme with an enlarged spiniform tubercle projecting backwards; Dorsal lateral projecting and curving laterally almost reaching lateral supramedian distal margin, creating a semi ring of strong serrated granulation.

Genital operculum: Male genital operculum: wider than long, with three pairs of macrosetae. Sclerites free on longitudinal edge moving independently but unable to open more than 45°. Genital papillae protrude posteriorly.

Sternites: Sternites III–VI with all carinae obsolete and surface matte, V in ♂ with distomedian glandular spot weak, not protruding from adjacent surfaces, in ♀ obsolete; Sternite VII with ventral lateral carinae finely crenulated; ventral submedian carinae vestigial expressed

by a fine row of minute granulation, weakly costated and lacking macrosetae. Distomedian glandular spot strong in ♂, shaped as truncated triangle, moderated in ♀. Spiracle elongated, slit-like, approximately two times longer than wide.

Pectines: Pectines in ♂ longer than distal margin of coxa VI, in ♀ at or slightly longer than coxa IV. Basal piece with two minor macrosetae. Marginal lamella consist of three sclerites, medial lamella proximally fuse distally progressively forming conspicuous 10–12 beads. Fulcra with 17–20 in ♂. Pectinal tooth count 15–17.

Hemispermatophore: Lamina 1.88 longer than trunk. Dorsal through margin long, narrow, curving proximally, and removed from ventral trough. Hemimating plug developed from the inner lobe, distal barb margin with 10 elongated spinules. Primary and secondary hook positioned on the apex of lateral margin extension of the lamina (flange). Both hooks rounded low, separated slightly, forming a shallow notch. Median lobe ental terminus moderated and rounded. Basal plate of inner lobe removed from ventral trough. Spine of inner lobe relatively long and strongly sclerotized, secondary spine on ventromedian aspect of neck relatively long. Neck relatively short (0.44 times longer than basal plate). Measurements, lamina, 2.82; trunk, 1.50; dorsal trough/laminar hooks, 1.14; ventral trough/laminar hook, 0.66; neck, 0.24; basal plate, 0.54.

Metasoma: All intercarinal surfaces matter, except ventral surface of metasomal segment I–V with scattered moderated granules. Dorsal lateral carinae of metasomal segments I–V and lateral median carinae of segments I–III crenatoserrated, proximally end with an elongated spiniform tubercle pointing backwards, except in V. Lateral median in IV distal terminus weakly expanded or flared. Lateral inframedian in I complete crenatoserrated, in II and III irregularly serrated expressed in distal fourth becoming weaker proximally, in IV absent, in V partial, finely

crenatoserrated and expressed in distal two thirds. Ventral lateral I–V, ventral submedian I–IV and ventral median in V finely crenatoserrated. Setae: setae absent in all carinae.

Telson: Ventral and dorsal surfaces smooth, densely hirsute with 12 or more pairs of macrosetae on each carinae plus accessory macrosetae positioned in intercarinal surfaces, forming a median-distal tuft. Dorsal surface with carinae bearing five or more macrosetae in each carina. Laterobasal microserration of aculeus 6 sharp tines. Subaculear tubercle absent.

DISTRIBUTION: *Kochius hirsuticauda* is the most widely distributed species of the genus with records form Baja California, Mexico to Arizona, California, and Nevada in the U.S.A. Although, there is no precise record published from Idaho, Sissom (2000) cited this species for that state.

ECOLOGY: *Kochius hirsuticauda* is not a common scorpion, it seems to have little activity on the surface; as a consequence, few specimens are collected during standard collection surveys. This species inhabits a wide range of altitude from sea level to 1100 m. The specimens collected in Baja California were found on hard packed, fine, and gravel soil intersperse with sand dunes. The rest of the specimens were collected in similar habitats but also in oak woodland and grassy slopes with sandy-loam to volcanic fine soil. This is the only species that extends to most of the classified types of deserts of Western U.S.A. and Baja California, from the Great Basin, to the Sonoran desert.

MATERIAL EXAMINED: **MEXICO: Baja California:** *Municipio de Ensenada*: Bahía de Los Angeles, 4−9 km NW, [28°57'N 113°33'W], 20.vi.1972, 1 ♂, 1 ♀ (IBUNAM); Calamajue, 25.i.1966, V. Roth, 1 ♀ (AMNH); Punta Calamajue, abandoned fishing village, 29°41.119'N 114°09.774'W, 5.4 m, 1.vii.2008, H. Montaño and E. González, sand dunes, collected at night with UV light, 1 ♀ (AMNH [LP 8819]); San José, 8 km E, Meling Ranch, 1.v.1961, V. Roth and

W.J. Gertsch, 1 juv. (AMNH). **U.S.A.: Arizona:** *Mohave Co.*: Black Mountains: E side of Sitgreaves Pass on Oatman Hwy, 12.viii.2007, 35°02.287'N 114°21.070'W, 982 m, 1 ♂ (AMNH), 35°02.427'N 114°21.429'W, 1015 m, 1 juv. (AMNH [LP 7816]), 2 ♀ (AMNH), W.D. Sissom, T. Anton, and G. Casper; loop road on W side of Union Pass, W of Kingman, 35°12.970'N 114°24.456'W, 993 m, 11.viii.2007, W.D. Sissom, T. Anton, and G. Casper, 1 ♂ (AMNH [LP 7817]); Gold Road, [35°02.773'N 114°22.948'W], 17.v.1969, M. Cazier et al., 1 ♂, 1 ♀, 1 juv. (AMNH); Burro Creek Camp Canyon B.L.M., 37 km S Wikieup, [34°42.550'N 113°16.91666'W], 16.v.1970, M. Cazier, Coursen, and Bigelow, 1 ♀ (AMNH). *Yuma Co.*: 2nd Mine Kofa Game Range, [33°17.81667'N 113°58.15'W], 27.iii.1970, C. Synder, under rock in dry creek bed, 1 subad. ♂ (AMNH); Alamo Lake State Park, [34°13.933'N 113°36.1666'W], 13.iii.1976, M. Cazier and O. Francke, collected at night with UV light, 2 ♀ (AMNH); Cravey Well, [33°26.352018'N 113°50.279274'W], 8.v.1960, V. Roth and W.J. Gertsch, 1 ♂ (AMNH); Palm Canyon: 3.2 km W, [33°21.636'N 114°5.9118'W], 12.x.1968, M. Cazier et al., 1 ♂, 1 ♀ (AMNH), 3.2 km W, Kofa Mountains, 12.x.1968, M. Cazier et al., 7 ♂, 2 ♀ (AMNH), Kofa Mountains, 11−12.x.1968, M. Cazier et al., 20 ♂, 1 ♀, 2 juv. (AMNH), Trigo Mountains, 24 km S, Cibola Lake Road, floor of Canyon, [33°18.28533'N 114°32.8305'W], 3−4.iv.1969, M. Cazier et al., 1 ♀, 5 juv. (AMNH). **California:** *Inyo Co.*: Death Valley National Park, Grapevine Canyon, Saline Valley Road, 36°33.591'N 117°35.219'W, 1290 m, 4.ix.2005, R. Mercurio and L. Prendini, collected at night with UV light, 1 ♂ (AMNH [LP 5049]); Mesquite Springs, Death Valley National Mountains, [36°14.51667'N 116°49.55'W], 10.vi.1970, M. Cazier et al., 1 ♀ (AMNH); Saline Valley, [36°44.9933'N 117°48.87833'W], 1350 m, 15.viii.1959, B. Banta, 1 ♂ (CAS). *Kern Co.*: Jawbone Canyon Road, 6.4 km NW intersection with Hwy 14, 35°18'55.0"N 118°05'14.5"W, 803 m, 13.ix.2007, L. Prendini and J. Huff, Mohave desert in rocky canyon,

volcanic slope and rock walls, 1 juv. (AMNH [LP 7171]); 7.6 km NW intersection with Hwy 14, 35°19'02.6"N 118°04'38.6"W, 786 m, 13.ix.2007, L. Prendini and J. Huff, 2 ♀ (AMNH); 8 km NW intersection with Hwy 14, 35°19'02.9"N 118°04'51.6"W, 790 m, 14.ix.2007, L. Prendini and J. Huff, 1 juv. (AMNH); 8.5 km NW intersection with Hwy 14, 35°18'59.3"N 118°05'05.9"W, 790 m, 14.ix.2007, L. Prendini and J. Huff, 2 ♀ (AMNH); 8.9 km NW intersection with Hwy 14, 35°18'51.9"N 118°05'20.9"W, 808 m, 13.ix.2007, L. Prendini and J. Huff, Mohave desert in rocky canyon, 1 juv. (AMNH [LP 7193]); SW of Red Rock Canyon State Park, Alpine Canyon off Gold Canyon Road, 35°20'29.0"N 118°04'48.4"W, 880 m, 16.viii.2004, W.E. Savary, R. Mercurio, K. Bamba, and M. McCoy, 2 ♂, 1 ♀ (AMNH [LP 3227]). *Riverside Co.*: Joshua Tree National Park, Little San Bernardino Mountains, Berdoo Canyon, 13 km NE Berdoo Canyon Road, Dillon Road junction on Berdoo Canyon Road, 33°49'48.93"N 116°04'49.21"W, 1018 m, 3.viii.2008, Z.J. Valois and W.E. Savary, Mohave desert, 1 ♂ (AMNH [LP 8915]). *San Bernardino Co.*: Park Moabi Road, 9.7 km from intersection with I-40, 34°42'35.7"N 114°30'59.7"W, 231 m, 9.ix.2007, L. Prendini and J. Huff, 1 subad. ♂ (AMNH [LP 7199]). *San Diego Co.*: Anza Borrego Desert State Park, Indian Gorge Canyon, [33°13.4118'N 116°27.26'W], 15.vii.1999, M.E. Soleglad, 1 ♂ (AMNH [LP 1691]); Pinyon Mountain Road, ca. 4.8 km towards Pinyon Mountain Valley from junction with Route S2, 33°03.043'N 116°23.270'W, 870 m, 30.viii.2005, R. Mercurio and L. Prendini, collected at night with UV light, 1 subad. ♂ (AMNH [LP 5013]), 1 ♂ (AMNH). *Tulare Co.*: Exeter, Rocky Hill Road, 1.2 km W intersection with Yokohl Drive, 36°17'50.4"N 119°04'51.2"W, 146 m, 14.ix.2007, L. Prendini and J. Huff, 2 ♀, 1 juv. (AMNH), 1 ♂ (AMNH [LP 7216]). **Nevada:** *Nye Co.*: Mercury, [36°39.7335'N 115°59.4707'W], 1961, 1 ♂ (AMNH), 5.ii.1961, 1 ♂ (AMNH), 23.v.1961, 1 ♀

(AMNH), 25.v.1961, 1 subad. ♀ (AMNH), 10.vi.1961, 1 juv. (MCZ), 13.vi.1961, 1 ♂ (AMNH), 4.vii.1961, 1 ♂ (AMNH), 1.vi.1962, 1 subad. ♂ (AMNH).

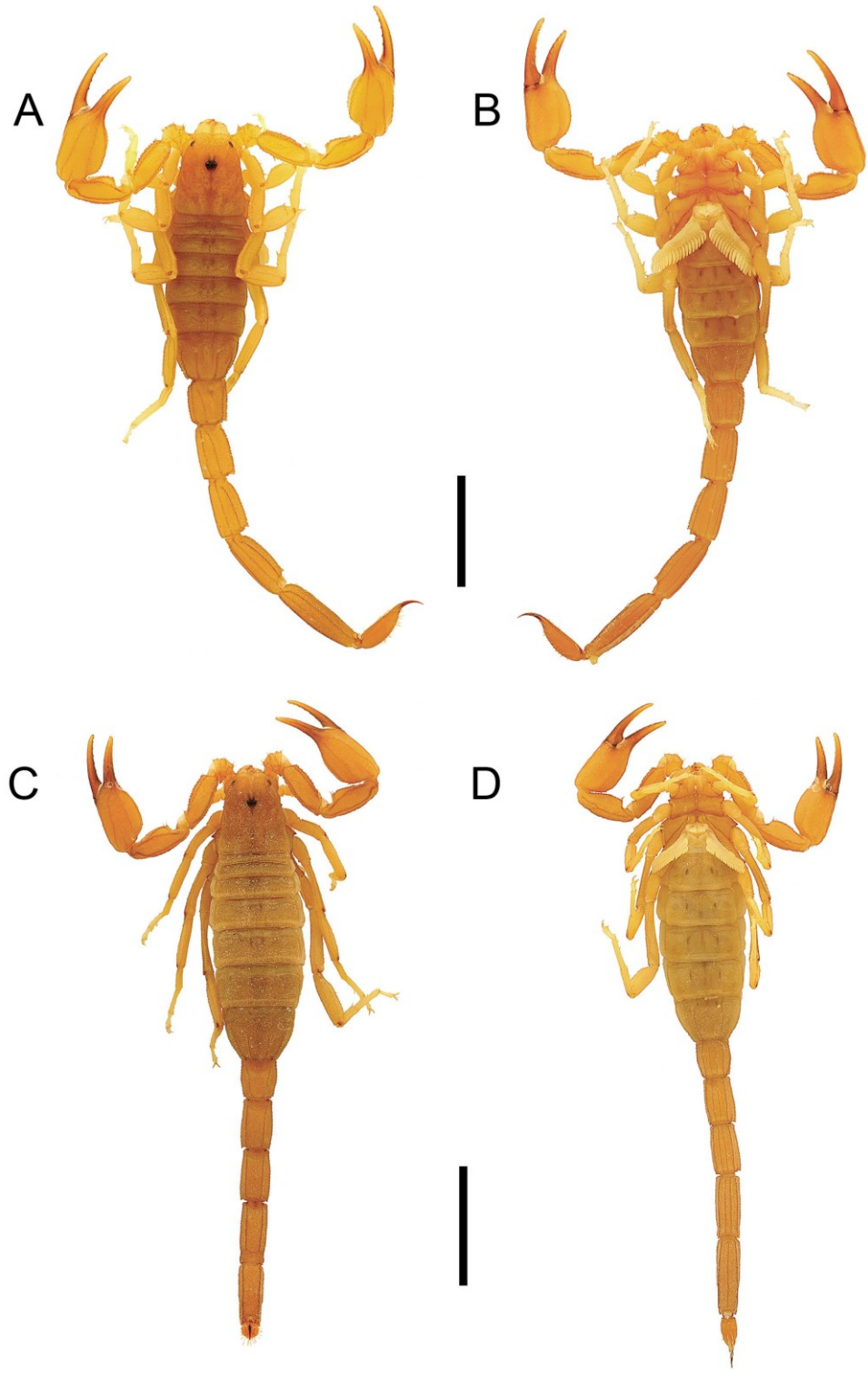


Figure 163. *Kochius hirsuticauda* (Banks, 1910), habitus. **A**, **B**. ♂ (AMNH). **C**, **D**. ♀ (AMNH). **A**, **C**. Dorsal aspect. **B**, **D**. Ventral aspect. Scale bars = 5 mm.

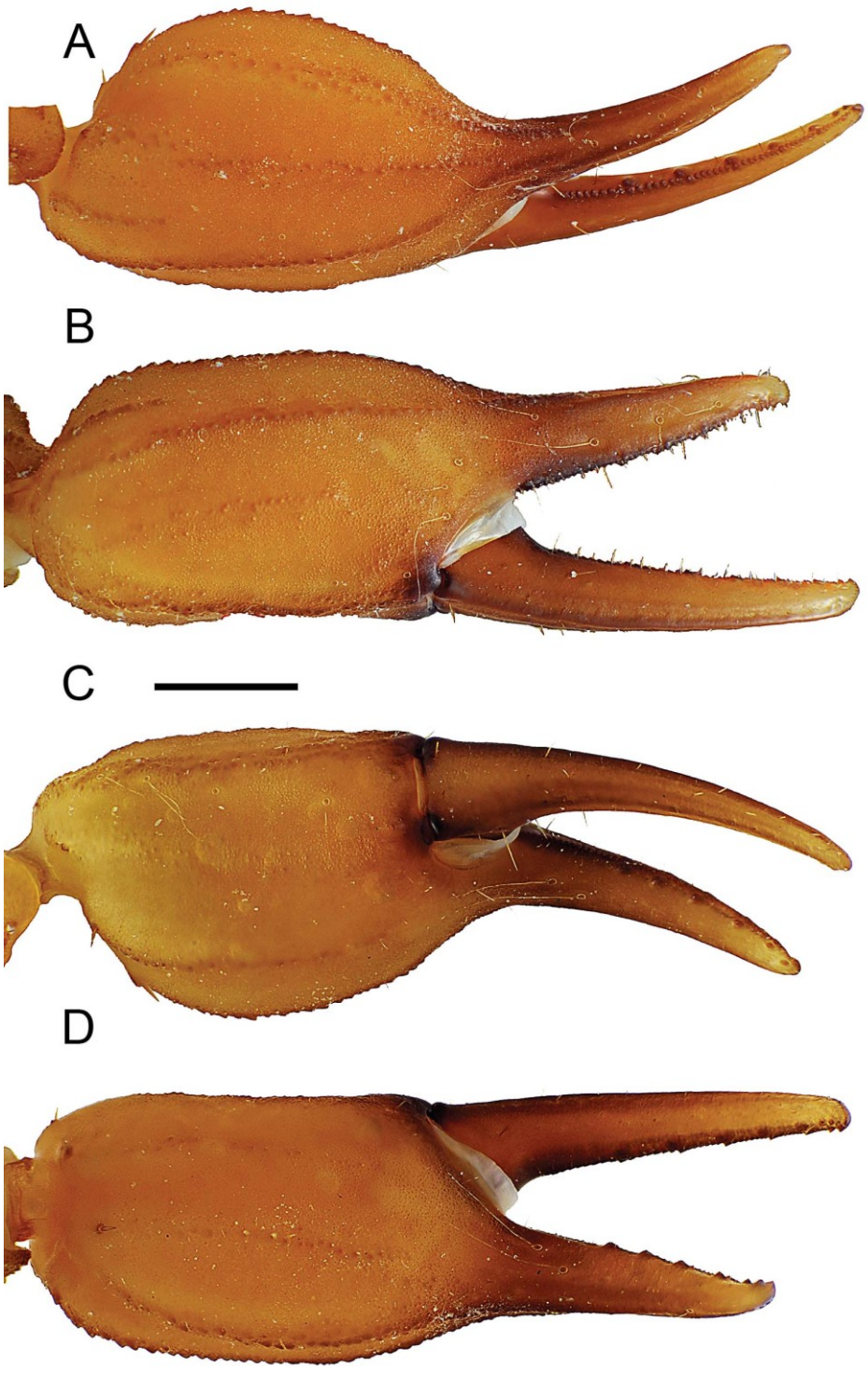


Figure 164. *Kochius hirsuticauda* (Banks, 1910), ♂ (AMNH), dextral pedipalp chela. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

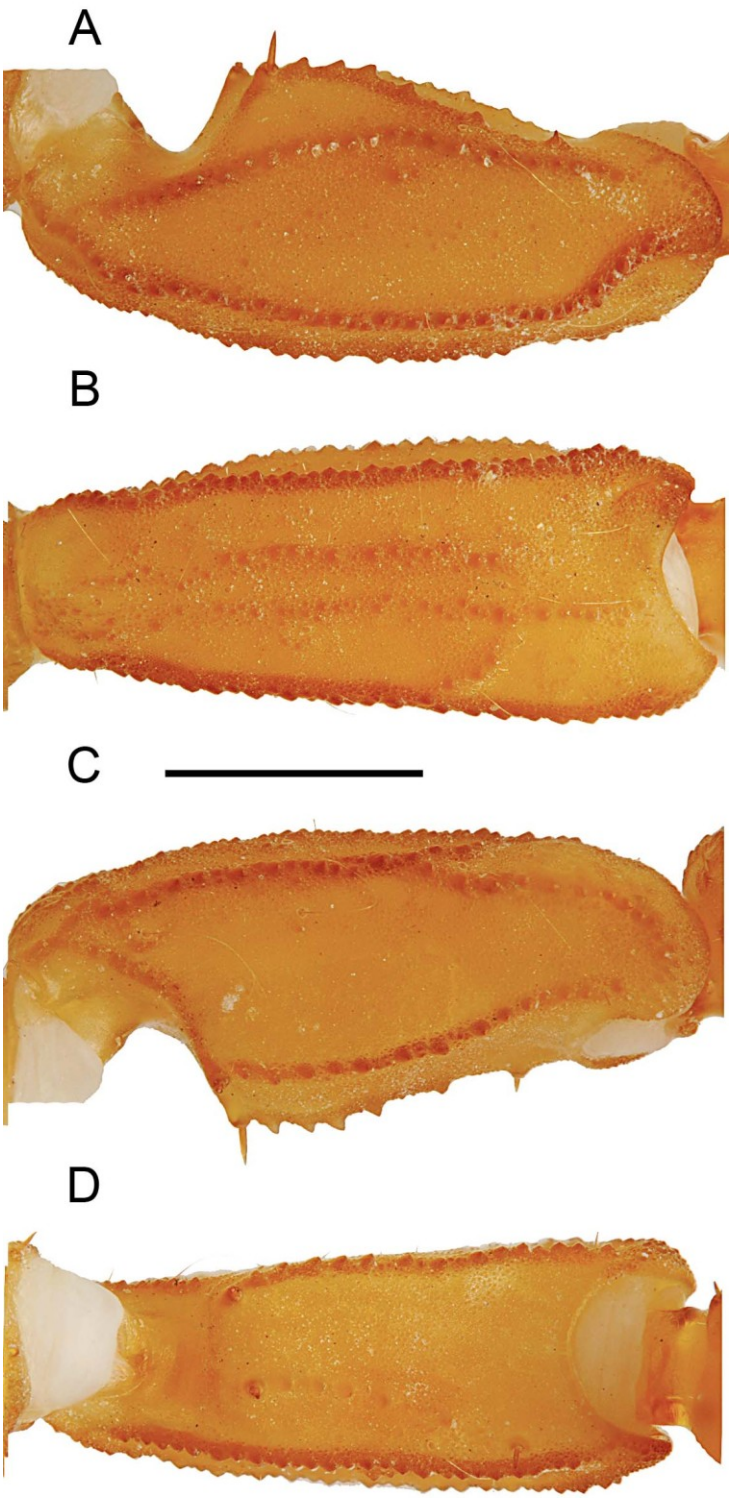


Figure 165. *Kochius hirsuticauda* (Banks, 1910), ♂ (AMNH), dextral pedipalp patella. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

Kochius insularis (Williams, 1970)

Figures 144, 166–168, 194C, 200C, 206B, 210B, 213F, 217G, 221B

Vejovis insularis Williams, 1970c: 318, 322–325, figs. 26, 27; Soleglad, 1973b: 357.

Vaejovis insularis: Díaz-Nájera, 1975: 7, 15; Williams, 1980: 54, 84–86, figs. 56E, 83, 86; Kovařík, 1998: 147; Beutelspacher, 2000: 88, 137, 153, map 64; Sissom, 2000: 549; Sissom and Hendrixson, 2005a: 128, tab. 6.2; Francke and González-Santillán, 2007: 590.

Kochius insularis: Soleglad and Fet, 2008: 66, 93, 94.

TYPE MATERIAL: **MEXICO: Baja California Sur:** *Municipio de La Paz*: Holotype ♂ (CAS, Type No. 10422), Isla Partida, central valley, 10.vii.1968, S.C. Williams, M. Bentzien, and B. Fox. Paratypes: 2 ♂, 2 ♀ (CAS, including ♀ allotype), same locality as holotype; 2 ♀ (CAS), Isla Partida; 1 ♂, 1 ♀ (CAS), Isla Espiritu Santo.

DIAGNOSIS: *Kochius insularis* is closely related to *K. jatay*, **n. sp.** and *K. villosus*, with which forms a monophyletic group. The scheme of relationship resultant of the phylogenetic analysis is as follow: (*K. insularis* (*K. jatay* + *K. villosus*)). *K. insularis* may be distinguished by having ventral surface of telson relatively bald, with seven ore less macrosetae in each carina restricted to distal surface, instead of having eight or more macrosetae spread out over all surface. *K. insularis* has aculeus relatively elongated, instead of relatively short. From *K. villosus* differs by having vesicle telson relatively elongated, instead of having it relatively globose. Furthermore, differs by having six retrolateral denticles and six rows of median denticles on movable finger of pedipalp chelae, instead of having seven retrolateral denticles and seven rows. Whereas *K. villosus* has base color brownish to orange, *K. insularis* has base color pale yellow.

From *K. jatay*, **n. sp.** differs by having ventral submedian carinae of mesosomal segment VII obsolete, expressed by only three macrosetae, instead of having it vestigial, with few moderated granules adjacent to the distomedian glandular spot.

DESCRIPTION: The following redescription supplements Williams' (1971a) original description. It is based on adult ♂ and ♀ paratypes and the material examined.

Color and infuscation (in alcohol): Base color of chelicerae, carapace, tergites, legs, metasoma, coxal region, sternites, and telson homogeneously pale yellow to golden-yellowish, lacking infuscation. Pectines pale whitish. Aculeus base reddish turning brownish-red distally. Base of pedipalp fingers reddish.

Carapace: Carapace anterior margin emarginated with a moderated median notch and three pairs of minor macrosetae. Surface completely shagreened with scattered moderated conical and minute granules. Anteromedian, posteromedian, and posterolateral sulci deep, posterior transverse obsolete. Ocular tubercle moderately rose, superciliary carina weakly crenulated higher than median eyes. Median eyes approximately double size of lateral frontal pair. Three lateral eyes, two frontal pairs same size and posterior reduced approximately in half.

Sternum and coxal region: Sternum pentagonal subequilateral with three pairs of setae, one distal, one median pair and one pair on the lobes, median notch deep. Anterior margin of coxa II with three oblique slit-like structures, adjacent to an enlarge protuberance with coarse crenulations. Base coxal endite II with a moderated depression each. Coxa IV 1.67 times longer than coxa II.

Chelicerae: Dorsal surface smooth, dentition of fixed and movable fingers as in typical vaejovids. Distal margin of manus with one median macrosetae. Serrula with 12/12 tines.

Pedipalps: Trichobothrial pattern Type C, orthobothriotaxic. Chelae wider than patella and patella wider than femur. Femur: retro and prolateral intercarinal surfaces matte, dorsal and ventral shagreened, with dense coarse granules on median surface. Carinae: Dorsal retrolateral, dorsal prolateral, and ventral prolateral carinae strongly granular with conical and sharp enlarged granules; retrolateral dorsosubmedian complete, with a moderated proximal spinoid tubercle, moderately crenatoserrated, and two minor macrosetae medially, prolateral ventrosubmedian complete and strong, oblique row of sharp, conical, and enlarged granules, starting at mid surface slanting gently towards distal end of dorsal prolateral carinae, lacking macrosetae; prolateral ventral vestigial, expressed by two proximal tubercles, ventral one with a macroseta on top and three, proximal and distal with a macroseta on base, distributed from the basal to the mid aspect of the segment; ventral median and retrolateral ventral vestigial expressed by scattered serrated granules; ventral retrosubmedian partial, expressed by scattered irregular serrated granules, reaching proximal half.

Patella: All intercarinal surfaces matte. Carinae: Dorsal prolateral, dorsal retrolateral, ventral prolateral, and ventral retrosubmedian strongly granular with sharp, conical and enlarge granules; ventral median vestigial expressed as a short basal row of scattered granules, reaching mid segment; retrolateral dorsosubmedian and retrolateral median complete, moderately granular with irregular moderated and minute granules; prolateral median on a vaulted projection, extending from a proximal tubercle with a minor macroseta on top, and three to four subserrate granules reducing in size ending in few distal minute serrations, reaching trichobothrium d_2 and beyond demarcated by a flat surface ending on one distal minor macrosetae; prolateral ventral obsolete expressed by two minor macrosetae, one basal and one distal.

Chelae: Pedipalp manus incrassate. Manus 1.40 times longer than fixed finger. Intercarinal surface matte. Carinae: Dorsal prolateral, dorsal median, dorsal retrosubmedian accessory, and dorsal retrolateral carinae strongly scattered granular; dorsal prosubmedian and prolateral dorsal vestigial expressed by scattered crenulations flanking dorsal lateral carina; retrolateral median complete strongly crenulated; retrolateral subventral accessory vestigial expressed by few minute distal granulation; retrolateral subventral vestigial but considerably more developed than retrolateral subventral accessory, expressed by a row of irregular minute granules extending to distal third of manus, running parallel to ventral retrolateral carinae for half of the length of the same retrolateral subventral; ventral retrolateral strongly granular and partial, ending half way of retrolateral subventral, these two never connected but parallel; ventral prosubmedian weakly crenulated and ventral median vestigial expressed proximally as irregular row of crenulations fusing medially with ventral prosubmedian. Ventral prolateral crenulated and strongly costated; prolateral median strongly crenatoserrated, distally, slanting towards dorsal prolateral carinae as a fine row of crenulations. Trichobothria *Dt* and *Db* dorsal to dorsal retrolateral carinae. Trichobothrium *Dt* positioned subbasal on manus. Trichobothrium *Dt* positioned at mid manus.

Fingers: Fixed finger dentition: PD = 6, RD = 5, MD rows = 5, all denticles subserrate, retrolateral denticles comparatively smaller than prolateral denticles. Movable finger PD = 7, RD = 6, MD rows = 6, distal row with one denticle, prolateral and retrolateral denticles subpaired. Trichobothrium *ib* positioned between PD6 and PD7, PD7 lacking granule, and *it* positioned adjacent to PD6. Fingers lacking scalloped. Gap created when fingers close absent, fingers fit evenly.

Legs: Spinules: Basitarsi I–III with prolateral ventral and retrolateral ventral carinae with complete rows of spinules, in IV absent; retrolateral median rows in I–IV vestigial expressed as few terminal spinules; retrolateral dorsal in I–III, partial expressed in distal half, IV absent. Telotarsi I–IV with two pairs of ventrodistal spinules in I–IV. Setae: Prolateral ventral 3:4:5:5; medians in III and IV stout, retrolateral ventral 4:7:7:7; retrolateral dorsal 2:4:4:4; dorsal 3: 3:3:3 retrolateral dorsal and dorsal series arranged in two independent rows.

Tergites: Pretergites matte, posttergites with scattered moderated and coarse conical granules. Dorsal median carinae strong with a short row of distal crenatoserrations on proximal half; dorsal submedian strong complete, expressed along the entire postergite. Tergite VII with intercarinal surfaces scattered with large conical granules; dorsal median carina partial and strong expressed on proximal third, strongly costate and irregularly serrated; dorsal submedian vestigial expressed as a pair of distal irregular serrations strongly costated; dorsal lateral and lateral supramedian strong, proximal extreme with an enlarged spiniform tubercle projecting backwards; Dorsal lateral projecting and curving laterally almost reaching lateral supramedian distal margin, creating a semi ring of strong serrated granulation.

Genital operculum: Male genital operculum: wider than long, with three pairs of macrosetae. Sclerites free on longitudinal edge moving independently but unable to open more than 45°. Genital papillae protrude posteriorly. Female genital operculum: Wider than long, with three macrosetae. Sclerites fuse longitudinal.

Sternites: Sternites III–VI with all carinae obsolete and surface matte, V in ♂ with distomedian glandular spot weak, not protruding from adjacent surfaces, in ♀ obsolete. Sternite VII with ventral lateral carinae finely crenulated and strongly costated, ventral submedian carinae vestigial expressed by few moderated granules, weakly costated and lacking macrosetae

in ♂, with three macrosetae in ♀. Distomedian glandular spot strong in ♂, shaped as truncated triangle, moderated and broader in ♀. Spiracle elongated, slit-like, approximately two times longer than wide.

Pectines: Pectines in ♂ longer than distal margin of coxa VI, in ♀ at or slightly longer than coxa IV. Basal piece with two minor macrosetae. Marginal lamella consist of three sclerites, medial lamella proximally fuse distally progressively forming conspicuous 9–10 beads. Fulcra with 17–18 in ♂, 15–16 in ♀. Pectinal tooth count 18–19 in ♂, 16–17 in ♀.

Hemispermatophore: Lamina 1.73 longer than trunk. Dorsal through margin long, narrow, curving proximally, and removed from ventral trough. Hemimating plug developed from the inner lobe, distal barb margin with 12 elongated spinules. Primary and secondary hook positioned on the apex of lateral margin extension of the lamina (flange). Both hooks rounded low, separated slightly, forming a shallow notch. Median lobe ental terminus moderated and rounded. Basal plate of inner lobe removed from ventral trough. Spine of inner lobe moderate, secondary spine on ventromedian aspect of neck shorter. Neck relatively short (0.63 times longer than basal plate). Measurements, lamina, 3.12; trunk, 1.80; dorsal trough/laminar hooks, 1.14; ventral trough/laminar hook, 0.72; neck, 0.30; basal plate, 0.48.

Metasoma: All intercarinal surfaces matter, except dorsal surface of metasomal segment I–III with scattered moderated granules. Dorsal lateral carinae of metasomal segments I–V and lateral median carinae of segments I–III crenatoserrated, proximally end with an elongated spiniform tubercle pointing backwards, except in V. Lateral median in IV distal terminus weakly expanded or flared laterally. Lateral inframedian in I complete crenatoserrated, in II vestigial irregularly expressed on distal third, in III irregularly serrated expressed in distal fourth becoming weaker proximally, in IV absent, in V partial, finely crenatoserrated and strongly

costated, expressed in distal two thirds. Ventral lateral I–V, ventral submedian I–IV and ventral median in V finely crenatoserrated. Setae: In ♀ dorsal lateral, 0:0:1:1:4, lateral median, 0:1:1:2, lateral inframedian, 0:0:0:0:2, ventral lateral, 2:2:2:2:5, ventral submedian, 3:3:3:3, ventral sublateral, 2; all carinae major; in ♂ all macrosetae absent or reduced to microsetae.

Telson: Ventral and dorsal surfaces smooth, relatively hirsute with ventral submedian, and ventral sublateral carinae with seven macrosetae, lateral and dorsal carinae with three pairs of macrosetae on each carinae, restricted to distal surface in both sexes. Laterobasal microserration of aculeus with 4 sharp tines. Subaculear tubercle absent. Vesicle, 1.26 times longer than vesicle in ♀, in ♂1.40 times.

DISTRIBUTION: *Kochius insularis* is endemic to Espiritu Santo and Partida Islands, in Baja California Sur, Mexico. Williams (1980) additionally reported the presence of this species on Las Ánimas Island.

ECOLOGY: *Kochius insularis* was collected from sea level to approximately 50 m altitude. The specimens were found on gravel-sandy packed soil with thorn scrub vegetation.

MATERIAL EXAMINED: **MEXICO: Baja California Sur:** *Municipio de La Paz*: Isla Espíritu Santo, [24°30'N 110°22'W], 29.i.2009, 4 ♀ (IBUNAM), 1.iii.2010, 2 ♂, 1 ♀ (IBUNAM), W. López-Forment; Isla Espíritu Santo, Playa Bonanza, 24°27.3636'N 110°18.47'W, 0–50 m, 31.v.2008, E. González and I.G. Nieto, desert, collected at night with UV light, 1 ♂, 1 ♀ (AMNH [ARA2875]), 1 ♂, 1 ♀ (IBUNAM [ARA2260]), bajada, collected at night with UV light, 1 ♂ (AMNH [LP 8801]).

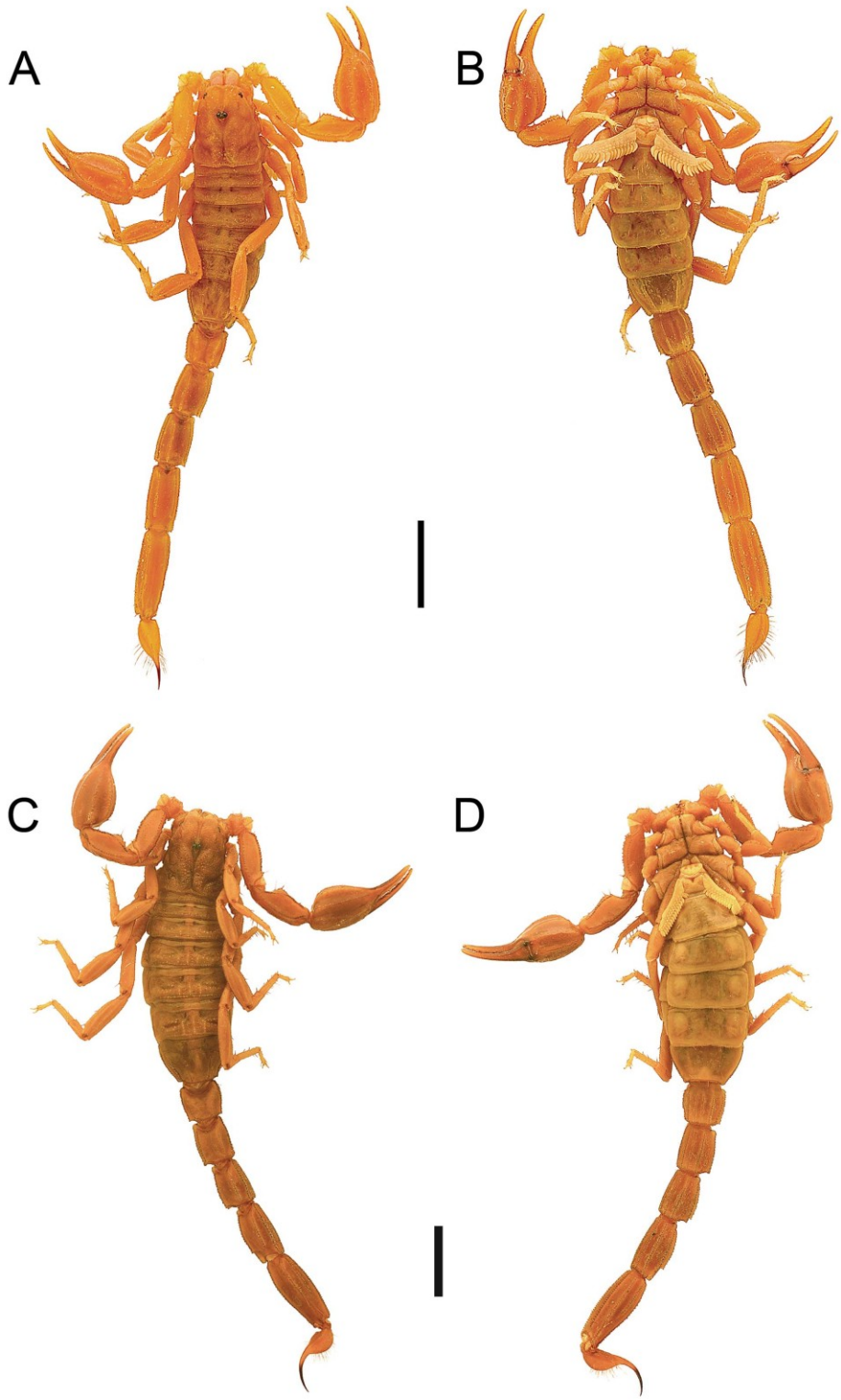


Figure 166. *Kochius insularis* (Williams, 1971), habitus. **A**, **B**. ♂ (AMNH). **C**, **D**. ♀ (AMNH). **A**, **C**. Dorsal aspect. **B**, **D**. Ventral aspect. Scale bars = 5 mm.

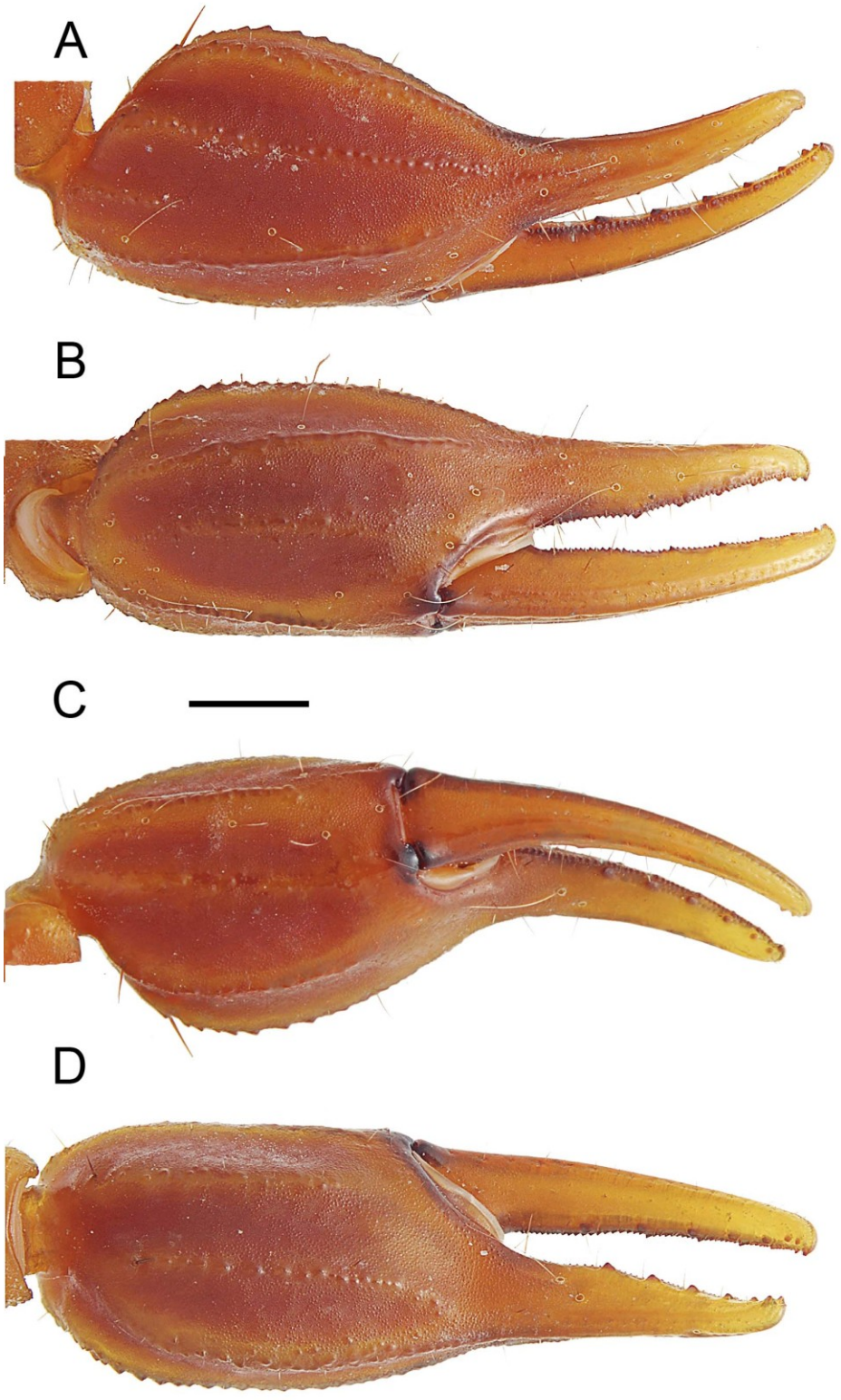


Figure 167. *Kochius insularis* (Williams, 1971), ♂ (AMNH), dextral pedipalp chela. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

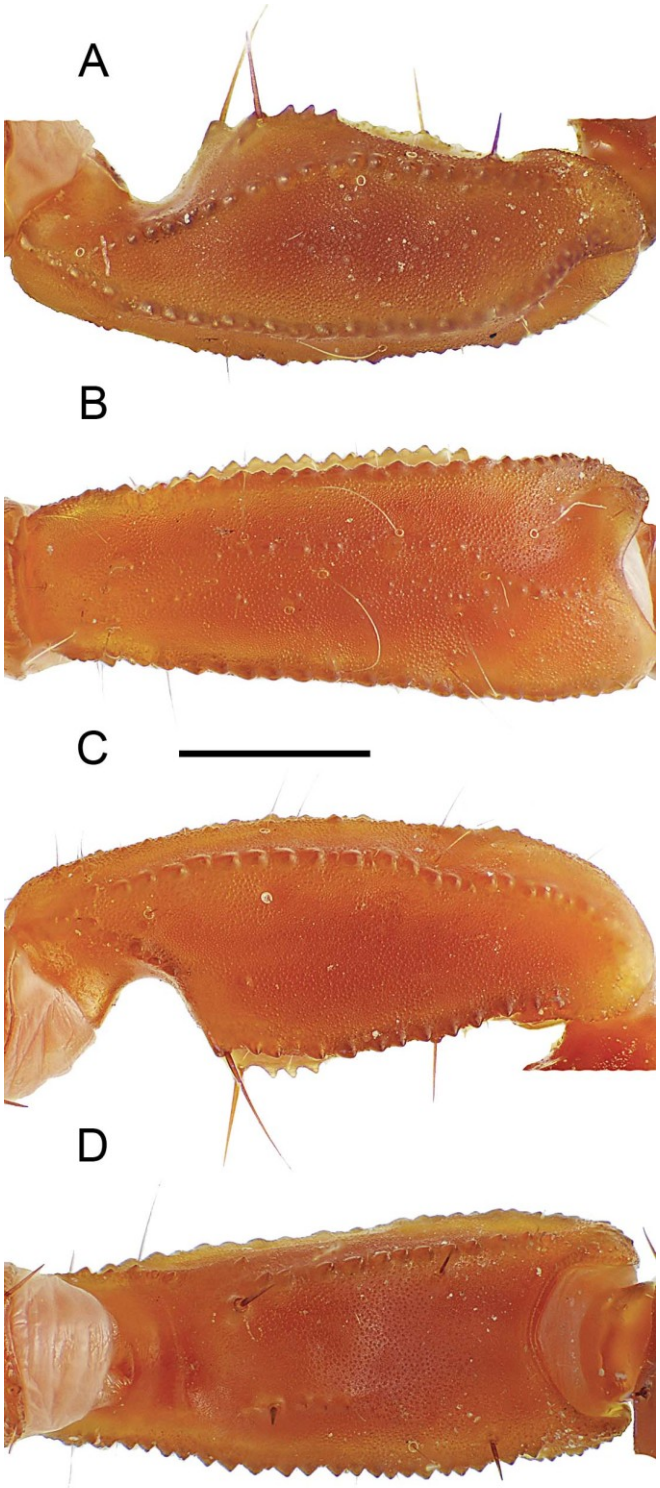


Figure 168. *Kochius insularis* (Williams, 1971), ♂ (AMNH), dextral pedipalp patella. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

Kochius jatay, **n. sp.**

Figures 116, 169–171, 194D, 201A, 206C, 210C, 214B, 217H, 221C; Table 13

Vaejovis bruneus loretoensis Williams, 1980: 82 (in part).

Vaejovis bruneus "form" *loretoensis* Beutelspacher, 2000: 76, map 49 (in part).

TYPE MATERIAL: **MEXICO: Baja California Sur:** *Municipio de La Paz*: Holotype ♂ Isla San José, Fishing camp Palma Sola, 25°03.091'N 110°40.037'W, 0–50 m, 3.vi.2008, E. González and I.G. Nieto, arroyo wash, sandy area, collected at night with UV light. Paratypes: 3 ♂, 2 juv. (AMNH [ARA2868]), 6 ♂, 1 ♀, 1 juv. (AMNH [ARA2869]), 2 ♂, 1 ♀ (CAS [ARA2253]), 7 ♂, 2 ♀ (IBUNAM [ARA2254]), same locality as holotype; 10 ♂, 2 ♀, 2 juv. (AMNH [ARA2849]), 11 ♂, 3 ♀ (IBUNAM [ARA2248]), Isla San José, W side, 24°56.7216'N 110°38.9076'W, 50 m, 2.vi.2008, desert, collected at night with UV light, 2 ♂ (IBUNAM), Northwest end Isla San José, [25°0.2167'N 110°37.8'W], 14.i.1991, R. Medina and L. Cervantes.

ETYMOLOGY: The species name *jatay* is a word in Kiliwa language of the aboriginal inhabitants of northern Baja California region that means sea. The name refers to the restricted distribution of this species in the San José Island in the Sea of Cortés (Ja' Tay Eñoom). The name is used as a noun in apposition.

DIAGNOSIS: *Kochius jatay*, **n. sp.** is closely related to *K. insularis* and *K. villosus*, with which it forms a monophyletic group (see *K. insularis* for details). *K. jatay*, **n. sp.** may be distinguished by having telson vesicle relatively elongated, instead of globose. Whereas *K. jatay*, **n. sp.** has ventral submedian carinae of mesosomal segment VII vestigial, with few moderated granules adjacent to the distomedian glandular spot, the other two species have it obsolete, expressed by only three macrosetae. From *K. villosus* differs by having six retrolateral denticles

and six rows of median denticles on movable finger of pedipalp chelae, instead of having seven retrolateral denticles and seven rows. Furthermore, *K. jatay*, **n. sp.** has base color pale yellow and *K. villosus* has base color brownish to orange. From *K. insularis* differs by having telson relatively bald with seven or less macrosetae in each carina restricted to distal surface, instead of having eight or more macrosetae spread out over all surface.

DESCRIPTION: The following description is based on types and the specimens listed in material examined.

Color and infuscation (in alcohol): Base color of chelicerae, carapace, tergites, legs, metasoma, coxal region, sternites, and telson homogeneously pale yellow to golden-yellowish, lacking infuscation. Pectines pale whitish. Aculeus base reddish turning brownish-red distally. Base of pedipalp fingers reddish.

Carapace: Carapace anterior margin emarginated with a moderated median notch and three pairs of minor macrosetae. Surface completely shagreened with scattered moderated conical and minute granules. Anteromedian, posteromedian, and posterolateral sulci deep, posterior transverse obsolete. Median ocular tubercle moderately raised, superciliary carina weakly crenulated and low, slightly higher than median eyes. Median eyes approximately double size of lateral frontal pair. Three lateral eyes, two frontal pairs same size and posterior reduced approximately in half.

Sternum and coxal region: Sternum pentagonal subequilateral with three pairs of setae, one distal, one median pair and one pair on the lobes, median notch deep. Anterior margin of coxa II with three oblique slit-like structures, adjacent to an enlarge protuberance with moderated granules. Base coxal endite II with a broad depression each. Coxa IV 2.00 times longer than coxa II.

Chelicerae: Dorsal surface smooth, dentition of fixed and movable fingers as in typical vaejovids. Distal margin of manus with one median macrosetae. Serrula with 14/14 tines.

Pedipalps: Trichobothrial pattern Type C, orthobothriotaxic. Chelae wider than patella, and patella wider than femur. Femur: retro and prolateral intercarinal surfaces matte, dorsal and ventral shagreened, with dense coarse granules on median surface. Carinae: Dorsal retrolateral, dorsal prolateral, and ventral prolateral carinae strongly granular with conical and sharp enlarged granules; retrolateral dorsosubmedian partial, with a moderated proximal spinoid tubercle, followed by a short gap of finely granulated surface and followed by a moderate crenatoserrated carinae and two median minor macrosetae; prolateral ventrosubmedian complete and strong, oblique row of sharp, conical, and enlarged granules, starting at mid surface slanting gently towards distal end of dorsal prolateral carinae, lacking macrosetae in male, with a median minor macrosetae in female; prolateral ventral vestigial, expressed by two proximal tubercles, ventral one with a minor macroseta on top and three, proximal and distal with a minor macroseta on top, distributed from the basal to the mid aspect of the segment; ventral median and retrolateral ventral vestigial expressed by scattered serrated granules; ventral retrosubmedian partial, expressed by scattered irregular serrated granules, reaching proximal half.

Patella: All intercarinal surfaces matte. Carinae: Dorsal prolateral, dorsal retrolateral, ventral prolateral, and ventral retrosubmedian strongly granular with sharp, conical and enlarge granules; ventral median vestigial expressed by three or five proximal conical granules; retrolateral dorsosubmedian and retrolateral median complete, moderately granular with irregular moderated and minute granules; prolateral median on a vaulted projection, extending from a proximal tubercle with a minor macroseta on top, and three to five subserrate granules reducing in size ending in few distal minute serrations, reaching trichobothrium d_2 and beyond demarcated

by a flat surface followed by one distal minor macrosetae, pointing dorsally; prolateral ventral obsolete expressed by two minor macrosetae, one basal and one distal.

Chelae: Pedipalp manus incrassate. Manus 1.60 times longer than fixed finger. Intercarinal surface matte. Carinae: Dorsal prolateral and dorsal median carinae strongly granular; dorsal retrosubmedian accessory vestigial, expressed proximally by four to six enlarged granules; dorsal retrolateral strongly granular on proximal third, crenular medially and distal third weakly crenular to smooth; dorsal prosubmedian and prolateral dorsal vestigial expressed by scattered crenulations flanking dorsal lateral carina; retrolateral median complete strong irregularly crenulated; retrolateral subventral accessory and retrolateral subventral vestigial expressed by few minute distal granulation; ventral retrolateral partial strongly granular becoming weakly crenular ending at the level of trichobothrium *Est*; ventral prosubmedian weakly crenulated and ventral median vestigial expressed proximally as irregular row of crenulations fusing medially with ventral prosubmedian; ventral prolateral irregularly crenulated and moderately costate; prolateral median with scattered crenatoserrations distally, gently slanting towards dorsal prolateral carinae as a fine row of crenulations. Trichobothria *Dt* and *Db* dorsal to dorsal retrolateral carinae. Trichobothrium *Dt* positioned subbasal on manus. Trichobothrium *Dt* positioned at mid manus.

Fingers: Fixed finger dentition: PD = 6, RD = 5, MD rows = 5, all denticles subserrate, retrolateral denticles comparatively smaller than prolateral denticles. Movable finger PD = 7, RD = 6, MD rows = 6, distal row with one denticle, prolateral and retrolateral denticles subpaired. Trichobothrium *ib* positioned between PD6 and PD7, PD7 lacking granule, and *it* positioned adjacent to PD6. Fingers lacking scalloped. Gap created when fingers close absent, fingers fit evenly.

Legs: Spinules: Basitarsi I–II with prolateral ventral and retrolateral ventral carinae with complete rows of spinules, retrolateral ventral in III partial expressed in distal half, in IV absent; prolateral ventral absent in III and IV; retrolateral median rows in I–IV vestigial expressed as few terminal spinules; retrolateral dorsal in I–III, partial expressed in distal half, IV absent. Telotarsi I–IV with two pairs of ventrodistal spinules in I–IV. Setae: Prolateral ventral 3:4:5:5; medians in III and IV stout, retrolateral ventral 3:7:7:7; retrolateral dorsal 2:4:4:4; dorsal 3: 3:3:3 retrolateral dorsal and dorsal series arranged in two independent rows.

Tergites: Pretergites matte, posttergites with scattered moderated and coarse conical granules. Dorsal median carinae strong with a short row of distal crenatoserrations on proximal half; dorsal submedian strong complete, expressed along the entire postergite. Tergite VII with intercarinal surfaces scattered with large conical granules; dorsal median carina partial and strong expressed on proximal third, strongly costate and irregularly serrated; dorsal submedian vestigial expressed as a pair of distal irregular serrations strongly costate; dorsal lateral and lateral supramedian strong, proximal extreme with an enlarged spiniform tubercle projecting backwards; Dorsal lateral projecting and curving laterally almost reaching lateral supramedian distal margin, creating a semi ring of strong serrated granulation.

Genital operculum: Male genital operculum: wider than long, with three pairs of macrosetae. Sclerites free on longitudinal edge moving independently but unable to open more than 45°. Genital papillae protruding posteriorly. Female genital operculum: Wider than long, with three macrosetae. Sclerites fuse longitudinal.

Sternites: Sternites III–VI with all carinae obsolete and surface matte, V in ♂ with distomedian glandular spot weak, not protruding from adjacent surfaces, in ♀ obsolete. Sternite VII intercarinal surfaces cover with fine granules and scattered moderated granules, with ventral

lateral carinae finely crenulated and strongly costate, ventral submedian carinae obsolete to vestigial expressed by few moderated granules adjacent to the distomedian glandular spot with three macrosetae. Distomedian glandular spot strong in ♂, shaped as truncated triangle, moderated in ♀. Spiracle elongated, slit-like, approximately two times longer than wide.

Pectines: Pectines in ♂ longer than distal margin of coxa VI, in ♀ at or slightly longer than coxa IV. Basal piece with two minor macrosetae in ♀, in ♂ lacking macrosetae. Marginal lamella consist of three sclerites, medial lamella proximally fuse distally progressively forming conspicuous 10–12 beads. Fulcra with 16–18 in ♂, in ♀ 14–15. Pectinal tooth count 17–19 ♂, in ♀ 15–16.

Hemispermatophore: Lamina 1.73 longer than trunk. Dorsal through margin long, narrow, curving proximally, and removed from ventral trough. Hemimating plug developed from the inner lobe, distal barb margin with 11 elongated spinules. Primary and secondary hook positioned on the apex of lateral margin extension of the lamina (flange). Both hooks rounded and low, separated slightly, forming a shallow notch. Median lobe ental terminus moderated and rounded. Basal plate of inner lobe removed from ventral trough. Spine of inner lobe relatively long and strongly sclerotized. Neck relatively short (0.67 times longer than basal plate). Measurements, lamina, 3.12; trunk, 1.80; dorsal trough/laminar hooks, 3.12; ventral trough/laminar hook, 0.72; neck, 0.36; basal plate, 0.54.

Metasoma: All intercarinal surfaces matter, except dorsal surface of metasomal segment I–III with scattered moderated granules. Dorsal lateral carinae of metasomal segments I–V and lateral median carinae of segments I–III crenatoserrated, proximally end with an elongated spiniform tubercle pointing backwards, except in V. Lateral median in IV distal terminus weakly expanded or flared laterally. Lateral inframedian in I complete crenatoserrated, in II vestigial

irregularly expressed on distal third, in III irregularly serrated expressed in distal fourth becoming weaker proximally, in IV absent, in V partial, finely crenatoserrated and strongly costate, expressed in half. Ventral lateral I–V, ventral submedian I–IV and ventral median in V finely crenatoserrated. Setae: In ♀ dorsal lateral, 0:0:1:1:4, lateral median, 0:1:2:2, lateral inframedian, 0:0:0:0:2, ventral lateral, 2:2:2:2:5, ventral submedian, 3:3:3:3, ventral sublateral, 2; all macrosetae minor; in ♂ all macrosetae absent or reduced to microsetae.

Telson: Ventral and dorsal surfaces smooth, hirsute with 8–11 macrosetae ventral in each carinae, dorsal carinae with three pairs of macrosetae in both sexes. Laterobasal microserration of aculeus with 4–6 sharp tines. Subaculear tubercle absent. Vesicle 1.05 times longer than aculeus in ♀, in ♂ 1.35 times.

DISTRIBUTION: *Kochius jatay*, **n. sp.** is endemic to San José Island in the Sea of Cortez, Baja California, Mexico.

ECOLOGY: This species is one of the most common on the island, and inhabits most of the available habitats; it was collected in the north, south and west of the island, from sea level to approximately 50 m altitude.

REMARKS: Williams (1980) identified the populations of the San José Island as *K. villosus.* Based on the analyses presented here, these populations are redefined as *K. jatay*, **n. sp.**

MATERIAL EXAMINED: **MEXICO: Baja California Sur:** *Municipio de La Paz*: Isla San José, Fishing camp Palma Sola, 0–50 m, 3.vi.2008, 25°03.091'N 110°40.037'W, arroyo wash, sandy area, collected at night with UV light 1 ♂ (AMNH [LP 8802]); Isla San José, W side, 24°56.7216'N 110°38.9076'W, 50 m, 2.vi.2008, desert, collected at night with UV light, 1 ♂ (AMNH [LP 8790]), E. González and I.G. Nieto.

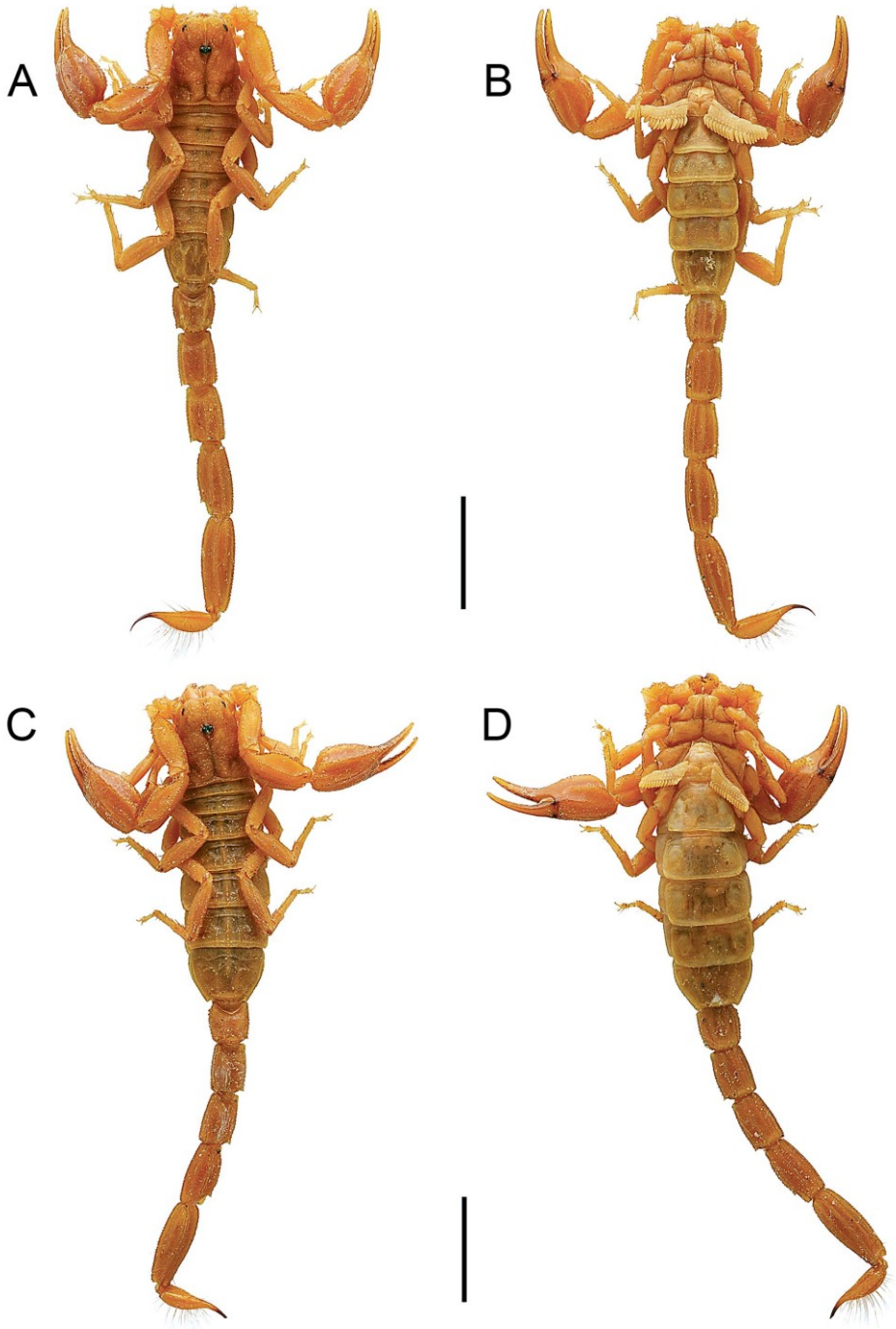


Figure 169. *Kochius jatay*, **n. sp.**, habitus. **A**, **B**. Paratype ♂ (AMNH). **C**, **D**. ♀ (AMNH). **A**, **C**. Dorsal aspect. **B**, **D**. Ventral aspect. Scale bars = 5 mm.

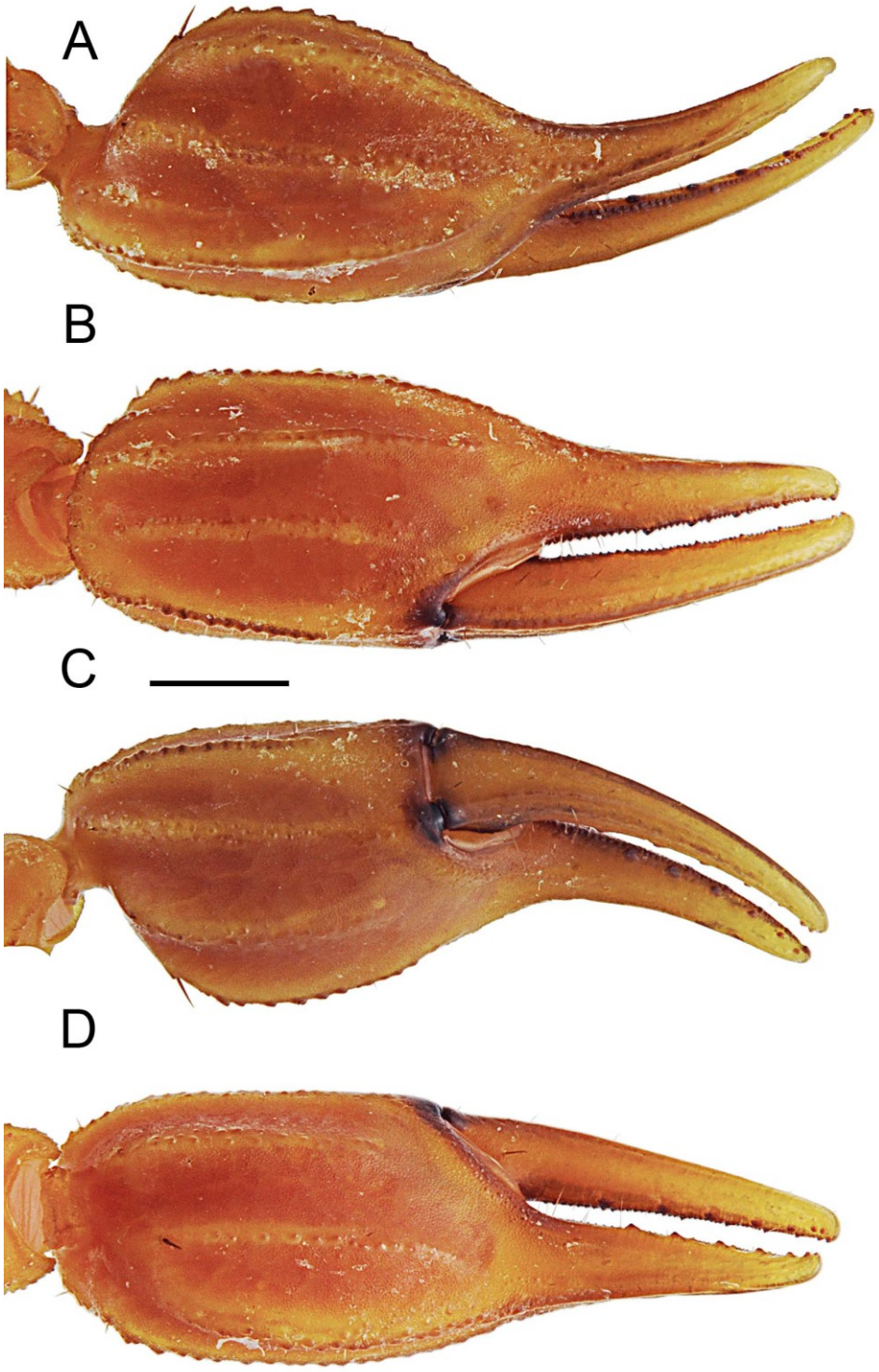


Figure 170. *Kochius jatay*, **n. sp.**, paratype ♂ (AMNH), dextral pedipalp chela. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

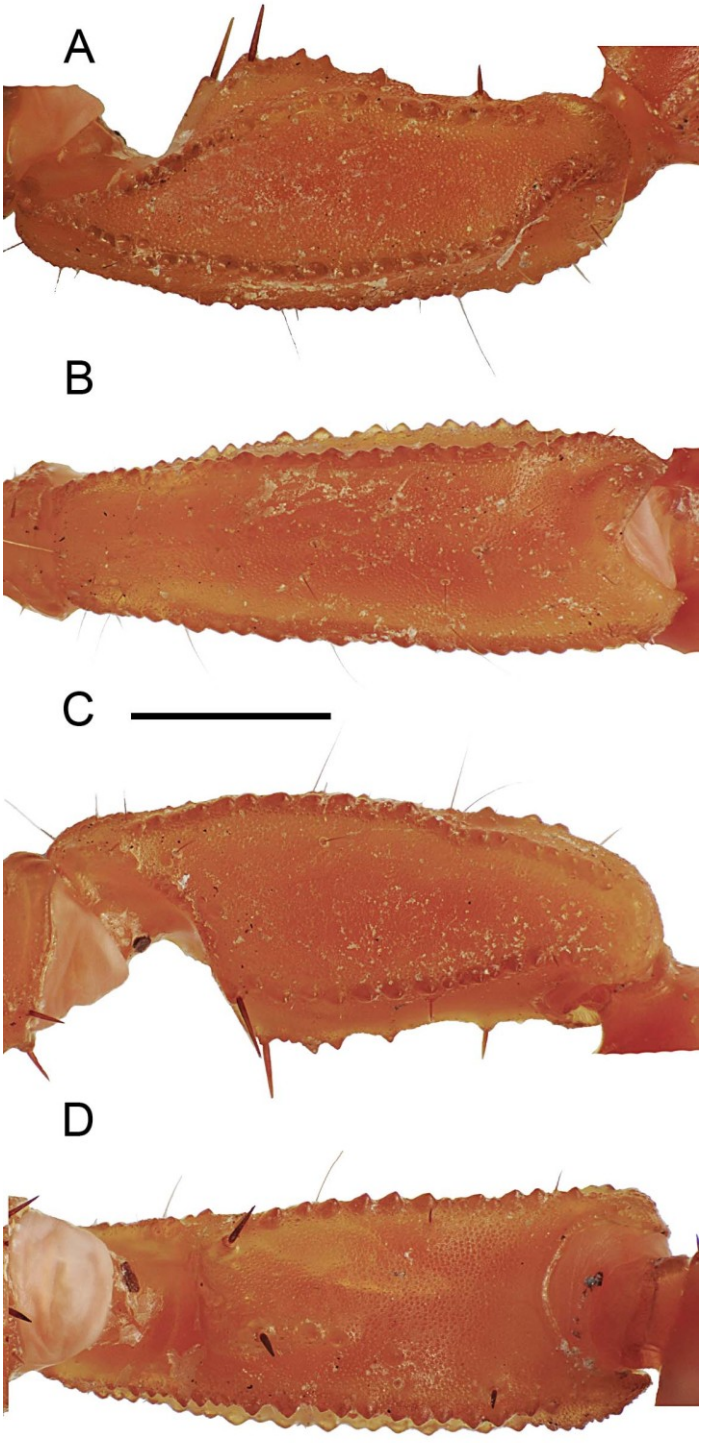


Figure 171. *Kochius jatay*, **n. sp.**, paratype ♂ (AMNH), dextral pedipalp patella. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

Kochius kiliwa, **n. sp.**

Figures 146, 172–174, 195A, 201B, 206D, 210D, 214C, 218A, 221D; Table 13

TYPE MATERIAL: **MEXICO: Baja California Sur:** *Municipio de Mulegé*: Holotype ♂ (IBUNAM) Microwave station San Lucas, 27°11.550'N 112°14.150'W, 185 m, 5.vii.2005, W.E. Savary and R. Mercurio, desert, collected at night with UV light. Paratypes: same locality as holotype, 3 ♂ (AMNH [ARA1484]).

ETYMOLOGY: The species name *kiliwa* refers to the aboriginal people Kiliwa inhabitants of the northern region of Baja California. The name is a noun in apposition.

DIAGNOSIS: *Kochius kiliwa*, **n. sp.** is closely related to *K. bruneus*, *K. danzante*, **n. sp.**, and *K. hirsuticauda*, with which it forms a monophyletic group (see *K. hirsuticauda* for details). *K. kiliwa*, **n. sp.** may be separated from these species by having the most hirsute ventral surface of telson with seven to nine macrosetae in each carinae, instead of three in *K. bruneus* or 12 or more in *K. danzante*, **n. sp.** and *K. hirsuticauda*. From *K. hirsuticauda* differs by having base color brownish to orange dark and weak fuscous markings on carapace and tergites, instead of having base color yellow pale and immaculate surface. Furthermore, differs from *K. hirsuticauda* by having metasomal segment I wider than long, instead of having it longer than wide. From *K. bruneus* and *K. hirsuticauda* differs by having aculeus relatively elongate, instead of having it relatively short. Additionally, *K. kiliwa*, **n. sp.** has carinae of pedipalp femur and patella outlined with intense infuscation and these two species have these carinae immaculate or weakly infuscate. From *K. danzante*, **n. sp.** differs by having base color moderate orange to brownish, instead of having base color brownish dark. *K. kiliwa*, **n. sp.** has base of pedipalp fingers intensely infuscate, but *K. danzante*, **n. sp.** has not infuscation.

DESCRIPTION: The following description is based on types and the specimens listed in material examined.

Color and infuscation (in alcohol): Base color brownish to dark orange. Legs and pedipalps slightly paler yellowish. Base of pedipalp fingers reddish and intensely infuscate. Pectines and genital operculum pale whitish. Carapace and tergites with diffuse markings of infuscation. Aculeus reddish at base turning brownish.

Carapace: Carapace anterior margin emarginated with a moderated, relatively broad median notch and three pairs of minor macrosetae. Surface completely shagreened with scattered moderated conical and minute granules. Anteromedian sulcus moderated, posteromedian deep and narrow, posterolateral moderated and broad, posterior transverse obsolete. Median ocular tubercle moderately raised, superciliary carina moderately crenulated and higher than median eyes. Median eyes approximately double size of lateral frontal pair. Three lateral pair of eyes, two frontal pairs same size and posterior reduced approximately in half.

Sternum and coxal region: Sternum pentagonal subequilateral with three pairs of setae, one distal, one median pair and one pair on the lobes, median notch deep. Anterior margin of coxa II with three oblique slit-like structures, adjacent to a moderate protuberance weakly crenulated. Base coxal endite II with a shallow depression each. Coxa IV 2.03 times longer than coxa II.

Chelicerae: Dorsal surface smooth, dentition of fixed and movable fingers as in typical vaejovids. Distal margin of manus with one median macrosetae. Serrula with 14/15 tines.

Pedipalps: Trichobothrial pattern Type C, orthobothriotaxic. Chelae wider than patella and patella wider than femur. Femur: retro and prolateral intercarinal surface matte, dorsal and ventral shagreened with coarse scattered granules on median surface. Carinae: Dorsal

retrolateral, dorsal prolateral, and ventral prolateral carinae strongly granular with conical and sharp enlarged granules; retrolateral dorsosubmedian complete, moderately crenatoserrated, and two minor macrosetae medially; prolateral ventrosubmedian complete and strong, oblique row of sharp, subserrate, and enlarged granules, starting at mid surface slanting gently towards distal end of dorsal prolateral carinae, lacking macrosetae; prolateral ventral vestigial, expressed by two proximal enlarged granules adjacent to a minor macrosetae and two additional pairs of granules, median and distal, each pair with a macroseta at base of one granule, distributed from the basal to the mid aspect of the segment; ventral median and retrolateral ventral vestigial expressed by a row of scattered proximal serrated granules; ventral retrosubmedian partial, expressed by scattered irregular enlarge and moderated conical granules, reaching proximal half.

Patella: All intercarinal surfaces matte. Carinae: Dorsal prolateral, dorsal retrolateral, ventral prolateral, and ventral retrosubmedian strongly granular with sharp, conical and enlarge granules; ventral median vestigial expressed as a short basal row of scattered granules, reaching proximal third; retrolateral dorsosubmedian and retrolateral median partial, expressed as broken irregular rows of moderate and minute granules, strongly costate; prolateral median on a vaulted projection, extending from a proximal tubercle with a minor macroseta on top, and a row of subserrate granules reducing in size ending in few distal minute serrations, reaching trichobothrium d_2 and beyond demarcated by a flat surface ending on one distal minor macrosetae; prolateral ventral obsolete expressed by two minor macrosetae, one basal and one distal.

Chelae: Pedipalp manus moderated (manus 1.69 times longer than fixed finger). Intercarinal surface matte. Carinae: Dorsal prolateral, dorsal median, and dorsal retrosubmedian accessory carinae strong with moderate granules; dorsal retrolateral proximally granular

becoming distally crenular; dorsal prosubmedian and prolateral dorsal vestigial expressed by scattered crenulations flanking dorsal lateral carina; retrolateral median complete moderately granular; dorsal prosubmedian and prolateral dorsal vestigial expressed by short distal crenulations; retrolateral subventral accessory and retrolateral subventral vestigial expressed by few distal short low crenulation; ventral retrolateral partial, strongly granular, ending at the level of trichobothrium *Est*; ventral prosubmedian moderately crenulated and costate; ventral median vestigial expressed as crenulations flanking ventral prosubmedian reaching proximal half; ventral prolateral moderate proximally granulated and costate becoming crenulated distally; prolateral median with scattered enlarged crenatoserrations, gently slanting towards dorsal prolateral carinae as a fine row of crenulations. Trichobothria *Dt* and *Db* dorsal to dorsal retrolateral carinae. Trichobothrium *Dt* positioned subbasal on manus. Trichobothrium *Dt* positioned at mid manus.

Fingers: Fixed finger dentition: PD = 6, RD = 6, MD rows = 6, all denticles subserrate, retrolateral denticles comparatively smaller than prolateral denticles. Movable finger PD = 7, RD = 7, MD rows = 7, distal row with one denticle, prolateral and retrolateral denticles subpaired. Trichobothrium *ib* positioned between PD6 and PD7, PD7 lacking granule, and *it* positioned adjacent to PD6. Fingers lacking scalloped. Gap created when fingers close absent, fingers fit evenly.

Legs: Spinules: Basitarsi I and II with prolateral ventral and retrolateral ventral carinae with complete rows of spinules; prolateral ventral absent in III and IV; retrolateral ventral in III vestigial expressed on distal third; retrolateral median rows in I–IV absent; retrolateral dorsal in I–II, partial expressed in distal half, in III vestigial expressed on distal third, IV absent. Telotarsi I–IV with two pairs of ventrodistal spinules in I–IV. Setae: Prolateral ventral 3:4:5:5; retrolateral

ventral 4:7:7:7; retrolateral dorsal 2:4:4:4; dorsal 3:3:3:3 retrolateral dorsal and dorsal series arranged in two independent rows.

Tergites: Pretergites matte, posttergites with densely cover with moderated and coarse conical granules. Dorsal median and dorsal submedian carinae strong with a row of distal crenatoserrations expressed on proximal half. Tergite VII with intercarinal surfaces scattered with few large conical granules; dorsal median carina partial and strong expressed on proximal third, strongly costate and irregularly serrated; dorsal submedian vestigial expressed as a short distal row of irregular serrations strongly costate; dorsal lateral and lateral supramedian strong, distal extreme with an enlarged spiniform tubercle projecting backwards; dorsal lateral projecting and curving laterally almost reaching lateral supramedian distal margin, creating a semi ring of strong serrated granulation.

Genital operculum: Male genital operculum: wider than long, with three pairs of macrosetae. Sclerites free on longitudinal edge moving independently but unable to open more than 45°. Genital papillae protruding posteriorly. Female genital operculum: Wider than long, with three macrosetae. Sclerites fuse longitudinal.

Sternites: Sternites III–VI with all carinae obsolete and surface matte in both sexes, V in ♂ with distomedian glandular spot weak, not protruding from adjacent surfaces, but contrasting strongly with the base dark color of the sternites, in ♀ obsolete. Sternite VII with ventral lateral carinae moderately crenatoserrated and strongly costate; ventral submedian obsolete expressed by three minor macrosetae. Distomedian glandular spot strong, shaped as a truncated triangle, strongly protruding from adjacent surface, in ♀ lower and less developed. Spiracle elongated, slit-like, approximately two times longer than wide.

Pectines: Pectines in ♂ longer than distal margin of coxa VI, in ♀ at or slightly longer than coxa IV. Basal piece with two minor macrosetae. Marginal lamella consist of three sclerites, medial lamella proximally fuse distally progressively forming conspicuous 9–12 beads. Fulcra with 17–19 beads in ♂, 13–15 beads in ♀. Pectinal tooth count 18–20 in ♂, 14–16 in ♀.

Hemispermatophore: Lamina 1.83 longer than trunk. Dorsal through margin long, narrow, curving proximally, and removed from ventral trough. Hemimating plug developed from the inner lobe, distal barb margin with 6 broad and elongated spinules. Primary and secondary hook positioned on the apex of lateral margin extension of the lamina (flange). Both hooks rounded low, separated slightly, forming a moderate notch. Median lobe ental terminus moderated and rounded. Basal plate of inner lobe removed from ventral trough. Spine of inner lobe relatively long and strongly sclerotized, secondary spine on ventromedian aspect of neck, weaker. Neck slightly longer than basal plate (1.1 times longer than basal plate). Measurements, lamina, 3.30; trunk, 1.80; dorsal trough/laminar hooks, 1.32; ventral trough/laminar hook, 0.90; neck, 0.60; basal plate, 0.54.

Metasoma: All intercarinal surfaces matter, except dorsal surface of metasomal segment I–IV with few scattered moderated granules. Dorsal lateral carinae of metasomal segments I–V and lateral median carinae of segments I–III finely crenatoserrated, proximally end with an elongated spiniform tubercle pointing backwards, except in V. Lateral median in IV distal terminus weakly expanded or flared laterally. Lateral inframedian in I complete crenatoserrated, in II partial crenatoserrated becoming weaker proximally, expressed on distal half, in III crenatoserrated expressed in distal third becoming weaker proximally, in IV absent, in V partial, finely crenatoserrated and strongly costate, expressed in distal three fourths. Ventral lateral I–V, ventral submedian I–IV and ventral median in V finely crenatoserrated. Setae: In ♀ dorsal

lateral, 0:0:0:1:3, lateral median, 0:1:1:1, lateral inframedian, 1:0:0:0:3, ventral lateral, 2:2:2:2:4, ventral submedian, 3:3:3:3, ventral sublateral, 2; all carinae minor; in ♂ all macrosetae absent or reduced to microsetae.

Telson: Ventral and dorsal surfaces smooth, relatively hirsute, ventral carinae with seven to nine macrosetae in each carinae plus additional three or more macrosetae in intercarinal surfaces positioned distally in both sexes. Laterobasal microserration of aculeus with 7 sharp tines. Subaculear tubercle absent.

DISTRIBUTION: *Kochius kiliwa*, **n. sp.** has been recorded only in the type locality, 16 km south of Santa Rosalía, Baja California Sur, Mexico.

ECOLOGY: As in other species of the genus, *K. kiliwa*, **n. sp.** was found at night using ultraviolet detection, along a dirt road at 185 m altitude.

REMARKS: Williams (1971a) recorded paratype specimens of *Vaejovis bruneus villosus* from Santa Rosalía. The phylogenetic analyses conducted here produced a scheme of relationships, in which this population represents a distinctive linage. Further morphological studies permitted diagnosing this species.

MATERIAL EXAMINED: **MEXICO: Baja California Sur:** *Municipio de Mulegé*: Microwave station San Lucas, 27°11.550'N 112°14.150'W, 185 m, 5.vii.2005, W.E. Savary and R. Mercurio, desert, collected at night with UV light 1 ♂ (AMNH [LP 4553]).

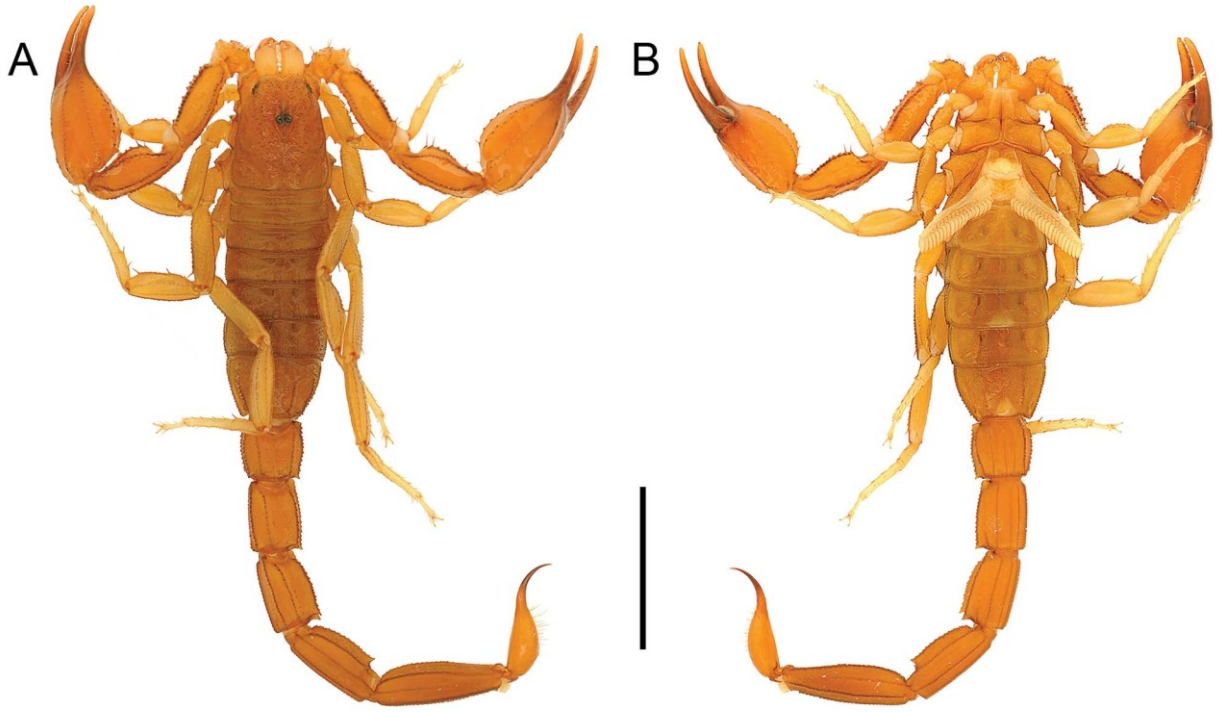


Figure 172. *Kochius kiliwa*, **n. sp.**, paratype ♂ (AMNH), habitus. **A**. Dorsal aspect. **B**. Ventral aspect. Scale bars = 5 mm.

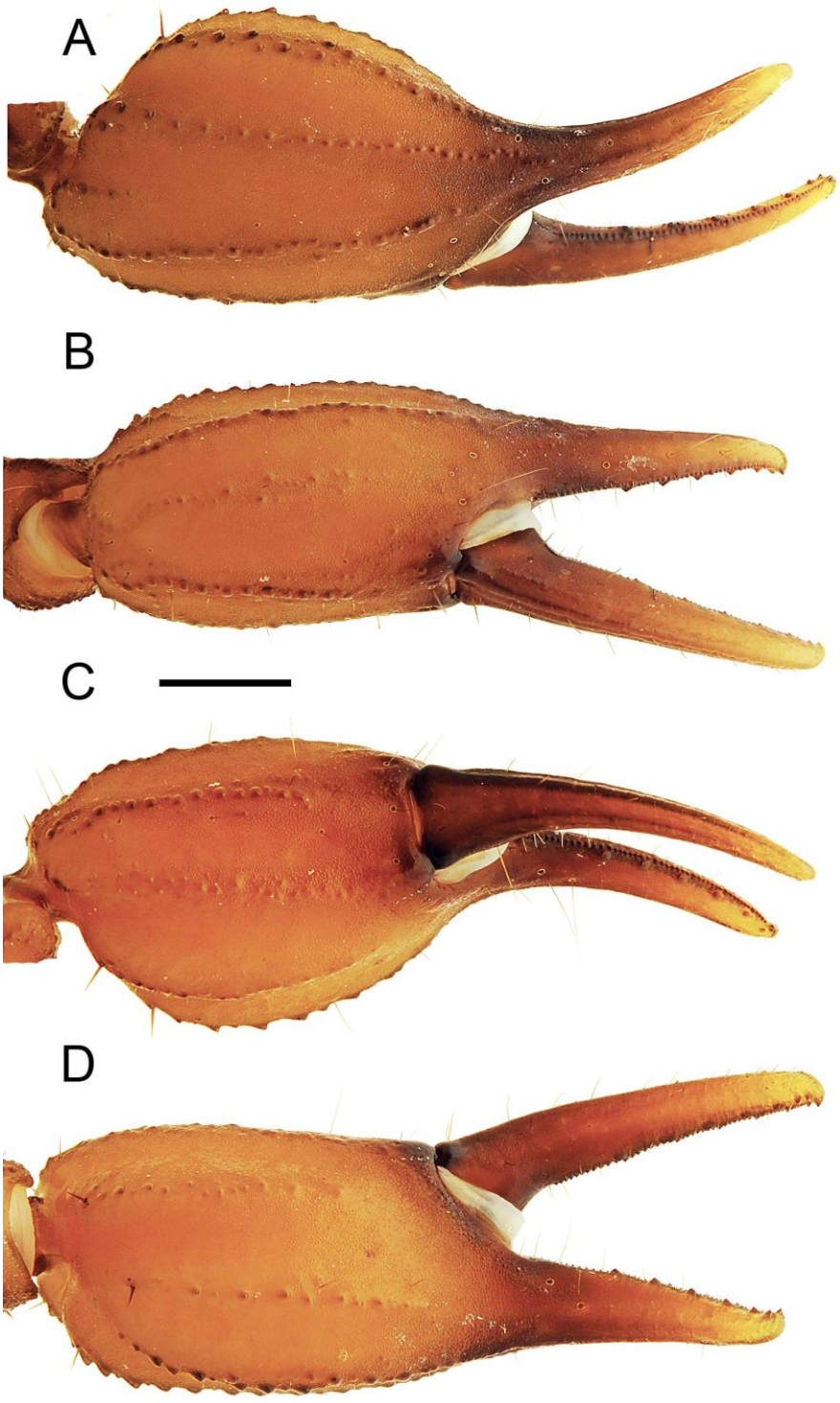


Figure 173. *Kochius kiliwa*, **n. sp.**, paratype ♂ (AMNH), dextral pedipalp chela. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

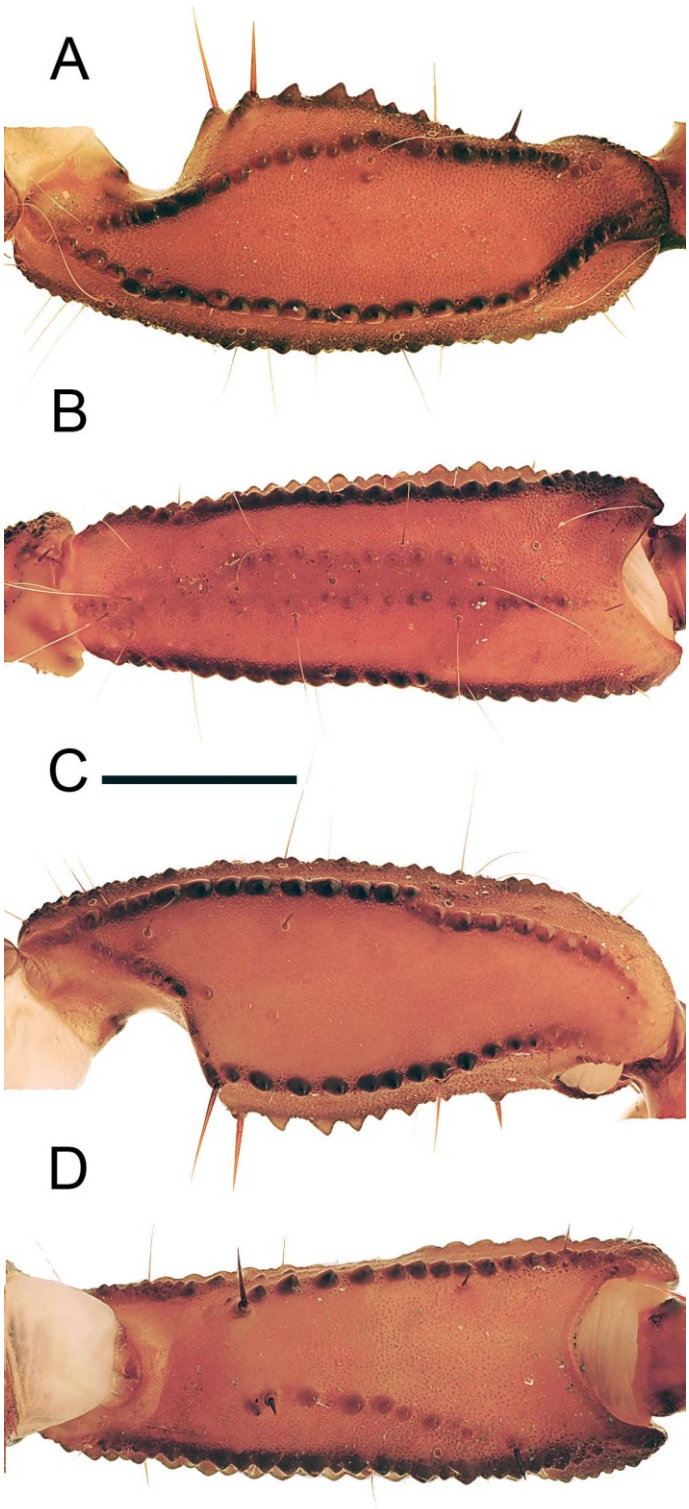


Figure 174. *Kochius kiliwa*, **n. sp.**, paratype ♂ (AMNH), dextral pedipalp patella. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

Kochius magdalensis (Williams, 1971)

Figures 147, 175–177, 195B, 201C, 206E, 210E, 215A, 18B, 221E

Vejovis magdalensis Williams, 1971a: 40, 47–51, fig. 2; Soleglad, 1973b: 357.

Vaejovis magdalensis: Díaz Nájera, 1975: 7, 15; Williams, 1980: 53, 86, fig. 56B, 87, 88; Beutelspacher, 2000: 95, 138, 153, map 72; Sissom, 2000: 549–550; Sissom and Hendrixson, 2005a: 128, tab. 6.2; Francke and González-Santillán, 2007: 590; Kamenz and Prendini, 2008: 10, 28, tab. 2, plate 93.

Vaejovis magdalenensis: Kovařík, 1998: 147 (lapsus).

Kochius magdalensis: Soleglad and Fet, 2008: 92–94.

TYPE MATERIAL: **MEXICO: Baja California Sur:** Holotype ♂ (CAS, Type No. 11468), La Paz, 121 km NW, along road to El Crucero [Ciudad Constitución], 200 ft [61 m], 4.vii.1968, S.C. Williams and M.A. Cazier. Paratypes: 13 ♂, 9 ♀ (CAS, including ♀ allotype, Type No. 11468), same locality as holotype.

DIAGNOSIS: *Kochius magdalensis* is closely related to *K. barbatus*, *K. cerralvensis* and *K. punctipalpi*, with which it forms a monophyletic group. (see *K. barbatus* for details). These species can be separated from the other species in the genus by having the proximal notch and median lobe of chela fixed and movable fingers moderately to strongly developed in ♂ and moderate in ♀, and chela finger closure with distinct gap, fingers fit unevenly in ♂; instead of having proximal notch and median lobe of chela fixed and movable fingers absent in ♂ and in ♀, and chela finger closure lacking gap, fingers fit evenly in ♂ and in ♀. *K. magdalensis* may be distinguished from *K. cerralvensis* and *K. punctipalpi* by having by having proximal notch and median lobe of chela fixed and movable fingers moderated in ♂, and chela finger closure lacking

gap in ♀, instead of having proximal notch and median lobe strong, and chela finger with distinct gap in ♀. From *K. barbatus* and *K. cerralvensis* differs by having telson relatively bald, with carinae with two or three minor macrosetae in both sexes, instead of having telson hirsute, with carinae with nine or more macrosetae as long as aculeus in ♀ for the former and in both sexes in the latter. *K. barbatus* and *K. punctipalpi* differs by having aculeus relatively short instead of having aculeus relatively elongated.

DESCRIPTION: The following redescription supplements Williams' (1971a) original description. It is based on adult ♂ and ♀ paratypes, freshly collected, and the museums indicated in material examined.

Color and infuscation (in alcohol): Base color of chelicerae, carapace, tergites, legs, metasoma, coxal region, sternites, and telson homogeneously pale yellow to golden-yellowish, lacking infuscation. Pectines pale whitish. Aculeus base reddish turning brownish-red distally. Base of pedipalp fingers reddish.

Carapace: Carapace anterior margin emarginated with a moderated median notch and three pairs of minor macrosetae. Surface completely shagreened with scattered moderated conical and minute granules. Anteromedian, posteromedian, and posterolateral sulci deep, posterior transverse obsolete. Median ocular tubercle moderately raised, superciliary carina crenulated slightly higher than median eyes. Median eyes approximately double size of lateral frontal pair. Three lateral eyes, two frontal pairs same size and posterior reduced approximately in half.

Sternum and coxal region: Sternum pentagonal subequilateral with three pairs of setae, one distal, one median pair and one pair on the lobes, median notch deep. Anterior margin of coxa II with three oblique slit-like structures, adjacent to a moderated protuberance with coarse

crenulations. Base of coxal endite II with a moderated depression each, median margin with fine serration on proximal half, becoming smooth distally. Coxa IV 2.01 times longer than coxa II.

Chelicerae: Dorsal surface smooth, dentition of fixed and movable fingers as in typical vaejovids. Distal margin of manus with one median macrosetae. Serrula with 16/16 tines.

Pedipalps: Trichobothrial pattern Type C, orthobothriotaxic. Chelae wider than patella and patella wider than femur. Femur: all intercarinal surfaces matte, dorsal and ventral with few median moderated granules. Carinae: Dorsal retrolateral, dorsal prolateral, and ventral prolateral carinae strongly granular with conical and sharp enlarged granules; retrolateral dorsosubmedian complete, with a moderated proximal spinoid tubercle, moderately crenatoserrated, and two minor macrosetae medially, prolateral ventrosubmedian complete and strong, oblique row of sharp, conical, and enlarged granules, starting at mid surface slanting gently towards distal end of dorsal prolateral carinae, lacking macrosetae in ♂, in ♀ with one minor median macroseta; prolateral ventral vestigial, expressed by two proximal tubercles, ventral one with a macroseta on top and two moderated granules with minor macrosetae at base, distributed from the basal to the mid aspect of the segment; ventral median and retrolateral ventral vestigial expressed by proximal scattered serrated granules; ventral retrosubmedian partial, expressed by scattered irregular serrated granules, reaching proximal third.

Patella: All intercarinal surfaces matte. Carinae: Dorsal prolateral, dorsal retrolateral, ventral prolateral, and ventral retrosubmedian strongly granular with sharp, conical and enlarge granules; ventral median vestigial expressed as a short proximal row of scattered granules; retrolateral dorsosubmedian and retrolateral median complete, moderately granular with irregular moderated and minute granules; prolateral median on a vaulted projection, extending from a proximal tubercle with a minor macroseta on top, and a short row of serrated granules reducing

in size ending in few distal minute serrations, reaching trichobothrium d_2 and beyond demarcated by a flat surface ending on one distal minor macrosetae. Prolateral ventral vestigial, with a proximal tubercle with a minor macroseta on top and one distal lower tubercle with a minor macroseta on top.

Chelae: Pedipalp manus incrassate (manus 1.34 times longer than fixed finger). Intercarinal surface matte. Carinae: Dorsal prolateral, dorsal median, dorsal retrosubmedian accessory, and dorsal retrolateral carinae moderately scattered granular; dorsal prosubmedian and prolateral dorsal vestigial expressed by scattered crenulations flanking dorsal lateral carina; retrolateral median partial moderately crenular, expressed in proximal two thirds; retrolateral subventral and retrolateral subventral accessory vestigial expressed by few minute distal granulation; ventral retrolateral strongly granular and partial, ending at the level of trichobothrium *Esb*; ventral prosubmedian weakly crenulated and moderately costate; ventral prolateral crenatoserrated proximally becoming crenulated distally; prolateral median strong with scattered crenatoserrations, parallel to ventral prolateral. Trichobothria *Dt* and *Db* dorsal to dorsal retrolateral carinae. Trichobothrium *Dt* positioned subbasal on manus. Trichobothrium *Dt* positioned at mid manus.

Fingers: Fixed finger dentition: PD = 6, RD = 5, MD rows = 5, all denticles subserrate, retrolateral denticles comparatively smaller than prolateral denticles. Movable finger PD = 7, RD = 6, MD rows = 6, distal row with one denticle, prolateral and retrolateral denticles subpaired. Trichobothrium *ib* positioned between PD6 and PD7, PD7 lacking granule, and *it* positioned adjacent to PD6. Fingers with scalloped, proximal notch and medial lobe of pedipalp fixed and movable finger moderately developed. Gap created when fingers close moderated in, fingers fit unevenly in ♂, in ♀ absent.

Legs: Spinules: Basitarsi I–II with prolateral ventral and retrolateral ventral carinae with complete rows of spinules, prolateral ventral in III and IV absent; retrolateral ventral in III partial, expressed on distal half, in IV absent; retrolateral median rows in I–IV vestigial expressed as few terminal spinules; retrolateral dorsal in I–III, partial expressed in distal third, in IV absent. Telotarsi I–IV with two pairs of ventrodistal spinules. Setae: Prolateral ventral 3:4:5:5; medians in III and IV stout, retrolateral ventral 4:7:7:7; retrolateral dorsal 2:3:3:3; dorsal 3: 4:4:4 retrolateral dorsal and dorsal series arranged in two independent rows.

Tergites: Pretergites matte, posttergites with scattered moderated and coarse conical granules. Dorsal median carinae strong with a short row of distal crenatoserrations on proximal half; dorsal submedian strong complete, expressed along the entire postergite. Tergite VII with intercarinal surfaces scattered with large conical granules; dorsal median carina partial and strong expressed on proximal third, strongly costate and irregularly serrated; dorsal submedian vestigial expressed as a pair of distal irregular serrations strongly costate; dorsal lateral and lateral supramedian strong, proximal extreme with an enlarged spiniform tubercle projecting backwards; Dorsal lateral projecting and curving laterally almost reaching lateral supramedian distal margin, creating a semi ring of strong serrated granulation.

Genital operculum: Male genital operculum: wider than long, with four pairs of macrosetae. Sclerites free on longitudinal edge moving independently but unable to open more than 45°. Genital papillae protruding posteriorly. Female genital operculum: Wider than long, with three macrosetae. Sclerites fuse longitudinal.

Sternites: Sternites III–VI with all carinae obsolete and surface matte, V in ♂ with distomedian glandular spot weak, not protruding from adjacent surfaces, restricted to median third, in ♀ obsolete. Sternite VII with ventral lateral carinae moderately crenatoserrated and

strongly costate; distomedian glandular spot strong in ♂, piriform, gently rounded and distally protruding slightly, in ♀ moderated. Ventral submedian carinae vestigial expressed by few irregular moderated granules, with three macrosetae. Spiracle elongated, slit-like, approximately two times longer than wide.

Pectines: Pectines in ♂ longer than distal margin of coxa VI, in ♀ at or slightly longer than coxa IV. Basal piece with two minor macrosetae. Marginal lamella consist of three sclerites, medial lamella proximally fuse distally progressively forming conspicuous 10–12 beads. Fulcra with 16–18 beads in ♂, 15–16 beads in ♀. Pectinal tooth count 17–19 in ♂, 16–17 in ♀.

Hemispermatophore: Lamina 1.68 longer than trunk. Dorsal through margin long, narrow, curving proximally, and removed from ventral trough. Hemimating plug developed from the inner lobe, distal barb margin with 10 elongated spinules. Primary and secondary hook positioned on the apex of lateral margin extension of the lamina (flange). Both hooks rounded low, separated slightly, forming a shallow notch. Median lobe ental terminus moderated and rounded. Basal plate of inner lobe removed from ventral trough. Spine of inner lobe moderate, secondary spine on ventromedian aspect of neck shorter. Neck relatively short (0.56 times longer than basal plate). Measurements, lamina, 3.72; trunk, 2.22; dorsal trough/laminar hooks, 1.26; ventral trough/laminar hook, 0.90; neck, 0.30; basal plate, 0.54.

Metasoma: All intercarinal surfaces matter, except dorsal surface of metasomal segment I–III with scattered moderated granules. Dorsal lateral carinae of metasomal segments I–V and lateral median carinae of segments I–III crenatoserrated, proximally end with an elongated spiniform tubercle pointing backwards, except in V. Lateral median in IV distal terminus weakly expanded or flared laterally. Lateral inframedian in I complete crenatoserrated, in II vestigial irregularly expressed on distal third, in III irregularly serrated expressed in distal fourth

becoming weaker proximally, in IV absent, in V partial, finely crenatoserrated and strongly costate, expressed in distal two thirds. Ventral lateral I–V, ventral submedian I–IV and ventral median in V finely crenatoserrated. Setae: Dorsal lateral, 0:0:1:1:4, lateral median, 1:1:2:2, lateral inframedian, 0:0:0:0:2, ventral lateral, 2:2:2:2:4, ventral submedian, 3:3:3:3, ventral sublateral, 2; all carinae minor; in ♂ all macrosetae reduced to microsetae.

Telson: Ventral and dorsal surfaces smooth, relatively bald with three macrosetae in each carinae in both sexes. Laterobasal microserration of aculeus with 4–7 sharp tines. Subaculear tubercle absent. (measurements and ratios). Aculeus longer than vesicle in ♀, in ♂ aculeus shorter than vesicle.

DISTRIBUTION: *Kochius magdalensis* is endemic to the Magdalena Plains, Baja California Sur, Mexico.

ECOLOGY: *Kochius magdalensis* inhabits a very distinctive area in the Peninsula of Baja California. The Magdalena Plains have vegetation dominated by scrub and cacti with a marked influence of the Pacific fog. The localities where this species has been collected range between 20 and 305 m in altitude. The dominant soil in this area is sandy and moderately compacted.

MATERIAL EXAMINED: **MEXICO: Baja California Sur:** *Municipio de La Paz*: El Pilar, ca. 20 km NE of Las Pocitas, 92 m, 25.vi.2008, 24°28.7616'N 111°1.12'W, desert, collected at night with UV light, 1 ♀ (AMNH [ARA2874]), 7 ♂ (AMNH [ARA2874]), 8 ♂, 2 ♀ (IBUNAM [ARA2259]), 24°28.762'N 111°01.125'W, oasis, collected at night with UV light, 1 ♂ (AMNH [LP 8796]), H. Montaño and E. González; junction Route 1, 5 km N, and road to Juan de la Costa, 24°08.500'N 110°28.566'W, 30 m, 9.vi.2005, E. González, W.E. Savary, R. Mercurio, and L. Prendini, 2 ♀ (AMNH); La Paz, 41 km NW, 256 m, 7.vii.2004, 24°4.5996'N 110°36.9498'W, desert, collected at night with UV light, 1 ♂, 1 juv. (IBUNAM [ARA2086]), 24°4'36.2"N

110°36'57.1"W, 1 ♂, 1 juv. (AMNH), O. Francke, E. González, and A. Valdez; La Paz, 50 km NW, 24°05'56.2"N 110°43'41"W, 256 m, 7.vii.2004, O. Francke, E. González, and A. Valdez, collected at night with UV light, 1 ♂, 1 ♀ (AMNH [LP 3155]); La Paz, 51 km NW, 256 m, 7.vii.2004, 24°5.9328'N 110°4.98'W, desert, collected at night with UV light, 1 ♂, 2 ♀ (AMNH [ARA1477]), 1 ♀, 1 subad. ♂ (CAS [ARA1533]), 1 ♀ (CAS [ARA1535]), 1 ♂, 1 ♀, 1 juv. (IBUNAM [ARA2083]), 24°5'56.2"N 110°43'41"W, 3 ♂, 4 ♀, 1 juv. (AMNH), O. Francke, E. González, and A. Valdez; La Paz, 75 km NW, 7.vii.2004, 24°05'56.2"N 110°45'41"W, 256 m, desert, collected at night with UV light, 1 ♀ (AMNH), 24°5.9328'N 110°45.6828'W, 114 m, 1 ♀ (AMNH [ARA1479]), O. Francke, E. González, and A. Valdez; La Paz, ca. 10 km SE on BCS 286 route to San Juan de los Planes, 24°8.4330'N 110°15.33'W, 106 m, 9.vii.2005, R. Mercurio and L. Prendini, desert, collected at night with UV light, 1 ♀ (AMNH [ARA3054]), 1 ♀ (AMNH [ARA3055]), 1 ♂ (AMNH [LP 4545]); La Paz, ca. 20 km N, junction Route 1 and road to San Juan de la Costa, 24°13.3830'N 110°35.76'W, 20 m, 9.vii.2005, E. González, W.E. Savary, L. Prendini, and R. Mercurio, desert, collected at night with UV light, 1 ♂ (AMNH [ARA3052]), 1 ♂ (IBUNAM [ARA2356]), 1 juv. (AMNH [LP 4552]); La Paz, ca. 38 km N, 1 km off Route 1 on Ley Federal de la Reforma Agraria, 24°03.609'N 110°36.777'W, 256 m, 9.vii.2005, W.E. Savary and E. González, desert, collected at night with UV light, 1 juv. (AMNH [LP 5150]), 1 ♀ (AMNH [ARA3053]); La Paz, ca. 5 km N, junction Route 1 and road to San Juan de la Costa, 24°08.500'N 110°28.566'W, 30 m, 9.vii.2005, R. Mercurio, W.E. Savary, L. Prendini, and E. González, collected at night with UV light, 1 ♂ (AMNH [LP 4550]). Misión San Luis Gonzaga, [24°54'29.76"N 111°17'29.89"W], 14.ii.1966, V. Roth, 1 subad. ♂ (AMNH); Misión San Luis Gonzaga, 8 km W, 12.ii.1966, V. Roth, 1 ♂, 1 ♀, 1 subad. ♂, 4 subad. ♀ (AMNH).

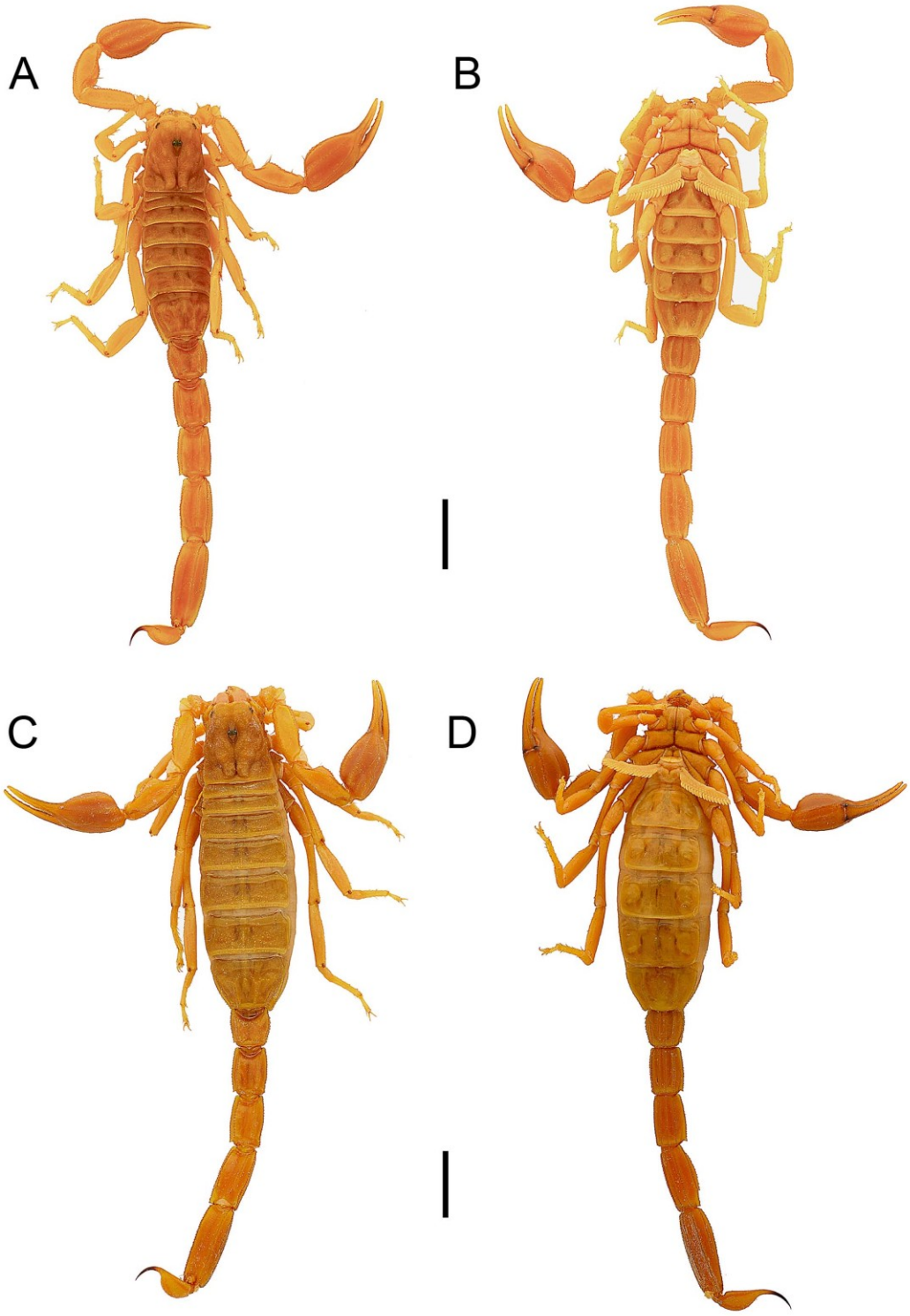


Figure 175. *Kochius magdalensis* (Williams, 1971), habitus. **A**, **B**. ♂ (AMNH). **C**, **D**. ♀ (AMNH). **A**, **C**. Dorsal aspect. **B**, **D**. Ventral aspect. Scale bars = 5 mm.

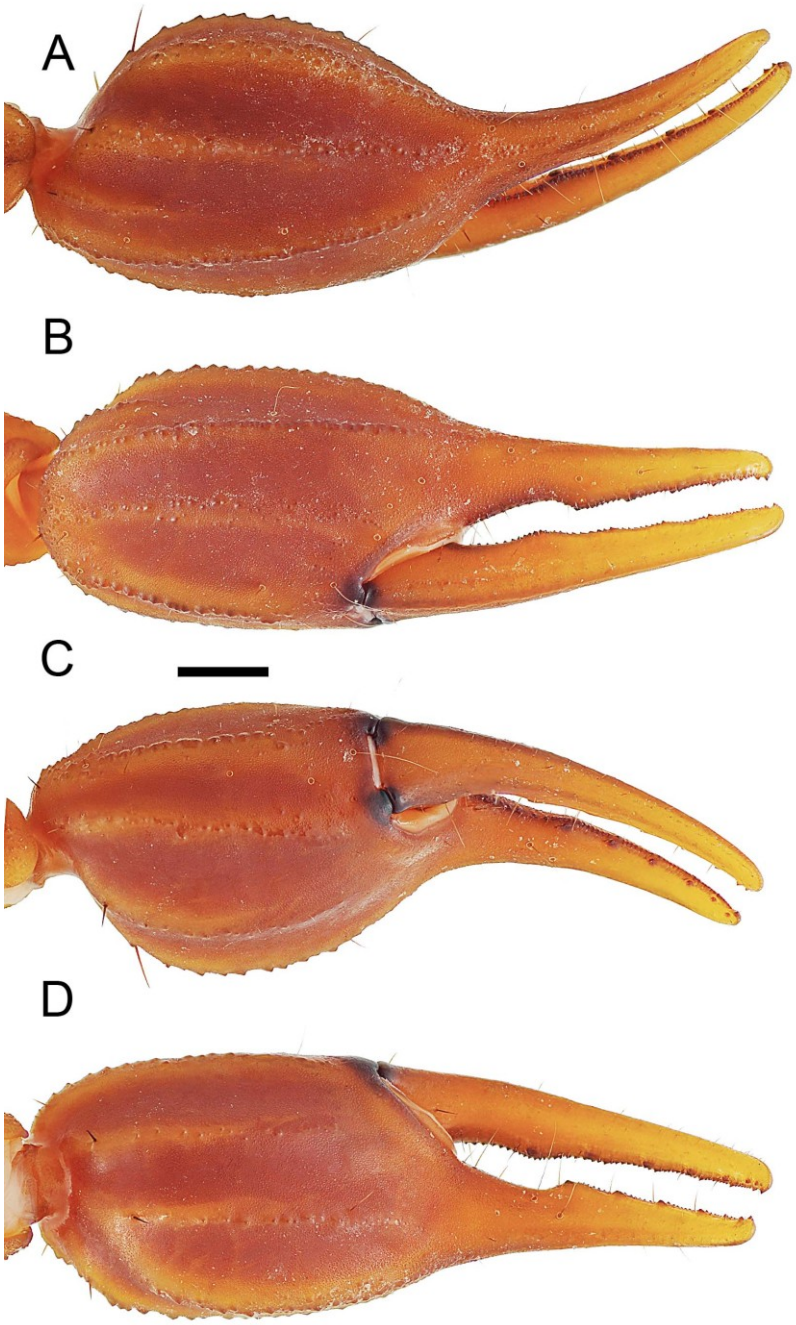


Figure 176. *Kochius magdalensis* (Williams, 1971), ♂ (AMNH), dextral pedipalp chela. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

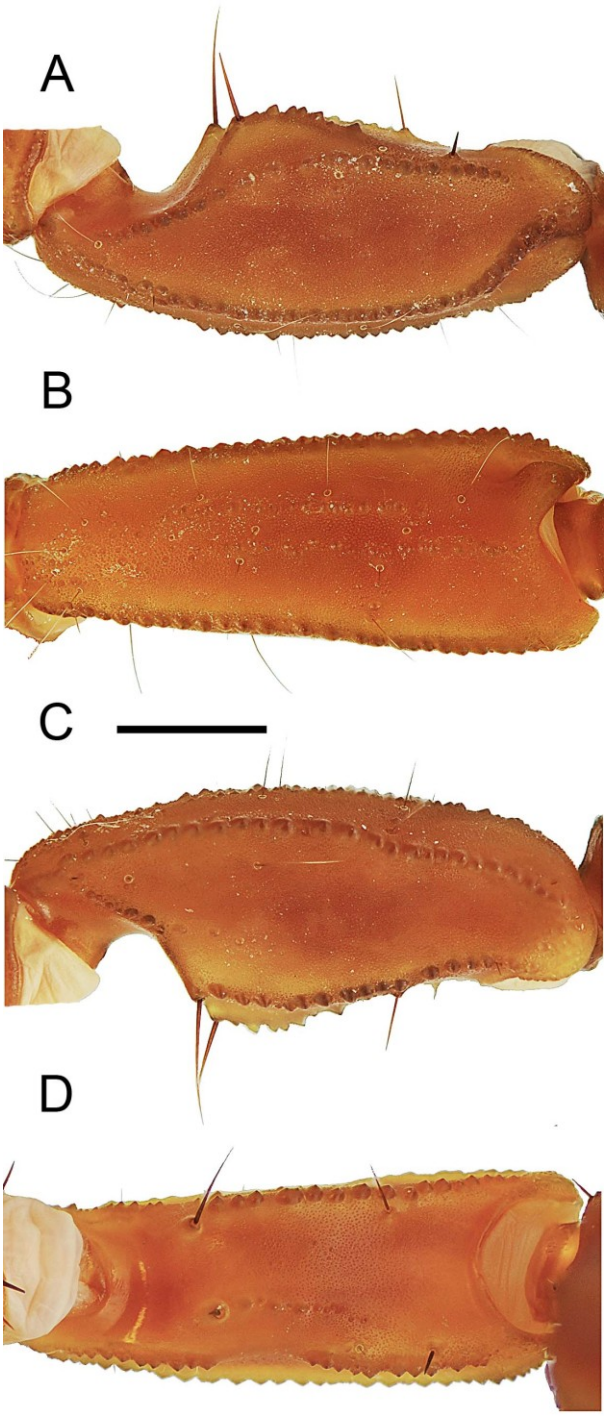


Figure 177. *Kochius magdalensis* (Williams, 1971), ♂ (AMNH), dextral pedipalp patella. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

Kochius maroma, **n. sp.**

Figures 145, 178–180, 195C, 201D, 207A, 211A, 215B, 218C, 222A; Table 13

TYPE MATERIAL: **MEXICO: Baja California Sur:** *Municipio de Comondú*: Holotype ♂ (IBUNAM) Sierra San Francisco, 27°35'6.8"N 113°3'44.8"W, 1179 m, 17.vii.2004, E. González, O. Francke, W.E. Savary, and A. Valdez, collected at night with UV light. Paratypes: 3 ♂ (AMNH), same locality as holotype; *Municipio de Mulegé*: 3 ♂, 2 ♀ (AMNH [ARA3815]), Cueva del Raton, 5 km SW Sierra de San Francisco, 1130 m, 6.vii.2005, 27°35.4906'N 113°1.4406'W, desert, collected at night with UV light; 2 ♂ (AMNH [ARA1486]), 1 ♂ (CAS [ARA1529]), 2 ♂, 1 ♀ (IBUNAM [ARA2071]), 5 ♂, 1 ♀ (AMNH), 1 ♂, 1 ♀ (IBUNAM [ARA2079]), Microwave station El Abulón, 27°17.4828'N 113°1.9164'W, 141 m, 14.vii.2004, E. González, O. Francke, W.E. Savary, and A. Valdez desert, collected at night with UV light; ♀ (IBUNAM [ARA2080]), Sierra de San Francisco, 27°35.1'N 113°3.0996'W, 1179 m, 17.vii.2004, A. Valdez, E. González, O. Francke, and W.E. Savary, desert, collected at night with UV light, 3 subad.; 1 ♀, 1 subad. ♀ (CAS [ARA1530]), Sierra de San Francisco, 8 km SW at La Presa junction, 27°35.1780'N 113°3.57'W, 1170 m, 6.vii.2005, E. González and L. Prendini, desert, collected at night with UV light.

ETYMOLOGY: The specific name *maroma* is derived from the name of an eating technique used by the Cochimí people, aboriginal inhabitants of central Baja California Peninsula. A valued morsel of meat was tied with a string, swallowed, and then pulled back up and passed to the next person in a circle of consumers, until the meat finally disintegrates. The name is a noun in apposition.

DIAGNOSIS: *Kochius maroma*, **n. sp.** is closely related to *K. catavina*, **n. sp.** and *K. moosni*, **n. sp.** with which it forms a monophyletic group (see *K. catavina*, **n. sp.** for details). *K. maroma*, **n. sp.** may be separated from these species by having base color brownish to orange, instead of pale yellow. *K. maroma*, **n. sp.** has six retrolateral denticles and six median denticles on pedipalp fixed finger, instead of having five retrolateral denticles and five rows. *K. maroma*, **n. sp.** has metasomal segment I wider than long, instead of having it as long as wide. *K. maroma*, **n. sp.** has distomedian glandular spot piriform, instead of having it shaped as a truncated triangle. From *K. catavina*, **n. sp.** differs by having five macrosetae in each carinae of ventral surface of telson, instead of having between seven and nine. From *K. moosni*, **n. sp.** differs by having ventral surface of metasomal segment V weakly granular with minute granules, instead of having that surface moderately granular with moderately enlarge conical granules. Furthermore, *K. maroma*, **n. sp.** has higher pectinal count: 18–20 in ♂, 16–20 in ♀, instead of having 15–17 in ♂, 14–16 in ♀.

DESCRIPTION: The following description is based on types and the specimens listed in material examined.

Color and infuscation (in alcohol): Base color of carapace, tergites, coxal region, and sternites orange to medium brownish; metasoma, telson, and pedipalps slightly paler; chelicerae and legs yellowish; pectines pale whitish; aculeus brownish; base of pedipalp fingers reddish.

Carapace: Carapace anterior margin emarginated with a moderate median notch and three pairs of minor macrosetae. Surface completely shagreened with scattered moderate conical and minute granules. Anteromedian, posteromedian, and posterolateral sulci moderate, posterior transverse obsolete. Median ocular tubercle moderately raised, superciliary carina granular

higher than median eyes. Median eyes approximately double size of lateral frontal pair. Three lateral pair of eyes, two frontal pairs same size and posterior reduced approximately in half.

Sternum and coxal region: Sternum pentagonal subequilateral with three pairs of setae, one distal, one median pair and one pair on the lobes, median notch deep. Anterior margin of coxa II with three oblique slit-like structures, adjacent to an enlarge protuberance finely granulated. Base of coxal endite II with a shallow depression each. Coxa IV 2.00 times longer than coxa II.

Chelicerae: Dorsal surface smooth, dentition of fixed and movable fingers as in typical syntropine. Distal margin of manus with one median macrosetae. Serrula with 12/12 tines.

Pedipalps: Trichobothrial pattern Type C, orthobothriotaxic. Chelae wider than patella and patella wider than femur. Femur: retro and prolateral intercarinal surfaces matte, dorsal and ventral shagreened, with relatively dense coarse granules on median surface. Carinae: Dorsal retrolateral, dorsal prolateral, and ventral prolateral carinae strongly granular with conical and sharp enlarged granules; retrolateral dorsosubmedian complete, moderately crenatoserrated, and two minor macrosetae medially; prolateral ventrosubmedian complete and strong, oblique row of sharp, conical, and enlarged granules, starting at mid surface slanting gently towards distal end of dorsal prolateral carinae, lacking macrosetae; prolateral ventral vestigial, expressed by two proximal granules, dorsal one with a macroseta on top and three additional granules, median and distal with a macroseta on base, distributed from the basal to the mid aspect of the segment; ventral median and retrolateral ventral vestigial expressed by scattered serrated granules; ventral retrosubmedian partial, expressed by scattered irregular serrated granules, reaching proximal half.

Patella: All intercarinal surfaces matte. Carinae: Dorsal prolateral, dorsal retrolateral, ventral prolateral, and ventral retrosubmedian strongly granular with sharp, conical and enlarge granules; ventral median vestigial expressed as a short basal row of scattered granules, reaching proximal third; retrolateral dorsosubmedian and retrolateral median partial, expressed as broken irregular rows of moderate and minute granules; prolateral median on a vaulted projection, extending from a proximal tubercle with a minor macroseta on top, and three to five subserrate granules reducing in size ending in few distal minute serrations, reaching trichobothrium d_2 and beyond demarcated by a flat surface ending on one distal minor macrosetae; prolateral ventral obsolete expressed by two minor macrosetae, one basal and one distal.

Chelae: Pedipalp manus incrassate (manus 1.4 times longer than fixed finger). Intercarinal surface matte. Carinae: Dorsal prolateral, dorsal median, and dorsal retrosubmedian accessory carinae strong with scattered conical moderate granules; dorsal retrolateral proximally granular, medially and distally strongly crenular; dorsal prosubmedian and prolateral dorsal vestigial expressed by scattered crenulations flanking dorsal lateral carina; retrolateral median partial moderately granular, expressed on proximal two thirds; dorsal prosubmedian and prolateral dorsal vestigial expressed by scattered crenulations flanking dorsal lateral carina; retrolateral subventral accessory and retrolateral subventral vestigial expressed by few distal crenulations; ventral retrolateral partial, strongly granular, ending at the level of trichobothrium *Est*. Ventral prosubmedian moderately crenulated and costate; ventral median vestigial expressed as crenulations flanking ventral prosubmedian reaching proximal half; ventral prolateral with proximal scattered granules becoming crenular medially and distally smooth, but strongly costate; prolateral with scattered enlarge granules, parallel to ventral prolateral. Trichobothria *Dt*

and *Db* dorsal to dorsal retrolateral carinae. Trichobothrium *Db* positioned subbasal on manus. Trichobothrium *Dt* positioned at mid manus.

Fingers: Fixed finger dentition: PD = 6, RD = 6, MD rows = 6, all denticles subserrate, retrolateral denticles comparatively smaller than prolateral denticles. Movable finger PD = 7, RD = 7, MD rows = 7, distal row with one denticle, prolateral and retrolateral denticles subpaired. Trichobothrium *ib* positioned between PD6 and PD7, PD7 lacking granule, and *it* positioned adjacent to PD6. Fingers lacking scalloped. Gap created when fingers close absent, fingers fit evenly.

Legs: Spinules: Basitarsi I and II with prolateral ventral and retrolateral ventral carinae with complete rows of spinules, prolateral ventral in III vestigial, with few distal spinules, in IV absent; retrolateral ventral in III partial expressed in distal third, in IV absent; retrolateral median rows in I–IV vestigial expressed as few terminal spinules; retrolateral dorsal in I–III, partial expressed in distal third, IV absent. Telotarsi I–IV with two pairs of ventrodistal spinules in I–IV. Setae: Prolateral ventral 3:4:5:5, medians in III and IV stout; retrolateral ventral, 4:7:7:7; retrolateral dorsal, 2:4:4:4; dorsal, 3:3:3:3; retrolateral dorsal and dorsal series arranged in two independent rows.

Tergites: Pretergites matte, posttergites with scattered moderate and coarse conical granules. Dorsal median and dorsal submedian carinae strong with a row of distal crenatoserrations expressed on proximal half. Tergite VII with intercarinal surfaces scattered with few large conical granules; dorsal median carina partial and strong expressed on proximal third, strongly costate and irregularly serrated; dorsal submedian vestigial expressed as a short distal row of irregular serrations strongly costate; dorsal lateral and lateral supramedian strong, distal extreme with an enlarged spiniform tubercle projecting backwards; Dorsal lateral

projecting and curving laterally almost reaching lateral supramedian distal margin, creating a semi ring of strong serrated granulation.

Genital operculum: Male genital operculum: wider than long, with three pairs of macrosetae. Sclerites free on longitudinal edge moving independently but unable to open more than 45°. Genital papillae protruding posteriorly. Female genital operculum: Wider than long, with three macrosetae. Sclerites fuse longitudinal.

Sternites: Sternites III–VI with all carinae obsolete and surface matte in ♂, punctuated in ♀, V in ♂ with distomedian glandular spot moderate, protruding slightly from adjacent surfaces, in ♀ obsolete. Sternite VII with ventral lateral carinae moderately crenulated and strongly costate; ventral submedian obsolete expressed by three minor macrosetae. Distomedian glandular spot strong piriform, strongly protruding from adjacent surface in ♂, in ♀ lower and less developed. Spiracle elongated, slit-like, approximately two times longer than wide.

Pectines: Pectines in ♂ longer than distal margin of coxa VI, in ♀ at or slightly longer than coxa IV. Basal piece with two minor macrosetae. Marginal lamella consist of three sclerites, medial lamella proximally fuse distally progressively forming conspicuous 10–12 beads. Fulcra with 17–19 beads in ♂, 15–19 beads in ♀. Pectinal tooth count 18–20 in ♂, 16–20 in ♀.

Hemispermatophore: Lamina 1.57 longer than trunk. Dorsal through margin long, narrow, curving proximally, and removed from ventral trough. Hemimating plug developed from the inner lobe, distal barb margin with 18 elongated spinules. Primary and secondary hook positioned on the apex of lateral margin extension of the lamina (flange). Both hooks moderately rounded low, separated slightly, forming a shallow notch. Median lobe ental terminus moderate and rounded. Basal plate of inner lobe removed from ventral trough. Spine of inner lobe relatively short, secondary spine on ventromedian aspect of neck shorter. Neck relatively short

(0.4 times longer than basal plate). Measurements, lamina, 3.48; trunk, 2.22; dorsal trough/laminar hooks, 1.38; ventral trough/laminar hook, 0.90; neck, 0.24; basal plate, 0.60.

Metasoma: All intercarinal surfaces matter, except dorsal surface of metasomal segment I–IV with scattered moderate granules. Dorsal lateral carinae of metasomal segments I–V and lateral median carinae of segments I–III crenatoserrated, proximally end with an elongated spiniform tubercle pointing backwards, except in V. Lateral median in IV distal terminus weakly expanded or flared laterally. Lateral inframedian in I complete crenatoserrated, in II vestigial irregularly expressed on distal third, in III irregularly serrated expressed in distal fourth becoming weaker proximally, in IV absent, in V partial, finely crenatoserrated and strongly costate, expressed in distal two thirds. Ventral lateral I–V, ventral submedian I–IV and ventral median in V finely crenatoserrated. Setae: in ♀ dorsal lateral, 0:0:0:0:3; lateral median, 0:1:1:2; lateral inframedian, 0:0:0:0:2; ventral lateral, 2:2:2:2:4; ventral submedian, 3:3:3:3; ventral sublateral, 2; all carinae minor; in ♂ all macrosetae absent or reduced to microsetae.

Telson: Ventral and dorsal surfaces smooth, relatively hirsute, ventral carinae with five macrosetae, lateral and dorsal carinae with three pairs of macrosetae on each carinae in both sexes. Laterobasal microserration of aculeus with 5–9 sharp tines. Subaculear tubercle absent. Aculeus longer in ♀ than in ♂ (measurements and ratios).

DISTRIBUTION: *Kochius maroma*, **n. sp.** is endemic to the Sierra de San Francisco, at the northern extreme of Baja California Sur, Mexico.

ECOLOGY: *Kochius maroma*, **n. sp.** inhabits a mountain range of volcanic origin; the sites of collection were dominated by scrubland and numerous endemic Crassulaceae. Most of the scorpions were found on rocky slopes and washes. As in other *Kochius*, this species appears to be lapidicolous. The collection localities range between 141 to 1179 m in altitude.

MATERIAL EXAMINED: **MEXICO: Baja California Sur:** *Municipio de Comondú*: Holotype ♂ (IBUNAM) Sierra San Francisco, 27°35'6.8"N 113°3'44.8"W, 1179 m, 17.vii.2004, E. González, O. Francke, W.E. Savary, and A. Valdez, collected at night with UV light, 1 juv. (AMNH [LP 3160]) *Municipio de Guerrero Negro*: near San Miguel, 27°56'5.8"N 113°54'23.1"W, 25 m, 16.vii.2004, O. Francke, W.E. Savary, E. González, and A. Valdez, collected at night with UV light, 1 ♀, 1 juv. (AMNH [LP 3159]); Vizcaino desert, 27°29'54.7"N 114°17'35.6"W, 223 m, 16.vii.2004, O. Francke, W.E. Savary, E. González, and A. Valdez, collected at night with UV light, 1 juv. (AMNH [LP 3158]). *Municipio de Mulegé*: Cueva del Raton, 5 km SW Sierra de San Francisco, 1130 m, 6.vii.2005, 27°35.4906'N 113°1.4406'W, desert, collected at night with UV light, 2 ♂, 1 ♀ (AMNH [LP 4549]); Microwave station El Abulón, 141 m, 14.vii.2004, 27°17.4828'N 113°1.9164'W, desert, collected at night with UV light, 1 ♂ (AMNH [LP 4554]); Sierra de San Francisco, 8 km SW at La Presa junction, 27°35.1780'N 113°3.57'W, 1170 m, 6.vii.2005, E. González and L. Prendini, 1 subad. ♀ (AMNH [LP 4546]).

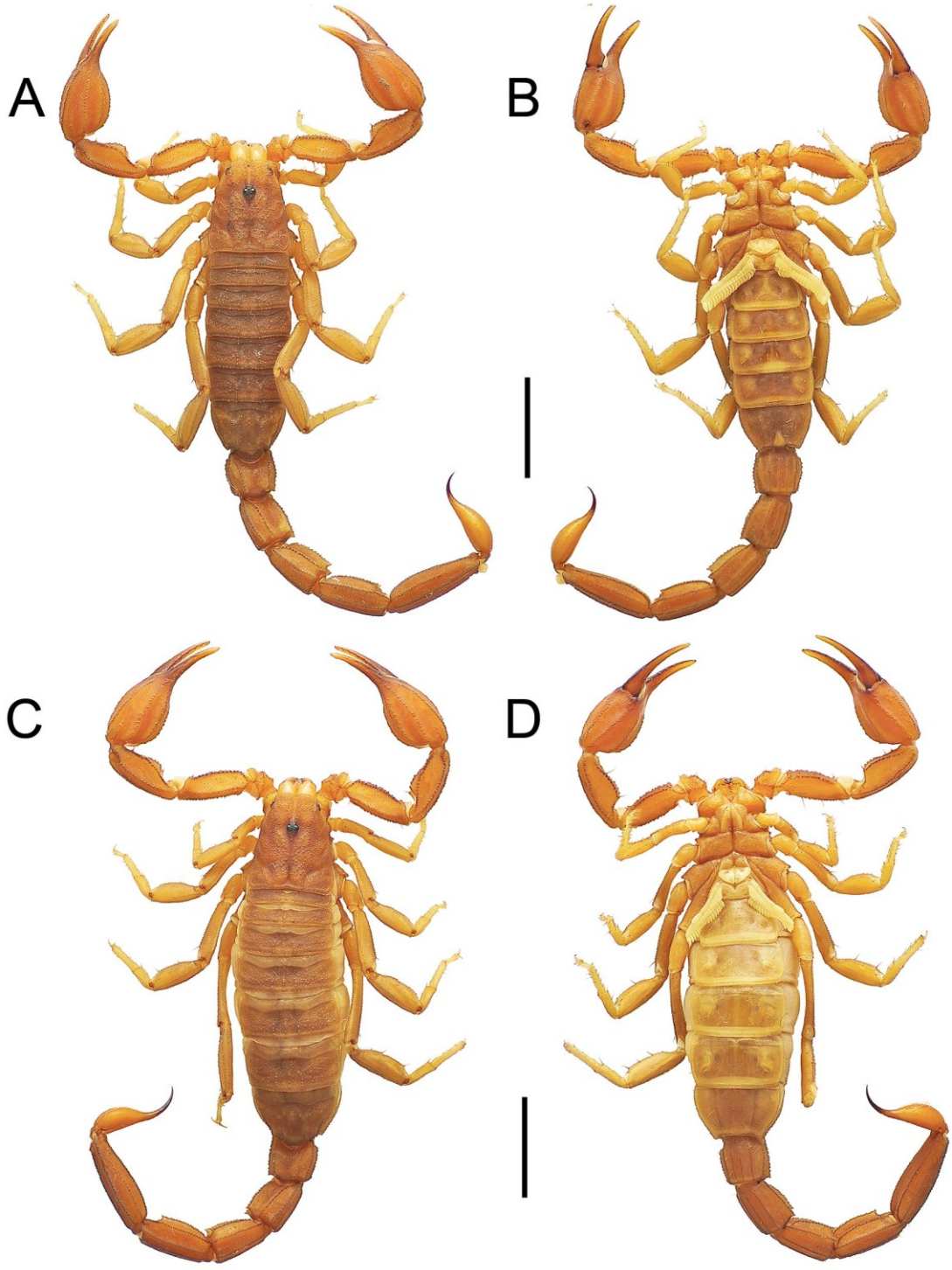


Figure 178. *Kochius maroma*, **n. sp.**, habitus. **A**, **B**. Paratype ♂ (AMNH). **C**, **D**. ♀ (AMNH). **A**, **C**. Dorsal aspect. **B**, **D**. Ventral aspect. Scale bars = 5 mm.

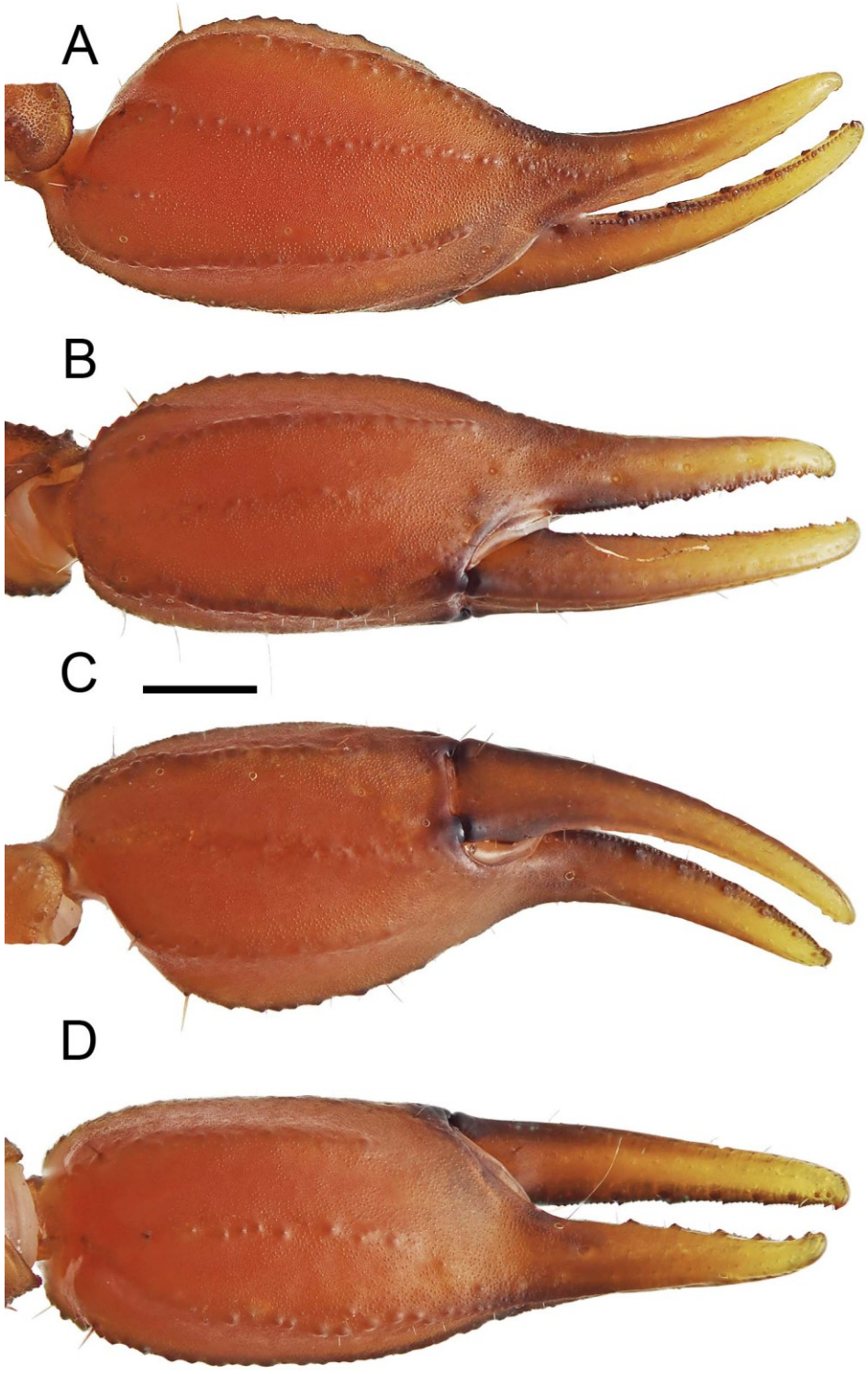


Figure 179. *Kochius maroma*, **n. sp.**, paratype ♂ (AMNH), dextral pedipalp chela. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

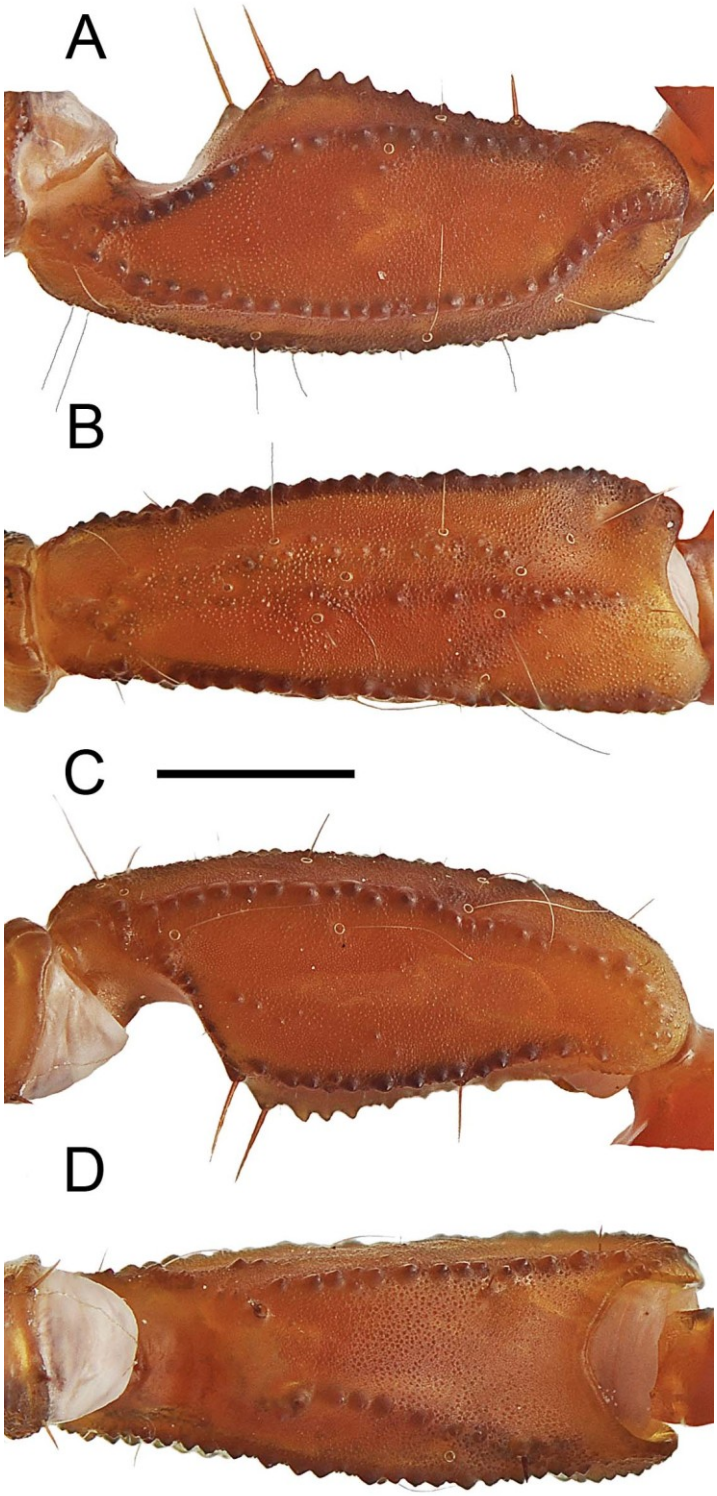


Figure 180. *Kochius maroma*, **n. sp.**, paratype ♂ (AMNH), dextral pedipalp patella. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

Kochius moosni, **n. sp.**

Figures 147, 181–183, 195D, 202A, 207B, 211B, 215C, 218D, 222B; Table 13

TYPE MATERIAL: **MEXICO: Baja California Sur:** *Municipio de Mulegé*: Holotype ♂ Sierra del Placer, 21 km to junction Bahía Tortugas and Bahía Asunción, 98 km E of Vizcaino towards Bahía Tortugas, 27°28.9278'N 114°17.0928'W, 262 m, 28.vi.2008, H. Montaño and E. González, desert, collected at night with UV light. Paratypes: same locality as holotype, 3 ♂, 2 ♀ (AMNH [ARA2890]), 3 ♂, 1 ♀ (IBUNAM [ARA2267]); 1 ♀ (IBUNAM [ARA2073]), Bahía Tortugas, 10 km NW, 27°45.3888'N 114°57.1026'W, 110 m, 7.vii.2008, H. Montaño and E. González, desert, collected at night with UV light, 1 ♀ (AMNH [ARA2886]); San Miguel, 346 m, 16.vii.2004, 27°33.0828'N 114°33.8664'W, desert, under rock, 1 subad. ♂ (AMNH), 27°33'5.3"N 114°33'52"W, collected at night with UV light, 1 ♀ (AMNH [ARA1488]), E. González, O. Francke, W.E. Savary, and A. Valdez; Vizcaino desert, 223 m, 16.vii.2004, 27°29.8998'N 114°17.58'W, desert, under rock, 1 subad. ♀ (AMNH), 27°29'54.7"N 114°17'35.6"W, collected at night with UV light, , E. González, O. Francke, W.E. Savary, and A. Valdez.

ETYMOLOGY: The specific name *moosni* is derived from the Seri language and means sea turtle, referring to the type locality at Bahía Tortugas (Turtles Bay), in the Vizcaino desert, Baja California Sur, Mexico. The name is a noun in apposition.

DIAGNOSIS: *Kochius moosni*, **n. sp.** is closely related to *K. catavina*, **n. sp.** and *K. maroma*, **n. sp.** with which it forms a monophyletic group (see *K. catavina*, **n. sp.** for details). *K. moosni*, **n. sp.** may be separated from these species by having lower pectinal count 15–17 in ♂, 14–16 in ♀, instead of 18–20 in ♂, 16–20 in ♀. Furthermore, *K. moosni*, **n. sp.** has relatively

bald ventral surface of telson with three macrosetae in each carinae, instead of having between five and nine macrosetae in each carinae. *K. moosni*, **n. sp.** has ventral surface of metasomal segment V moderately granular with moderately enlarge conical granules, instead of having it weakly granular with minute granules. From *K. maroma*, **n. sp.** differs by having metasomal segment I as long as wide, instead of having it wider than long, and by having base color pale yellow, instead of having base color brownish to orange. *K. moosni*, **n. sp.** has five retrolateral denticles and five median denticles on pedipalp fixed finger, instead of having six retrolateral denticles and six rows. Furthermore, *K. moosni*, **n. sp.** has distomedian glandular spot shaped as a truncated triangle, instead of having it piriform.

DESCRIPTION: The following description is based on types and the specimens listed in material examined.

Color and infuscation (in alcohol): Base color uniformly pale yellow. Pectines pale whitish. Aculeus reddish at base turning brownish. Base of pedipalp fingers slightly reddish.

Carapace: Carapace anterior margin emarginated with a moderate median notch and three pairs of minor macrosetae. Surface completely shagreened with scattered moderate conical and minute granules. Anteromedian, posteromedian, and posterolateral sulci moderate, posterior transverse obsolete. Median ocular tubercle moderately raised, superciliary carina granular and higher than median eyes. Median eyes approximately double size of lateral frontal pair. Three lateral pair of eyes, two frontal pairs same size and posterior reduced approximately in half.

Sternum and coxal region: Sternum pentagonal subequilateral with three pairs of setae, one distal, one median pair and one pair on the lobes, median notch deep. Anterior margin of coxa II with three oblique slit-like structures, adjacent to an enlarge protuberance finely

granulated. Base of coxal endite II with a shallow depression each. Coxa IV 1.56 times longer than coxa II.

Chelicerae: Dorsal surface smooth, dentition of fixed and movable fingers as in typical vaejovids. Distal margin of manus with one median macrosetae. Serrula with 12 tines.

Pedipalps: Trichobothrial pattern Type C, orthobothriotaxic. Chelae wider than patella, patella wider than femur. Femur: retro and prolateral intercarinal surfaces matte, dorsal shagreened with coarse granules on median surface, ventral densely cover with enlarged, moderate and minute granules. Carinae: Dorsal retrolateral, dorsal prolateral, and ventral prolateral carinae strongly granular with conical and sharp enlarged granules; retrolateral dorsosubmedian complete, moderately crenatoserrated, and two minor macrosetae medially; prolateral ventrosubmedian complete and strong, oblique row of sharp, subserrate, and enlarged granules, starting at mid surface slanting gently towards distal end of dorsal prolateral carinae, lacking macrosetae; prolateral ventral vestigial, expressed by two proximal granules, ventral one with a macroseta on top and two additional granules, median and distal with a macroseta at base, plus two or three intersperse irregular moderate conical granules, distributed from the basal to the mid aspect of the segment; ventral median and retrolateral ventral vestigial expressed by scattered proximal serrated granules; ventral retrosubmedian partial, expressed by scattered irregular enlarge and moderate serrated granules, reaching proximal half.

Patella: All intercarinal surfaces matte. Carinae: Dorsal prolateral, dorsal retrolateral, ventral prolateral, and ventral retrosubmedian strongly granular with sharp, conical and enlarge granules; ventral median vestigial expressed as a short basal row of scattered granules, reaching proximal third; retrolateral dorsosubmedian and retrolateral median partial, expressed as broken irregular rows of moderate and minute granules, strongly costate; prolateral median on a vaulted

projection, extending from a proximal tubercle with a minor macroseta on top, and three to five subserrate granules reducing in size ending in few distal minute serrations, reaching trichobothrium d_2 and beyond demarcated by a flat surface ending on one distal minor macrosetae. Prolateral ventral obsolete expressed by two minor macrosetae, one basal and one distal.

Chelae: Pedipalp manus incrassate (manus 1.45 times longer than fixed finger). Intercarinal surface matte. Carinae: Dorsal prolateral, dorsal median, and dorsal retrosubmedian accessory carinae strong with scattered enlarge granules; dorsal retrolateral proximally granular becoming distally crenular; dorsal prosubmedian and prolateral dorsal vestigial expressed by scattered crenulations flanking dorsal lateral carina; retrolateral median partial moderately granular, expressed on proximal two thirds; dorsal prosubmedian and prolateral dorsal vestigial expressed by scattered crenulations flanking dorsal lateral carina; retrolateral subventral accessory and retrolateral subventral vestigial expressed by few distal minute granules; ventral retrolateral partial, moderately crenular, ending at the level of trichobothrium *Est*. Ventral prosubmedian moderately crenulated and costate; ventral median vestigial expressed as crenulations flanking ventral prosubmedian reaching proximal third; ventral prolateral moderately crenulated and costate; prolateral median with scattered moderate crenulations, parallel to ventral prolateral. Trichobothria *Dt* and *Db* dorsal to dorsal retrolateral carinae. Trichobothrium *Dt* positioned subbasal on manus. Trichobothrium *Dt* positioned at mid manus.

Fingers: Fixed finger dentition: PD = 6, RD: 6, MD rows = 6, all denticles subserrate, retrolateral denticles comparatively smaller than prolateral denticles. Movable finger PD = 7, RD = 7, MD rows = 7, distal row with one denticle, prolateral and retrolateral denticles subpaired. Trichobothrium *ib* positioned between PD6 and PD7, PD7 lacking granule, and *it* positioned

adjacent to PD6. Fingers lacking scalloped. Gap created when fingers close absent, fingers fit evenly.

Legs: Spinules: Basitarsi I and II with prolateral ventral and retrolateral ventral carinae with complete rows of spinules, in III and IV; retrolateral median rows in I–IV absent; retrolateral dorsal in I–II, partial expressed in distal third, in III and IV absent. Telotarsi I–IV with two pairs of ventrodistal spinules in I–IV. Setae: Prolateral ventral, 3:4:5:4; retrolateral ventral, 3:6:6:6; retrolateral dorsal, 2:4:4:4; dorsal, 3:3:3:3; retrolateral dorsal and dorsal series arranged in two independent rows.

Tergites: Pretergites matte, posttergites with scattered moderate and coarse conical granules. Dorsal median and dorsal submedian carinae strong with a row of distal crenatoserrations expressed on proximal half. Tergite VII with intercarinal surfaces scattered with few large conical granules; dorsal median carina partial and strong expressed on proximal third, strongly costate and irregularly serrated; dorsal submedian vestigial expressed as a short distal row of irregular serrations strongly costate; dorsal lateral and lateral supramedian strong, distal extreme with an enlarged spiniform tubercle projecting backwards; Dorsal lateral projecting and curving laterally almost reaching lateral supramedian distal margin, creating a semi ring of strong serrated granulation.

Genital operculum: Male genital operculum: wider than long, with three pairs of macrosetae. Sclerites free on longitudinal edge moving independently but unable to open more than 45°. Genital papillae protruding posteriorly. Female genital operculum: Wider than long, with three macrosetae. Sclerites fuse longitudinal.

Sternites: Sternites III–VI with all carinae obsolete and surface matte in ♂, punctuated in ♀, V in ♂ with distomedian glandular spot weak, not protruding from adjacent surfaces, in ♀

obsolete. Sternite VII with ventral lateral carinae moderately crenulated and strongly costate; ventral submedian obsolete expressed by three minor macrosetae. Distomedian glandular spot strong in ♂, shaped as a truncated triangle, strongly protruding from adjacent surface, in ♀ lower and less developed. Spiracle elongated, slit-like, approximately two times longer than wide.

Pectines: Pectines in ♂ longer than distal margin of coxa VI, in ♀ at or slightly longer than coxa IV. Basal piece with two minor macrosetae. Marginal lamella consist of three sclerites, medial lamella proximally fuse distally progressively forming conspicuous 9–11 beads. Fulcra with 14–16 beads in ♂, 13–15 beads in ♀. Pectinal tooth count 15–17 in ♂, 14–16 in ♀.

Hemispermatophore: Lamina 1.68 longer than trunk. Dorsal through margin long, narrow, curving proximally, and removed from ventral trough. Hemimating plug developed from the inner lobe, distal barb margin with 12 elongated spinules. Primary and secondary hook positioned on the apex of lateral margin extension of the lamina (flange). Both hooks rounded and low, separated slightly, forming a shallow notch. Median lobe ental terminus moderate and rounded. Basal plate of inner lobe removed from ventral trough. Spine of inner lobe relatively long and strongly sclerotized. Neck relatively short (0.40 times longer than basal plate). Measurements, lamina, 2.52; trunk, 1.57; dorsal trough/laminar hooks, 1.14; ventral trough/laminar hook, 0.78; neck, 0.16; basal plate, 0.42.

Metasoma: All intercarinal surfaces matter, except dorsal surface of metasomal segment I–III with few scattered moderate granules. Dorsal lateral carinae of metasomal segments I–V and lateral median carinae of segments I–III finely crenatoserrated, proximally end with an elongated spiniform tubercle pointing backwards, except in V. Lateral median in IV distal terminus weakly expanded or flared laterally. Lateral inframedian in I complete crenatoserrated, in II partial crenatoserrated becoming weaker proximally, expressed on distal half, in III

crenatoserrated expressed in distal third becoming weaker proximally, in IV absent, in V partial, finely crenatoserrated and strongly costate, expressed in distal three fourths. Ventral lateral I–V, ventral submedian I–IV and ventral median in V finely crenatoserrated. Setae: In ♀ dorsal lateral, 0:0:0:0:3; lateral median, 0:1:1:1; lateral inframedian, 0:0:0:0:3; ventral lateral, 2:2:2:2:4; ventral submedian, 3:3:3:3; ventral sublateral, 2; all carinae minor; in ♂ all macrosetae absent or reduced to microsetae.

Telson: Ventral and dorsal surfaces smooth, relatively bald, ventral carinae with three macrosetae in each carinae in both sexes. Laterobasal microserration of aculeus with 7–9 sharp tines. Subaculear tubercle absent.

DISTRIBUTION: *Kochius moosni*, **n. sp.** is endemic to the Sierra del Placer and Sierra Morro Hermoso in the western extreme of the Vizcaino Desert, on the coast of the Pacific Ocean, Baja California Sur, Mexico.

ECOLOGY: *Kochius moosni*, **n. sp.** was collected in an area east of Bahía Tortugas devoid of vegetation; only a few sparse scrubs were present. The collection site was covered by movable and semi-stabilized sand dunes intersperse with granitic outcrops. The bedrock was heavily eroded and fragmentary, forming monticules of gravel and small rocks where the specimens rest during the day. These microhabitats were the only sites were this species was collected. At Sierra del Placer, the localities were more vegetated, but the cover was still scattered. The localities ranged in altitude from 17 to 262 m. Scorpions were found at night using ultraviolet detection.

MATERIAL EXAMINED: **MEXICO: Baja California Sur:** *Municipio de Mulegé*: Holotype ♂ Bahía Tortugas, 10 km NE, 27°45.216'N 114°50.602'W, 17 m, 5.vii.2008, H. Montaño and E. González, san dunes, collected at night with UV light, 1 subad. ♂ (AMNH [LP 8811]); Bahía Tortugas, 10 km NW, 27°45.3888'N 114°57.1026'W, 110 m, 7.vii.2008, H. Montaño and E.

González, desert, collected at night with UV light, sand banks, collected at night with UV light, 1 ♂ (AMNH [LP 8789]).

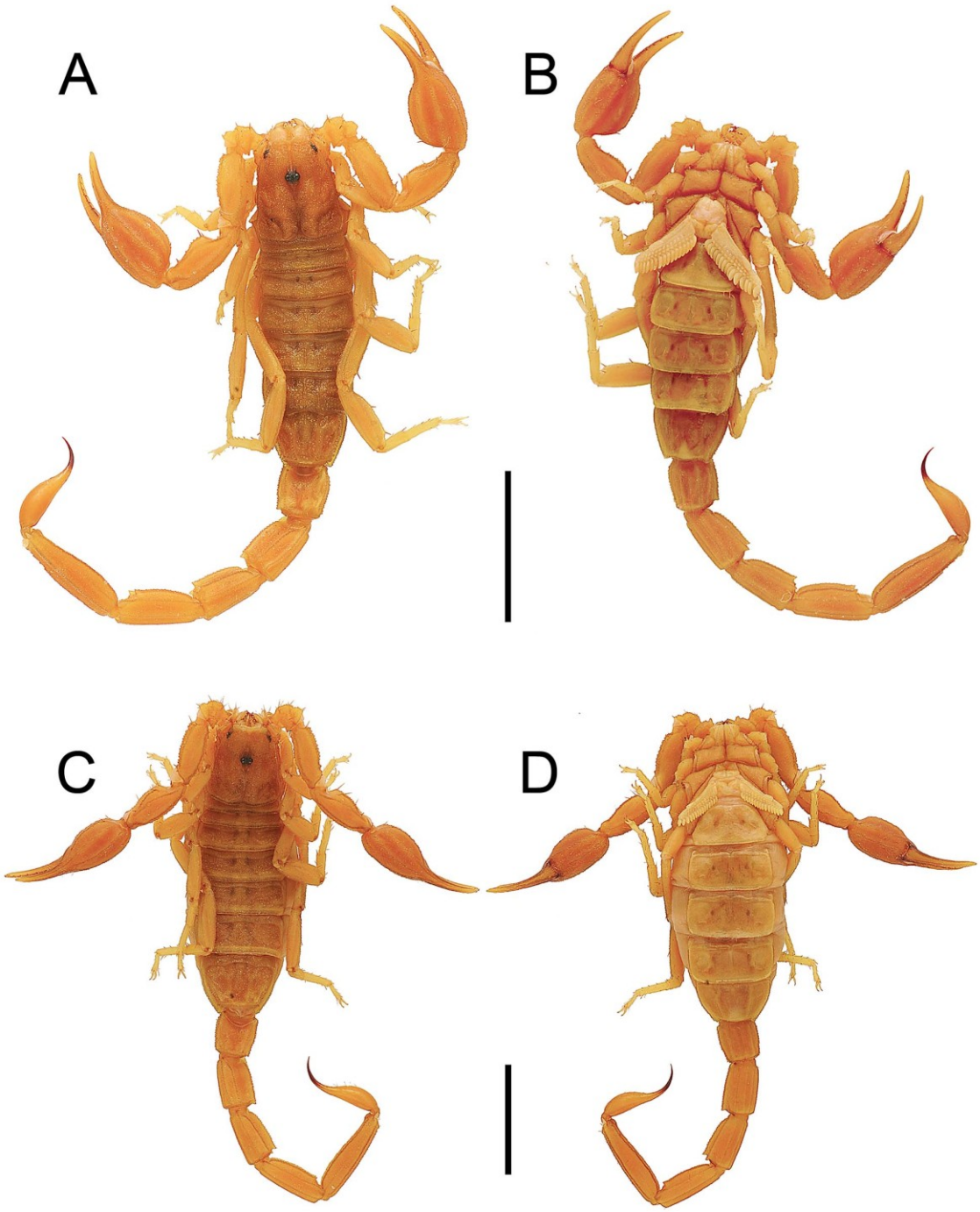


Figure 181. *Kochius moosni*, **n. sp.**, habitus. **A**, **B**. Paratype ♂ (AMNH). **C**, **D**. ♀ (AMNH). **A**, **C**. Dorsal aspect. **B**, **D**. Ventral aspect. Scale bars = 5 mm.

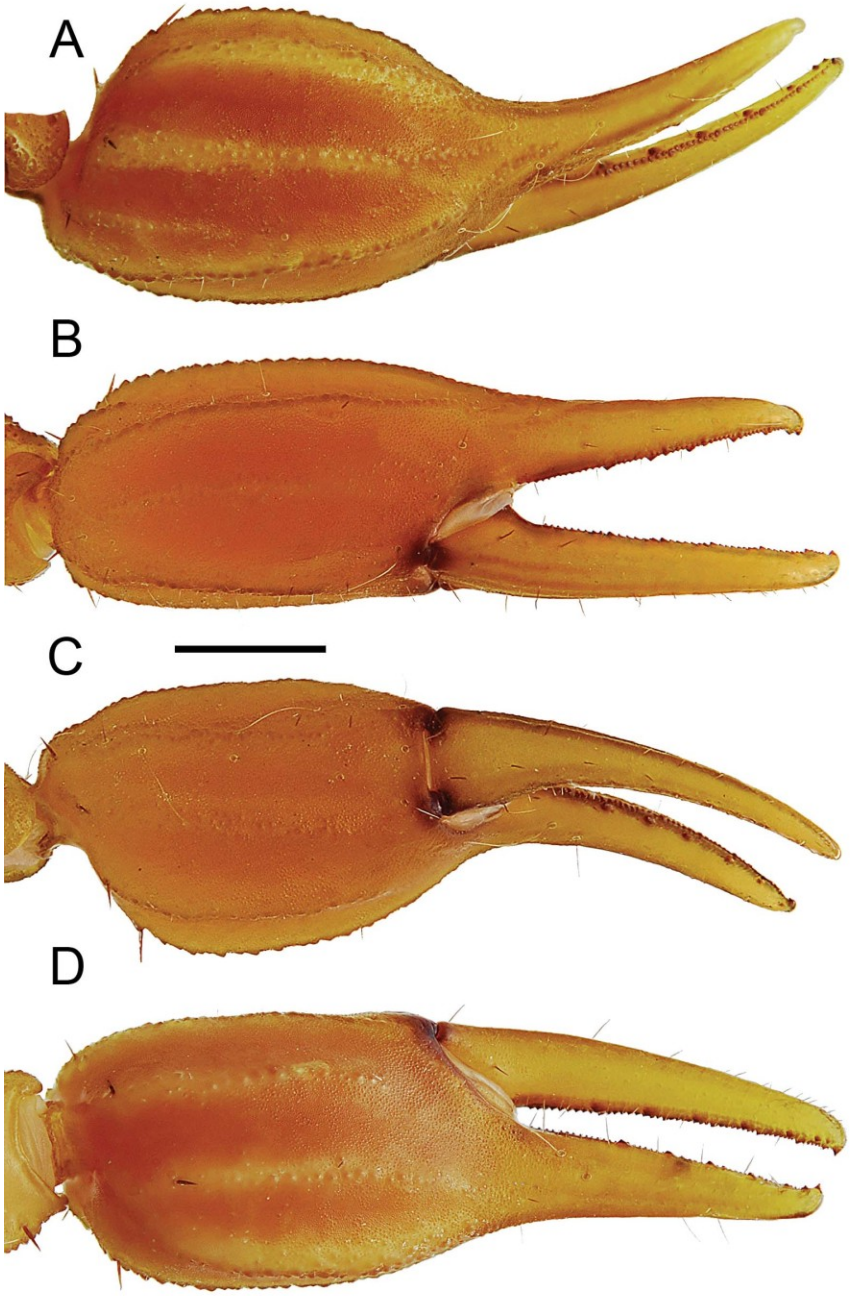


Figure 182. *Kochius moosni*, **n. sp.**, paratype ♂ (AMNH), dextral pedipalp chela. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

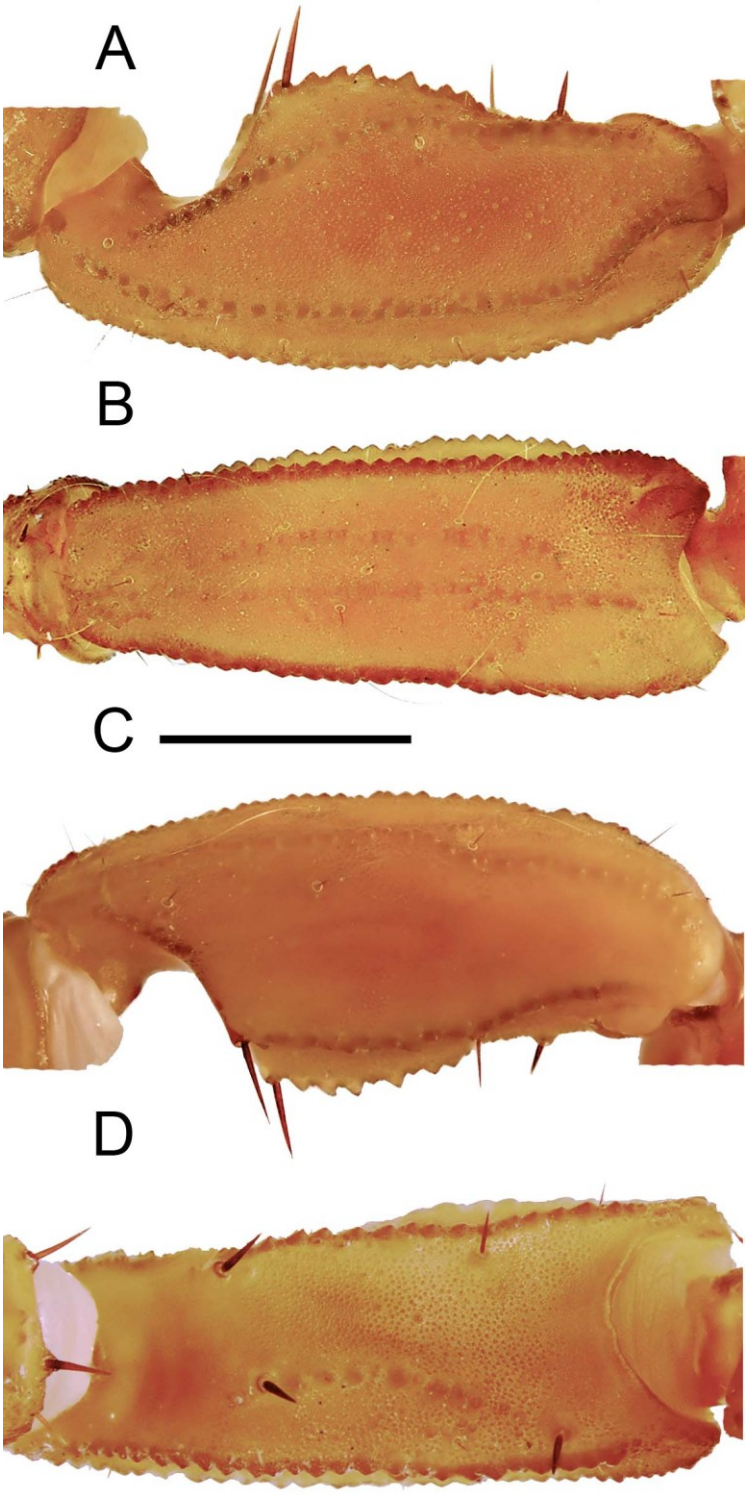


Figure 183. *Kochius moosni*, **n. sp.**, paratype ♂ (AMNH), dextral pedipalp patella. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

Kochius punctipalpi (Wood, 1863)

Figures144, 184–186, 196A, 202B, 207C, 211C, 215D, 218E, 222C

Buthus punctipalpi Wood, 1863a: 109; 1863b: 369, 370; Underwood, 1885: 165.

Vejovis punctipalpis: Marx, 1890: 91 (incorrect subsequent spelling).

Vejovis mexicanus: Kraepelin, 1894: 199; 1899: 184, 185 (in part and probable misidentification).

Vejovis punctipalpi: Banks, 1900: 424 (in part); Banks, 1910: 189 (in part); Hoffmann, 1931: 402; Comstock, 1940: 31 (in part); Soleglad, 1973b: 357; Stahnke, 1974: 135.

Vaejovis punctipalpis: Ewing, 1928: 10 (in part and incorrect subsequent spelling).

Vaejovis punctipalpus: Ewing, 1928: 10, 11 (in part and incorrect subsequent spelling).

Vejovis punctipalpus (incorrect subsequent spelling): Gertsch, 1958: 9–11; Gertsch and Soleglad, 1966: 1; Williams, 1970c: 318, 322.

Vaejovis punctipalpi: Williams, 1971a: 40; 1980: 53, 86, 87; Cokendolpher and Peek, 1991: 97, 98; Kovařík, 1998: 147; Beutelspacher, 2000: 103, 138, 154, map 86; Sissom, 2000: 550; Soleglad and Fet, 2003a: 6, 20, fig. 30; Soleglad and Fet, 2003b: 9, 57, fig. 105, 67, 68, tab. 4, 150, 151, fig. B-1, 152, fig. B-2, 161; Ponce-Saavedra and Sissom, 2004: 541; Sissom and Hendrixson, 2005a: 128, tab. 6.2; Graham and Fet, 2006: 11; Francke and González-Santillán, 2007: 586, 590; Soleglad et al., 2007: 120; Jiménez-Jiménez and Palacios-Cardiel, 2010: 70, 72, tab. 1, 73, 74.

Vaejovis punctipalpi punctipalpi: Williams, 1971a: 40–44, fig. 1; 1980: 53, 87, 88, figs. 51, 52, 53L, 56A, 57 (A, B), 89; Sissom, 2000: 550; McWest, 2009: 20, tab. 1, 91, 92, fig. 327, 123.

Kochius punctipalpi punctipalpi: Soleglad and Fet, 2008: 4, 17, 28, tab. 1, fig. 11, 29, fig. 36, 32 figs. 44–46, 39, fig. 76, 45, fig. 103, 50, tab. 3, 55, 128, 56, fig. 140, 57, fig. 140, 60, fig. 165, 61, figs. 172, 173, 62, fig. 183, 66, 73, 92–94.

TYPE MATERIAL: **MEXICO: Baja California Sur:** Lectotype (designated by Cokendolpher and Peek, 1991) ♀ (USNM), Cabo San Lucas [not examined]. Paralectotype ♂ (USNM), same locality as lectotype [not examined].

DIAGNOSIS: *Kochius punctipalpi* is closely related to *K. barbatus*, *K. cerralvensis*, and *K. magdalensis* with which it forms a monophyletic group (see *K. barbatus* for details). These species can be separated from the other species in the genus by having the proximal notch and median lobe of chela fixed and movable fingers moderately to strongly developed in ♂ and moderate in ♀, and chela finger closure with distinct gap, fingers fit unevenly in ♂; instead of having proximal notch and median lobe of chela fixed and movable fingers absent in ♂ and in ♀, and chela finger closure lacking gap, fingers fit evenly in ♂ and in ♀. From *K. barbatus* and *K. magdalensis* differs by having proximal notch and median lobe of chela fixed and movable fingers strong in ♂, and chela finger closure with distinct gap in ♀, instead of having proximal notch and median lobe moderate, and chela finger closure lacking gap in ♀. From *K. barbatus* and *K. cerralvensis* differs by having telson relatively bald, with carinae with two or three minor macrosetae in both sexes, instead of having telson hirsute, with carinae with nine or more macrosetae as long as aculeus in ♀ for the former and in both sexes in the latter. *K. magdalensis* and *K. cerralvensis* differs by having aculeus relatively elongated instead of having aculeus relatively short.

DESCRIPTION: The following redescription supplements Williams' (1971a) redescription. It is based on adult ♂, ♀ topotypes, freshly collected, and the museums indicated in material examined.

Color and infuscation (in alcohol): Base color of chelicerae, carapace, tergites, legs, metasoma, coxal region, sternites, and telson homogeneously pale yellow to golden-yellowish, lacking infuscation. Pectines and genital operculum pale whitish. Aculeus reddish to brownish. Base of pedipalp fingers reddish.

Carapace: Carapace anterior margin emarginated with a weak to moderated median notch and three pairs of minor macrosetae. Surface shagreened with scattered moderated conical and dense minute granules. Anteromedian, and posterolateral sulci moderated, posteromedian deep, posterior transverse obsolete. Median ocular tubercle moderately raised, superciliary carina crenulated higher than median eyes. Median eyes approximately double size of lateral frontal pair. Three lateral eyes, two frontal pairs same size and posterior reduced approximately in half.

Sternum and coxal region: Sternum pentagonal subequilateral with three pairs of setae, one distal, one median pair and one pair on the lobes, median notch deep. Anterior margin of coxa II with three oblique slit-like structures, adjacent to an enlarge protuberance with coarse crenulations. Base of coxal endite II with a moderated depression each, median margin with fine granulation on proximal half, becoming smooth distally. Coxa IV 2.17 times longer than coxa II.

Chelicerae: Dorsal surface smooth, dentition of fixed and movable fingers as in typical syntropine. Subdistal margin of manus with one median macrosetae and distal manus outlined with broad carinae with or without a short striation adjacent to the base of fixed finger. Serrula with 15–17 tines.

Pedipalps: Trichobothrial pattern Type C, orthobothriotaxic. Chelae wider than patella and patella wider than femur. Femur: retro and prolateral intercarinal surfaces matte, dorsal and ventral with few coarse granules on median surface. Carinae: Dorsal retrolateral, dorsal prolateral, and ventral prolateral carinae strongly granular with conical and sharp enlarged granules; retrolateral dorsosubmedian partial, with a moderated proximal spinoid tubercle, a gap of smooth surface and moderately crenatoserrated, and two minor macrosetae medially extending two thirds of the segment; prolateral ventrosubmedian complete and strong with a proximal bicuspid enlarged tubercle followed by an oblique row of sharp, conical, and enlarged granules, starting at mid surface slanting gently towards distal end of dorsal prolateral carinae, lacking macrosetae; prolateral ventral vestigial, expressed by two proximal tubercles, ventral one with a macroseta on top and three additional tubercles, one proximal, one medial and one distal with a macroseta on base, distributed from the proximal to the mid aspect of the segment; ventral median and retrolateral ventral vestigial expressed by a row of serrated enlarged granules; ventral retrosubmedian partial, expressed by scattered irregular serrated granules, reaching proximal half.

Patella: All intercarinal surfaces matte, except dorsal with few scattered medial moderated granules. Carinae: Dorsal prolateral, dorsal retrolateral, ventral prolateral, and ventral retrolateral strongly granular with sharp, conical and enlarge granules; ventral median vestigial expressed as a short basal row of scattered moderate and minute granules, reaching proximal third; retrolateral dorsosubmedian and retrolateral median complete, moderately granular with irregular moderated and minute granules; prolateral median on a vaulted projection, extending from a proximal tubercle with a minor macroseta on top, and three to six subserrate granules reducing in size ending in few distal minute serrations, reaching trichobothrium d_2 and beyond

demarcated by a flat surface ending on one distal minor macrosetae; prolateral ventral obsolete expressed by two minor macrosetae, one basal and one distal. These two carinae, indicated by macrosetae diverge distally.

Chelae: Pedipalp manus incrassate (manus 1.47 times longer than fixed finger). Intercarinal surface matte. Carinae: Dorsal prolateral, dorsal median, dorsal retrosubmedian accessory, and carinae strongly scattered granular; dorsal retrolateral granulated proximally, becoming crenulated distally; dorsal prosubmedian and prolateral dorsal vestigial expressed by scattered crenulations flanking dorsal lateral carina; retrolateral median complete strongly crenulated; retrolateral subventral accessory vestigial expressed by few minute distal granulation; retrolateral subventral vestigial but considerably more developed than retrolateral subventral accessory, expressed by a row of irregular minute granules extending to distal third of manus, running parallel to ventral retrolateral carinae for half of the length of the same retrolateral subventral; ventral retrolateral strongly granular and partial, ending at the level of trichobothrium *Est*; ventral prosubmedian strongly crenulated; ventral median obsolete; ventral prolateral weakly crenulated and moderately costate; prolateral median weak and scattered crenatoserrated, distally slanting towards dorsal prolateral carinae as a fine row of crenulations. Trichobothria *Dt* and *Db* dorsal to dorsal retrolateral carinae. Trichobothrium *Dt* positioned subbasal on manus. Trichobothrium *Dt* positioned at mid manus.

Fingers: Fixed finger dentition: PD = 6, RD = 5, MD rows = 5, all denticles subserrate, retrolateral denticles comparatively smaller than prolateral denticles. Movable finger PD = 7, RD = 6, MD rows = 6, distal row with one denticle, prolateral and retrolateral denticles subpaired. Trichobothrium *ib* positioned between PD6 and PD7 or at the level of PD6, PD7 lacking granule, and *it* positioned adjacent to PD6 or between PD5 and PD6. Fingers with strong scalloped,

proximal notch and median lobe of pedipalp fixed and movable fingers in ♂ strong, in ♀ moderate. Gap created when fingers close absent, in ♂ strong, in ♀ moderate.

Legs: Spinules: Basitarsi I–II with prolateral ventral and retrolateral ventral carinae with complete rows of spinules, prolateral ventral in III vestigial with few distal spinules, in IV absent; retrolateral ventral in III complete, in IV absent; retrolateral median rows in I–IV vestigial expressed as few terminal spinules; retrolateral dorsal in I–III, partial expressed in distal half, IV vestigial, expressed in distal third. Telotarsi I–IV with two pairs of ventrodistal spinules in I–IV. Setae: Prolateral ventral 3:4:5:5, medians in II and IV stout; retrolateral ventral, 3:7:7:7, medians in II and III slightly stout; retrolateral dorsal, 2:3:3:3; dorsal, 3:3:3:3; retrolateral dorsal and dorsal series arranged in two independent rows.

Tergites: Pretergites matte, posttergites with scattered moderated and coarse conical granules. Dorsal median and dorsal submedian carinae strong and complete expressed along the entire postergite. Tergite VII with intercarinal surfaces scattered with large conical granules; dorsal median carina partial and strong expressed on proximal third, strongly costate and irregularly serrated; dorsal submedian vestigial expressed as a pair of distal irregular serrations strongly costate; dorsal lateral and lateral supramedian strong, proximal extreme with an enlarged spiniform tubercle projecting backwards; Dorsal lateral projecting and curving laterally almost reaching lateral supramedian distal margin, creating a semi ring of strong serrated granulation.

Genital operculum: Male genital operculum: wider than long, with two pairs of macrosetae. Sclerites free on longitudinal edge moving independently but unable to open more than 45°. Genital papillae protruding posteriorly.

Sternites: Sternites III–VI with all carinae obsolete and surface matte in ♂ and punctuated in ♀, V in ♂ with distomedian glandular spot weak, no protruding from adjacent surfaces, in ♀ vestigial, slightly whitish. Sternite VII with ventral lateral carinae finely crenulated; distomedian glandular spot strong in ♂, shaped as truncated triangle, moderated in ♀. Ventral submedian carinae obsolete with three minor macrosetae. Spiracle elongated, slit-like, approximately between three and two times longer than wide.

Pectines: Pectines in ♂ longer than distal margin of coxa VI, in ♀ at or slightly longer than coxa IV. Basal piece with two minor macrosetae. Marginal lamella consist of three sclerites, medial lamella proximally fuse distally progressively forming conspicuous 9–10 beads. Fulcra with 17–19 beads in ♂, 15–17 beads in ♀. Pectinal tooth count 18–20 in ♂, 16–18 in ♀.

Hemispermatophore: Lamina 1.5 longer than trunk. Dorsal through margin long, narrow, curving proximally, and removed from ventral trough. Hemimating plug developed from the inner lobe, distal barb margin with 20 elongated spinules. Primary and secondary hook positioned on the apex of lateral margin extension of the lamina (flange). Both hooks rounded low, slightly separated, forming a shallow notch. Median lobe ental terminus moderated and rounded. Basal plate of inner lobe removed from ventral trough. Spine of inner lobe relatively long and strongly sclerotized. Neck as long as basal plate. Measurements, lamina, 3.60; trunk, 2.40; dorsal trough/laminar hooks, 1.2; ventral trough/laminar hook, 0.06; neck, 0.60; basal plate, 0.60.

Metasoma: All intercarinal surfaces matter, except dorsal surface of metasomal segment I–III with scattered moderated granules. Dorsal lateral carinae of metasomal segments I–V and lateral median carinae of segments I–III crenatoserrated, proximally end with an elongated spiniform tubercle pointing backwards, except in V. Lateral median in IV distal terminus weakly

expanded or flared laterally. Lateral inframedian in I complete crenatoserrated, in II and III vestigial irregularly expressed on distal third, in IV absent, in V partial, finely crenatoserrated and strongly costate, expressed in distal two thirds. Ventral lateral I–V, ventral submedian I–IV and ventral median in V finely crenatoserrated. Setae: In ♀ dorsal lateral, 0:1:1:1:4, lateral median, 0:1:1:2, lateral inframedian, 0:0:0:0:2, ventral lateral, 2:2:2:2:5, ventral submedian, 3:3:3:3, ventral sublateral, 2; all carinae major; in ♂ all macrosetae absent or reduced to microsetae.

Telson: Ventral and dorsal surfaces smooth, relatively bald with three minor or major macrosetae in each carinae and sometimes with one or two additional smaller macrosetae on ventral surface in both sexes. Laterobasal microserration of aculeus with 3–4 sharp tines. Subaculear tubercle absent. Aculeus longer than vesicle in ♀, in ♂ aculeus shorter than vesicle.

DISTRIBUTION: *Kochius punctipalpi* is endemic to the southern end of the Baja California Peninsula from Los Cabos region to a few kilometers south La Paz city, Baja California Sur, Mexico.

ECOLOGY: *Kochius punctipalpi* is a lapidicolous species adapted to rocky sparse soils with hard compacted sandy substrate and granitic outcrops. It has been collected from 15 to 717 m altitude. It can be found in mesic or arid vegetation. According to Jiménez-Jiménez and Palacios-Cardel (2010) it is the most abundant vaejovid in xeric vegetation in four oases south of La Paz. As in most *Kochius*, the most efficient way of collect this species is at night using ultraviolet detection.

REMARKS: Sissom (2000) reported that besides of the lectotype and paralectotype deposited at USNM, a third specimen exists (S- 3, jar 1) labeled: Cape San Lucas, Lower California, which was previously thought to be one of Xantus de Vesey's syntypes. Sissom

presumed that the specimen could be part of the type series of Marx (1890a), and labeled accordingly. He then asserted that the label for specimen S-3 is clearly not in Wood's handwriting (Cokendolpher and Peek, 1991). This specimen appears to be conspecific with a specimen at MCZ previously thought to be the holotype of *V. flavus* Banks. Sissom concluded that the specimen S-3 is not referable to *V. punctipalpi* (Wood) or to any other known taxon.

MATERIAL EXAMINED: **MEXICO: Baja California Sur:** *Municipio de Comondú*: San Hilario, 1.6 km SW, 26°12.1860'N 111°46.86'W, 274 m, 7.xi.1972, E.L. Sleeper and F.J. Moore, 1 ♂, 2 ♀ (OSAL). *Municipio de La Paz*: El Triunfo, S of La Paz, [23°49.9980'N 109°58.99'W], 3.ii.1965, V. Roth, 1 subad. ♂ (AMNH); La Huerta, 4 km E, 24°4.0020'N 110°13.00'W, 670 m, 9.x.1972, E.L. Sleeper and F.J. Moore, 1 ♂ (OSAL); La Paz, 15 km SE, 8.vii.2004, 24°3.7332'N 110°10.53'W, 476 m, desert, collected at night with UV light, 1 ♂, 3 juv. (CAS [ARA1537]), 2 ♂, 1 subad. ♂, 1 juv. (IBUNAM [ARA2088]), 3 ♂ (AMNH [ARA1472]), 24°3'44.7"N 110°10'32"W, 475 m, collected at night with UV light, 6 ♂, 1 ♀, 5 juv. (AMNH), O. Francke, E. González, and A. Valdez; La Paz, 18 km SE, 8.vii.2004, 24°2.7498'N 110°8.85'W, 626 m, desert, collected at night with UV light, 2 ♂, 1 subad. ♂ (AMNH [ARA1478]), 2 ♂ (CAS [ARA1534]), 3 ♂ (IBUNAM [ARA2084]), 24°2'45.9"N 110°8'51.9"W, 627 m, 5 ♂, 3 juv. (AMNH), O. Francke, E. González, and A. Valdez; San Antonio, 6.4 km S, near La Paz, 23°45.84'N 110°00.33'W, 543 m, 20.v.2001, M. Nishiguchi, deciduous forest, 1 ♂ (AMNH [LP 2153]); Todos los Santos, South, 10.vii.2004, 23°25.7832'N 110°11.5998'W, 80 m, desert, collected at night with UV light, 1 ♂ (AMNH [ARA1480]), 23°25'47.6"N 110°11'36.1"W, 83 m, 1 ♂ (AMNH), 1 juv. (AMNH [LP 3156]), E. González, O. Francke, W.E. Savary, and A. Valdez. *Municipio de Loreto*: Boca de la Sierra, near Miraflores, 23°12'9.52"N 109°27'28.95"W, 10.ii.1966, V. Roth, 1 ♀, 6 juv. (AMNH). *Municipio de Los Cabos*: Cabo San Lucas,

[22°53.3833'N 109°54.933'W], T. Greig, 3.iii.1928, 1 subad. ♀ (AMNH), V. Roth, 5–8.ii.1966, 3 ♀ (AMNH), 9.ii.1966, 1 ♂, 1 ♀ (AMNH); Cabo San Lucas, 24 km E, [22°53.3833'N 109°54.933'W], 1.vi.1999, M.E. Soleglad, 1 ♀ (AMNH [LP 1679]); Cabo San Lucas, 19 km NE, 7.ii.1966, V. Roth, in palm oasis, 1 subad. ♀ (AMNH); Ejido San Dionisio, Chinal [23°33.0833'N 109°50.6167'W], H. Carmona, 1 subad. ♂ (IBUNAM); Ejido San Dionisio, Encino Gordo, 30.vi.2006, H. Carmona, 1 ♀ (IBUNAM); La Burrera, Sierra de La Laguna, [23°33'1.6"N 110°2'28.7"W], 517 m, 18.x.1972, E.L. Sleeper and F.J. Moore, 1 subad. ♂ (OSAL); Los Frailes Bay, under rocks hill side, [23°22'N 109°25.9333'W], 19.iii.1953, 1 ♂, 1 ♀ (AMNH); San Bartolo, 6 km SW, 100 m, 13.vii.2008, 23°41.8158'N 109°50.7996'W, desert, collected at night with UV light, 1 ♀, 1 juv. (AMNH [ARA2887]), 1 juv. (AMNH [ARA2892]), 23°41.816'N 109°50.800'W, 1 ♂ (AMNH [LP 8843]), H. Montaño and E. González; San José del Cabo, 27 km N, [23°3.9060'N 109°40.65'W], 9.ii.1966, V. Roth, 1 subad. ♀ (AMNH); San José del Cabo, 9.7 km E, 23°3.9060'N 109°40.65'W, 27.x.1972, E.L. Sleeper and F.J. Moore, 1 subad. ♀ (OSAL); San José del Cabo, ca. 10 km S off Route 1, 23°1.7622'N 109°43.49'W, 50 m, 10.vii.2005, W.E. Savary, E. González, and R. Mercurio, desert, collected at night with UV light, 2 ♂ (AMNH [LP 4551]), 2 ♂, 2 ♀ (AMNH [ARA1473]), 2 ♂, 2 ♀ (AMNH [ARA1538]), 2 ♂, 2 ♀ (AMNH [ARA2089]); Santiago, 225 m, 9.vii.2004, 23°26.4'N 109°43.5666'W, desert, collected at night with UV light, 1 ♂, 1 subad. ♀, 4 juv. (AMNH [ARA1471]), 3 juv. (CAS [ARA1536]), 1 ♂, 2 subad. ♂, 2 juv. (IBUNAM [ARA2087]), 23°26'24.5"N 109°43'34.6"W, 1 ♂ (AMNH [LP 3157]), 2 ♂, 12 juv. (AMNH), O. Francke, E. González, and A. Valdez; Sierra de La Laguna, W. López-Forment, 30.iii.2005, 1 ♂, 1 ♀ (IBUNAM), O. Francke, E. González and A. Valdez, 717 m, 9.vii.2004, 23°38.5500'N 109°54.0828'W, desert, collected at night with UV light, 1 ♂, 1 subad. ♂ (IBUNAM [ARA2085]), 23°38'33.5"N 109°54'5.1"W, collected at night

with UV light, 1 ♂, 1 juv. (AMNH). *Municipio de San José del Cabo*: Punta Palmilla, 2.5 km NE, [23°2.74900'N 109°42.3366'W], 15 m, 16.vii.1968, S.C. Williams and M. Cazier, 1 ♂, 1 ♀ (AMNH); Punta Palmilla, 3 km NE, [23°2'44.13"N 109°42'25.94"W], 15 m, 17.vii.1972, 2 ♂, 2 ♀ (IBUNAM).

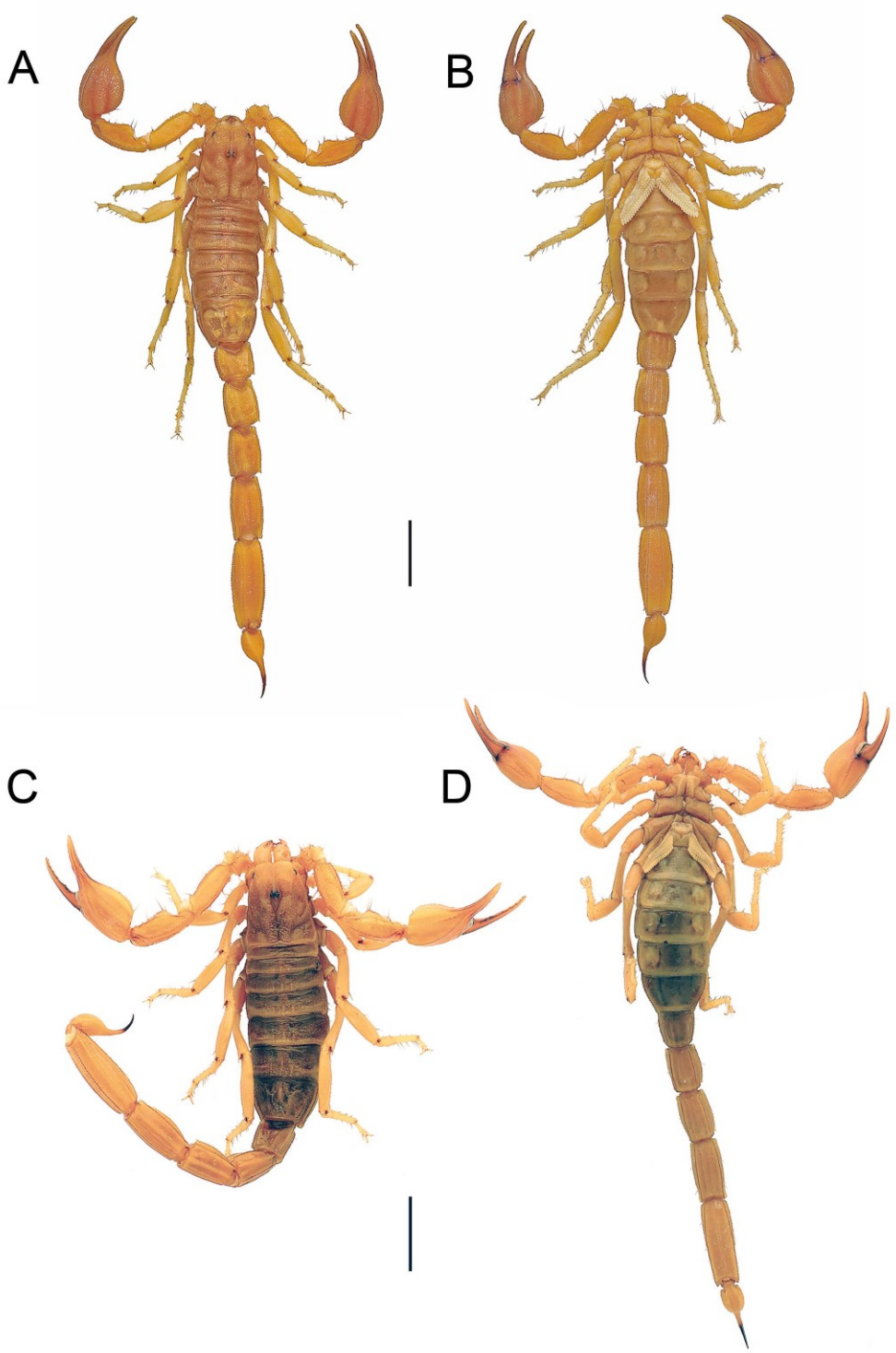


Figure 184. *Kochius punctipalpi* (Wood, 1863), habitus. **A**, **B**. ♂ (AMNH). **C**, **D**. ♀ (AMNH). **A**, **C**. Dorsal aspect. **B**, **D**. Ventral aspect. Scale bars = 5 mm.

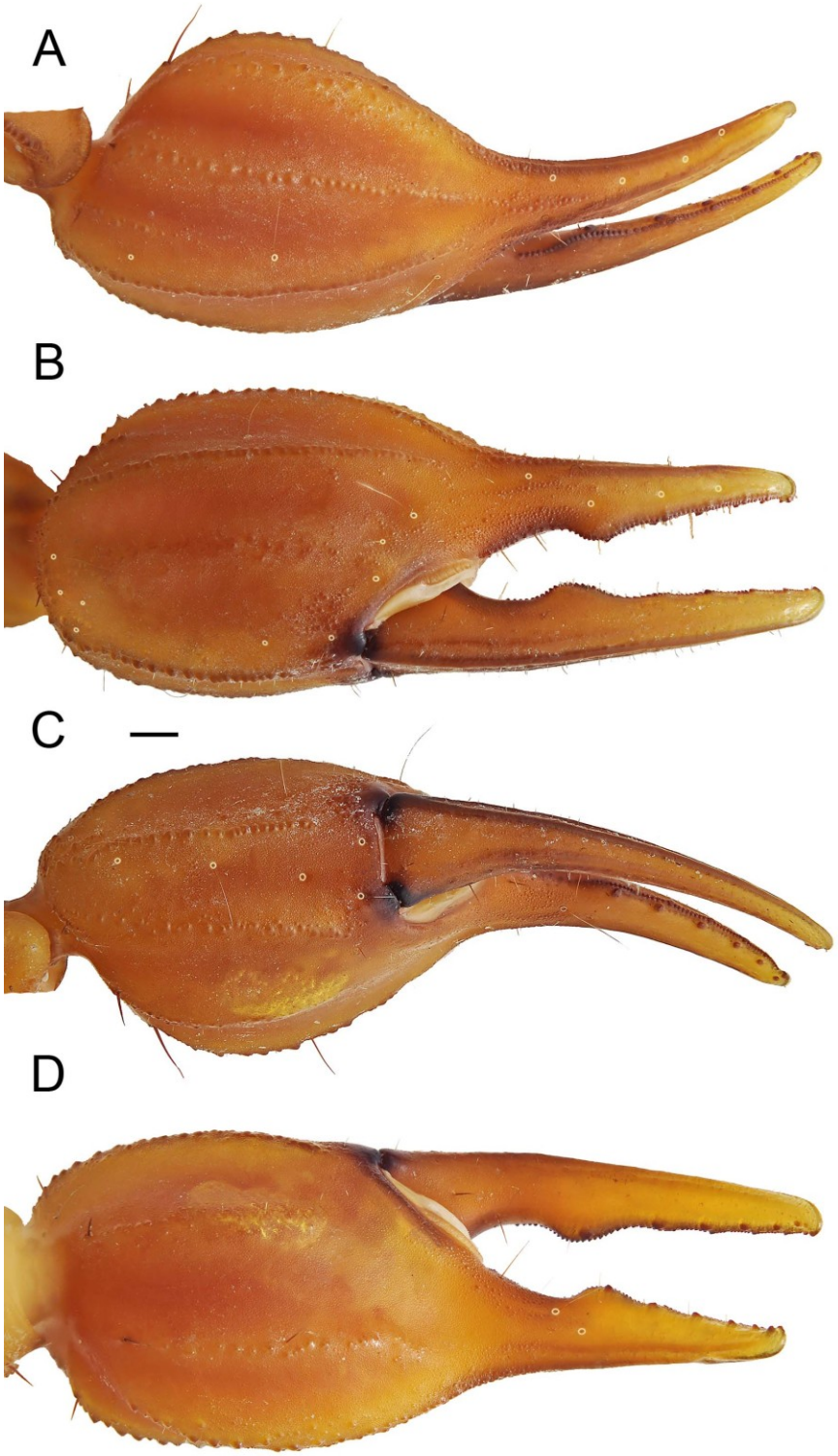


Figure 185. *Kochius punctipalpi* (Wood, 1863), ♂ (AMNH), dextral pedipalp chela. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

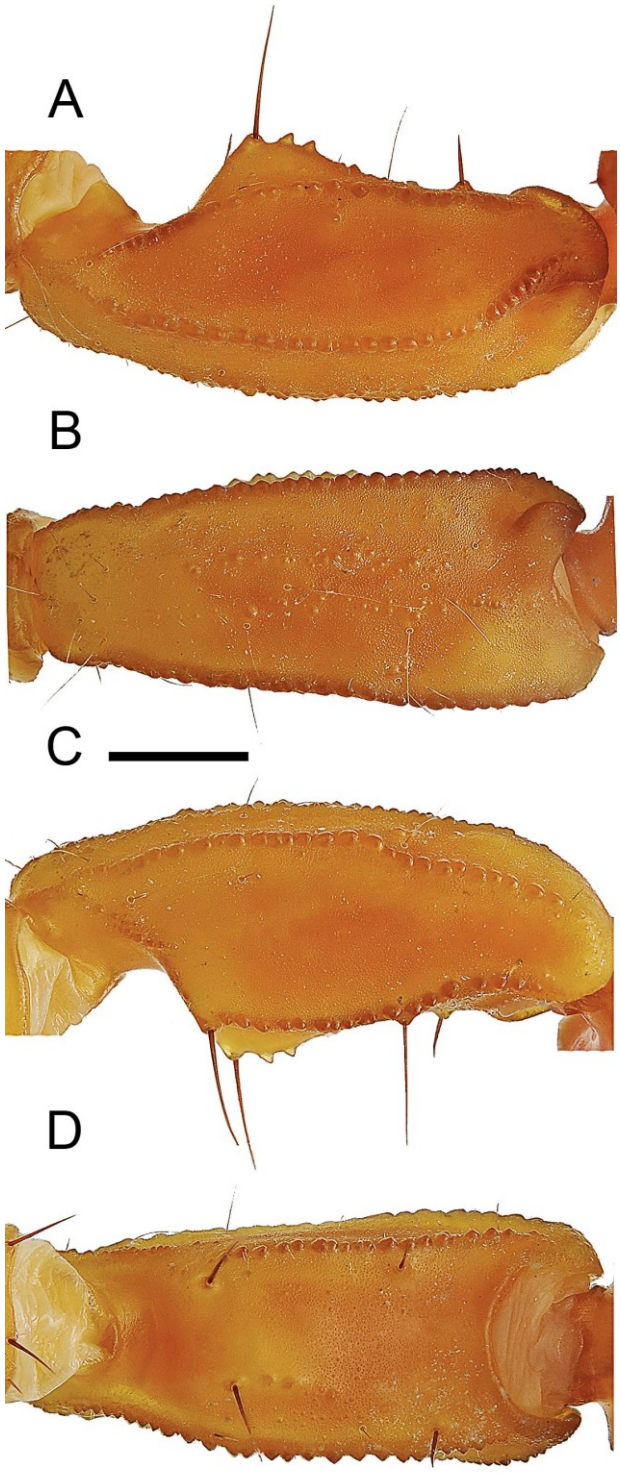


Figure 186. *Kochius punctipalpi* (Wood, 1863), ♂ (AMNH), dextral pedipalp patella. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

Kochius sonorae (Williams, 1971)

Figures 146, 187–189, 196B, 202C, 207D, 211D, 215E, 218F, 222D

Vaejovis sonorae Williams, 1971a: 57–59, fig. 3; Díaz-Nájera, 1975: 7, 31; Sissom, 1991a: 220, 221, figs. 11–14; Kovařík, 1998: 148; Beutelspacher, 2000: 110, 146, 154, map 89; Sissom, 2000: 551; Sissom and Hendrixson, 2005a: 128, tab. 6.2; Francke and González-Santillán, 2007: 590; Mcwest, 2009: 21, tab. 1, 93.

Vejovis sonorae: Soleglad, 1973b: 357.

Kochius sonorae: Soleglad and Fet, 2008: 69, 92–94.

TYPE MATERIAL: **MEXICO: Sonora:** Holotype ♂ (CAS, Type No. 11472), 11.2 mi W Alamos. Paratypes: 1 ♂ (CAS, Type No. 11472), 7 mi SE Alamos; 1 ♂ (CAS), 5.3 mi WSW Alamos on Cuchujaque River Bed along small stream.

DIAGNOSIS: *Kochius sonorae* forms a monophyletic group sister to the clade formed by: *K. barbatus*, *K. cerralvensis*, *K. magdalensis*, and *K. punctipalpi*. *K. sonorae* also serves as the connection between that monophyletic group and the monophyletic group that comprises the rest of species in *Kochius*. *K. sonorae* and *K. insularis*, *K. jatay*, **n. sp.**, *K. villosus*, *K. catavina* **n. sp.**, *K. moosni*, **n. sp.**, *K. maroma*, **n. sp.**, *K. kiliwa*, **n. sp.**, *K. danzante*, **n. sp.**, *K. bruneus*, and *K. hirsuticauda*; with which it forms a monophyletic group. This monophyletic group may be differentiated from the monophyletic basal by having proximal notch and median lobe of chela fixed and movable fingers absent, and chela finger closure with distinct gap obsolete in both sexes. *K. sonorae* is closely related to *K. insularis*, *K. jatay*, **n. sp.**, and *K. villosus* from which may be separated by having carapace, terga and prolateral surface of legs moderately infuscated with dusky markings, instead of having immaculate surfaces. *K. sonorae* has ventral

median and ventral prolateral carinae of pedipalp chela obsolete, and prolateral median weakly crenulated, instead of having the first two weakly to strongly crenulated and prolateral median strong with enlarge serrated granules. *K. sonorae* has ventral and dorsal surface of telson relatively bald, with three or less macrosetae in each carinae and lacks dorsal macrosetae, instead of having dense to moderate hirsute telson, with five or more macrosetae in each carinae and two or more pairs of setae in dorsal surface. From *K. insularis* differs by having relatively short aculeus, instead of having relatively long aculeus. From *K. villosus* differs by having six retrolateral denticles and six rows of median denticles on movable finger of pedipalp chelae, instead of having seven retrolateral denticles and seven rows.

DESCRIPTION: The following redescription supplements Williams' (1971a) original description. It is based on adult ♂, ♀ topotypes, freshly collected, and the material of the museums indicated in material examined.

Color and infuscation (in alcohol): Base color of chelicerae, carapace, terga, legs, metasoma, coxal region, sternites, and telson homogeneously medium yellow to orange, carapace and terga with diffuse fuscous markings. Pectines and genital operculum pale whitish. Aculeus base reddish to brownish.

Carapace: Carapace anterior margin emarginated with a moderated median notch and three pairs of minor macrosetae. Surface completely shagreened with dense moderated conical and minute granules. Anteromedian, posteromedian, and posterolateral sulci deep, posterior transverse obsolete. Median ocular tubercle moderately raised, superciliary carina cover with dense minute granules higher than median eyes. Merdian ocular tubercle positioned on distal half of the carapace. Median eyes approximately double size of lateral frontal pair. Three lateral eyes, two frontal pairs same size and posterior reduced approximately in half.

Sternum and coxal region: Sternum pentagonal subequilateral with three pairs of setae, one distal, one median pair and one pair on the lobes, median notch deep. Anterior margin of coxa II with three oblique slit-like structures, adjacent to a moderate protuberance with few fine granules. Base of coxal endite II with a deep depression each. Coxa IV 2.00 times longer than coxa II.

Chelicerae: Dorsal surface smooth, dentition of fixed and movable fingers as in typical vaejovids. Subdistal margin of dorsal manus with one median macrosetae and distal manus outlined with broad carinae with or without pair of denticles adjacent to the base of fixed finger. Serrula with 12–14 tines.

Pedipalps: Trichobothrial pattern Type C, orthobothriotaxic. Chelae wider than patella and patella wider than femur. Femur: retro and prolateral intercarinal surfaces matte, dorsal and ventral shagreened, with scattered coarse granules on median surface. Carinae: Dorsal retrolateral, dorsal prolateral, and ventral prolateral carinae with clusters of irregular moderate and minute granules; retrolateral dorsosubmedian complete, with a moderated proximal spinoid tubercle, moderately crenatoserrated, and two minor macrosetae medially, prolateral ventrosubmedian complete and strong, oblique row of sharp, conical, and enlarged granules, starting at mid surface slanting gently towards distal end of dorsal prolateral carinae, lacking macrosetae; prolateral ventral vestigial, expressed by one proximal tubercle with a minor macroseta on top, one medial reduced granule with a macroseta on top and a distal reduced granule with a macroseta on top, distributed from the basal to the mid aspect of the segment; ventral median and retrolateral ventral vestigial expressed by scattered serrated granules; ventral retrosubmedian partial, expressed by scattered irregular serrated granules, reaching proximal half.

Patella: All intercarinal surfaces matte. Carinae: Dorsal prolateral and dorsal retrolateral with cluster of irregular moderate and minute granules, ventral prolateral and ventral retrosubmedian with irregular moderate granules; ventral median vestigial expressed as a short basal row of scattered granules, reaching proximal third; retrolateral dorsosubmedian complete with irregular moderated and minute granules strongly costate; retrolateral median partial irregular moderate granules, broken into discontinuous weak costate rows; prolateral median on a vaulted projection, extending from a proximal tubercle with a minor macroseta on top, and a short row of subserrate granules reducing in size ending in few distal minute serrations, reaching trichobothrium d_2 and beyond demarcated by a flat surface ending on one distal minor macrosetae; prolateral ventral obsolete expressed by two minor macrosetae, one basal and one distal.

Chelae: Pedipalp manus moderately incrassate (manus 1.4 times longer than fixed finger). Intercarinal surface matte. Carinae: Dorsal prolateral finely granulated; dorsal prosubmedian and prolateral dorsal vestigial expressed by scattered crenulations flanking dorsal lateral carina; dorsal median and dorsal retrosubmedian finely cover by clusters of irregular granules, strongly broad and costate proximally, becoming narrower and lower distally; dorsal retrosubmedian accessory vestigial, covered by a cluster of irregular moderate granules, and dorsal retrolateral carinae covered with cluster of moderate granules; retrolateral median complete strongly crenulated proximally, becoming weaker and lower distally, ending as a fine irregular row of minute granules; retrolateral subventral accessory and retrolateral subventral vestigial expressed by few minute distal granulation; ventral retrolateral strong irregularly granular and partial, ending at the level of trichobothrium *Est*; ventral retrolateral vestigial, expressed medially by a short row of minute and moderate scattered granules; ventral

prosubmedian weakly finely granular, moderately costate; ventral prolateral mostly smooth with two or three basal irregular granules and moderately costate; prolateral median weakly crenatoserrated parallel to ventral prolateral. Trichobothria *Dt* and *Db* dorsal to dorsal retrolateral carinae. Trichobothrium *Dt* positioned subbasal on manus. Trichobothrium *Dt* positioned at mid manus.

Fingers: Fixed finger dentition: PD = 6, RD = 5, MD rows: 5, all denticles subserrate, retrolateral denticles comparatively smaller than prolateral denticles. Movable finger PD = 7, RD = 6, MD rows = 6, distal row with one denticle, prolateral and retrolateral denticles subpaired. Trichobothrium *ib* and *it* positioned between PD6 and PD7, PD7 lacking granule. Fingers lacking scalloped. Gap created when fingers close absent, fingers fit evenly.

Legs: Spinules: Basitarsi I–II with prolateral ventral and retrolateral ventral carinae with complete rows of spinules, in III vestigial expressed as few distal spinules, in IV absent; retrolateral median rows in I–IV vestigial expressed as few terminal spinules; retrolateral dorsal in I–III, vestigial expressed as few terminal spinules, IV absent. Telotarsi I–IV with two pairs of ventrodistal spinules in I–IV. Setae: Prolateral ventral, 3:4:4:4, medians in III and IV moderately stout; retrolateral ventral, 3:6:7:7; retrolateral dorsal, 2:4:4:4; dorsal 3:3:3:3; retrolateral dorsal and dorsal series arranged in two independent rows.

Tergites: Preterga matte, posterga with dense moderated and coarse conical granules. Dorsal median carinae strong with a short row of distal crenatoserrations on proximal half; dorsal submedian strong complete, expressed along the entire postergite. Tergite VII with intercarinal surfaces scattered with large conical granules; dorsal median carina partial and strong expressed on proximal third, strongly costate and irregularly serrated; dorsal submedian vestigial expressed as a pair of distal irregular serrations strongly costate; dorsal lateral and lateral supramedian

strong, proximal extreme with an enlarged spiniform tubercle projecting backwards; dorsal lateral projecting and curving laterally almost reaching lateral supramedian distal margin, creating a semi ring of strong serrated granulation.

Genital operculum: Male genital operculum: wider than long, with three pairs of macrosetae. Sclerites free on longitudinal edge moving independently but unable to open more than 45°. Genital papillae protruding posteriorly. Female genital operculum: Wider than long, with three macrosetae. Sclerites fuse longitudinal.

Sternites: Sternites III–VI with all carinae obsolete and surface matte, V in ♂ with distomedian glandular spot moderate, evidently protruding from adjacent surfaces, in ♀ obsolete. Sternite VII with ventral lateral carinae moderately crenatoserrated and strongly costate; ventral submedian obsolete in ♂, expressed by three macrosetae in ♀; distomedian glandular spot strong piriform, protruding from adjacent surface strongly in both sexes. Spiracle elongated, slit-like, approximately two times longer than wide.

Pectines: Pectines in ♂ longer than distal margin of coxa VI, in ♀ at or slightly longer than coxa IV. Basal piece with two minor macrosetae. Marginal lamella consist of three sclerites, medial lamella proximally fuse distally progressively forming conspicuous 9–10 beads. Fulcra with 13–15 in ♂, 13–14 in ♀. Pectinal tooth count 14–16 in ♂, 14–15in ♀.

Hemispermatophore: Lamina 1.50 longer than trunk. Dorsal through margin long, wide distally, curving and tapering proximally, and removed from ventral trough. Hemimating plug developed from the inner lobe, distal barb margin with 12 elongated spinules. Primary and secondary hook positioned on the apex of lateral margin extension of the lamina (flange). Both hooks rounded and low, separated slightly, forming a shallow notch. Median lobe ental terminus moderated and rounded. Basal plate of inner lobe removed from ventral trough. Spine of inner

lobe relatively long and strongly sclerotized. Neck moderate (0.71 times longer than basal plate). Measurements, lamina, 2.70; trunk, 1.80; dorsal trough/laminar hooks, 1.02; ventral trough/laminar hook, 0.60; neck, 0.30; basal plate, 0.42.

Metasoma: All intercarinal surfaces matter, except dorsal surface of metasomal segment I–III with scattered moderated granules. Dorsal lateral carinae of metasomal segments I–V and lateral median carinae of segments I–III crenatoserrated, proximally end with an elongated spiniform tubercle pointing backwards, except in V. Lateral median in IV distal terminus weakly expanded or flared laterally. Lateral inframedian in I complete crenatoserrated, in II and III vestigial irregularly expressed on distal third becoming weaker proximally, in IV absent, in V partial, finely crenatoserrated and strongly costate, expressed in distal two thirds. Ventral lateral I–V, ventral submedian I–IV, and ventral median in V finely crenatoserrated. Setae: In ♀ dorsal lateral, 0:0:1:1:4, lateral median, 0:1:1:2, lateral inframedian, 1:0:0:0:2, ventral lateral, 2:2:2:2:5, ventral submedian, 3:3:3:3, ventral sublateral, 2; all carinae major; in ♂ all macrosetae absent or reduced to microsetae.

Telson: Ventral and dorsal surfaces smooth, relatively bald with three minor macrosetae in male and major in female. Laterobasal microserration of aculeus with 4 to 7 sharp tines. Subaculear tubercle absent.

DISTRIBUTION: *Kochius sonorae* is distributed in the western foothills of the Sierra Madre Occidental, in the state of Sonora, Mexico and is here newly recorded from Arizona, U.S.A.

ECOLOGY: *Kochius sonorae* is typical of mesic to dry microclimates with sparse vegetation within the tropical deciduous forest and scrublands at an altitude of 258 to 937 m. The most efficient way of collecting this lapidicolous species is by ultraviolet detection.

MATERIAL EXAMINED: **MEXICO: Sonora:** *Municipio de Alamos*: Alamos, [27°1.6500'N 108°56.4'W], 304 m, 20.i.1972, V. Roth, 1 ♀ (AMNH); Alamos, 16 km W, 19.vii.1954, W.J. Gertsch, 1 ♀ (AMNH), 2 juv. (AMNH); Sierra de Alamos, [27°2.92717'N 109°5.019'W], i.1954, V. Roth, 2 ♂, 2 ♀ (AMNH). *Municipio de Croix*: Los Cedros, [27°24'20.21"N 109°11'30.62"W], 2.ii.2006, P. Berea, 1 ♀ (IBUNAM). *Municipio de Cumpas*: La Escondida Ranch, Alvaro Obregón, 30°16.473'N 109°50.070'W, 937 m, 27–28.vi.2006, E. González and P. Berea, collected at night with UV light, 1 ♂, 1 subad. ♂ (AMNH [LP 6318]), 1 ♀ (IBUNAM). *Municipio de Guaymas*: Guaymas, [27°56'N 110°54'W], 28.iii.1964, J. Julia, under adobes, 1 juv. (IBUNAM). *Municipio de Navojoa*: Microwave Cerro Prieto, 15 km E of Navojoa, 27°4.9830'N 109°17.4498'W, 375 m, 23.viii.2009, E. González and J.L. Castelo, tropical deciduous forest, collected at night with UV light, 1 ♂, 1 ♀, 4 juv. (AMNH [ARA3157]), 1 ♂, 1 ♀, 3 juv. (IBUNAM [ARA2405]); Microwaves Cerro Prieto, ca. 15 km E of Navojoa, 27°4.9368'N 109°17.4348'W, 375 m, 23.ix.2009, E. González and J.L. Castelo, collected at night with UV light, deciduous tropical forest, 2 juv. (AMNH [LP 9974]); Navojoa, 32 km S, [27°4.87800'N 109°26.766'W], 12.ix.1966, J. and W. Ivie, 2 juv. (AMNH). *Municipio de Soyopa*: dirty road between El Encinal and Tonichi, 28°33.2388'N 109°21.64'W, 645 m, 1.vii.2006, E. González and P. Berea, desert, collected at night with UV light, 2 ♂ (AMNH [ARA3015]), 1 ♂ (IBUNAM [ARA2330]); Plutarco Elias Calles Dam, Ejido el Novillo, 28°58.827'N 109°30.160'W, 258 m, 22.vi.2006, P. Berea and E. González, rock rolling by day, 1 ♂ (AMNH [LP 6301]); Sierra El Encinal, 9 km from Hwy MEX 16 on dirty road to El Encinal, 28°35.4120'N 109°27.1476'W, 380 m, 24.vi.2006, E. González and P. Berea, dry forest, collected at night with UV light, 2 ♂ (AMNH [ARA2539]). *Municipio de Yecora*: La Palma Agujerada Ranch, between Tepoca and Guizamopa, road SON 117, 28°28.722'N 109°10.298'W,

847 m, 23.vi.2006, P. Berea and E. González, collected at night with UV light, 1 ♂ (AMNH [LP 6304]). **U.S.A.: Arizona:** *Pima Co.*: Tucson, [32°13'18"N 110°55'35"W], 27.viii.2004, A. Corthals et al., 1 ♂ (AMNH [LP 3068]), 1 ♂ (AMNH [LP 3068]); Tucson, near Silverbell Road and Sunset Road, B.R. Tomberlin and S.J. Burchfield, 1 ♂ (AMNH [LP 3567]), 1 ♂ (AMNH [LP 3567]); Tucson Mountains, [32°13.8060'N 111°5.85'W], 18.viii.2002, P. Cooney, collected at night with UV light, 1 ♂ (AMNH [LP 2156]).

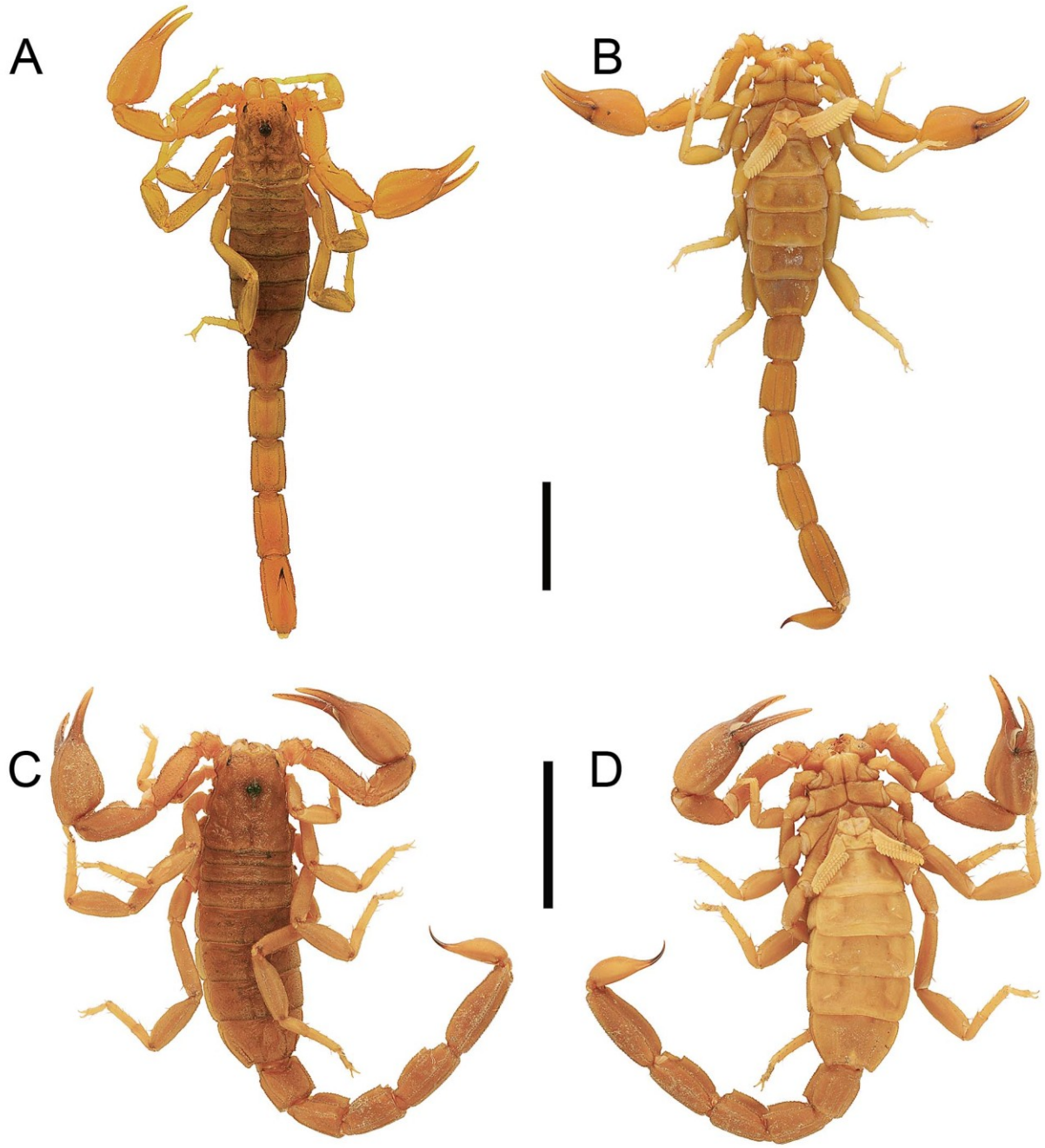


Figure 187. *Kochius sonorae* (Williams, 1971), habitus. **A**, **B**. ♂ (AMNH). **C**, **D**. ♀ (AMNH). **A**, **C**. Dorsal aspect. **B**, **D**. Ventral aspect. Scale bars = 5 mm.

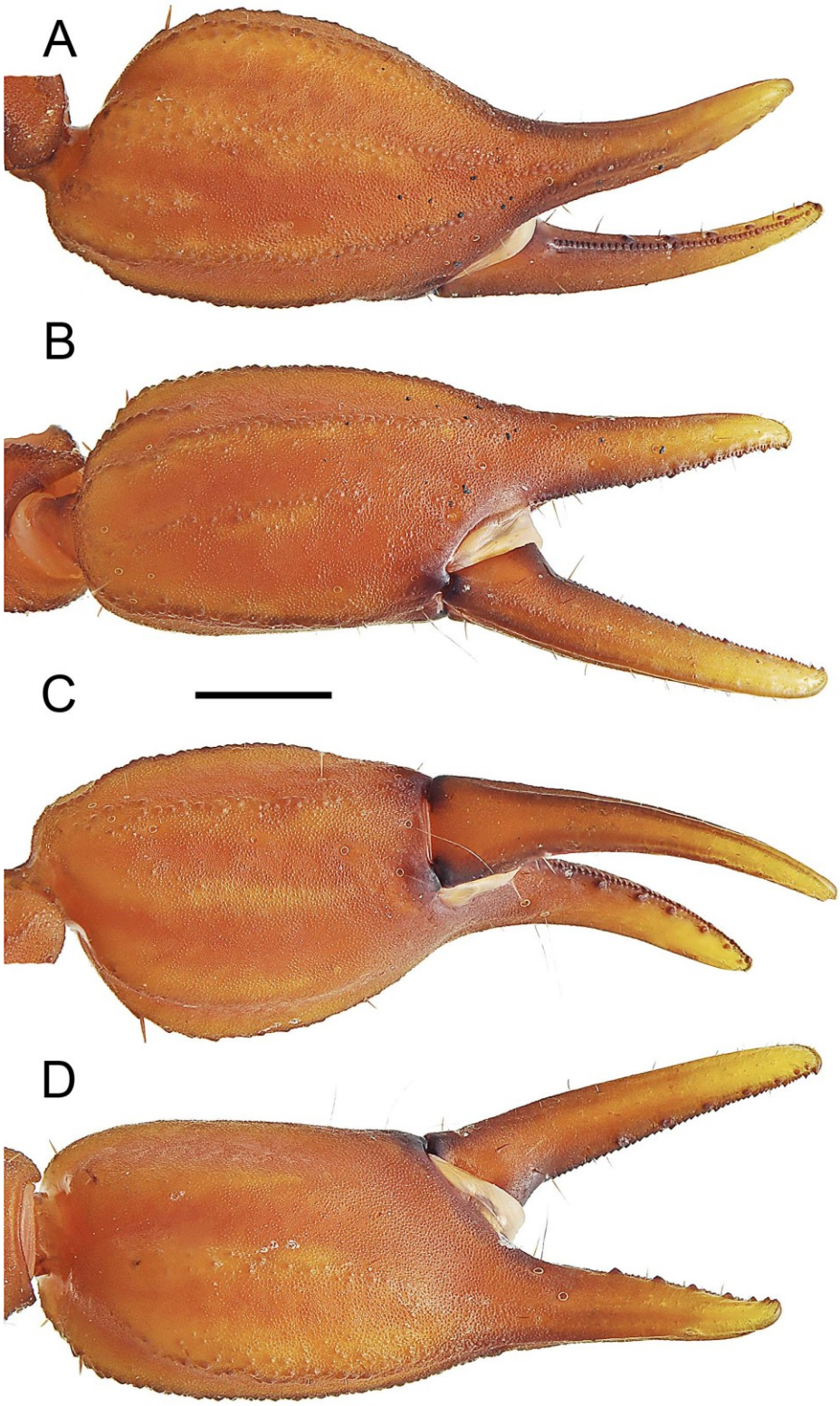


Figure 188. *Kochius sonorae* (Williams, 1971), ♂ (AMNH), dextral pedipalp chela. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

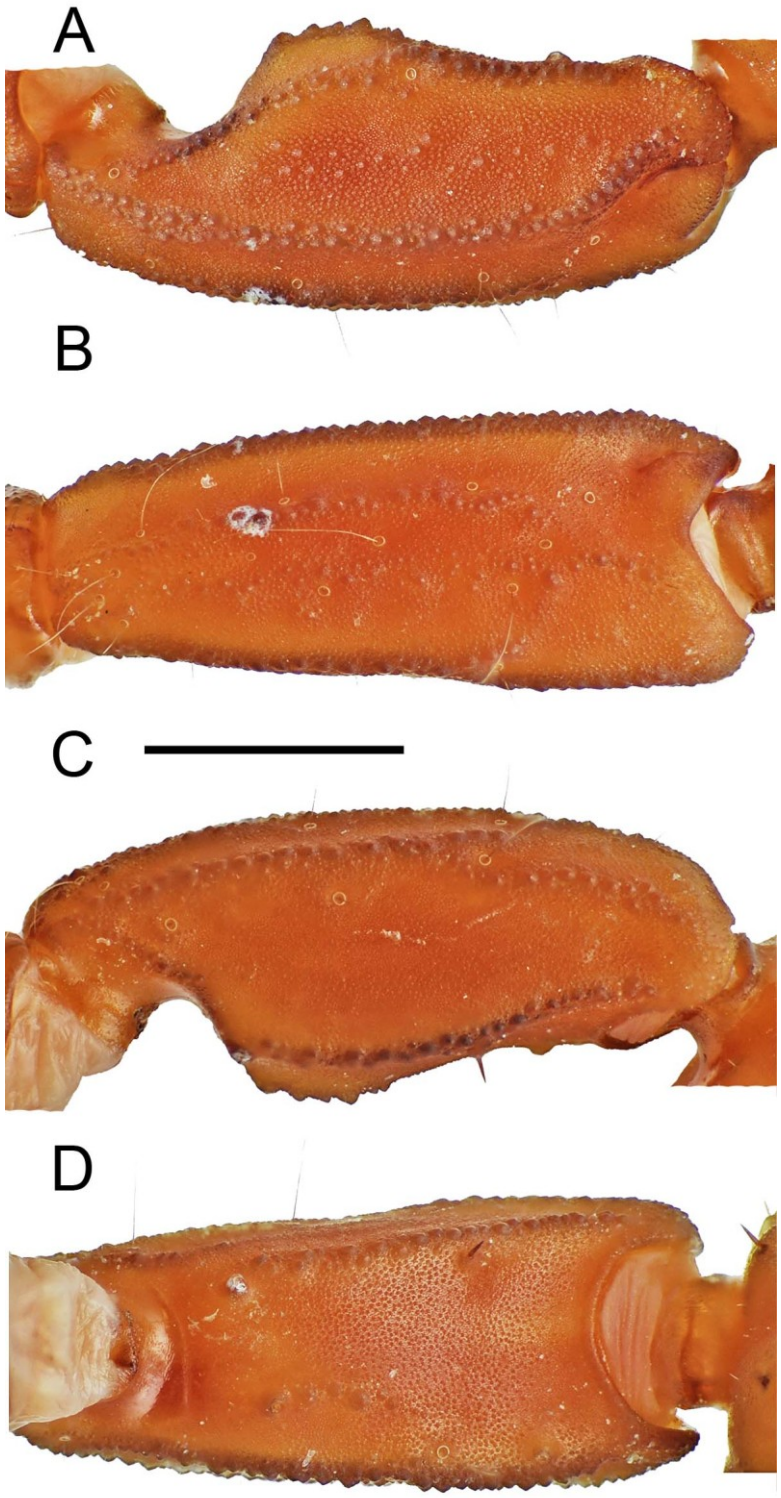


Figure 189. *Kochius sonorae* (Williams, 1971), ♂ (AMNH), dextral pedipalp patella. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

Kochius villosus (Williams, 1971)

Figures 147, 190–192, 196C, 202D, 207E, 211E, 214D, 218G, 222E

Vaejovis bruneus villosus Williams, 1971a: 51–54; Díaz-Nájera, 1975: 6; Williams, 1980: 54, 81, 82, fig. 57F, 83, 84; Kovařík, 1998: 146; Sissom, 2000: 548; McWest, 2009: 20, tab. 1, 41, 90, 91, 124.

Vaejovis broneus villosus: Díaz-Nájera, 1975: 13, 14 (lapsus).

Vaejovis bruneus form *villosus*: Beutelspacher, 2000: 76, 137, 152, map 49.

Kochius bruneus villosus: Soleglad and Fet, 2008: 92.

Vaejovis bruneus loretoensis Williams, 1971a: 54–57; Díaz-Nájera, 1975: 6; Williams, 1980: 54, 81, fig. 57E, 83, 84; Kovařík, 1998: 146; Sissom, 2000: 548; McWest, 2009: 124; Jiménez-Jiménez and Palacios-Cardiel, 2010: 70, 72, tab. 1, 73, 74.

Vaejovis broneus loretoensis: Díaz-Nájera, 1975: 13 (lapsus).

Vaejovis bruneus form *loretoensis*: Beutelspacher, 2000: 74, 137, 152, map 49.

Kochius bruneus loretoensis: Soleglad and Fet, 2008: 6, 55–57, 61, figs. 129, 142, 153, 171, 92.

TYPE MATERIAL: *Vaejovis bruneus bruneus*: **MEXICO: Baja California Sur:** [*Municipio de Comondús*]: Holotype ♂ (CAS, Type No. 11467), 5–10 mi southwest of San Miguel de Comondú, 3.vii.1968, 1000 ft, S.C. Williams and M.A. Cazier, and party, collected by means of ultraviolet detection. Paratypes: 13 ♂, 3♀; same locality as holotype; [*Municipio de Mulegé*]: San Ignacio (Mission), 21–25.i.1965, V. Roth, 4 ♀; 11 miles south of Santa Rosalía, 17.ii.1966, V. Roth, 1 ♀; Bahia Concepcion, near El Coyote, 17.ii.1966, V. Roth, 2 ♀; 14.7 miles southwest of Loreto, 26.v.1970, S.C. Williams and V.F. Lee, 1 ♂; Rancho Las Parras, 26.v.1970, S.C. Williams and V.F. Lee, 1 ♂; Rancho Las Parras, 12 miles south of Loreto,

29.i.1965, V. Roth, 1 ♂, 1 ♀; 0.5 miles west Rancho Las Parras, 26.v.1970, .C. Williams and V.F. Lee, 1 juv; 4 miles southwest of San Miguel de Comondú, 15.v.1969, S.C. Williams, 1 ♂; Puerto Escondido, 17 miles south of Loreto, 27.v.1970, S.C. Williams and V.F. Lee, 1 ♂; Rancho Chenque, north of Puerto Escondido, 7.iv.1962, Belvedere Expedition, 1 juv. [*Municipio de Loreto*]: Isla Carmen, Puerto Balandra, 24.v.1970, S.C. Williams and V.F. Lee, 24, ♂ 3, ♀; Isla Monserrat, northeast side 22.v.1970, S.C. Williams and V.F. Lee, 6 ♂, 2 ♀; Isla Danzante, northwest side, 24.v.1970, S.C. Williams and V.F. Lee, 2 ♂, 1 ♀; Isla San Jose, southwest side near salt works, 19.v.1970, S.C. Williams and V.F. Lee, 5 ♂, 2 ♀; Isla San Francisco, southwest side, 25.v.1969, S.C. Williams, 2 ♂, 1 ♀. **Baja California:** [*Minicipio de Ensenada*]: 11 miles southwest of Punta Prieta, 15.iv.1969, 1♀; Mission San Borja, 20.vi.1968, S.C. Williams and M.A. Cazier, and party, 14 ♂, 4 ♀; 3 miles south of Manuela, 22.vi.1968, S.C. Williams and M.A. Cazier, and party, 1 ♂, 1 ♀.

Vaejovis bruneus loretoensis: **MEXICO: Baja California Sur:** [*Municipio de Mulegé*]: Holotype ♂ (CAS, Type No. 11466 and allotype), San Ignacio, 24.vi.1968, 500 ft, S.C. Williams and M. Cazier, collected by means of ultraviolet detection. Paratypes: 15 ex. (CAS), same locality as holotype; Paratypes: 26 miles south El Arco, 17.iv.1969, S.C. Williams, 1 ♂, 2 ♀; 3 lies south of rancho Tablon, 23.vi.1968, S.C. Williams and M. Cazier, 3 ♂; San Ignacio, 24.vi.1968, S.C. Williams and M. Cazier and party, 11 ♂, 6 ♀; San Ignacio, 25–26.vi.1968, S.C. Williams and M. Cazier and party, 7 ♂; 20 miles south of Santa Rosalía, 19.iv.1969, S.C. Williams 3 ♂, 2 ♀; Mulege, 26.iv.1969, S.C. Williams 4 ♂, 5 ♀; Head of Bahia Concepcion, 23.v. 1961, G. Lindsay, 1 ♂; 5 miles of Canipole, 16.ii.1966, V. Roth, 1 ♂; 1 mile southwest of Rancho Canipole, 15v.1969, S.C. Williams 2 ♂; 24 miles northeast of San Jose de Comondu, 15.v.1969, S.C. Williams 8 ♂, 1 ♀; 5 miles southwest of San Miguel de Comondu, 2.vii.1968,

S.C. Williams and M. Cazier and party, 7 ♂, 4 ♀; 1 mile south of Loreto, 16–17.v.1969, S.C. Williams, 5 ♂; 5.6 miles southwest of Loreto, 27.v.1970, S.C. Williams and V.F. Lee, 1 ♀; 1 mile west of Loreto, 27.v.1970, S.C. Williams and V.F. Lee, 5 ♂; Arrollo las Parras, 26.v.1970, S.C. Williams and V.F. Lee, 3 ♂; Top of grade, 13 miles south of Loreto, 29.i.1965, V. Roth, 1 ♀; 2.2 miles west of rancho Las Parras, 26.v.1970, S.C. Williams and V.F. Lee, 3 ♂; 0.5 miles west of rancho Las Parras, 26.v.1970, S.C. Williams and V.F. Lee, 2 ♂, 1 ♀; Isla Coronados, southwest end, 25.v.1970, .C. Williams and V.F. Lee, 8 ♂, 1 ♀.

DIAGNOSIS: *Kochius villosus* is closely related to *K. jatay*, **n. sp.** and *K. insularis*, with which it forms a monophyletic group (see *K. insularis* for details). *K. villosus* may be distinguished by having color base brownish to orange, instead of having it pale yellow. Furthermore, has vesicle telson relatively globose, instead of relatively elongated. Whereas *K. villosus* has seven retrolateral denticles and seven rows of median denticles on movable finger of pedipalp chelae, the other two species has six retrolateral denticles and six rows. From *K. jatay*, **n. sp.** differs by having ventral submedian carinae of mesosomal segment VII obsolete, expressed by only three macrosetae, instead of having it vestigial, with few moderated granules adjacent to the distomedian glandular spot.

DESCRIPTION: The following redescription supplements Williams' (1971a) original description. It is based on adult ♂, ♀ topotypes, freshly collected, and the material of the museums indicated in material examined.

Color and infuscation (in alcohol): Base color from medium brown to orange-yellowish, carapace, terga, legs, dorsal metasoma, and uniformly yellowish-brown. Chelicerae, coxal region, sternites, and telson pale yellowish. Carapace and terga diffusely infuscate with fuscous markings. Pectines, basal piece and genital operculum paler whitish. Base of pedipalp fingers

reddish, darker than manus, manus immaculate. Aculeus base reddish turning brownish-red distally.

Carapace: Carapace anterior margin emarginated with a moderated median notch and three pairs of minor macrosetae. Surface completely shagreened with dense moderated conical and minute granules. Anteromedian, posteromedian, and posterolateral sulci moderate, posterior transverse obsolete. Median ocular tubercle moderately raised, superciliary carina crenulated higher than median eyes. Median ocular tubercle positioned on distal half of carapace. Median eyes approximately double size of lateral frontal pair. Three lateral eyes, two frontal pairs same size and posterior reduced approximately in half.

Sternum and coxal region: Sternum pentagonal subequilateral with three pairs of setae, one distal, one median pair and one pair on the lobes, median notch deep. All coxae matte. Anterior margin of coxa II with three oblique slit-like structures, adjacent to an enlarge protuberance with coarse crenulations. Base of coxal endite II with a moderated depression each. Coxa IV 2.14 times longer than coxa II.

Chelicerae: Dorsal surface smooth, dentition of fixed and movable fingers as in typical vaejovids. Subdistal margin of manus with one median macrosetae and distal manus outlined with broad carinae with or without a short striation adjacent to the base of fixed finger. Serrula with 12 tines.

Pedipalps: Trichobothrial pattern Type C, orthobothriotaxic. Chelae wider than patella and patella wider than femur. Femur: retro intercarinal surfaces matte, dorsal, ventral and prolateral shagreened, with some coarse granules on median surface. Carinae: Dorsal retrolateral, dorsal prolateral, and ventral prolateral carinae strongly granular with conical and sharp enlarged granules; retrolateral dorsosubmedian complete, with a moderated proximal spinoid tubercle,

moderately crenatoserrated, and two minor macrosetae medially; prolateral ventrosubmedian complete and strong, slightly oblique row of sharp, conical, and enlarged granules, starting at mid surface almost parallel to dorsal prolateral carinae, slanting almost imperceptibly towards distal end of dorsal prolateral carinae, lacking macrosetae; prolateral ventral vestigial, expressed by two proximal enlarge conical granules, ventral one with a macroseta at base, one similar median granule with a macroseta at base and a distal similar granule with a macroseta at base, distributed from the basal to the mid aspect of the segment; ventral median and retrolateral ventral vestigial expressed by scattered serrated granules; ventral retrosubmedian partial, expressed by scattered irregular serrated granules, reaching proximal third.

Patella: All intercarinal surfaces matte. Carinae: Dorsal prolateral, dorsal retrolateral, ventral prolateral, and ventral retrosubmedian strongly granular with conical and enlarge granules; ventral median vestigial expressed as a short basal row of scattered granules, reaching proximal third; retrolateral dorsosubmedian partial, strongly granular and costate, expressed on median third; retrolateral median partial, moderately granular with irregular moderated and minute granules broken in sparse cluster of granules; prolateral median on a vaulted projection, extending from a proximal tubercle with a minor macroseta on top, and a short row of strong serrated granules reducing in size ending in few distal minute serrations, reaching trichobothrium d_2 and beyond demarcated by a flat surface ending on one distal minor macrosetae; prolateral ventral obsolete expressed by two minor macrosetae, one basal and one distal.

Chelae: Pedipalp manus incrassate. Manus 1.77 times longer than fixed finger. Intercarinal surface matte. Carinae: Dorsal prolateral and dorsal median, with large and scattered granules; dorsal prosubmedian and prolateral dorsal vestigial expressed by scattered crenulations flanking dorsal lateral carina; dorsal retrosubmedian accessory vestigial with irregular moderated

conical granules; dorsal retrolateral proximally with strong scattered granules, distally becoming crenulated; retrolateral median partial moderately crenulated, expressed in proximal two thirds; retrolateral subventral accessory and retrolateral subventral vestigial expressed by few minute distal crenulations; ventral retrolateral partial, strongly irregularly granular basally, becoming crenulated distally, ending at the level of trichobothrium *Est*; ventral prosubmedian weakly crenulated and moderately costate; ventral prolateral with scattered few crenatoserrations and strongly costate; prolateral median crenatoserrated parallel to ventral prolateral. Trichobothria *Dt* and *Db* dorsal to dorsal retrolateral carinae. Trichobothrium *Dt* positioned subbasal on manus. Trichobothrium *Dt* positioned at mid manus.

Fingers: Fixed finger dentition: PD = 6, RD = 6, MD rows = 6, all denticles subserrate, retrolateral denticles comparatively smaller than prolateral denticles. Movable finger PD = 7, RD = 7, MD rows = 7, distal row with one denticle, prolateral and retrolateral denticles subpaired. Trichobothrium *ib* and *it* positioned between PD6 and PD7, PD7 lacking granule, *it* positioned adjacent to PD6. Fingers lacking scalloped. Gap created when fingers close absent, fingers fit evenly.

Legs: Spinules: Basitarsi I–II with prolateral ventral and retrolateral ventral carinae with complete rows of spinules, prolateral ventral in III and IV absent; retrolateral ventral in III partial expressed on distal two thirds, in IV absent; retrolateral median rows in I–IV absent; retrolateral dorsal in I–III, partial expressed in distal half, IV absent. Telotarsi I–IV with two pairs of ventrodistal spinules in I–IV. Setae: Prolateral ventral, 3:4:5:5, medians in III and IV stout; retrolateral ventral, 4:7:7:7; retrolateral dorsal, 2:4:4:4; dorsal, 3:3:3:3; retrolateral dorsal and dorsal series arranged in two independent rows.

Terga: Preterga matte, posterga with scattered moderated and coarse conical granules. Dorsal median carinae strong with a short row of distal crenatoserrations on proximal half; dorsal submedian strong complete, expressed along the entire postergite. Tergite VII with intercarinal surfaces scattered with large conical granules; dorsal median carina partial and strong expressed on proximal third, strongly costate and irregularly serrated; dorsal submedian vestigial expressed as a pair of distal irregular serrations strongly costate; dorsal lateral and lateral supramedian strong, proximal extreme with an enlarged spiniform tubercle projecting backwards; dorsal lateral projecting and curving laterally almost reaching lateral supramedian distal margin, creating a semi ring of strong serrated granulation.

Genital operculum: Male genital operculum: wider than long, with three pairs of macrosetae. Sclerites free on longitudinal edge moving independently but unable to open more than 45°. Genital papillae protruding posteriorly.

Sternites: Sternites III–VI with all carinae obsolete and surface punctuated, V in ♂ with distomedian glandular spot moderate, protruding slightly from adjacent surfaces and contrasting strongly with dark base color of sternite, in ♀ vestigial expressed as a diffuse weak whitish small spot. Sternite VII with ventral lateral carinae finely crenulated and strongly costate, ventral submedian carinae obsolete expressed by three minor macrosetae. Distomedian glandular spot piriform and strong in ♂, moderated and broader in ♀. Spiracle elongated, slit-like, approximately two times longer than wide.

Pectines: Pectines in ♂ longer than distal margin of coxa VI, in ♀ at or slightly longer than coxa IV. Basal piece with two minor macrosetae. Marginal lamella consist of three sclerites, medial lamella proximally fuse distally progressively forming conspicuous 10–12 beads. Fulcra with 16–18 in ♂, 15–16 in ♀. Pectinal tooth count 17–19 in ♂, 16–17 in ♀.

Hemispermatophore: Lamina 1.80 longer than trunk. Dorsal through margin long, narrow, curving proximally, and removed from ventral trough. Hemimating plug developed from the inner lobe, distal barb margin with 10 elongated spinules. Primary and secondary hook positioned on the apex of lateral margin extension of the lamina (flange). Both hooks rounded low, separated slightly, forming a shallow notch. Median lobe ental terminus moderated and rounded. Basal plate of inner lobe adjacent to ventral trough. Spine of inner lobe moderate, secondary spine on ventromedian aspect of neck shorter. Neck relatively short (0.40 times longer than basal plate). Measurements, lamina, 3.24; trunk, 1.80; dorsal trough/laminar hooks, 1.38; ventral trough/laminar hook, 1.08; neck, 0.24; basal plate, 0.60.

Metasoma: All intercarinal surfaces matter, except dorsal surface of metasomal segment I–III with scattered moderated granules. Dorsal lateral carinae of metasomal segments I–V and lateral median carinae of segments I–III crenatoserrated, proximally end with an elongated spiniform tubercle pointing backwards, except in V. Lateral median in IV distal terminus weakly expanded or flared laterally. Lateral inframedian in I complete crenatoserrated, in II and III vestigial irregularly expressed on distal third becoming weaker proximally, in IV absent, in V partial, finely crenatoserrated and strongly costate, expressed in distal two thirds. Ventral lateral I–V, ventral submedian I–IV and ventral median in V finely crenatoserrated. Setae: In ♀ dorsal lateral, 0:0:0:1:4; lateral median, 0:1:1:2; lateral inframedian, 1:0:0:0:2; ventral lateral, 2:2:2:2:5; ventral submedian, 3:3:3:3; ventral sublateral, 2; all carinae major; in ♂ all macrosetae absent or reduced to microsetae.

Telson: Ventral and dorsal surfaces smooth, hirsute with nine macrosetae in each carinae, and additional macrosetae in intercarinal surfaces in both sexes. Laterobasal microserration of

aculeus with 6 sharp tines. Subaculear tubercle absent. Vesicle 1.63 times longer than aculeus in ♀, in ♂ 1.87 times.

DISTRIBUTION: *Kochius villosus* is one of the more widely distributed species of this genus in Baja California Peninsula. It occurs along the chain of mountain ranges that divides east-west the central and south regions of the peninsula, including the Sierra de la Libertad and Sierra de la Giganta, from Misión de San Francisco de San Borja de Adac in the Municipio de Ensenada, Baja California to San Evaristo in the Municipio de La Paz, Baja California Sur. The distribution includs both sides of the Sierras.

ECOLOGY: *Kochius villosus* occupies a similar niche to *K. bruneus*. In the Comondús area the species were sympatric; both are adapted to volcanic soils, where a mix of rocks, gravel and fine textured volcanic ash had accumulated. All the specimens were collected using ultraviolet light at night. The weak leg armature, lacking the usual stout spiniform macrosetae found in burrowers, suggest that this species is lapidicolous. Williams (1980) presumed that the dark coloration of this species is an adaptation to dark volcanic habitats. The species is common in more mesic environments found in canyons of the main drainages of the volcanic mountain range it inhabits. According to Jiménez-Jiménez and Palacios-Cardiel (2010), *K. villosus* (identified as *Vaejovis bruneus loretoensis* and *V. b. villosus* by the authors) are the most abundant species (and more commonly found in mesic habitats) within a community of 13 species.

REMARKS: Williams (1971a) described *Vaejovis bruneus villosus* and *Vaejovis bruneus loretoensis* (transferred to *Kochius* by Soleglad and Fet, 2008) based on abundant material from the Peninsula and adjacent islands. He used the hirsuteness of the ventral surface of the telson as the only character to separate these two subspecies. After studying freshly collected and museum

material from the distribution range of these subspecies and using a more quantitative approach, counting the number of sockets of macrosetae on the ventral surface, I conclude that these two subspecies do not differ and cannot be satisfactorily diagnosed. Additionally the result of the phylogenetic analyses did not show any separation between these subspecies. Consequently, *K. loretoensis* is considered a junior synonym of *K. villosus* (González-Santillán and Prendini, in prep.). The specific name chosen to designate this new taxon rank is *villosus*, which has page priority and better represents the diagnostic character of the hirsute telson.

Williams (1971a, 1980) includs in the distribution range of this species the following islands: Carmen, Danzante, Monserrat, San José, and San Francisco (for *villosus*), and Coronados (for *loretoensis*). Although only San José and Danzante islands were sampled for this revision, yielded the two new species described here as *K. jatay*, **n. sp.** and *K. danzante*, **n. sp.** It appears that the diversity of this genus has been underestimated and further genetic and morphologic studies are needed to assess whether there are different lineages represented on these islands, or elsewhere on the peninsular.

MATERIAL EXAMINED: **MEXICO: Baja California:** *Municipio de Ensenada*: Misión de San Francisco de San Borja de Adac, 437 m, 30.vi.2008, [28°44.604'N 113°45.224'W], desert, collected at night with UV light, 5 ♂, 2 ♀, 1 subad. ♀, 1 subad. ♂ (AMNH [ARA2877]), 6 ♂, 2 ♀, 1 juv. (IBUNAM [ARA2263]), 28°44.604'N 113°45.224'W, collected at night with UV light, 1 ♂ (AMNH [LP 8785]), H. Montaño and E. González; Misión de San Francisco de San Borja de Adac, 5 km W, 28°44.558'N 113°47.935'W, 380 m, 30.vi.2008, H. Montaño and E. González, collected at night with UV light, 1 juv. (AMNH [LP 8814]); Misión San Borja, 28°44.607'N 113°45.233'W, 433 m, 13.vii.2005, E. González and W.E. Savary, desert, collected at night with UV light, 2 ♂, 1 ♀ (AMNH [ARA1483]), 3 ♂, 1 ♀ (IBUNAM [ARA2078]), 1 ♂ (AMNH [LP

4544]). **Baja California Sur:** *Municipio de Comondú*: San José de Comondú, 26°3.5418'N 111°48.9846'W, 239 m, 7.vii.2005, W.E. Savary, E. González, L. Prendini, and R. Mercurio, desert, collected at night with UV light, 2 ♂, 3 ♀ (AMNH [ARA1482]), 26°3.7380'N 111°48.74'W, 466 m, 15.xi.1972, E.L. Sleeper and F.J. Moore, 1 ♀ (OSAL); San José de Comondú, 9 km NW, Cerro el Pabellón, 26°5.9490'N 111°53.68'W, 742 m, 9.vii.2008, H. Montaño and E. González, desert, collected at night with UV light, 1 ♂, 1 ♀ (IBUNAM [ARA2255]); San Miguel de Comondú, 26°2.4330'N 111°49.9164'W, 220 m, 12.vii.2004, A. Valdez, E. González, O. Francke, and W.E. Savary, desert, collected at night with UV light, 9 ♂, 4 ♀, 1 juv. (AMNH [ARA1495]), 5 ♂, 2 ♀ (CAS [ARA1528]), 8 ♂, 4 ♀, 3 juv. (IBUNAM [ARA2070]); San Miguel Comondú, 8–16 km SW, 304 m, 3.vii.1968, S.C. Williams and M. Cazier, 1 ♀, 1 subad. ♀ (AMNH); San Miguel de Comondú, 2 km SW, 26°0'18.5"N 111°52'1.3"W, 169 m, 12.vi.2004, E. González, O. Francke, W.E. Savary, and A. Valdez, collected at night with UV light, 1 ♂ (AMNH). *Municipio de La Paz*: San Evaristo, 10–15 km S, dirty road, 24°47.757'N 110°40.502'W, 27–50 m, 12.vii.2008, H. Montaño and E. González, collected at night with UV light, 1 ♀ (AMNH [LP 8832]), 1 ♂, 1 ♀ (IBUNAM [ARA2275]), desert, collected at night with UV light, 2 ♂, 1 ♀ (IBUNAM [ARA2888]); San Evaristo, 5 km S, 24°52.901'N 110°41.404'W, 5–50 m, 12.vii.2008, H. Montaño and E. González, sand dunes, collected at night with UV light, 1 ♂ (AMNH [LP 8837]). *Municipio de Loreto*: Canipole, 8 km W, [26°24.16667'N 111°39.3666'W], 16.ii.1966, V. Roth, 1 ♂ (AMNH); Juncalito, 5 m, 20.v.2004, 25°49.8918'N 111°19.6908'W, collected at night with UV light, 4 ♂, 3 ♀ (AMNH [ARA3132]), 25°49.892'N 111°19.691'W, 2 ♂, 1 ♀ (AMNH [LP 3477]), R. Mercurio and M. Nishiguchi; Loreto, 12 km W, 25°58.6998'N 111°27.1662'W, 190 m, 13.vii.2004, A. Valdez, E. González, O. Francke, and W.E. Savary, desert, collected at night with UV light, 2 ♀ (AMNH

[ARA1489]), 1 ♂ (IBUNAM [ARA2074]); Loreto, 13 km W to San Javier, provisional dirty road, 25°59.733'N 111°25.116'W, 176 m, 26.vi.2008, H. Montaño and E. González, desert, collected at night with UV light, 3 ♂, 1 ♀ (AMNH [ARA2862]), 4 ♂, 1 ♀ (IBUNAM [ARA2241]); Loreto, 15 km W, 25°58.6332'N 111°27.8832'W, 213 m, 13.vii.2004, A. Valdez, E. González, O. Francke, and W.E. Savary, desert, collected at night with UV light, 1 ♀ (AMNH [ARA1487]), 1 ♂ (IBUNAM [ARA2072]); Loreto, 19 km S, El Parral Ranch, [26°0.76667'N 111°20.6'W], V. Roth, 29.i.1965, 1 ♂, 1 ♀ (AMNH); Loreto, 21 km S, 29.ii.1965, 1 ♀ (AMNH); Loreto, 25 km S on gravel road ca. 250 m E Route 1, 25°48.6660'N 111°19.26'W, 6 m, 7.vii.2005, W.E. Savary, E. González, L. Prendini, and R. Mercurio, desert, collected at night with UV light, 3 ♂, 1 ♀ (AMNH [ARA1490]), 4 ♂ (IBUNAM [ARA2075]); Loreto, 25 km S on gravel road just off Route 1, 25°48.6660'N 111°19.26'W, 6 m, 7.vii.2005, W.E. Savary, E. González, L. Prendini, and R. Mercurio, desert, collected at night with UV light, 3 ♂, 2 ♀, 39 juv. (AMNH [ARA1481]); Loreto, 25 km S, on gravel road ca. 0.25 km E Route 1, 25°48.666'N 111°19.266'W, 6 m, 7.vii.2005, W.E. Savary, L. Prendini, R. Mercurio, and E. González, collected at night with UV light, 1 subad. ♂ (AMNH [LP 4548]); Loreto, ca. 3 km S along gravel road to San Javier, from junction with Route 1, 8.vii.2005, [25°59'48.14"N 111°23'3.88"W], 120 m, 1 ♂, 1 ♀ (AMNH [ARA3160]), 2 ♂ (IBUNAM [ARA2407]), 38 m, desert, collected at night with UV light, 3 ♂ (IBUNAM [ARA2076]), E. González, W.E. Savary, L. Prendini, and R. Mercurio; Puerto Escondido, 1.6 km S, 25°48.6'N 111°18.55'W, 12 m, 12.xi.1972, E.L. Sleeper and F.J. Moore, 1 ♂ (OSAL); Puerto Escondido, 40 km S of Loreto, [25°48'24.96"N 111°18'55.27"W], 19.i.1996, W. López-Forment, 4 ♂, 2 ♀, 1 juv. (IBUNAM). *Municipio de Mulegé*: Bahía Concepción, near El Coyote, [26°23'59.64"N 111°30'0.15"W], 17.ii.1966, V. Roth, 2 ♀ (AMNH); Mulegé, [26°53'4.8"N 111°56'33.1"W], V. Roth, 26.i.1965, 1 ♀ (AMNH),

P. Berea, 5.viii.2003, 2 juv. (IBUNAM); San Ignacio Mission, [27°16.533'N 112°53.366'W], 21–25.i.1965, V. Roth, 4 ♀, 10 juv. (AMNH); San Ignacio, [27°16.533'N 112°53.366'W], 152 m, 24.vi.1968, S.C. Williams and M. Cazier, 1 ♂ (AMNH); San Ignacio, 28 km E on Route 1, 27°23.7300'N 112°39.54'W, 303 m, 8.vii.2005, R. Mercurio and L. Prendini, desert, collected at night with UV light, 1 ♀ (CAS [ARA1531]); Santa Rosalía, 18 km S, [27°20.333'N 112°16.01666667'W], 17.ii.1966, V. Roth, 1 ♀ (AMNH).

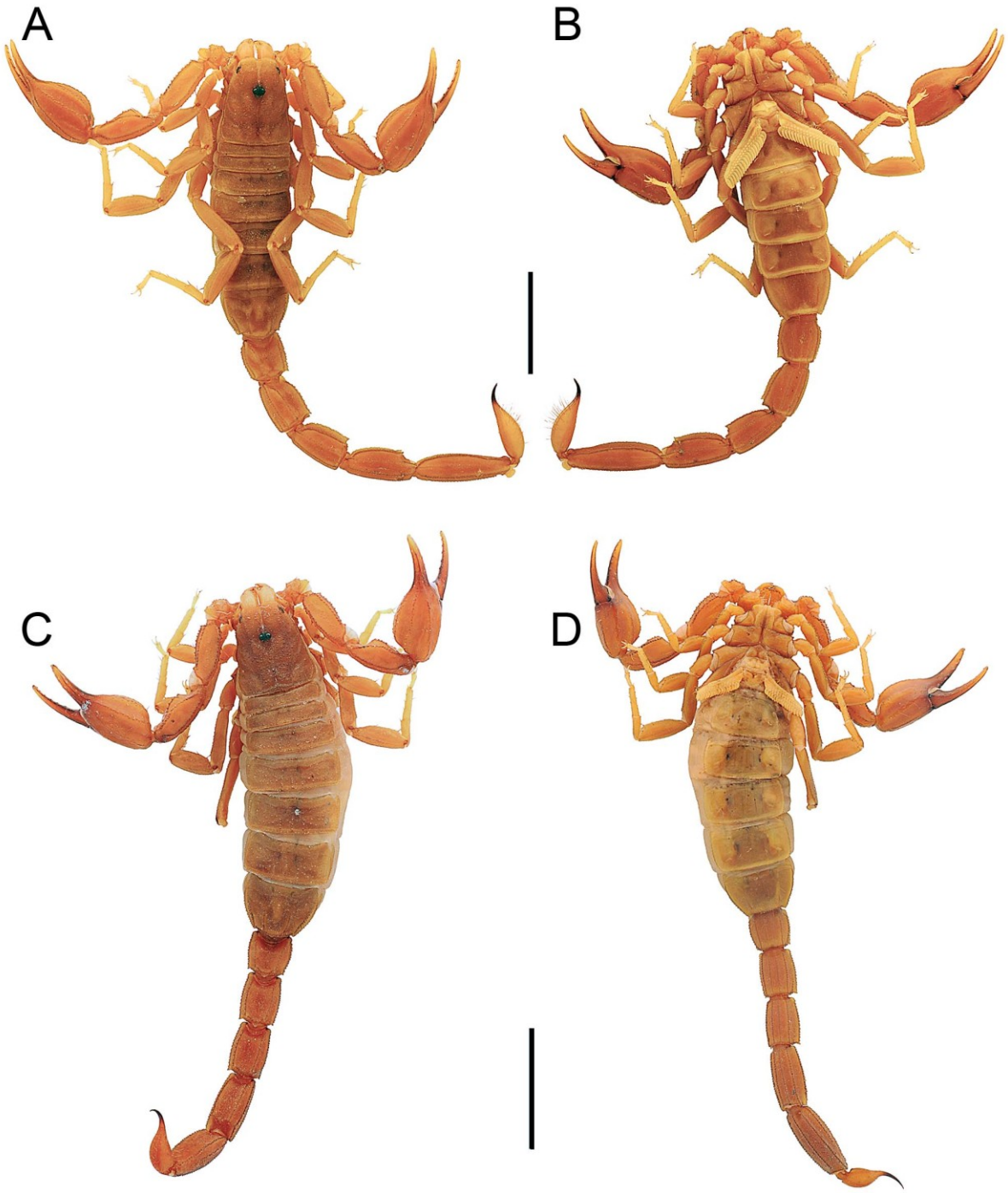


Figure 190. *Kochius villosus* (Williams, 1971), habitus. **A**, **B**. ♂ (AMNH). **C**, **D**. ♀ (AMNH). **A**, **C**. Dorsal aspect. **B**, **D**. Ventral aspect. Scale bars = 5 mm.

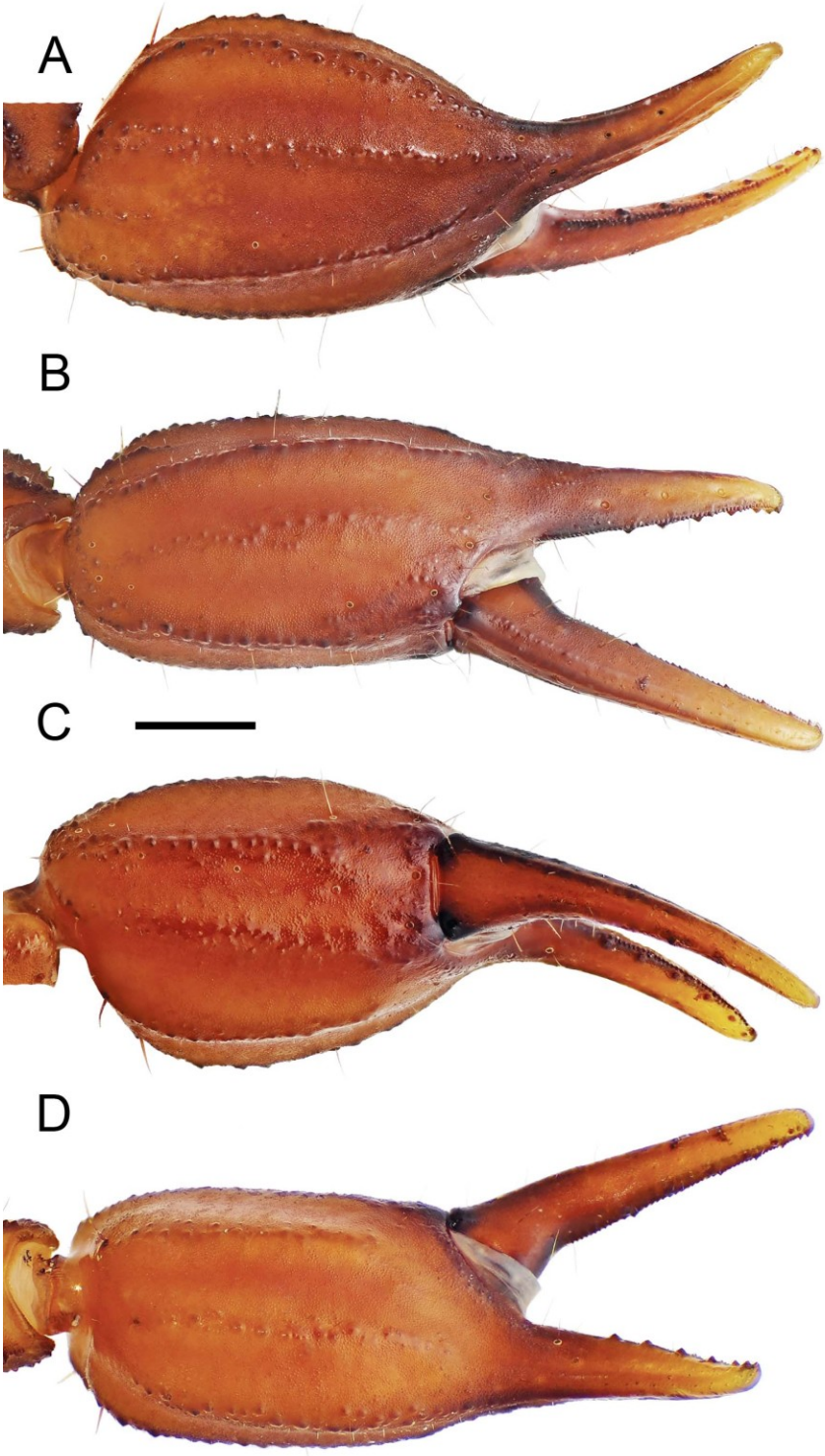


Figure 191. *Kochius villosus* (Williams, 1971), ♂ (AMNH), dextral pedipalp chela. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

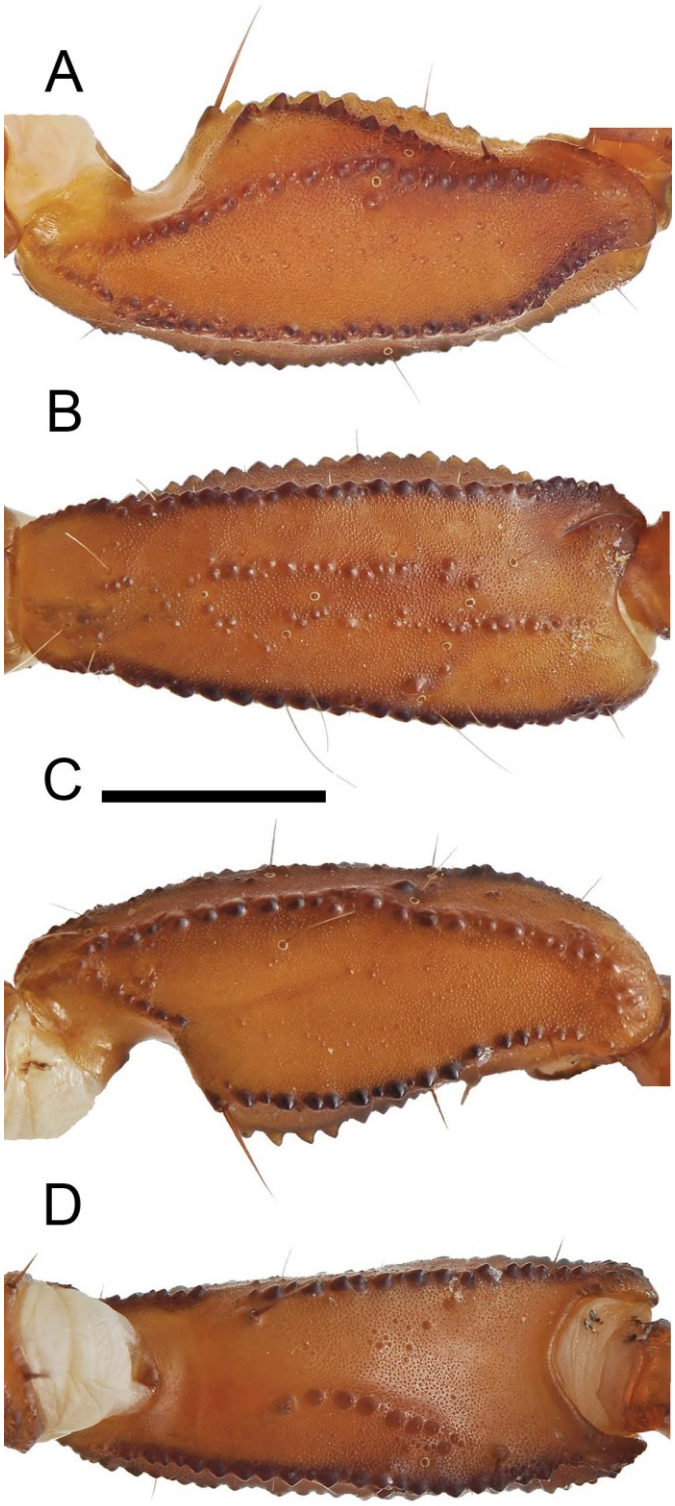


Figure 192. *Kochius villosus* (Williams, 1971), ♂ (AMNH), dextral pedipalp patella. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

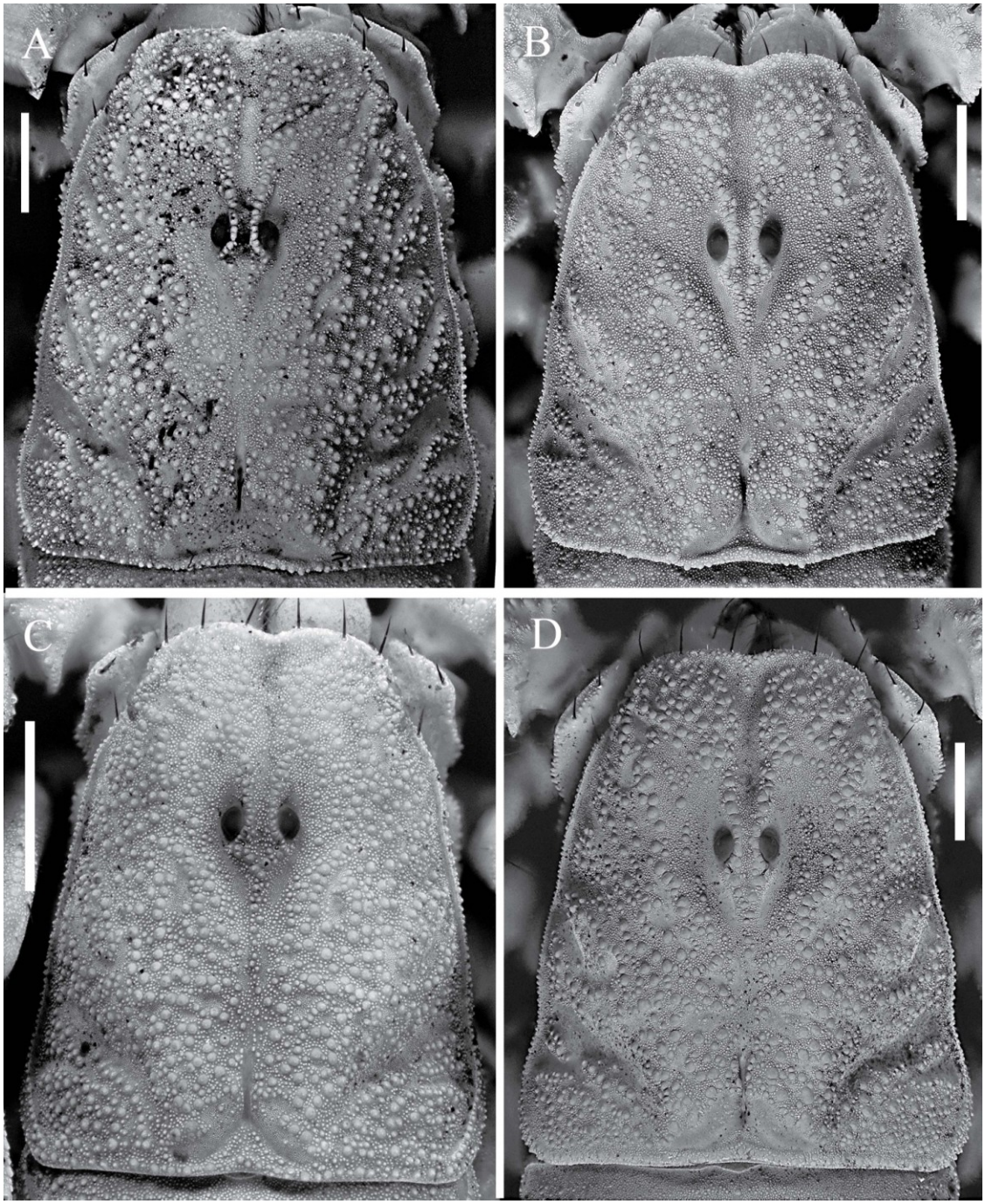


Figure 193. *Kochius* Soleglad and Fet, 2008, carapace. **A**. *Kochius barbatus* (Williams, 1971), paratype ♂ (AMNH). **B**. *Kochius bruneus* (Williams, 1971), ♂ (AMNH). **C**. *Kochius catavina*, **n. sp.**, paratype ♂ (AMNH). **D**. *Kochius cerralvensis* (Williams, 1971), paratype ♂ (AMNH). Scale bars = 1 mm.

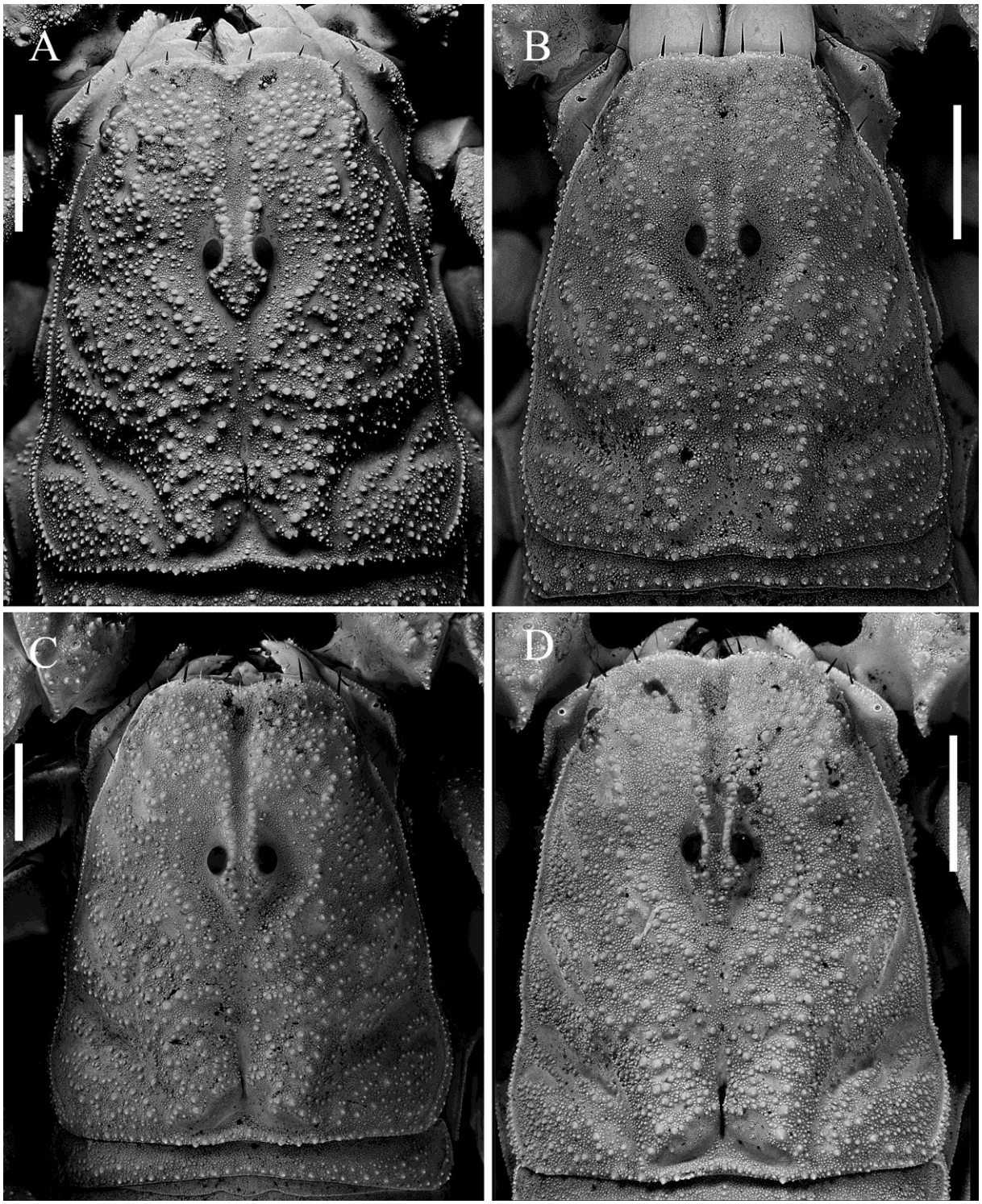


Figure 194. *Kochius* Soleglad and Fet, 2008, carapace. **A**. *Kochius danzante*, **n. sp.**, paratype ♂ (AMNH). **B**. *Kochius hirsuticauda* (Banks, 1910), ♂ (AMNH). **C**. *Kochius insularis* (Williams, 1971), ♂ (AMNH). **D**. *Kochius jatay*, **n. sp.**, paratype ♂ (AMNH). Scale bars = 1 mm.

Figure 195. *Kochius* Soleglad and Fet, 2008, carapace dorsal aspect. **A**. *Kochius kiliwa*, **n. sp.**, paratype ♂ (AMNH). **B**. *Kochius magdalensis* (Williams, 1971), ♂ (AMNH). **C**. *Kochius maroma*, **n. sp.**, paratype ♂ (AMNH). **D**. *Kochius moosni*, **n. sp.**, paratype ♂ (AMNH). Scale bars = 1 mm.

Figure 196. *Kochius* Soleglad and Fet, 2008, carapace dorsal aspect. **A**. *Kochius punctipalpi* (Wood, 1863) ♂ (AMNH). **B**. *Kochius sonorae* (Williams, 1971), ♂ (AMNH). **C**. *Kochius villosus* (Williams, 1971) ♂ (AMNH). **D**. *Kuarapu purhepecha* Francke and Ponce-Saavedra, 2010, paratype ♂ (AMNH). Scale bars = 1 mm.

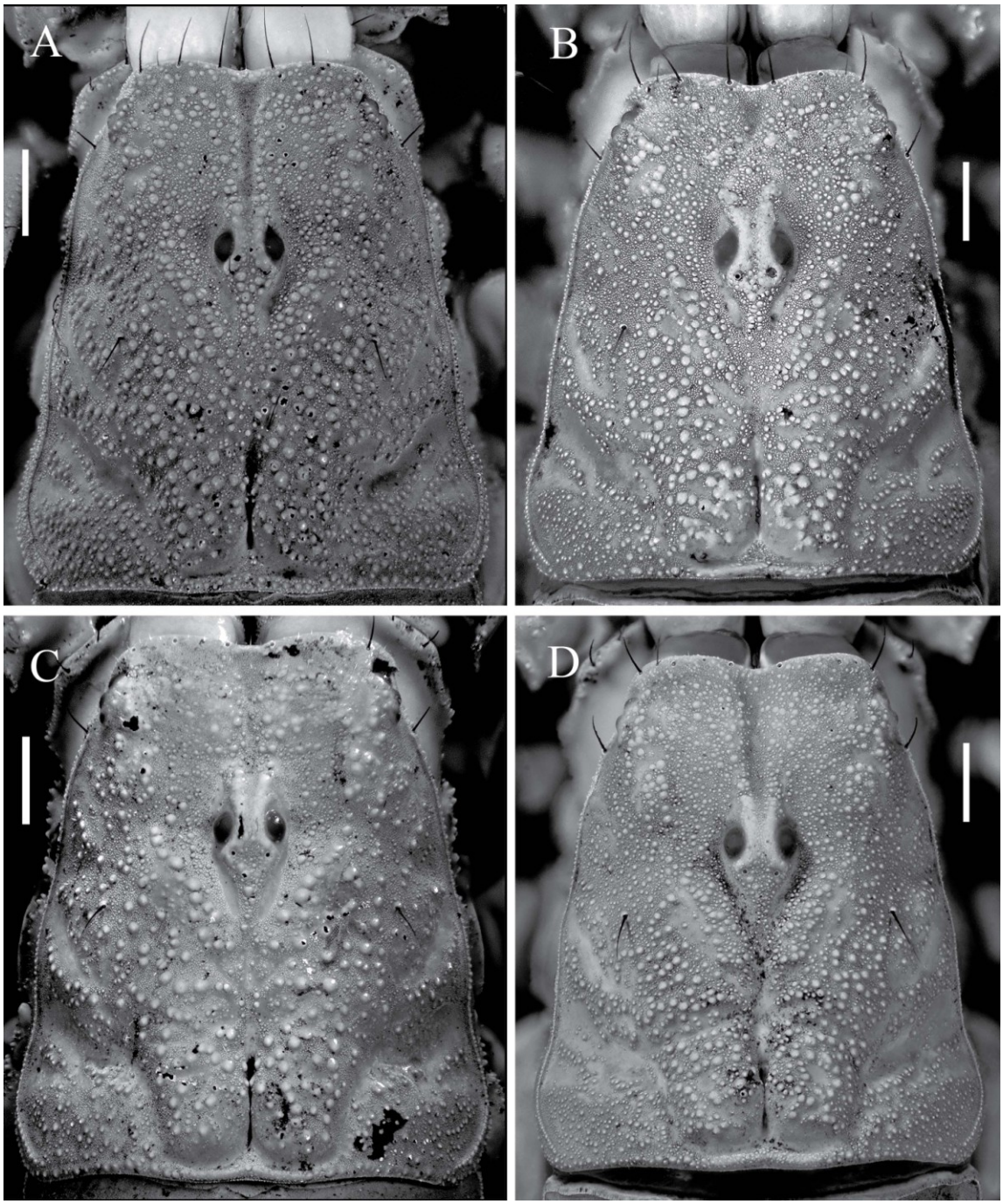


Figure 197. *Thorellius* Soleglad and Fet, 2008, carapace dorsal aspect. **A**. *Thorellius tekuani*, **n. sp.**, paratype ♂ (AMNH). **B**. *Thorellius cristimanus* (Pocock, 1898), paratype ♂ (AMNH). **C**. *Thorellius intrepidus* (Thorell, 1876), ♂ (AMNH). **D**. *Thorellius wixarika*, **n. sp.**, paratype ♂ (AMNH). Scale bars = 1 mm.

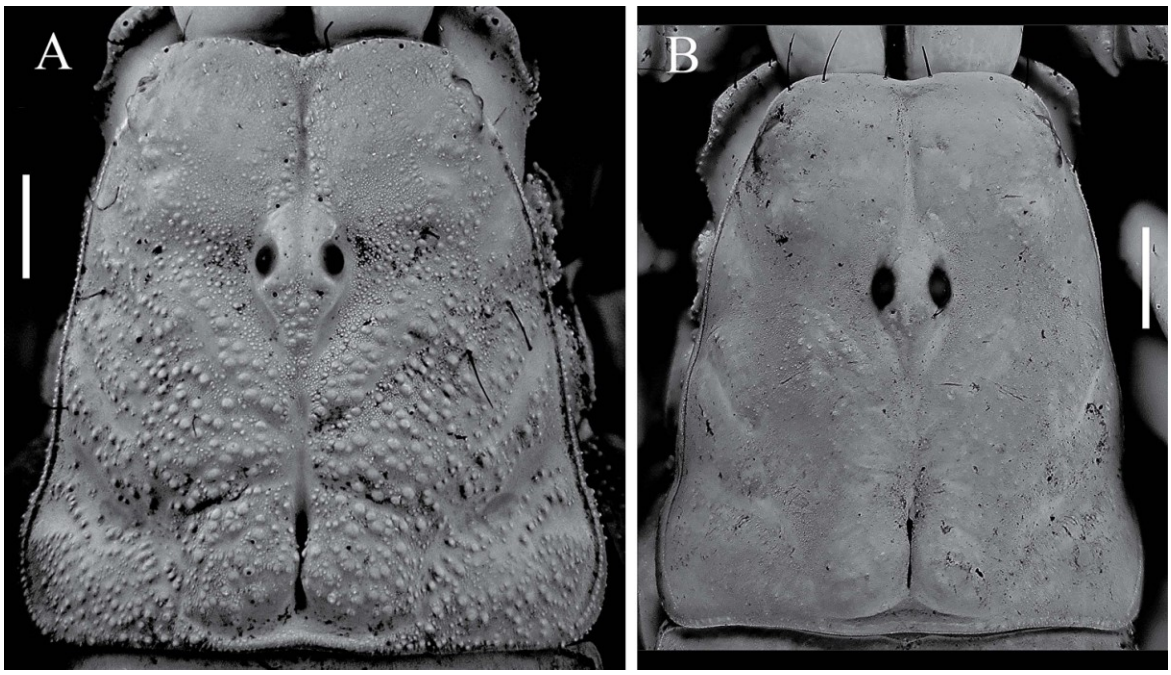


Figure 198. *Thorellius* Soleglad and Fet, 2008, carapace dorsal aspect. **A**. *Thorellius yuyuawi*, **n. sp.**, paratype ♂ (AMNH). **B**. *Balsateres cisnerosi* (Ponce-Saavedra and Sissom, 2004), ♂ (AMNH). Scale bars = 1 mm.

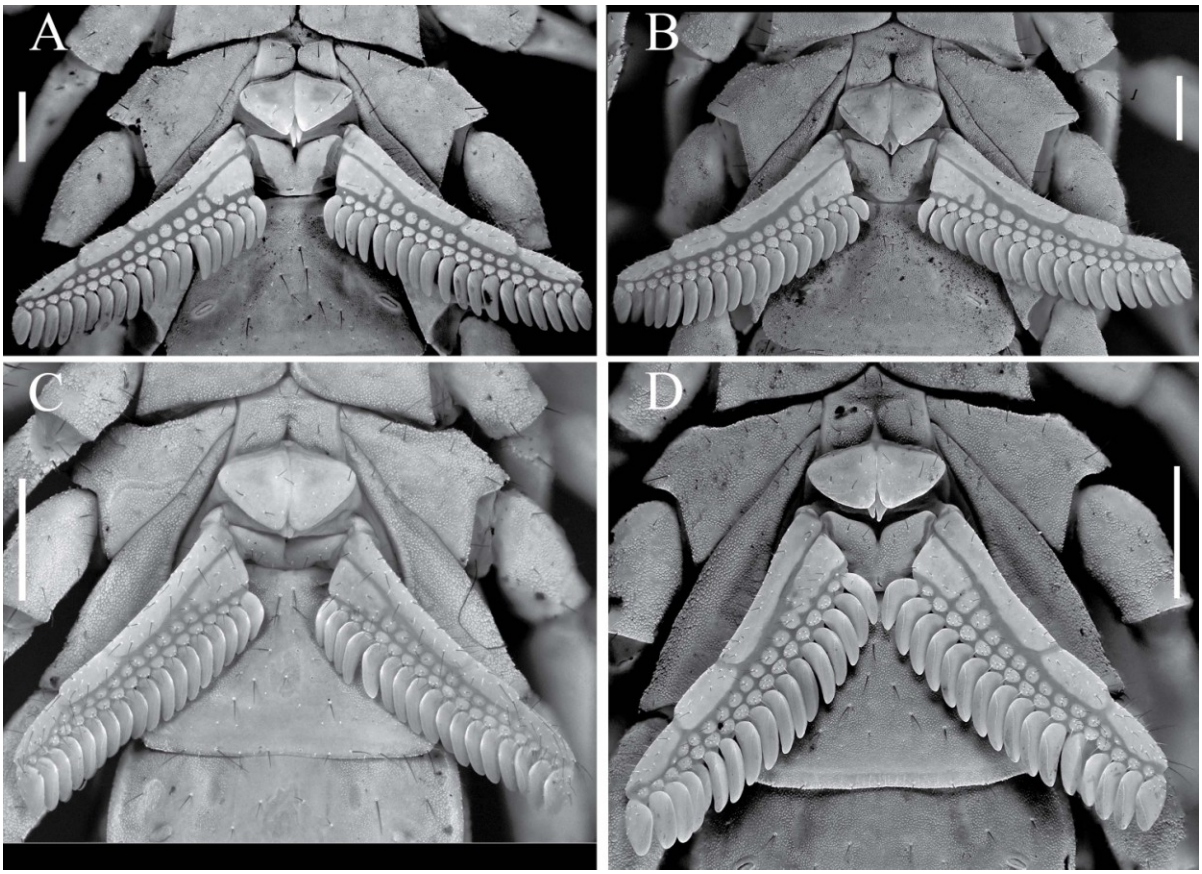


Figure 199. *Kochius* Soleglad and Fet, 2008, sternum, genital operculum and pectines. **A**. *Kochius barbatus* (Williams, 1971), paratype ♂ (AMNH). **B**. *Kochius cerralvensis* (Williams, 1971), paratype ♂ (AMNH). **C**. *Kochius catavina*, **n. sp.**, paratype ♂ (AMNH). **D**. *Kochius bruneus* (Williams, 1971), ♂ (AMNH). Scale bars = 1 mm

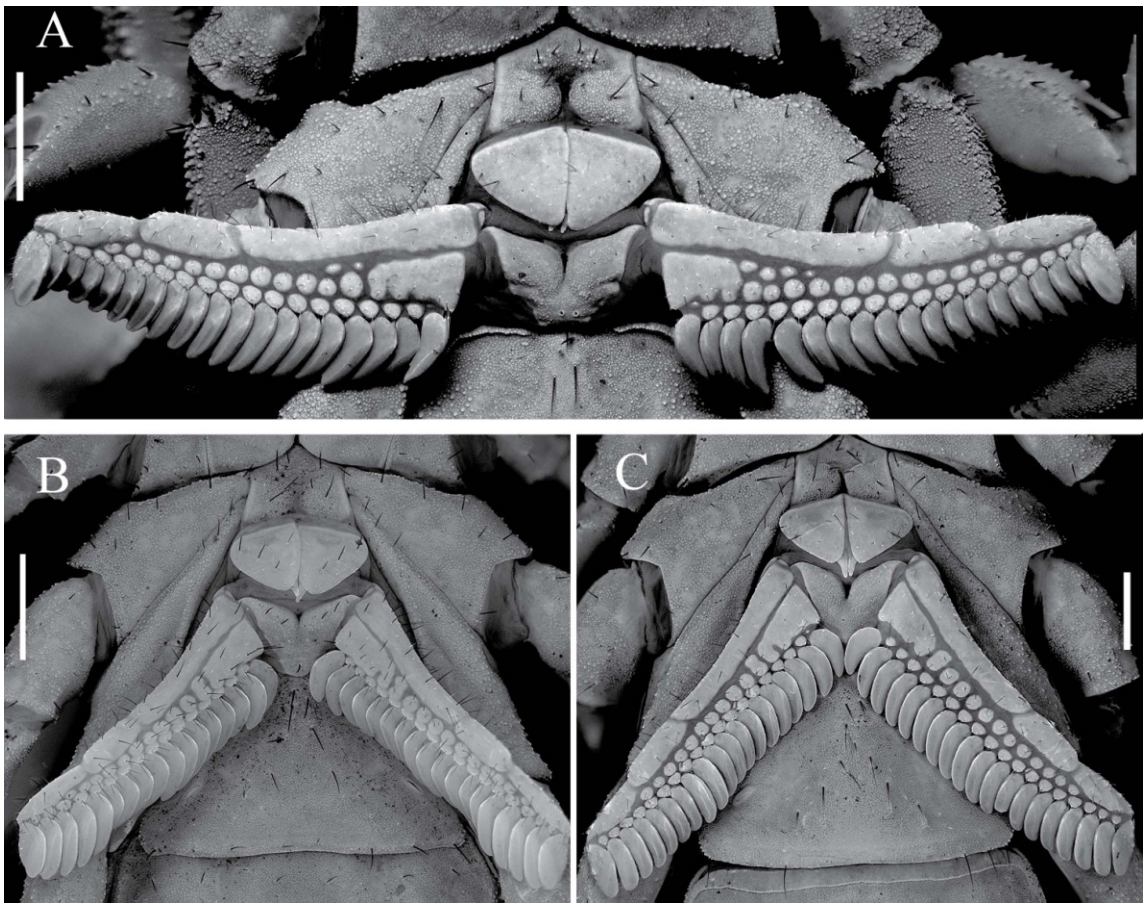


Figure 200. *Kochius* Soleglad and Fet, 2008, sternum, genital operculum and pectines. **A**. *Kochius danzante*, **n. sp.**, paratype ♂ (AMNH). **B**. *Kochius hirsuticauda* (Banks, 1910), ♂ (AMNH). **C**. *Kochius insularis* (Williams, 1971), ♂ (AMNH). Scale bars = 1 mm.

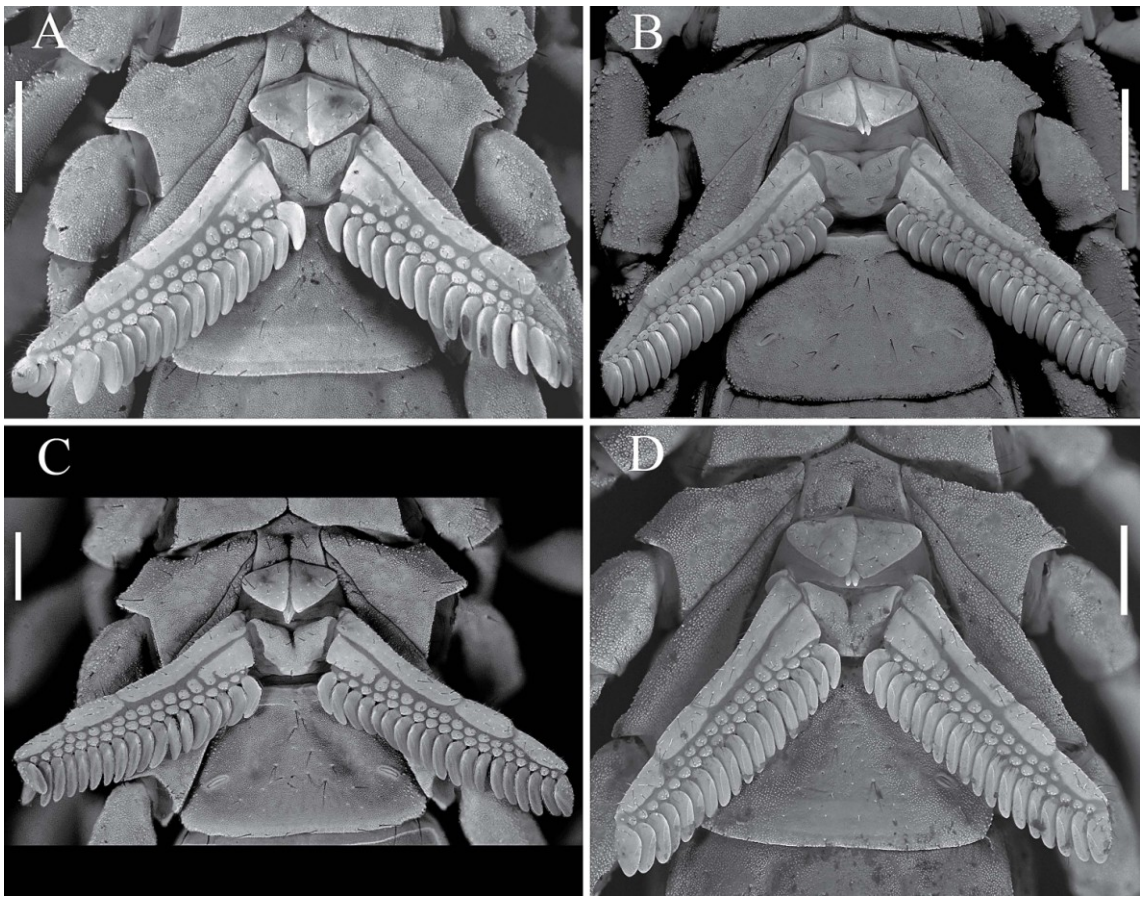


Figure 201. *Kochius* Soleglad and Fet, 2008, sternum, genital operculum and pectines. **A**. *Kochius jatay*, **n. sp.**, paratype ♂ (AMNH). **B**. *Kochius kiliwa*, **n. sp.**, paratype ♂ (AMNH). **C**. *Kochius magdalensis* (Williams, 1971), ♂ (AMNH). **D**. *Kochius maroma*, **n. sp.**, paratype ♂ (AMNH). Scale bars = 1 mm.

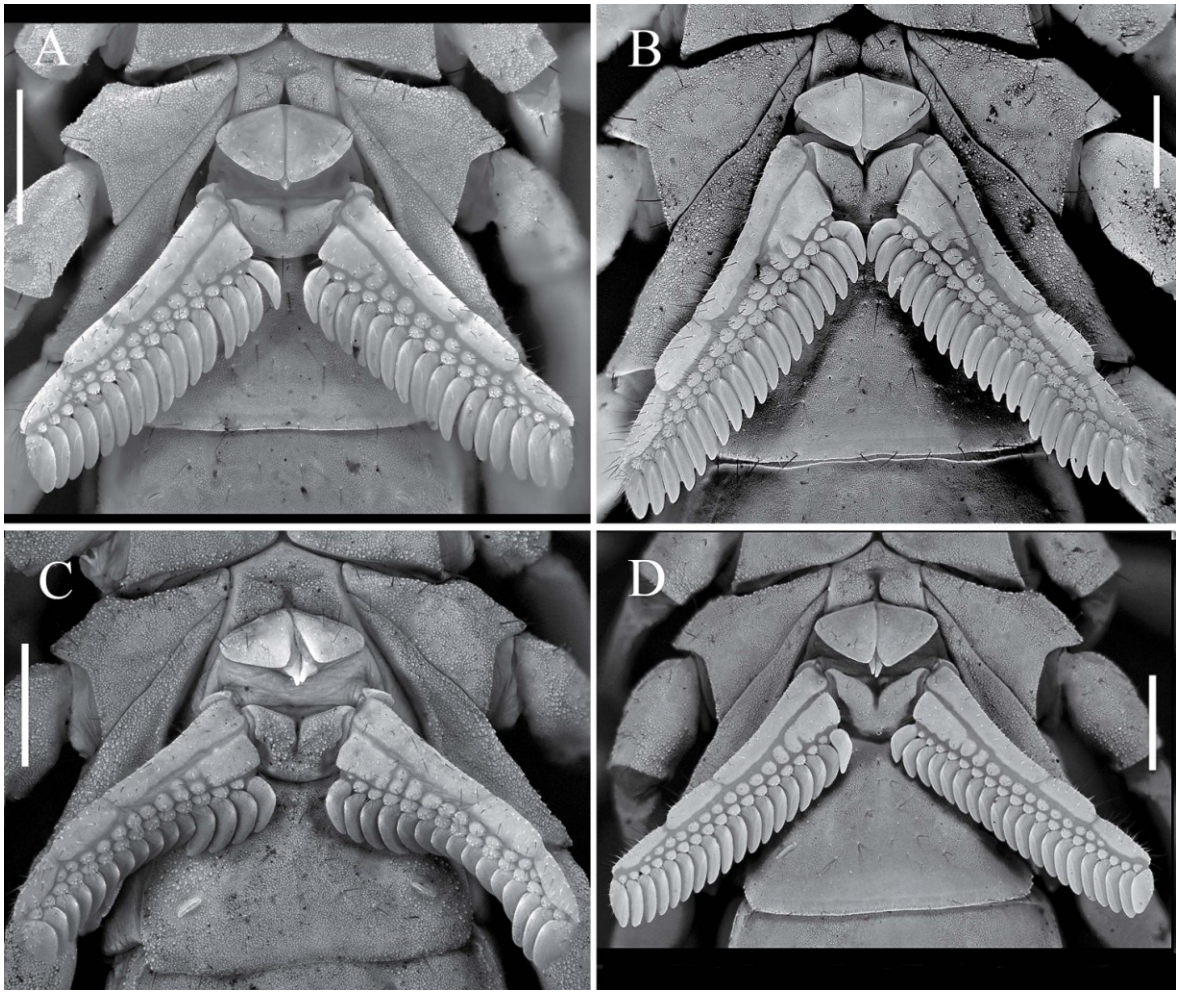


Figure 202. *Kochius* Soleglad and Fet, 2008, sternum, genital operculum and pectines. **A**. *Kochius moosni*, **n. sp.**, paratype ♂ (AMNH). **B**. *Kochius punctipalpi* (Wood, 1863), ♂ (AMNH). **C**. *Kochius sonorae* (Williams, 1971), ♂ (AMNH). **D**. *Kochius villosus* (Williams, 1971), paratype ♂ (AMNH). Scale bars = 1 mm.

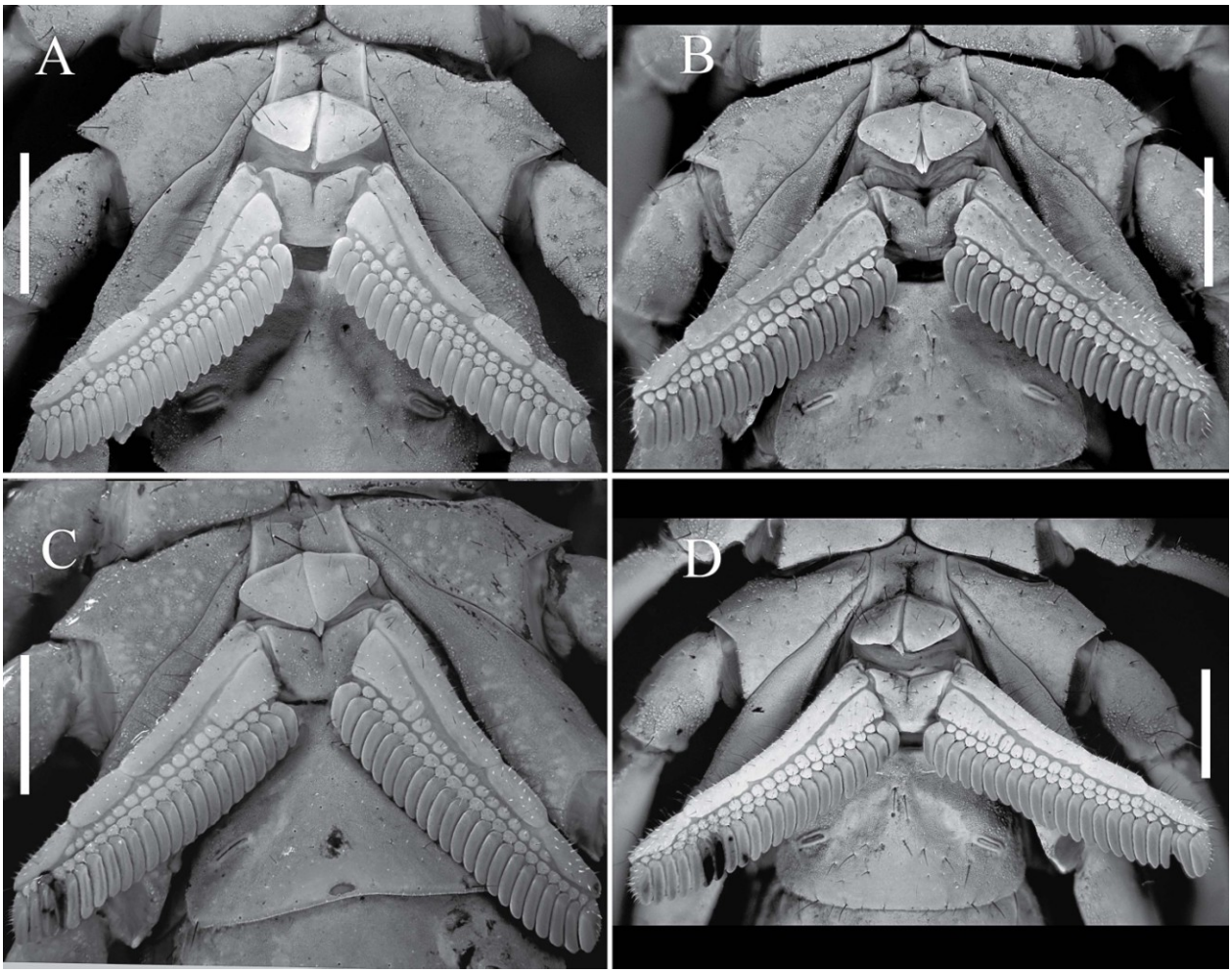


Figure 203. *Thorellius* Soleglad and Fet, 2008, sternum, genital operculum and pectines. **A**. *Thorellius tekuani*, **n. sp.**, paratype ♂ (AMNH). **B**. *Thorellius cristimanus* (Pocock, 1898), paratype ♂ (AMNH). **C**. *Thorellius intrepidus* (Thorell, 1876), ♂ (AMNH). **D**. *Thorellius wixarika*, **n. sp.**, paratype ♂ (AMNH). Scale bars = 1 mm.

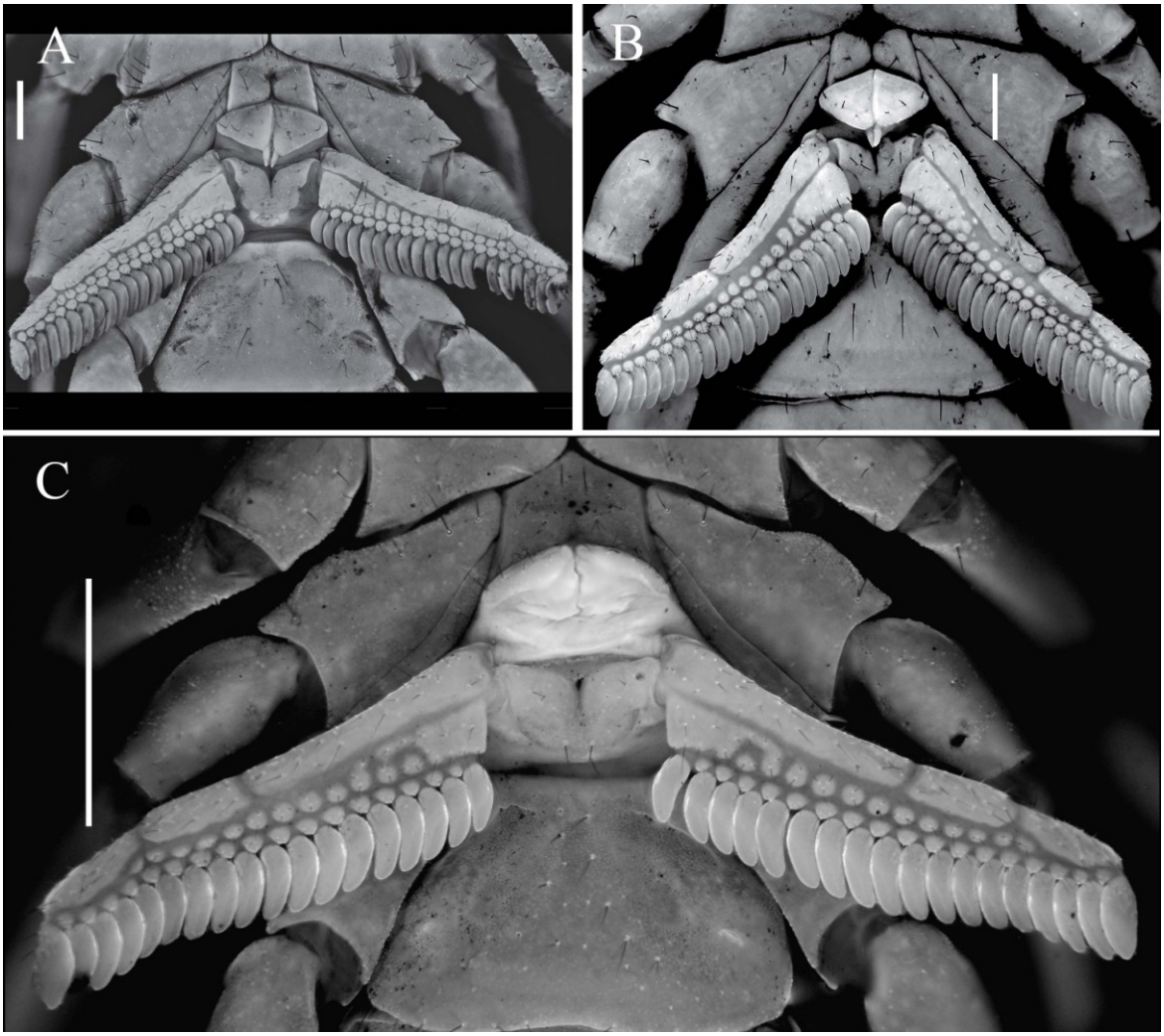


Figure 204. Sternum, genital operculum and pectines, ventral aspect. **A**. *Thorellius yuyuawi*, **n. sp.**, paratype ♂ (AMNH). **B**. *Balsateres cisnerosi* (Ponce-Saavedra and Sissom, 2004), ♂ (AMNH). **C**. *Kuarapu purhepecha* Francke and Ponce-Saavedra, 2010, paratype ♂ (AMNH). Scale bars = 1 mm.

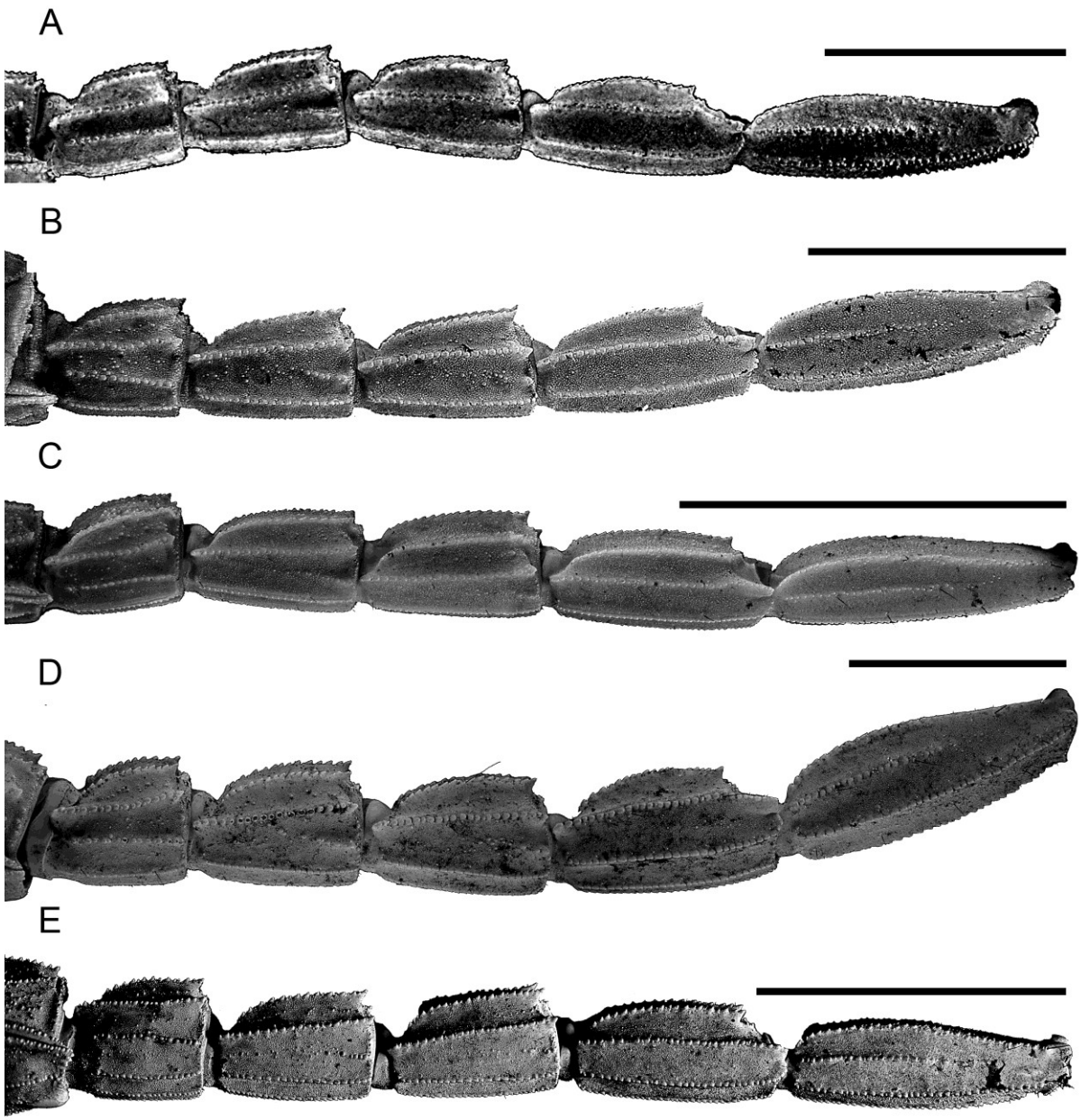


Figure 205. *Kochius* Soleglad and Fet, 2008, metasomal segments I–V, lateral aspect. **A**. *Kochius barbatus* (Williams, 1971), ♂ (AMNH). **B**. *Kochius bruneus* (Williams, 1971), ♂ (AMNH). **C**. *Kochius catavina*, **n. sp.**, paratype ♂ (AMNH). **D**. *Kochius cerralvensis* (Williams, 1971), ♂ (AMNH). **E**. *Kochius danzante*, **n. sp.**, paratype ♂ (AMNH). Scale bars = 1 mm.

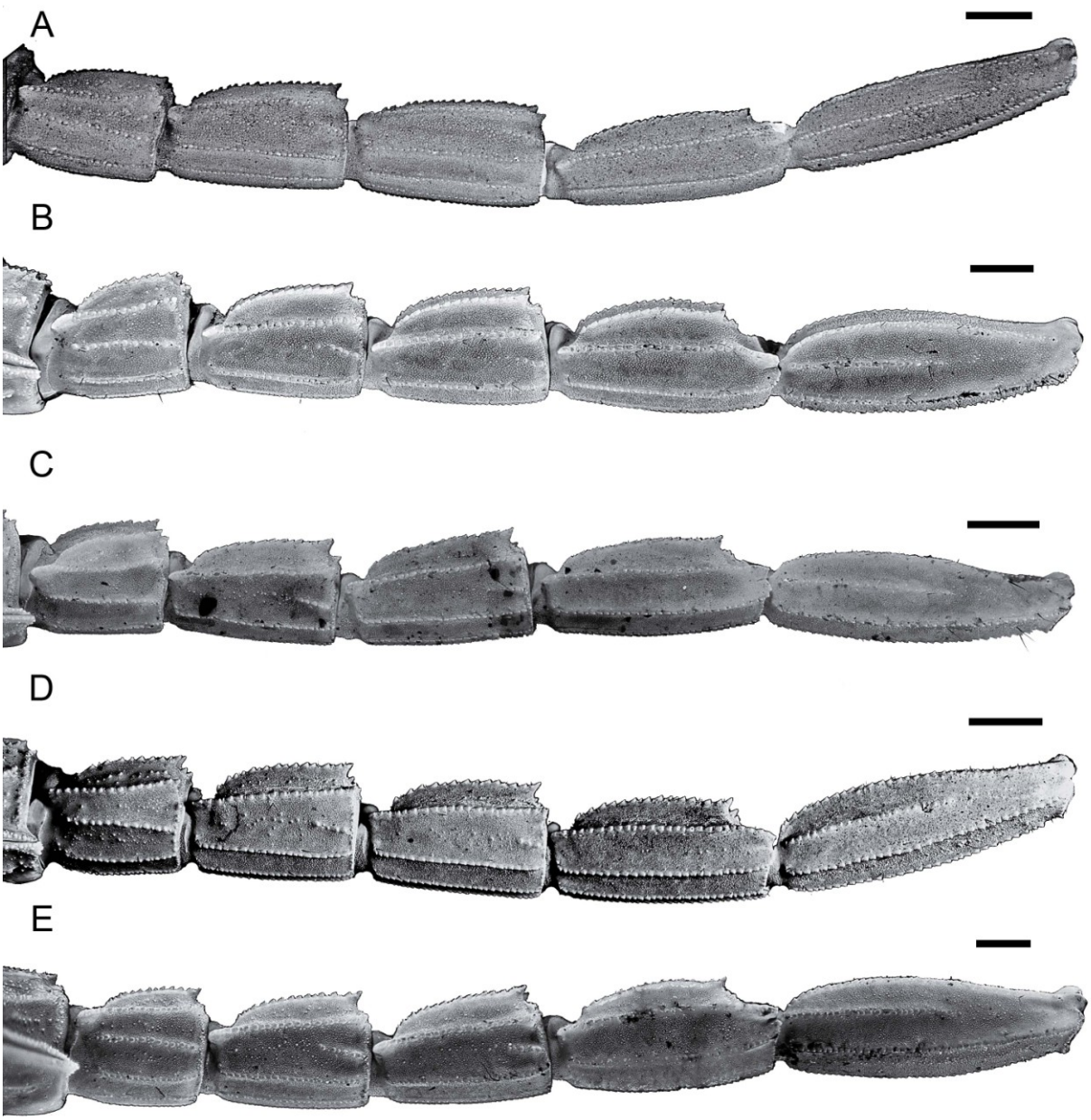


Figure 206. *Kochius* Soleglad and Fet, 2008, metasomal segments I–V, lateral aspect. **A**. *Kochius hirsuticauda* (Banks, 1910), ♂ (AMNH). **B**. *Kochius insularis* (Williams, 1971), ♂ (AMNH). **C**. *Kochius jatay*, **n. sp.**, paratype ♂ (AMNH). **D**. *Kochius kiliwa*, **n. sp.**, paratype ♂ (AMNH). **E**. *Kochius magdalensis* (Williams, 1971), ♂ (AMNH). Scale bars = 1 mm.

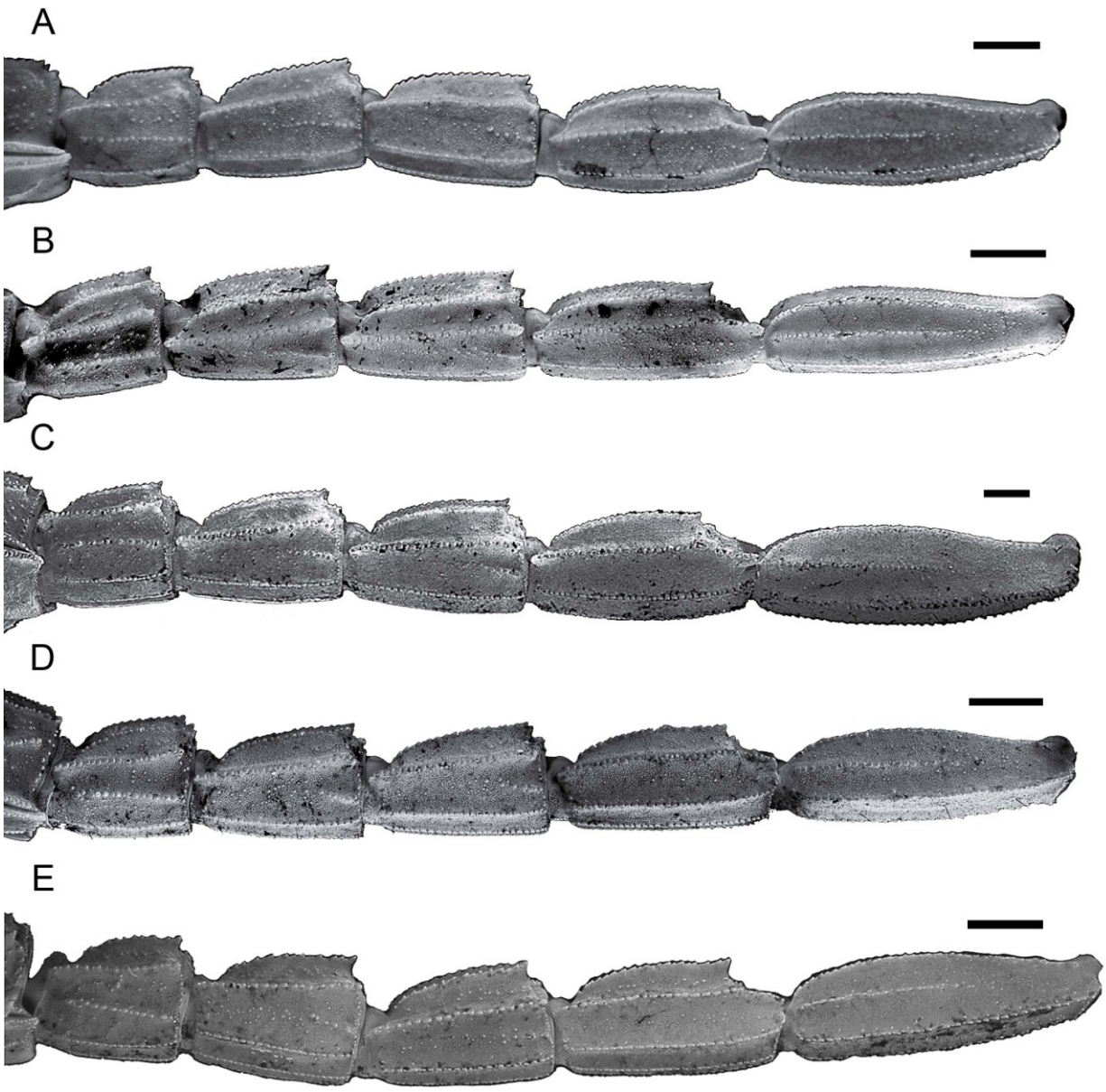


Figure 207. *Kochius* Soleglad and Fet, 2008, metasomal segments I–V, lateral aspect. **A**. *Kochius maroma*, **n. sp.**, paratype ♂ (AMNH). **B**. *Kochius moosni*, **n. sp.**, paratype ♂ (AMNH). **C**. *Kochius punctipalpi* (Wood, 1863), ♂ (AMNH). **D**. *Kochius sonorae* (Williams, 1971), ♂ (AMNH). **E**. *Kochius villosus* (Williams, 1971), ♂ (AMNH). Scale bars = 1 mm.

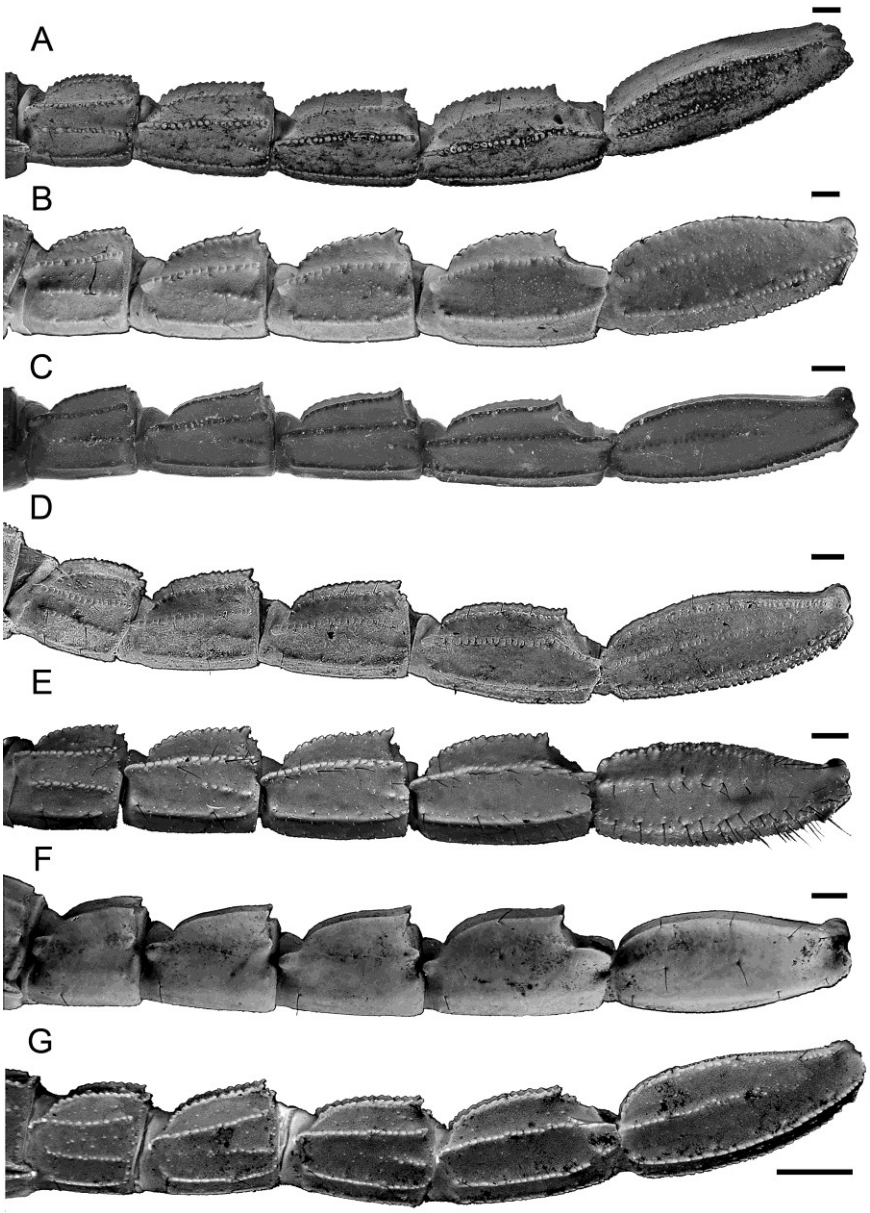


Figure 208. Metasomal segments I–V, lateral aspect. **A**. *Thorellius tekuani*, **n. sp.**, paratype ♂ (AMNH). **B**. *Thorellius cristimanus* (Pocock, 1898), paratype ♂ (AMNH). **C**. *Thorellius intrepidus* (Thorell, 1876), ♂ (AMNH). **D**. *Thorellius wixarika*, **n. sp.**, paratype ♂ (AMNH). **E**. *Thorellius yuyuawi*, **n. sp.**, paratype ♂ (AMNH). **F**. *Balsateres cisnerosi* (Ponce-Saavedra and Sissom, 2004), ♂ (IBUNAM). **G**. *Kuarapu purhepecha* Francke and Ponce-Saavedra, 2010, paratype ♂ (AMNH). Scale bars = 1 mm.

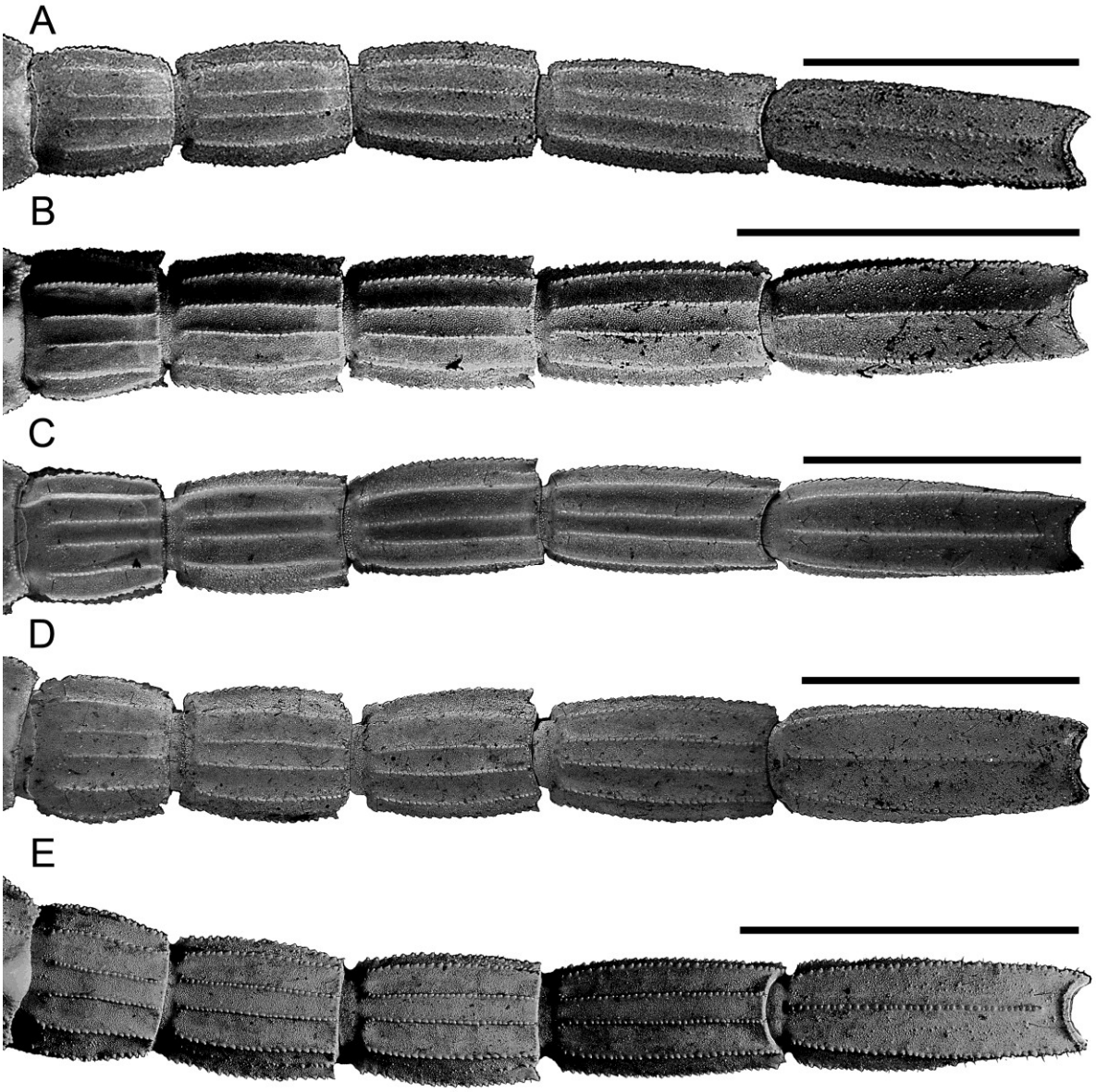


Figure 209. *Kochius* Soleglad and Fet, 2008, metasomal segments I–V, ventral aspect. **A**. *Kochius barbatus* (Williams, 1971), ♂ (AMNH). **B**. *Kochius bruneus* (Williams, 1971), ♂ (AMNH). **C**. *Kochius catavina*, **n. sp.**, paratype ♂ (AMNH). **D**. *Kochius cerralvensis* (Williams, 1971), ♂ (AMNH). **E**. *Kochius danzante*, **n. sp.**, paratype ♂ (AMNH). Scale bars = 1 mm.

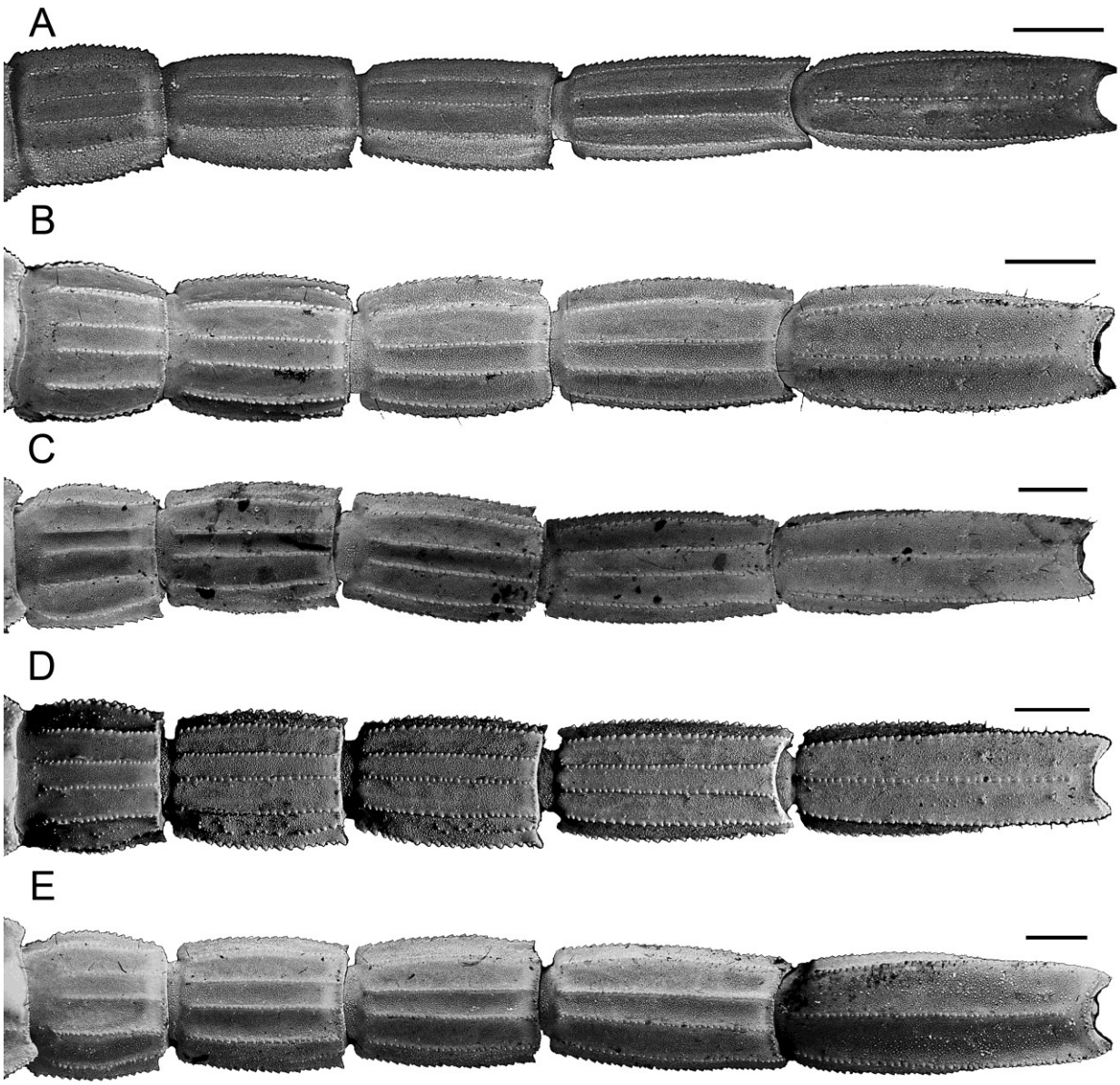


Figure 210. *Kochius* Soleglad and Fet, 2008, metasomal segments I–V, ventral aspect. **A**. *Kochius hirsuticauda* (Banks, 1910), ♂ (AMNH). **B**. *Kochius insularis* (Williams, 1971), ♂ (AMNH). **C**. *Kochius jatay*, **n. sp.**, paratype ♂ (AMNH). **D**. *Kochius kiliwa*, **n. sp.**, paratype ♂ (AMNH). **E**. *Kochius magdalensis* (Williams, 1971), ♂ (AMNH). Scale bars = 1 mm.

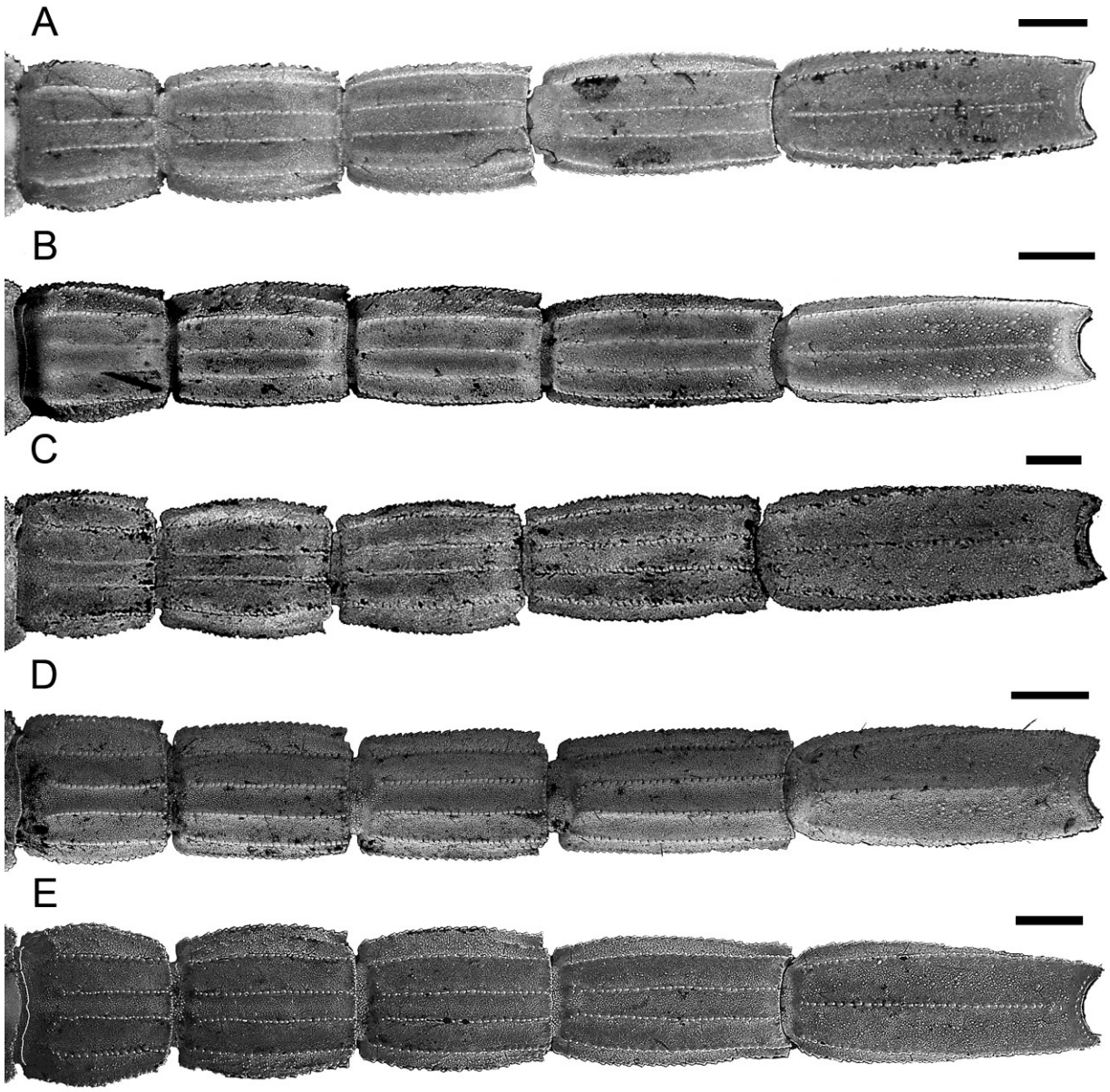


Figure 211. *Kochius* Soleglad and Fet, 2008, metasomal segments I–V, ventral aspect. **A**. *Kochius maroma*, **n. sp.**, paratype ♂ (AMNH). **B**. *Kochius moosni*, **n. sp.**, paratype ♂ (AMNH). **C**. *Kochius punctipalpi* (Wood, 1863), ♂ (AMNH). **D**. *Kochius sonorae* (Williams, 1971), ♂ (AMNH). **E**. *Kochius villosus* (Williams, 1971), ♂ (AMNH). Scale bars = 1 mm.

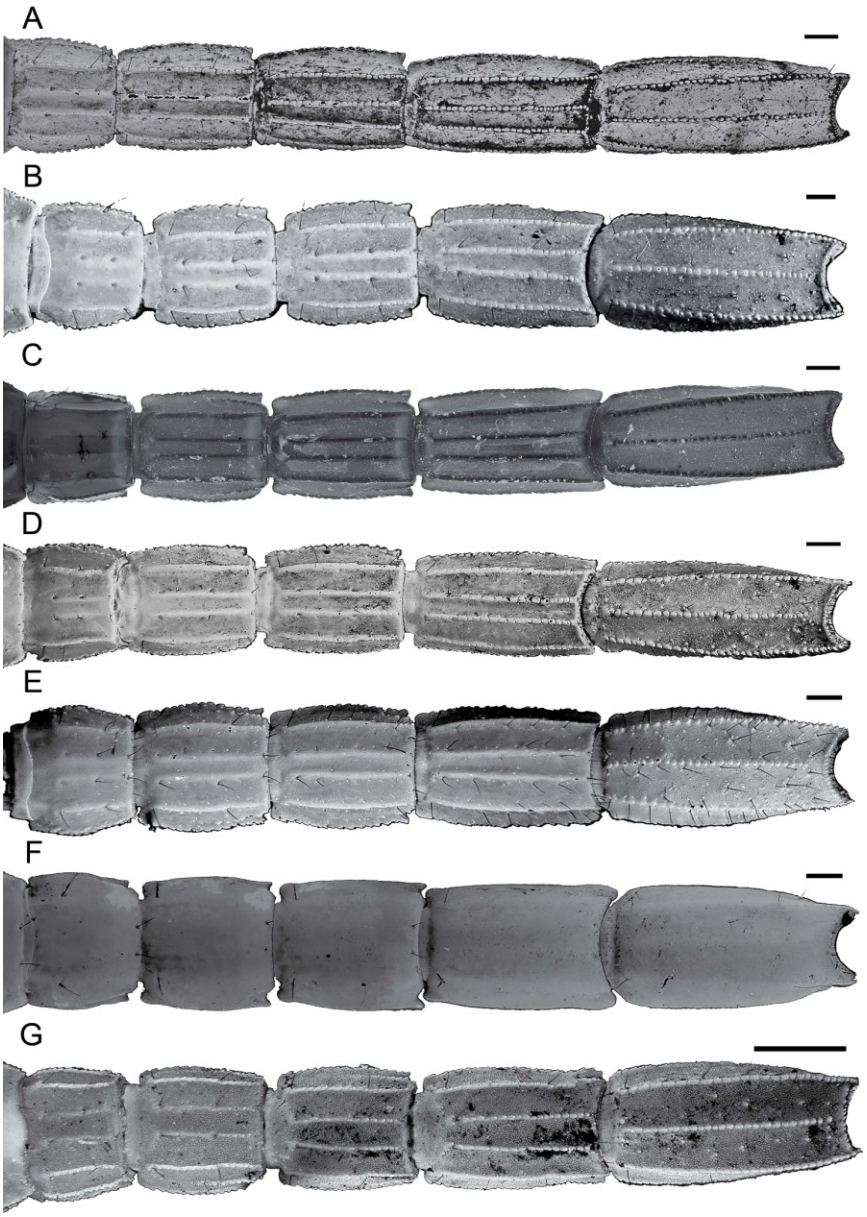


Figure 212. Metasomal segments I–V, ventral aspect. **A**. *Thorellius tekuani*, **n. sp.**, holotype ♂ (AMNH). **B**. *Thorellius cristimanus* (Pocock, 1898), ♂ (AMNH) **C**. *Thorellius intrepidus* (Thorell, 1876), ♂ (AMNH). **D**. *Thorellius wixarika*, **n. sp.**, holotype ♂ (AMNH). **E**. *Thorellius yuyuawi*, **n. sp.**, holotype ♂ (AMNH). **F**. *Balsateres cisnerosi* (Ponce-Saavedra and Sissom, 2004), ♂ (IBUNAM). **G**. *Kuarapu purhepecha* Francke and Ponce-Saavedra, 2010, paratype ♂ (AMNH). Scale bars = 1 mm.

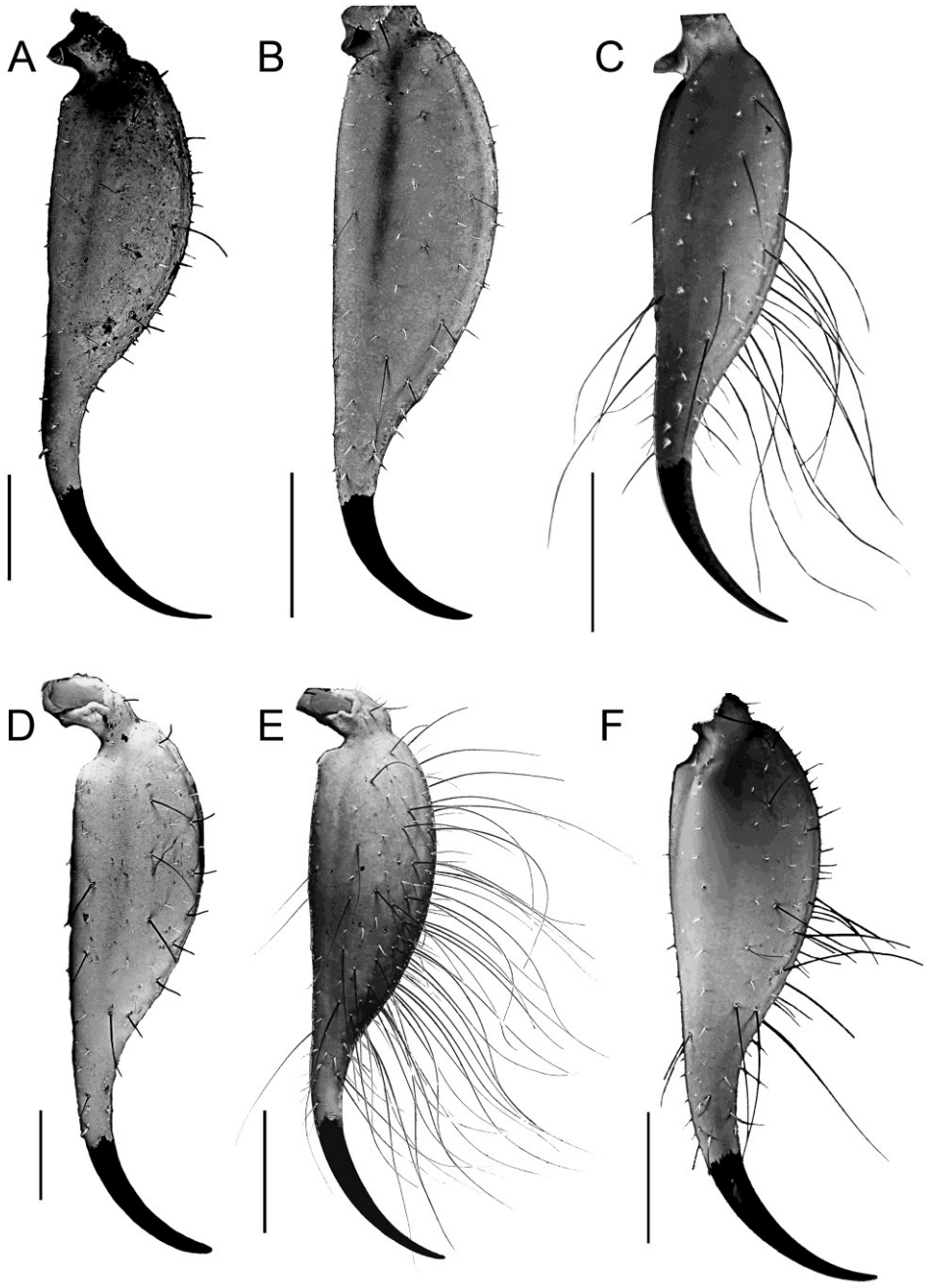


Figure 213. *Kochius* Soleglad and Fet, 2008, telson, lateral aspect. **A**. *Kochius barbatus* (Williams, 1971), ♂ (AMNH). **B**. *Kochius bruneus* (Williams, 1971), ♂ (AMNH). **C.** *Kochius catavina*, **n. sp.**, paratype ♂ (AMNH). **D**. *Kochius cerralvensis* (Williams, 1971), ♂ (AMNH). **E**. *Kochius danzante*, **n. sp.**, paratype ♂ (AMNH). **F**. *Kochius insularis* (Williams, 1971), ♂ (AMNH). Scale bars = 1 mm.

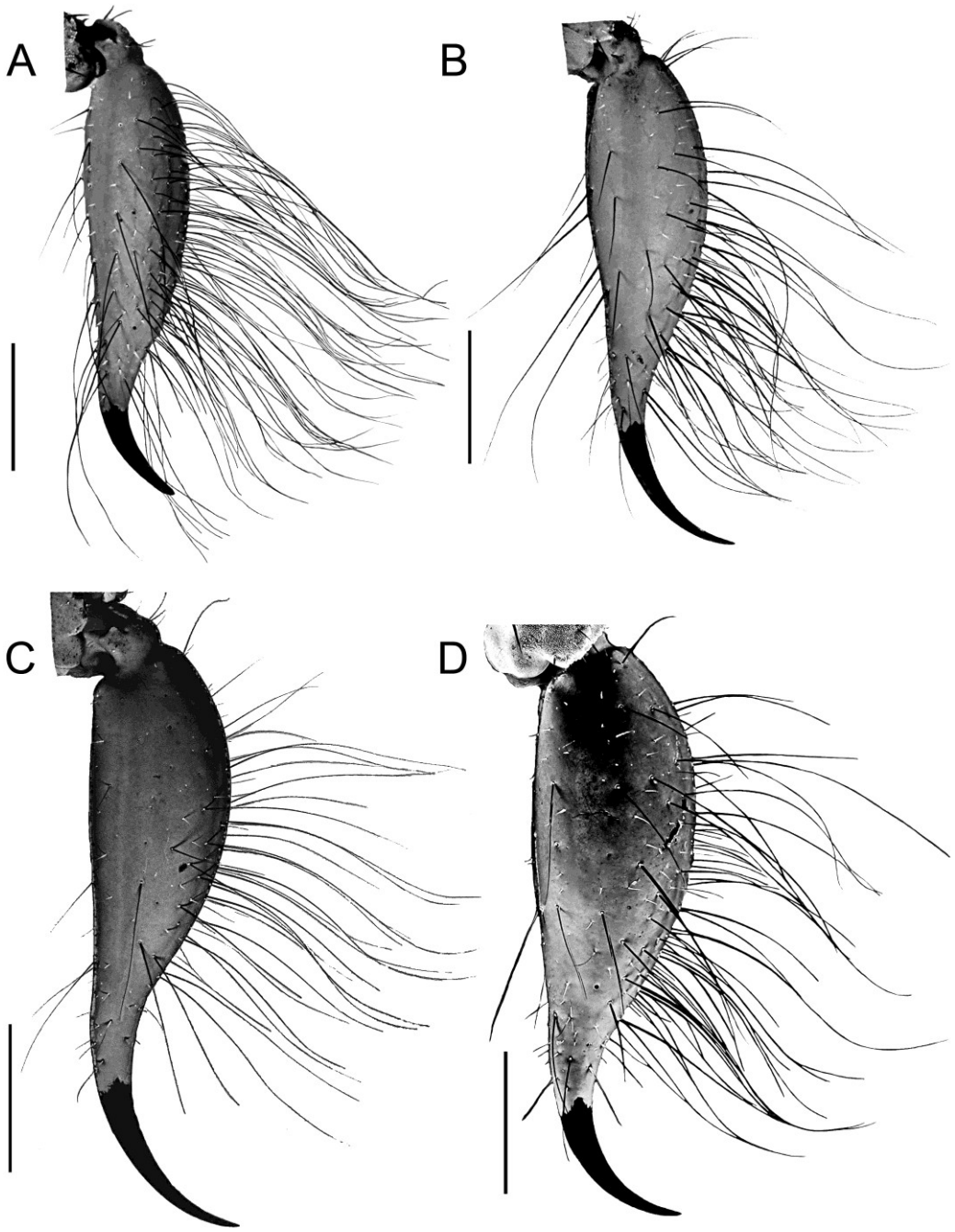


Figure 214. *Kochius* Soleglad and Fet, 2008, telson, lateral aspect. **A**. *Kochius hirsuticauda* (Banks, 1910), ♂ (AMNH). **B**. *Kochius jatay*, **n. sp.**, paratype ♂ (AMNH). **C**. *Kochius kiliwa*, **n. sp.**, paratype ♂ (AMNH). **D**. *Kochius villosus* (Williams, 1971), ♂ (AMNH). Scale bars = 1 mm.

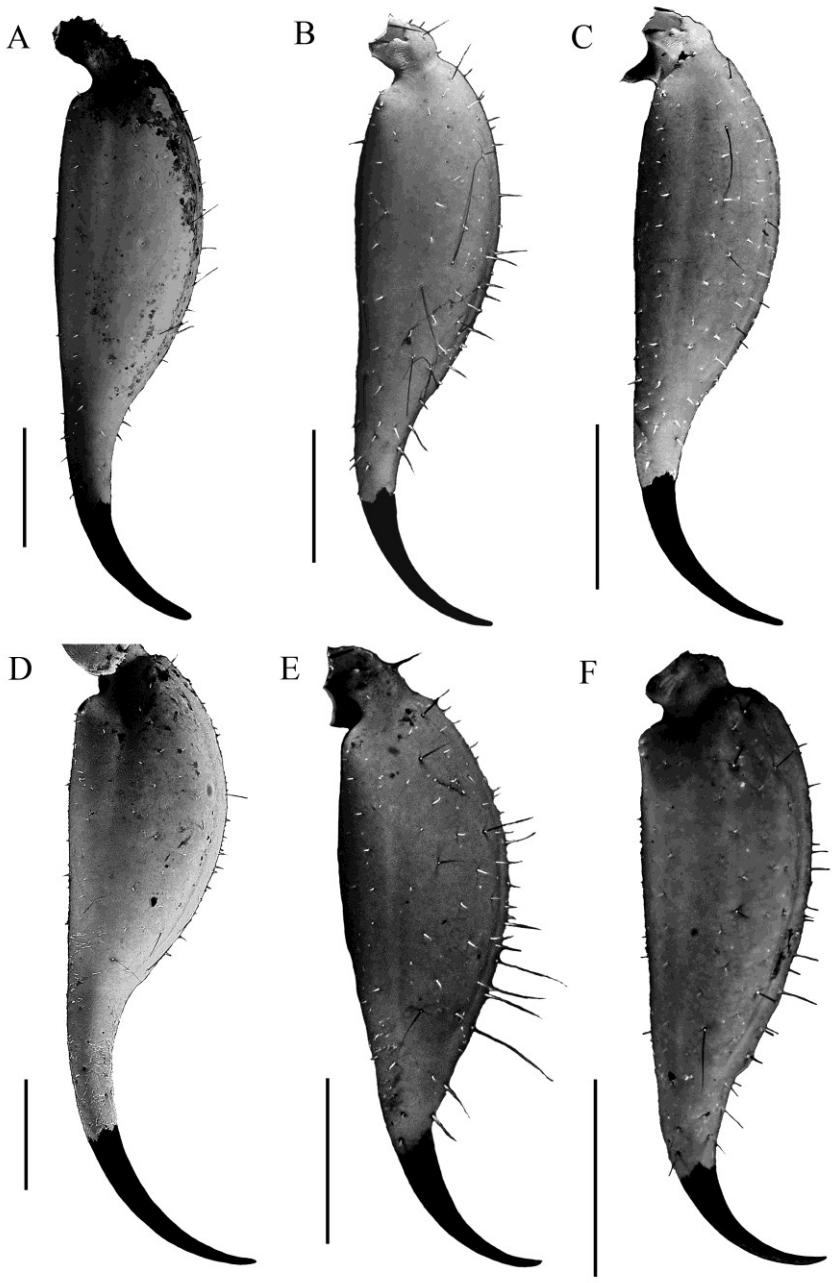


Figure 215. Telson, lateral aspect. **A**. *Kochius magdalensis* (Williams, 1971), ♂ (AMNH). **B**. *Kochius maroma*, **n. sp.**, paratype ♂ (AMNH). **C**. *Kochius moosni*, **n. sp.**, paratype ♂ (AMNH). **D**. *Kochius punctipalpi* (Wood, 1863), ♂ (AMNH). **E**. *Kochius sonorae* (Williams, 1971), ♂ (AMNH). **F**. *Kuarapu purhepecha* Francke and Ponce-Saavedra, 2010, paratype ♂ (AMNH). Scale bars = 1 mm.

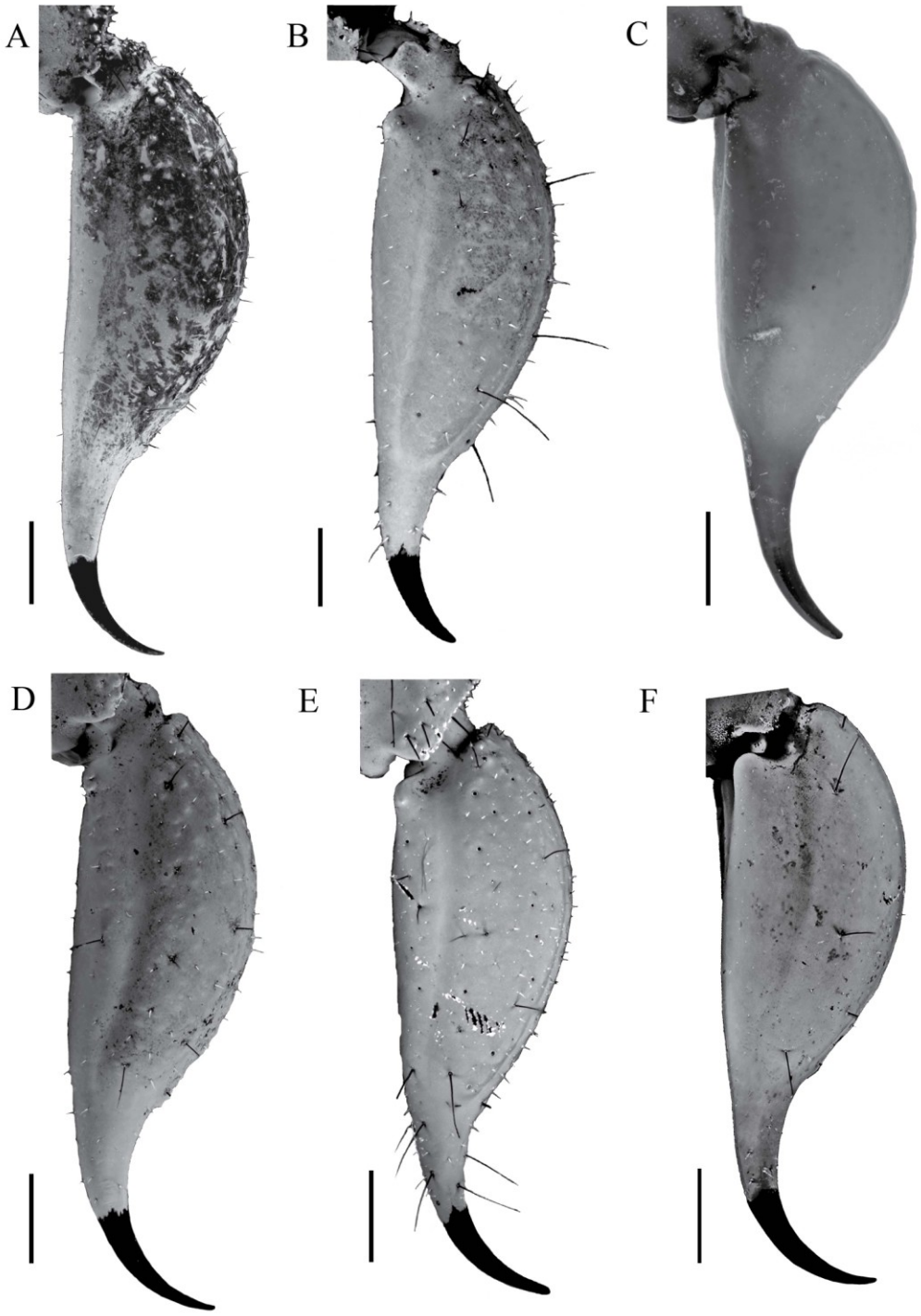


Figure 216. Telson, lateral aspect. **A**. *Thorellius tekuani*, **n. sp.**, holotype ♂ (AMNH). **B**. *Thorellius cristimanus* (Pocock, 1898), ♂ (AMNH) **C**. *Thorellius intrepidus* (Thorell, 1876), ♂ (AMNH). **D**. *Thorellius wixarika*, **n. sp.**, holotype ♂ (AMNH). **E**. *Thorellius yuyuawi*, **n. sp.**, holotype ♂ (AMNH). **F**. *Balsateres cisnerosi* (Ponce-Saavedra and Sissom, 2004) ♂ (IBUNAM). Scale bars = 1 mm.

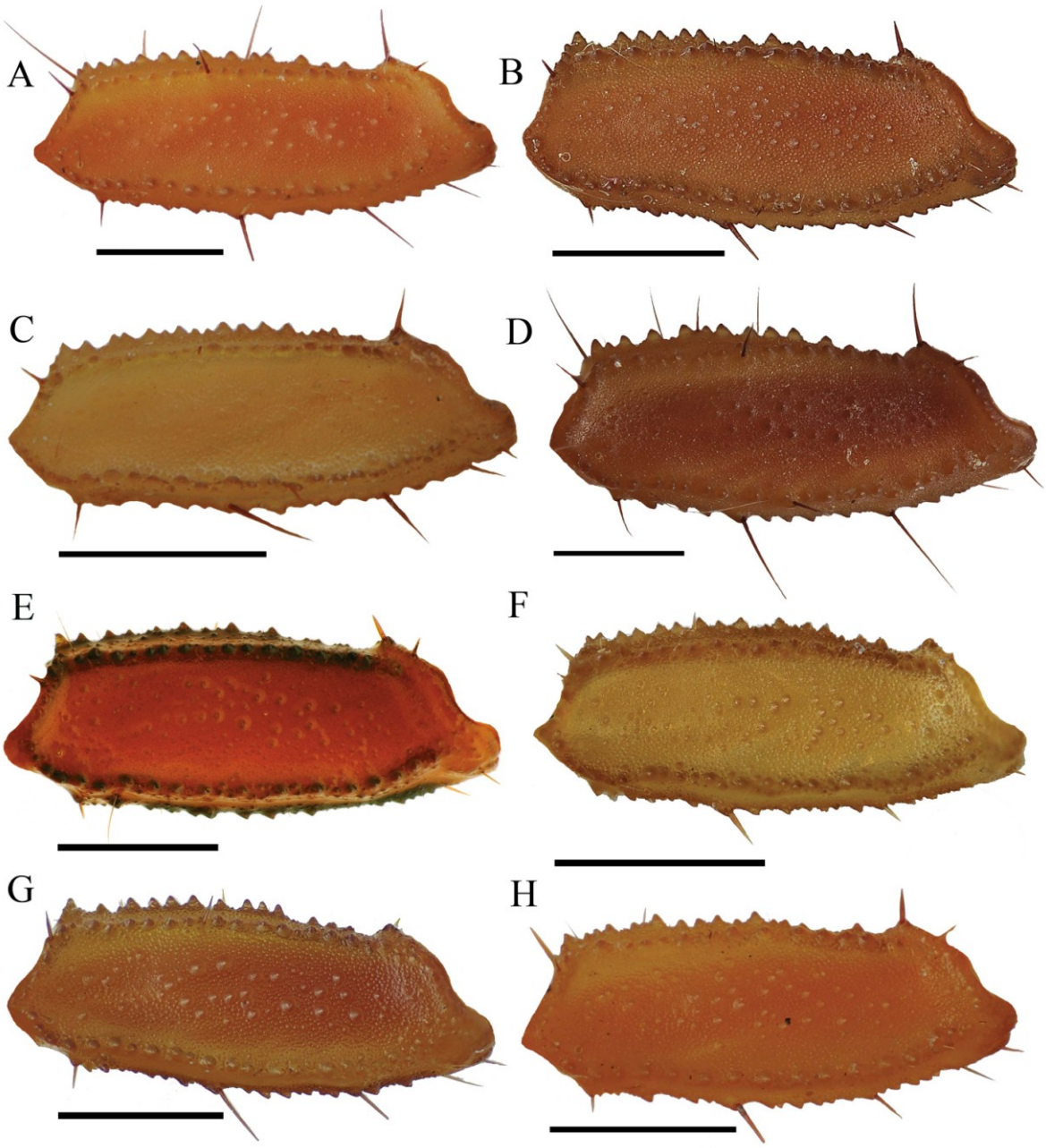


Figure 217. *Kochius* Soleglad and Fet, 2008, dextral dorsal pedipalp femur. **A**. *Kochius barbatus* (Williams, 1971), paratype ♂ (AMNH). **B**. *Kochius bruneus* (Williams, 1971), ♂ (AMNH). **C**. *Kochius catavina*, **n. sp.**, paratype ♂ (AMNH). **D**. *Kochius cerralvensis* (Williams, 1971), ♂ (AMNH). **E**. *Kochius danzante*, **n. sp.**, paratype ♂ (AMNH). **F**. *Kochius hirsuticauda* (Banks, 1910), ♂ (AMNH). **G**. *Kochius insularis* (Williams, 1971), ♂ (AMNH). **H**. *Kochius jatay*, **n. sp.**, paratype ♂ (AMNH). Scale bars = 1 mm.

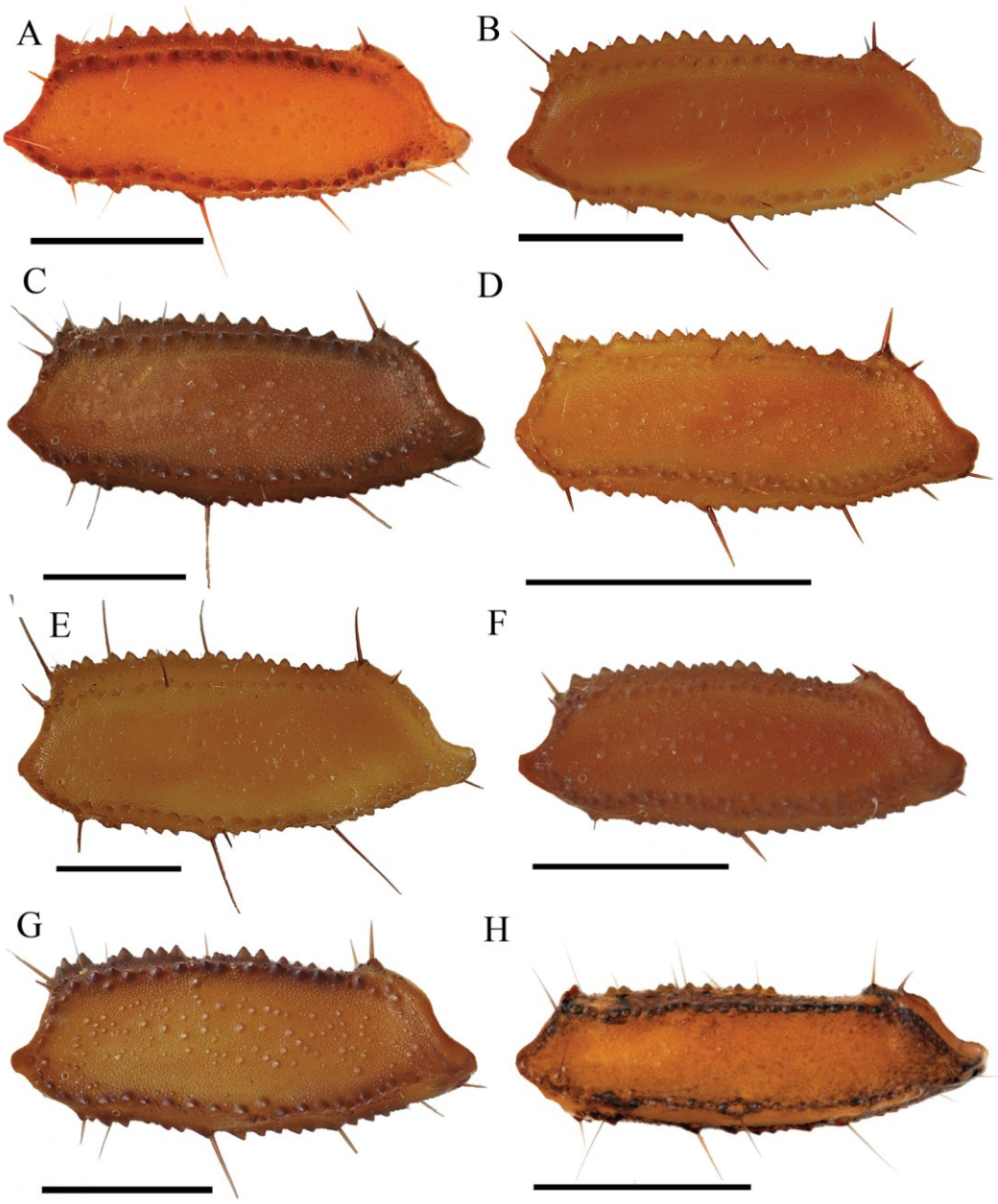


Figure 218. Dextral dorsal pedipalp femur. **A**. *Kochius kiliwa*, **n. sp.**, paratype ♂ (AMNH). **B**. *Kochius magdalensis* (Williams, 1971), ♂ (AMNH). **C**. *Kochius maroma*, **n. sp.**, paratype ♂ (AMNH). **D**. *Kochius moosni*, **n. sp.**, paratype ♂ (AMNH). **E**. *Kochius punctipalpi* (Wood, 1863), ♂ (AMNH). **F**. *Kochius sonorae* (Williams, 1971), ♂ (AMNH). **G**. *Kochius villosus* (Williams, 1971), ♂ (AMNH). **H**. *Kuarapu purhepecha* Francke and Ponce-Saavedra, 2010, paratype ♂ (AMNH). Scale bars = 1 mm.

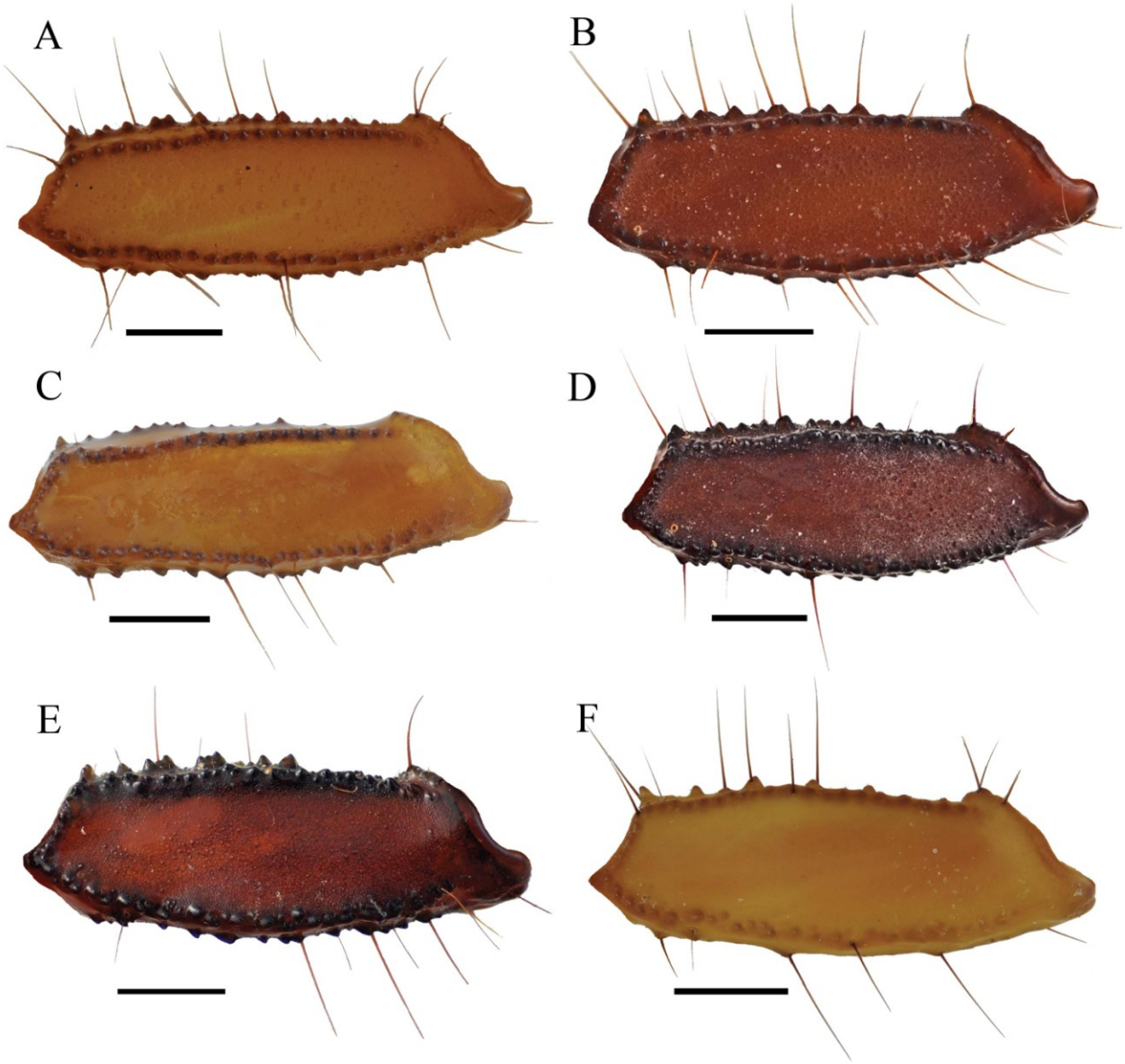


Figure 219. Dextral dorsal pedipalp femur. **A**. *Thorellius tekuani*, **n. sp.**, holotype ♂ (AMNH). **B**. *Thorellius cristimanus* (Pocock, 1898), ♂ (AMNH). **C**. *Thorellius intrepidus* (Thorell, 1876), ♂ (AMNH). **D**. *Thorellius wixarika*, **n. sp.**, holotype ♂ (AMNH). **E**. *Thorellius yuyuawi*, **n. sp.**, holotype ♂ (AMNH). **F**. *Balsateres cisnerosi* (Ponce-Saavedra and Sissom, 2004), paratype ♂ (AMNH). Scale bars = 1 mm.

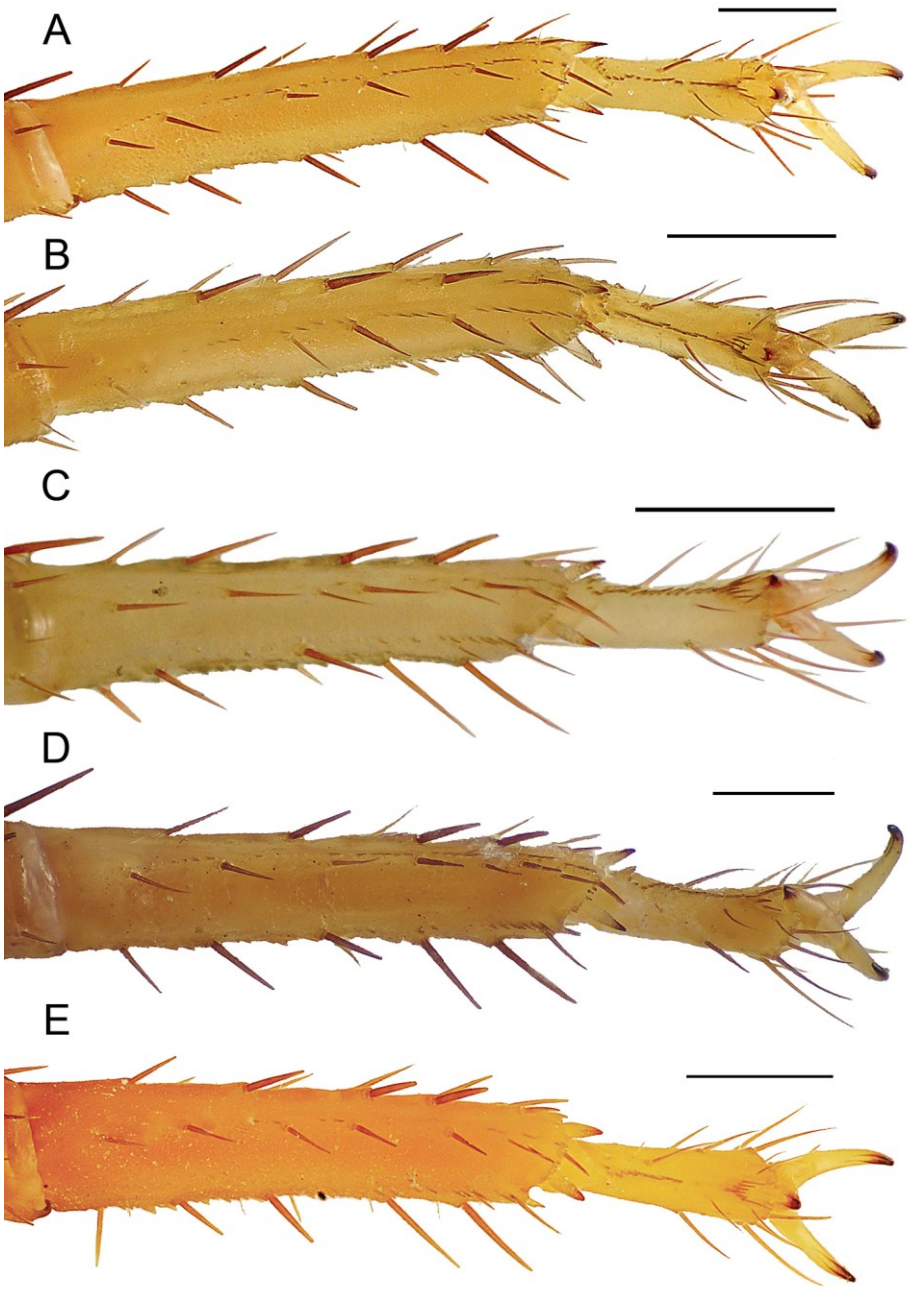


Figure 220. *Kochius* Soleglad and Fet, 2008, dextral basitarsus and telotarsus III. **A**. *Kochius barbatus* (Williams, 1971), paratype ♂ (AMNH). **B**. *Kochius bruneus* (Williams, 1971), ♂ (AMNH). **C**. *Kochius catavina*, **n. sp.**, paratype ♂ (AMNH). **D**. *Kochius cerralvensis* (Williams, 1971), paratype ♂ (AMNH). **E**. *Kochius danzante*, **n. sp.**, paratype ♂ (AMNH). Scale bars = 0.5 mm.

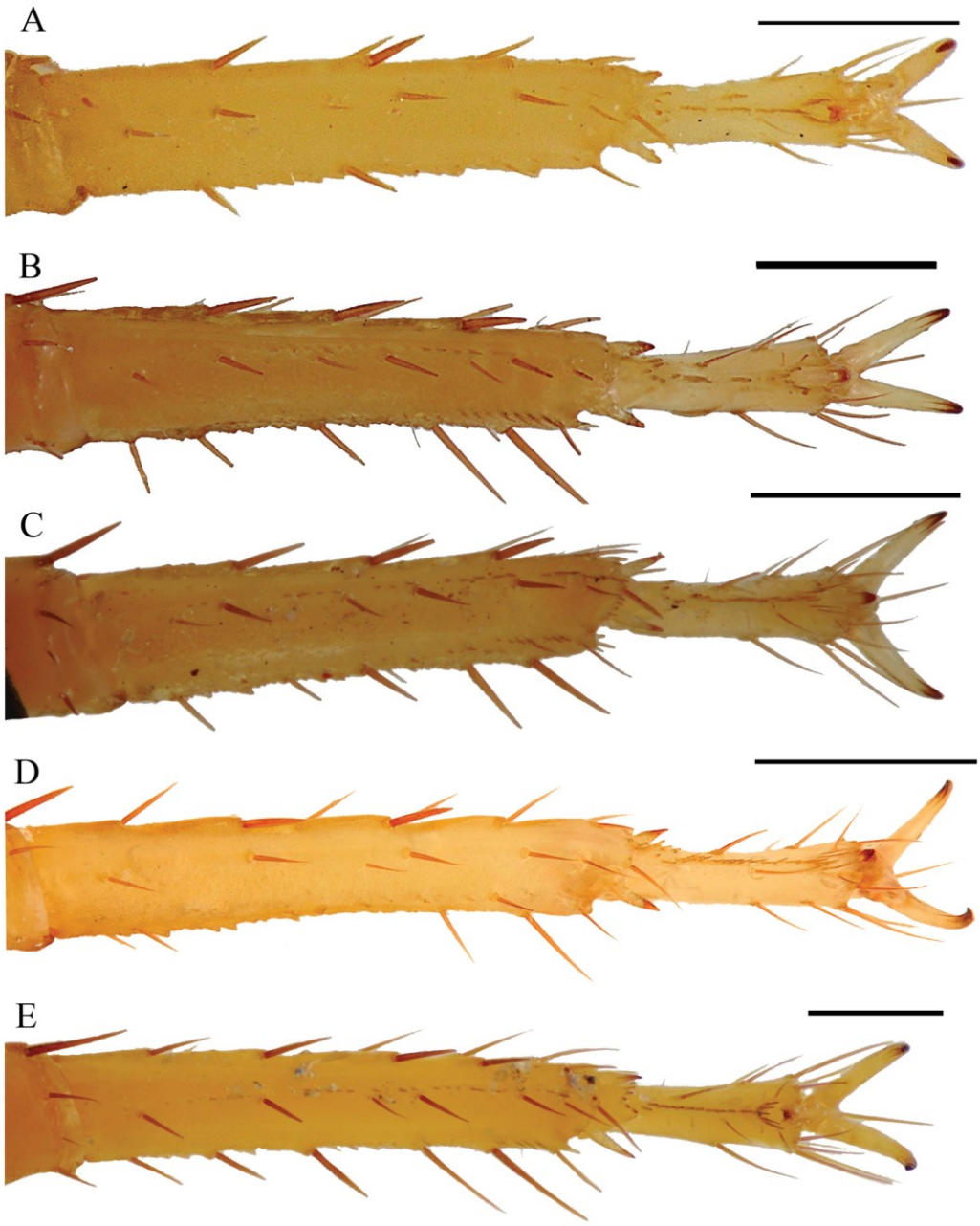


Figure 221. *Kochius* Soleglad and Fet, 2008, dextral basitarsus and telotarsus III. **A**. *Kochius hirsuticauda* (Banks, 1910), ♂ (AMNH). **B**. *Kochius insularis* (Williams, 1971), ♂ (AMNH). **C**. *Kochius jatay*, **n. sp.**, paratype ♂ (AMNH). **D**. *Kochius kiliwa*, **n. sp.**, paratype ♂ (AMNH). **E**. *Kochius magdalensis* (Williams, 1971), ♂ (AMNH). Scale bars = 0.5 mm.

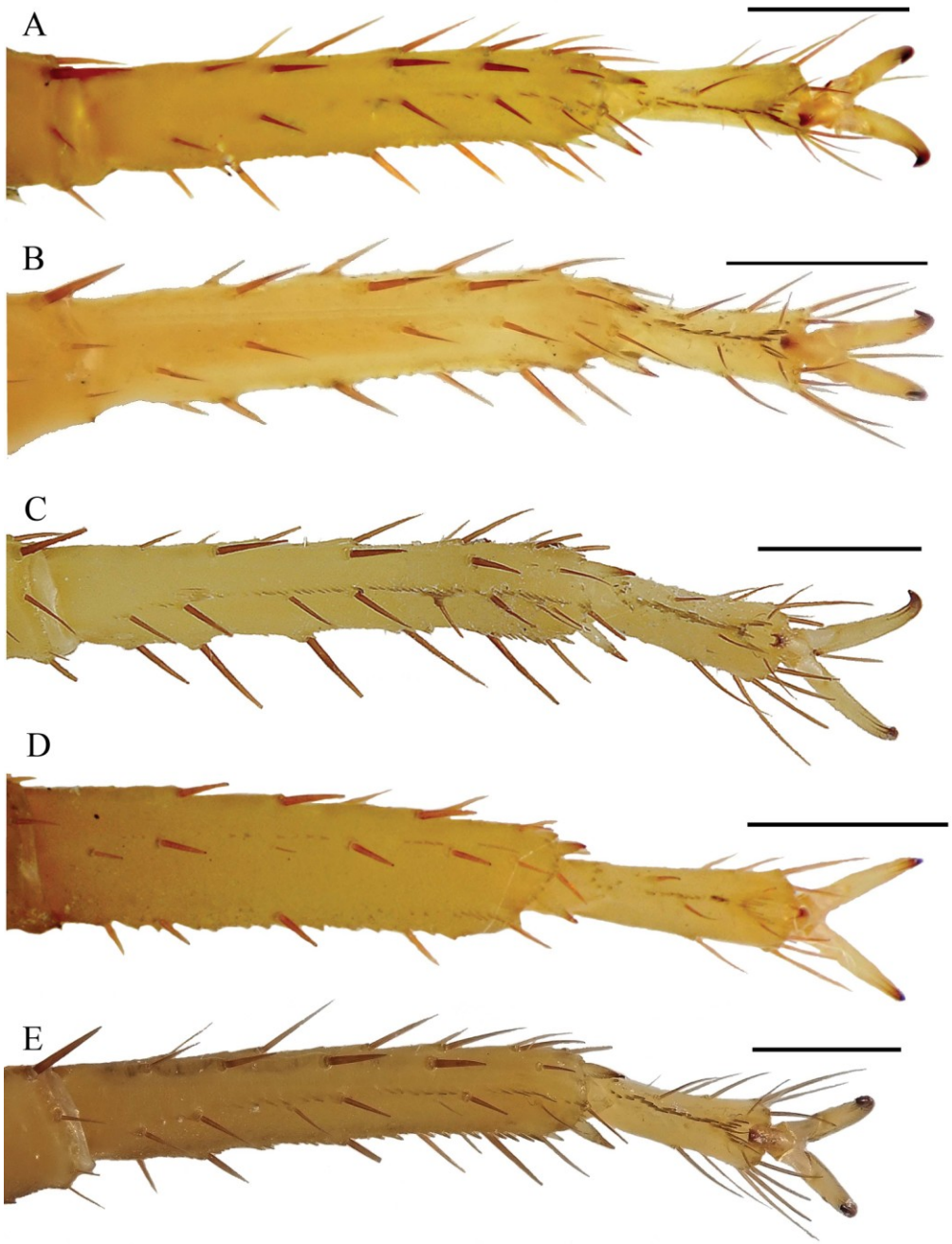


Figure 222. *Kochius* Soleglad and Fet, 2008, dextral basitarsus and telotarsus III. **A**. *Kochius maroma*, **n. sp.**, paratype ♂ (AMNH). **B**. *Kochius moosni*, **n. sp.**, paratype ♂ (AMNH). **C**. *Kochius punctipalpi* (Wood, 1863), ♂ (AMNH). **D**. *Kochius sonorae* (Williams, 1971), ♂ (AMNH). **E**. *Kochius villosus* (Williams, 1971), paratype ♂ (AMNH). Scale bars = 0.5 mm.

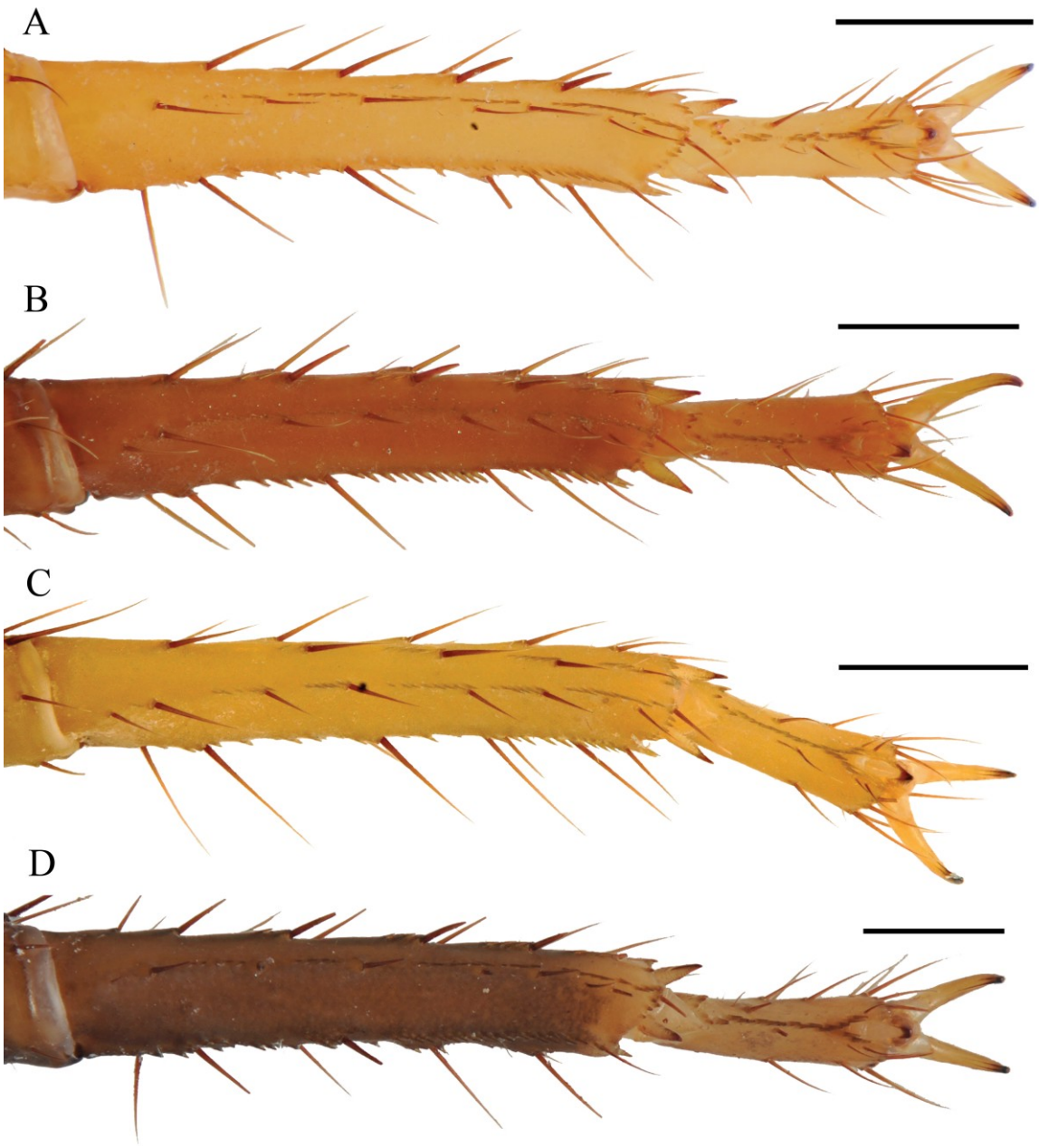


Figure 223. *Thorellius* Soleglad and Fet, 2008, dextral basitarsus and telotarsus III. **A**. *Thorellius tekuani*, **n. sp.**, paratype ♂ (AMNH). **B**. *Thorellius cristimanus* (Pocock, 1898), paratype ♂ (AMNH). **C**. *Thorellius intrepidus* (Thorell, 1876), ♂ (AMNH). **D**. *Thorellius wixarika*, **n. sp.**, paratype ♂ (AMNH). Scale bars = 0.5 mm.

Figure 224. Dextral basitarsus and telotarsus III. **A**. *Thorellius yuyuawi*, **n. sp.**, paratype ♂ (AMNH). **B**. *Balsateres cisnerosi* (Ponce-Saavedra and Sissom, 2004), paratype ♂ (AMNH). Scale bars = 1 mm. **C**. *Kuarapu purhepecha* Francke and Ponce-Saavedra, 2010, paratype ♂ (AMNH). Scale bar = 0.5 mm.

MESOMEXOVIS González-Santillán and Prendini, in prep.

KEY TO IDENTIFICATION OF THE SPECIES OF *Mesomexovis*

1. Ventral lateral carinae of metasomal segment I–IV and ventral submedian III–IV granular, crenulated to serrated, various pedipalp chela carinae crenular to costate…….….2

- Ventral lateral carinae of metasomal segment I–IV and ventral submedian III–IV costate to obsolete, all pedipalp chela carinae obsolete to costate but always smooth….....……....11

2. Ventral submedian carinae on metasomal segment I granular, crenulated to serrated……....3

- Ventral submedian carinae on metasomal segment I costate to obsolete.....4

3. Dorsal median, dorsal prolateral, dorsal retrolateral and ventral retrolateral carinae of pedipalp chela crenular to granular and costate, with six rows of median denticles and six retrolateral denticles on chela fixed finger, and seven rows of median denticles and seven retrolateral denticles on chela movable finger…….……..……*M. occidentalis*

- Dorsal median, dorsal prolateral, dorsal retrolateral and ventral retrolateral carinae of pedipalp chela weakly costate to obsolete, with five rows of median denticles and five retrolateral denticles on chela fixed finger, and six rows of median denticles and seven retrolateral denticles on chela movable finger…….…..…….....*M. subcristatus*

4. Distal margin of carapace with three pairs of setae, five rows of median denticles and five retrolateral denticles on chela fixed finger…….5

- Distal margin of carapace with four or five pairs of setae, with six rows of median denticles and six retrolateral denticles on chela fixed finger……...…….. *M. caxcan*, **n. sp.**

5. Dorsal median and prolateral median carinae of pedipalp chela weakly crenulated and costate, ventral median carinae of metasomal segments II and III finely serrated, pedipalp chela manus slender…….....…….…..*M. atenango*

- Dorsal median and prolateral median carinae of pedipalp chela smooth and costate, ventral median carinae of metasomal segments II and III obsolete to weakly crenulated on distal half, pedipalp chela moderately incrassate……..6

6. Proximal notch of fixed finger and median lobe of movable finger of pedipalp chelae prominent, carinae of pedipalp chela immaculate..…….....7

- Proximal notch of fixed finger and median lobe of movable finger of pedipalp chelae weak, carinae of pedipalp chela infuscated..……..……8

7. Metasomal segment II longer than wide, IV less than two times longer than wide, ventral submedian carinae of metasomal segment II and III obsolete and weakly costate on distal fourth, ventral surface of metasomal segment V shagreened with a mix of dense moderate and minute granules.…….……..……...…….……..…...*M. ofeliae*, **n. sp.**

- Metasomal segment II as long as wide or slightly longer than wide, IV more than two times longer than wide, ventral submedian carinae of metasomal segment II and III costate and weakly crenular on distal fourth, ventral surface of metasomal segment V finely granular…….……..…...…….....*M. zaragozai*, **n. sp.**

8. Ventral surface of telson granular, with six rows of median denticles and six retrolateral denticles on chela fixed finger, and seven rows of median denticles and seven retrolateral denticles on chela movable finger…….…..9

- Ventral surface of telson smooth, with five rows of median denticles and five retrolateral denticles on chela fixed finger, and six rows of median denticles and six retrolateral denticles on chela movable finger.……..…..…….....*M. izazagai*, **n. sp.**

9. Lateral surfaces of metasomal segments I–V smooth to few fine minute granules, dorsal surface of pedipalp femur with fine scattered granules, pedipalp manus relatively slender……...….....*M. hesperus*

- Lateral surfaces of metasomal segments I–V with scattered broad granules, dorsal surface of pedipalp femur with dense and broad granules, pedipalp manus relatively incrassate…….10

10. Median lateral carinae of metasomal segment V granular, retrolateral ventral carinae of pedipalp femur smooth, legs partially and diffusely infuscated…….*M. ponce*

- Median lateral carinae of metasomal segment V costate, retrolateral ventral carinae of pedipalp femur granular, legs almost completely and heavily infuscated…….…….*M. mintoni*

11. Telson relatively globose, expanded dorso-ventrally, dorsal retrolateral carinae of pedipalp patella completely crenulated, proximal notch of fixed finger and medial lobe of movable finger of pedipalp chela pronounced…….……*M. oaxaca*

- Telson relatively elongated, compressed dorso-ventrally, dorsal retrolateral carinae of pedipalp patella partially crenulated to smooth, proximal notch of fixed finger and medial lobe of movable finger of pedipalp chela moderate to weak……..……..…..…..…12

12. Dorsal and ventral surface of pedipalp femur shagreened, with scattered granulation, six median rows of denticles and six retrolateral denticles on pedipalp chela fixed finger, lateral basal denticles on aculeus absent……...13

- Dorsal and ventral surface of pedipalp femur smooth to matte, with minute scattered granules, five median rows of denticles and five retrolateral denticles on pedipalp chela fixed finger, lateral basal denticles on aculeus present……...…14

13. Base color dark red-brownish, ventral surface of metasomal segment V heavily shagreened, dense granulation on all surface…….……..…...……....*M. variegatus*

- Base color pale yellow-reddish, ventral surface of metasomal segment V moderately shagreened, proximal half with few granules and distal half moderately granular…*M. nigropictus*

14. Ventral lateral carinae of mesosomal sternite VII costate, lateral median carinae of segment IV granular…….....…..15

- Ventral lateral carinae of mesosomal sternite VII obsolete, lateral median carinae of segment IV costate…….……...….16

15. Pedipalp chela with carinae immaculate, sternite VII with setae base immaculate, ventral median carina of pedipalp patella granular, ventral surface of metasomal segment V moderately granular, ventral median carinae of metasomal segment V bifurcated on distal end.…*M. fasciatus*

- Pedipalp chela with carinae completely infuscate, sternite VII with setae base infuscate, ventral median carinae of pedipalp patella smooth, ventral surface of metasomal segment V essentially smooth, ventral median carina of metasomal segment V moniliform on distal end.....*M. tlayoli*, **n. sp.**

16. Lateral median carina of metasomal segment IV smooth, intercarinal surface of ventral submedian carinae of metasomal segments II–IV heavily infuscated……...….*M. tinctus*, **n. sp.**

- Lateral median carina of metasomal segment IV granular, intercarinal surface of ventral submedian carinae of metasomal segments II–IV immaculate……..……..*M. punctatus*

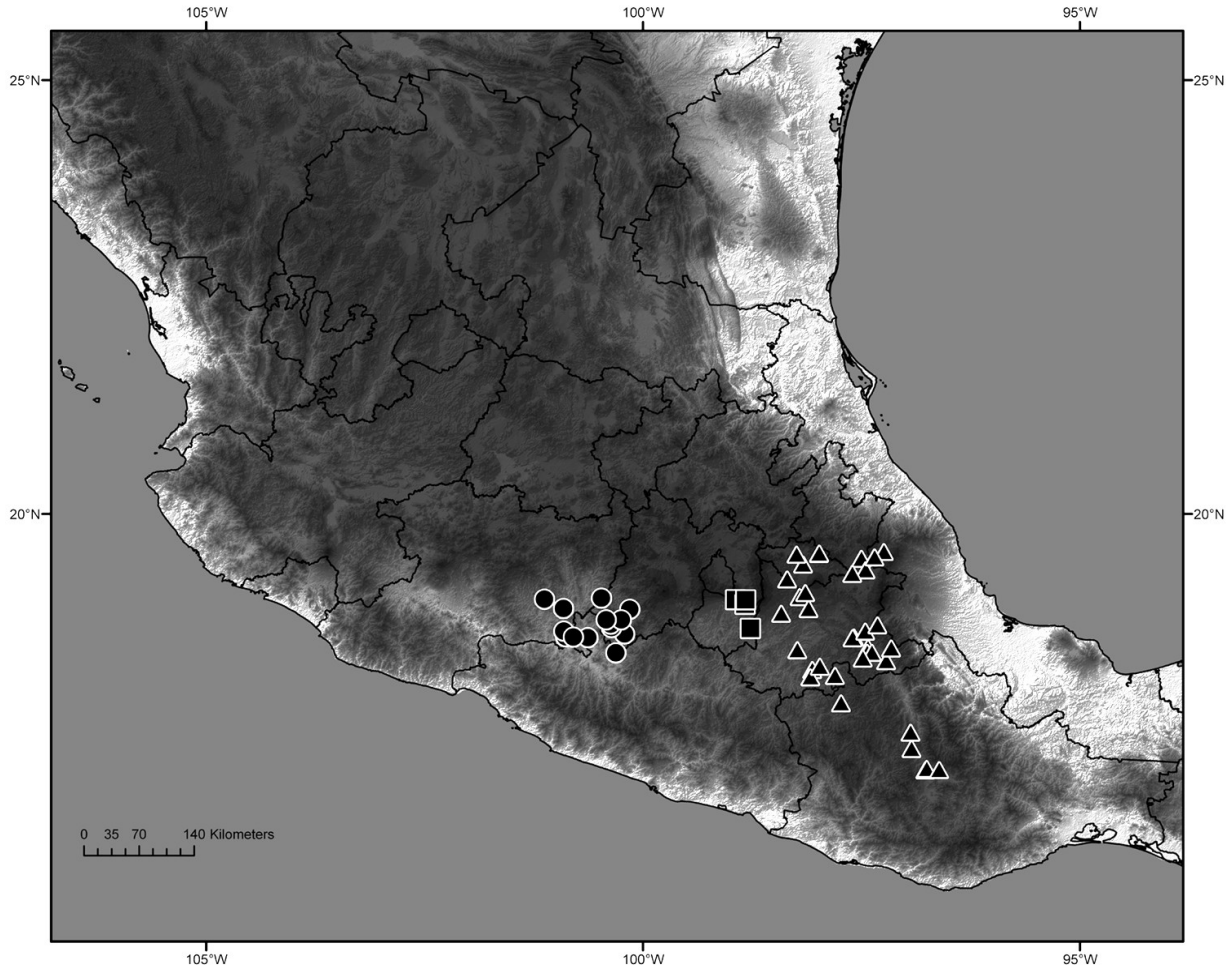


Figure 225. Map of Mexico, plotting known locality records for three species in the vaejovid scorpion genus *Mesomexovis* González-Santillán and Prendini, in prep., based on data collected in the present study: *Mesomexovis izazagai*, **n. sp.** (circles), *Mesomexovis ofeliae*, **n. sp.** (squares), *Mesomexovis zaragozai*, **n. sp.** (triangles), darker contour indicates increase of altitudinal gradient.

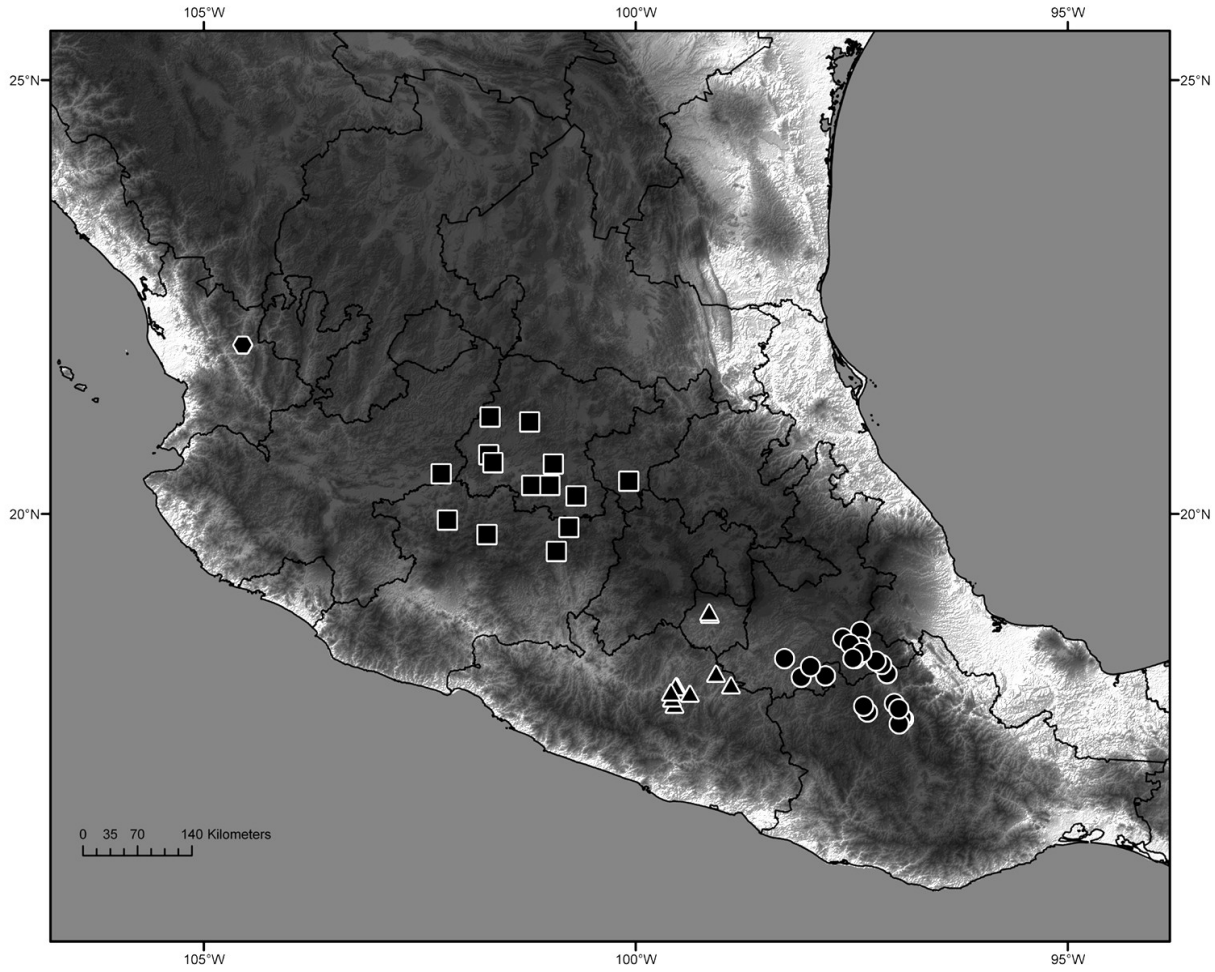


Figure 226. Map of Mexico, plotting known locality records for three species in the vaejovid scorpion genus *Mesomexovis* González-Santillán and Prendini, in prep., based on data collected in the present study: *Mesomexovis mintoni* Sissom and Hughes, in prep. (squares), *Mesomexovis hesperus* Sissom and Hughes, in prep. (hexagons), *Mesomexovis fasciatus* Sissom and Hughes, in prep. (circles), *Mesomexovis atenango* (Francke and González-Santillán, 2007) (triangles), darker contour indicates increase of altitudinal gradient.

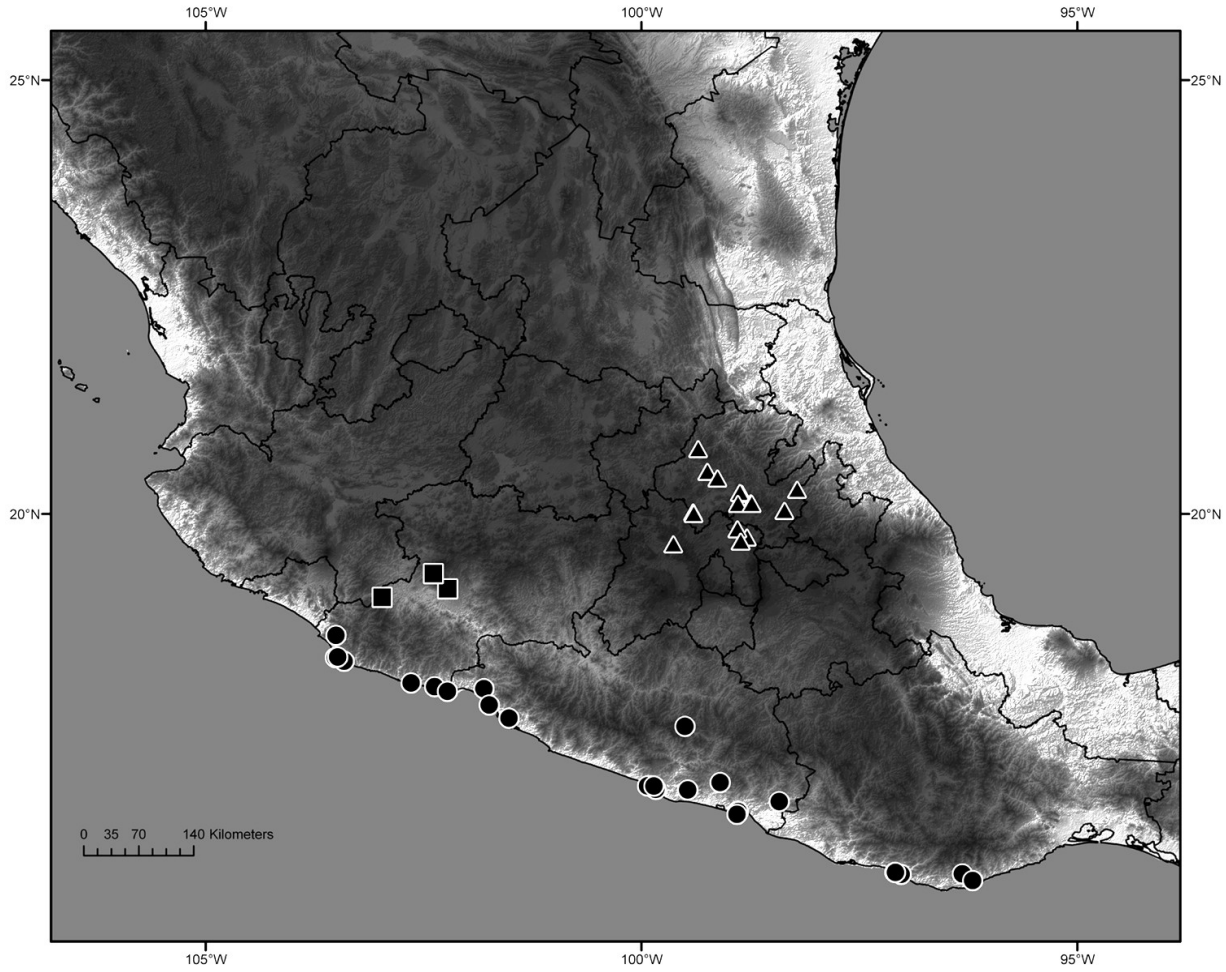


Figure 227. Map of Mexico, plotting known locality records for three species in the vaejovid scorpion genus *Mesomexovis* González-Santillán and Prendini, in prep., based on data collected in the present study: *Mesomexovis punctatus* (Karsch, 1879) (triangles), *Mesomexovis ponce* Sissom and Hughes, in prep. (squares), *Mesomexovis occidentalis* (Hoffmann, 1931) (circles), darker contour indicates increase of altitudinal gradient.

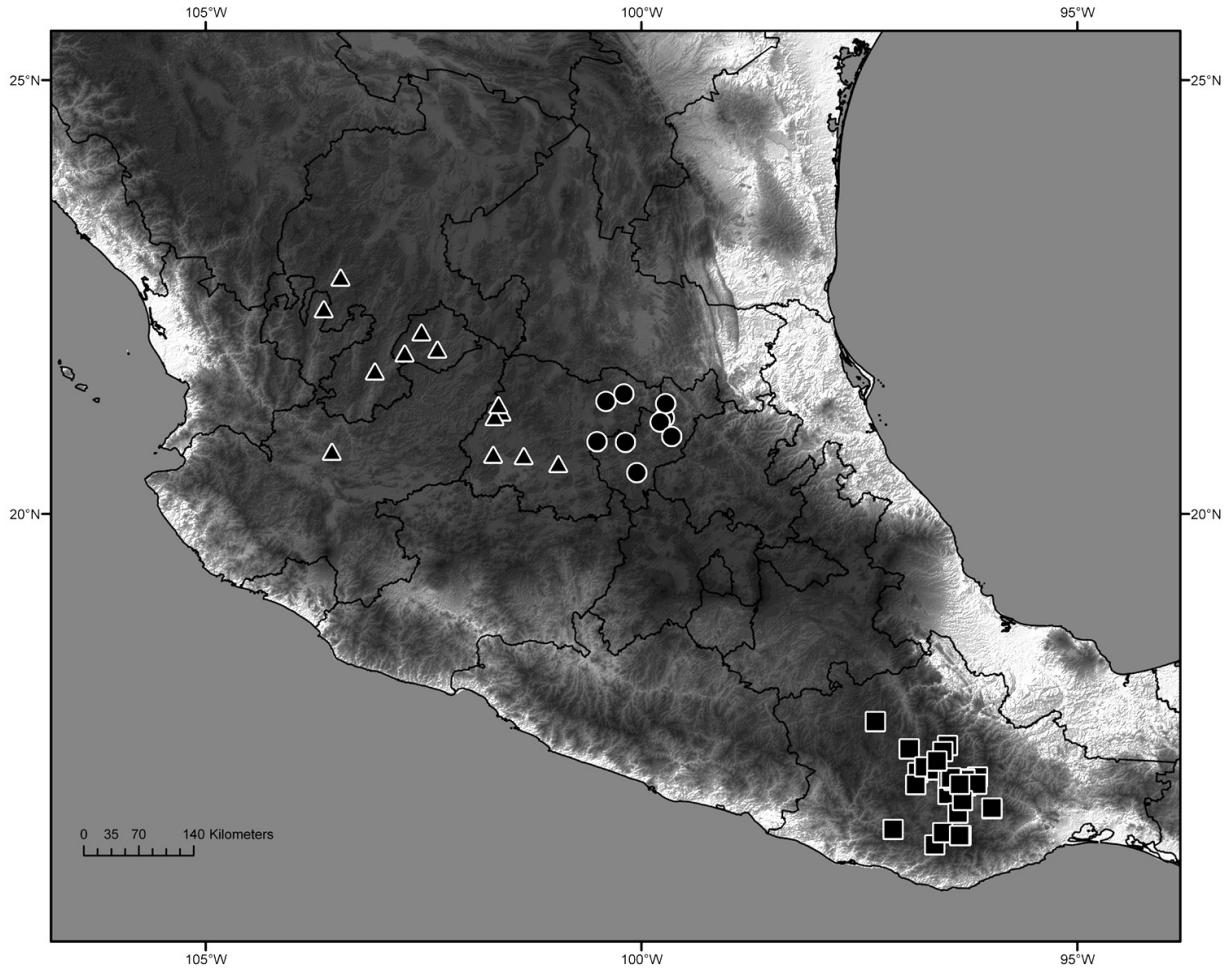


Figure 228. Map of Mexico, plotting known locality records for three species in the vaejovid scorpion genus *Mesomexovis* González-Santillán and Prendini, in prep., based on data collected in the present study: *Mesomexovis tinctus*, **n. sp.** (circles), *Mesomexovis oaxaca* (Santibáñez-López and Sissom, 2010) (squares), *Mesomexovis nigropictus* (Pocock, 1898) (triangles), darker contour indicates increase of altitudinal gradient.

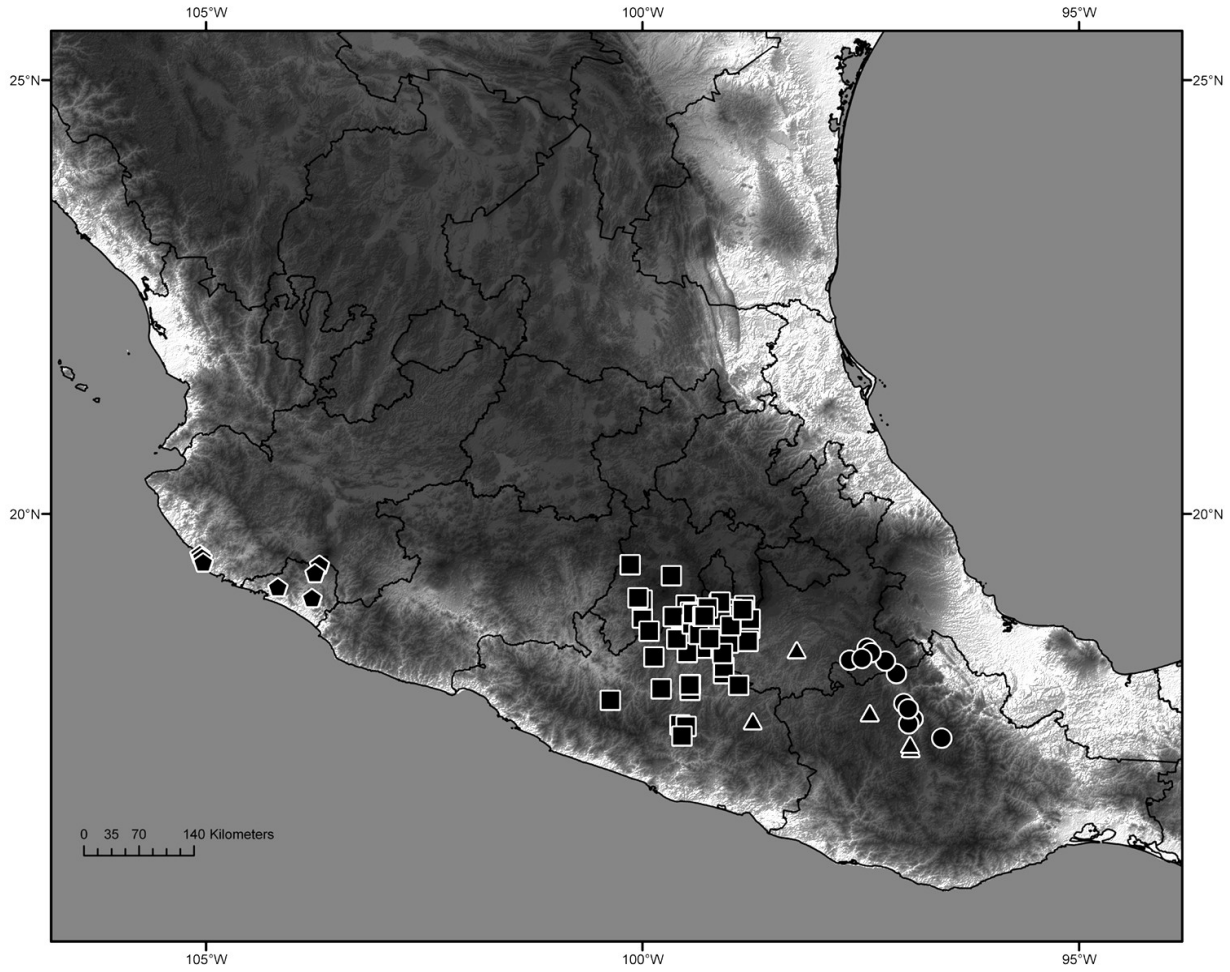


Figure 229. Map of Mexico, plotting known locality records for four species in the vaejovid scorpion genus *Mesomexovis* González-Santillán and Prendini, in prep., based on data collected in the present study: *Mesomexovis variegatus* (Pocock, 1898) (squares), *Mesomexovis tlayoli*, **n. sp.** (triangles), *Mesomexovis subcristatus* (Pocock, 1898) (circles), *Mesomexovis caxcan*, **n. sp.** (pentagons), darker contour indicates increase of altitudinal gradient.

Mesomexovis atenango (Francke and González-Santillán, 2007)

Figures 226, 230–232, 281A, 286A, 290A, 293A, 296A, 299A, 302A

Vaejovis atenango Francke and González-Santillán, 2007: 587–591, figs. 1–6; Quijano-Ravell et al., 2011: 133, 134.

Kochius atenango: Soleglad and Fet, 2008: 31, 35, 66, 73, 92–94.

TYPE MATERIAL: **MEXICO: Guerrero:** *Municipio de Atenango del Río*: Holotype ♂ (IBUNAM), 15 km N of Atenango del Río, 18'07.548'N, 99005.393'W, 651 m, 17.viii.2000, M. Capes, O. Delgado, O. Francke, and E. González. Paratypes: *Municipio de Huitzuco de los Figueroa*: 2 ♂, 1 ♀, 3 juv. ♀, 10 juv. ♂, same data as holotype; 1 ♂, Puente Mezcala Solidaridad, mirador, 17°55'36.96"N 99°22'23.22"W, 1054 m, 25.viii.2002; 1 ♀, La Cubetera, 21.vi.1964. **Morelos:** *Municipio de Jiutepec*: 1 ♂ (IBUNAM), Unidad Progreso, Jiutepec, 18°52.800′N, 99°90.000′W, 1330 m, 2.viii.2003; 1 ♂ (IBUNAM), Cerro La Quebrada, Cañon de Lobos, Carretera Jiutepec-Cuautla 18°50.4'N 99°8.4'W, 1540 m, M. Córdova; 1 ♂ (IBUNAM), La Cubetera, Valerio Trujano, 17°56'29.85"N 99°35'29.14"W, 500 m.

DIAGNOSIS: *Mesomexovis atenango* is the basal monophyletic group of this genus. It is distinguished from the other species by having ventral submedian carinae of metasomal segments II–III, instead of obsolete, costate, or partially granular in the other species. *M. atenango* is closely related to *M. caxcan*, **n. sp.**, *M. occidentalis*, and *M. oaxaca*, which form its sister monophyletic group. *M. atenango* differs from these species by having proximal notch and median lobe of pedipalp fixed finger weaker than these species, subaculear tubercle absent and three pairs of macrosetae on distal margin of carapace. From *M. oaxaca* differs by having slender pedipalp chelae, ventral submedian carinae of metasomal segments I–IV finely granular, telson

relatively elongated and four or five macrosetae on distal margin of carapace; instead of having incrassate pedipalp chelae, obsolete ventral submedian carinae on segments I–IV, and globose telson. From *M. occidentalis* and *M. caxcan*, **n. sp.** differs by having ventral surface of telson smooth, instead of scattered coarsely granular. From *M. occidentalis* differs by having ventral median, prolateral median and ventral retrolateral carinae of pedipalp chelae finely granular, instead of weakly crenular to smooth costate. *M. caxcan*, **n. sp.** differs from *M. atenango* by having these same carinae obsolete or moderately costate in the case of ventral retrolateral carinae.

DESCRIPTION: The following description supplements Francke and González-Santillán's (2007) original description. It is based on paratypes and freshly collected listed in material examined.

Color and infuscation (In alcohol): Base color of the pedipalps, chelicerae, legs and metasoma yellowish; carapace and tergites with faint dusky longitudinal stripes, restricted to median surface. Fingers of the pedipalp chelae yellowish orange. Aculeus reddish.

Carapace: Carapace 1.2 longer than anterior wide. Anterior margin emarginated with moderate median notch and with three pairs of macrosetae. Entire surface shagreened, with dense minute and moderately large granules, moderate granules scatter and less abundant on lateral surface. Median ocular tubercle moderately rose. Superciliary carinae moderate and strongly crenulated, median eyes slightly higher than superciliary carinae. Medina ocular tubercle positioned on distal third of carapace. Three pairs of lateral eyes, first anterior pair slightly larger than second posterior and third posterior reduced half size of first anterior pair. Median eyes approximately three times the size of lateral anterior pair. Anteromedian, posteromedian and posterolateral sulci deep, posterior transverse obsolete.

Sternum and coxal region: Sternum pentagonal subequilateral, wider than long with four pairs of setae, surface matte, median notch deep. Coxae surface moderately matte. Anterior margin of coxa II with three oblique slit-like structures, adjacent to a low granulate protuberance, the rest of the margin with moderate scattered crenatoserrations. Base of coxal endite II with a deep depression each. Coxa IV 2.07 times longer than coxa II.

Chelicerae: Dorsal surface smooth, subdistal margin of manus with one macrosetae. Distal margin costate and base of fixed finger with one to three minute granules. Serrula present on ventral distal half of movable finger, tines numbering 14.

Pedipalps: Trichobothrial pattern Type C, orthobothriotaxic. Pedipalp segment ratio length/wide, femur 3.1, patella 2.9, chela 3.3. Pedipalp wider than patella, patella wider than femur. Femur: Intercarinal surfaces matte with scattered moderate granules. Dorsal prolateral, dorsal retrolateral, and ventral prolateral carinae crenatoserrate, retrolateral dorsosubmedian vestigial mostly smooth with six or seven weak crenulations and five macrosetae; retrolateral ventral vestigial, expressed by few proximal moderate subserrate granules; ventral median vestigial, expressed as a short proximal row of moderate granules; ventral retrosubmedian vestigial expressed by few scattered proximal low crenulations; prolateral ventrosubmedian vestigial, expressed by a proximal bicuspid granule adjacent to trichobothrium *i*, positioned at proximal mid surface followed by a four or five irregular, enlarged, and conical granules, median and distal each with a macroseta at base; prolateral ventral vestigial, expressed by one proximal macroseta adjacent to two or three enlarged conical proximal granules, followed by two median moderate granules each with a macroseta at base; prolateral ventrosubmedian and prolateral ventral carinae parallel.

Patella: All intercarinal surface matte. Dorsal prolateral and ventral prolateral complete, strongly crenulated; dorsal retrolateral and ventral retrosubmedian complete, strong but weakly crenular; ventral median vestigial, expressed by few proximal moderate granules; prolateral median on a vaulted projection protruding strongly medially, expressed by a proximal tubercle with a macroseta on top and a row of coarse conical granules, the row has a median macrosetae and ends by the level of trichobothrium *d*, followed by a gap of smooth surface and ending on a distal macrosetae following a curve, slanting dorsally almost reaching dorsal prolateral carinae on distal fifth; prolateral ventral obsolete, expressed by three macrosetae, one proximal on the top of a moderate tubercle, one median and one distal, these adjacent to ventral prolateral carinae.

Chela: Manus smooth and relatively elongate (manus 1.45 times longer than fixed finger). Dorsal median, dorsal prolateral, dorsal retrolateral, ventral prolateral, and prolateral median smooth and moderately costate; ventral retrolateral partial costate and weakly crenular ending at the level of trichobothrium *Est*; all other carinae obsolete. Trichobothrium *Db* positioned on dorsal retrolateral carina, subbasal on chelae; *Dt* positioned close to mid manus but on the proximal half.

Fingers: Fixed finger, PD = 6, MD rows = 5, RD = 5, proximal RD positioned by mid finger. All retrolateral denticles subpaired with corresponding prolateral denticles. Movable finger, PD = 7, MD rows = 6, distal row bearing one minute granule, RD = 6, proximal RD positioned slightly proximal to mid finger. All retrolateral denticles subpaired with corresponding prolateral denticles. Trichobothria *ib* and *it* positioned subbasal on fixed finger, *ib* positioned between PD6 and PD7, PD7 lacking granule, in and *it* at the level of PD6; Fingers with moderate scalloping in ♂, proximal notch and medina lobe of fixed finger moderate;

proximal notch and medina lobe of movable finger weak, gap created when fingers closed strong, fingers fit unevenly; in ♀ fingers with weak scalloping, proximal notch and medina lobe of fixed and movable fingers weak, gap created when fingers closed weak, fingers fit unevenly.

Legs: Basitarsi I–II prolateral ventral retrolateral ventral and retrolateral dorsal carinae with complete rows of spinules, prolateral ventral in III and IV absent; retrolateral ventral in III complete, in IV absent, retrolateral dorsal in III partial expressed on distal half, in IV vestigial expressed on distal end by few scatter spinules; retrolateral median rows in I–IV vestigial expressed as few terminal spinules. Telotarsi I–IV with two or three pairs of ventrodistal spinules in I–IV. Setae: Prolateral ventral, 2:3:4:4, median two IV stout; retrolateral ventral, 4:7:7:7; retrolateral dorsal, 2:3:3:4; dorsal, 3:4:4:3; retrolateral dorsal and dorsal series separate in two independent rows, forming a setal combs, having dorsal median offset the row, retrolateral dorsal and dorsal series visibly thinner and longer than other series in ♀, in ♂ relatively shorter and stouter.

Tergites: Pretergites matte, postergites shagreened, scattered coarse and minute granulation, being moderate granules restricted to a band of proximal distal. Tergites I–VI ventral median and ventral submedian carinae moderate, expressed by a distal costa and few moderate distal granules. Tergite VII with intercarinal surfaces weakly shagreened with few scattered coarse granules, intercarinal surface between; dorsal median carina moderately costate expressed on proximal half of the postergite with few scattered granules; dorsal submedian vestigial expressed as a low short oblique proximal short protuberance with few low subserrate granules; dorsal lateral and lateral supramedian moderate becoming stronger distally, ending in a enlarge spiniform granule; dorsal lateral carinae projecting and curving laterally approximating to lateral supramedian distal margin, creating a semi ring of serrated granulation.

Genital operculum: Male genital operculum: wider than long, with two pairs of macrosetae. Sclerites free on longitudinal edge moving independently but unable to open more than 45°. Genital papillae protruding posteriorly. Female genital operculum: Wider than long, with three macrosetae. Sclerites fuse longitudinal.

Sternites: Sternites I–VII matte in ♂, in ♀ finely punctuated and lustrous. Sternite V with distal median glandular spot weak to moderate, not protruding from adjacent surface, expressed as a whitish moderate band, contrasting weakly to moderate with pale base color in ♂, in ♀ vestigial. Sternite VII ventral lateral carinae complete, moderate, finely crenatoserrate, other carinae obsolete expressed by two or three macrosetae. Distomedian glandular spot obsolete. Spiracle elongated, slit-like, approximately two times longer than wide.

Pectines: Pectines longer than distal edge of coxa IV in ♂, in ♀ at the level of distal edge of coxa IV. Basal piece with median notch deep. Marginal lamella consist of three sclerites, medial lamella proximally fuse distally progressively forming conspicuous 11 beads. Fulcra with 15–18 in ♂, 12–14 in ♀ beads. Pectinal tooth count16–19 in ♂, 13–15 in ♀.

Hemispermatophore: Lamina 2.33 longer than trunk. Dorsal through margin short, wide tapering and curving proximally, moderately removed from ventral trough. Hemimating plug developed from the inner lobe, distal barb margin with 14 elongated spinules. Primary and secondary hook positioned on the apex of lateral margin extension of the lamina (flange). Both hooks short and low, separated slightly, forming a shallow notch. Median lobe ental terminus moderate and rounded. Basal plate of inner lobe adjacent to ventral trough. Spine of inner lobe relatively long and strongly sclerotized, secondary spine on ventromedian aspect of neck absent. Neck relatively short (0.44 times longer than basal plate). Measurements, lamina, 4.20; trunk,

1.80; dorsal trough/laminar hooks, 1.50; ventral trough/laminar hook, 1.08; neck, 0.24; basal plate, 0.54.

Metasoma: Segments I–V progressively slender. Segment ratios length/wide, I, 1.00, II, 1.2, III, 1.4, IV, 1.7, V, 2.8. Dorsal lateral and lateral median carinae I–IV strong and irregularly serrated, terminus with a moderate spiniform projection, V strongly granular, serrated on distal third. Lateral inframedian I, complete strong, and crenatoserrated, on II present on distal fourth finely crenatoserrated, on III present as few distal granules, on IV absent, on V present on proximal half serrated; ventral lateral carinae I–V complete, strong, and crenatoserrated; ventral submedian on I costate and smooth, on II costate and smooth in proximal two thirds and serrate in distal third, on III costate and smooth in distal half and crenatoserrated distally, on IV strong crenulate to serrate; ventral median V, complete strong and serrate. Setae: Dorsal lateral, 1:2:3:3:6; lateral median, 0:2:2:4; lateral inframedian, 1:0:0:0:4; ventral lateral, 2:2:2:3:7; ventral submedian, 3:3:3:3:5; ventral sublateral, 2.

Telson: Telson vesicle 2.31 times longer than wide. Metasomal segment V 0.9 times wider than telson. Vesicle 1.96 times longer than aculeus. Dorsal and ventral surface smooth. Ventral surface with four to five macrosetae in each carina. Ventral median carinae with subaculear tubercle obsolete. Microserration on laterobasal aculeus numbering 4–6.

DISTRIBUTION: *Mesomexovis atenango* is endemic to the upper eastern drainage of the Balsas Depression and has been recorded in the states of Morelos and Guerrero, Mexico.

ECOLOGY: *Mesomexovis atenango* inhabits tropical deciduous forest at altitudes from 500 to 1540 m. Morphologically, this species shows a lapidicolous ecomorphotype because it lacks strong tarsal armature and crab-like chelae, and cannot be consider lithophilous because it lacks attenuation of appendices and dorso-ventral compression of the mesosoma. *M. atenango* was

collected at night using ultraviolet detection and during the day by rolling rocks. According to the original description (Francke and González-Santillán, 2007), adult males at the type locality attain sexual maturity at different stages of development, which was evidenced by dissecting hemispermatophore from individuals of different stage of development. This species is the least common among the assemblage of five sympatric species collected in the type locality: *Centruroides limpidus* (Karsch, 1879), *Diplocentrus coylei* Fritts and Sissom, 1996, *Hadrurus gertschi* Soleglad, 1976, and *Mesomexovis variegatus* (Pocock, 1898) (pers. obs.).

REMARKS: Francke and González-Santillán, 2007 assigned *M. atenango* to the *punctipalpi* group of *Vaejovis* based on the fine granulation of carinae ventral lateral I–IV and ventral submedian II–IV of the metasoma and the crenular of some carinae of pedipalp chelae. This relationship was further accepted by Soleglad and Fet (2008), who placed this species in the genus *Kochius*. The results of the phylogenetic analyses conducted in chapter 1 and 4 reject this hypothesis and instead place *M. atenango* within the monophyletic genus *Mesomexovis*. Francke and González-Santillán, (2007) proposed that the genus *Hadrurus* Thorell, 1876 and the *punctipalpi* group of *Vaejovis*, represented by *M. atenango*, exhibit a similar disjoint distribution with species of each group isolated in the Baja California Peninsula and in the Balsas Depression. This hypothetical parallelism is also rejected because *M. atenango* does not belong to the genus *Kochius*.

MATERIAL EXAMINED: **MEXICO: Guerrero:** *Municipio de Ahuelicán*: Ahuelicán, 2 km W, Cerro de La Coronilla, 18°0.9768'N 99°31.72'W, 853 m, 30.i.2009, A. Valdez, O. Francke, R. Paredes, S. Soriano, and T. López, 1 subad. ♀ (AMNH [LP 9982]). *Municipio de Atenango del Río*: Atenango del Río, [18°9.5158'N 99°4.1623'W], 17.viii.2000, E. González, O. Delgado, M. Capes, and O. Francke, 1 juv. (AMNH [LP 2023]). *Municipio de Copalillo*: Totonimitla,

Papalutla, 18°1.4700'N 98°53.8092'W, 650 m, 28.i.2011, U. Lonjino and J. Mendez, 4 ♂, 2 ♀ (IBUNAM). *Municipio de Eduardo Neri*: Plan de Libres, 1 km S, 17°52.3416'N 99°34.7736'W, 557 m, tropical dry forest, 1 ♂, 1 ♀ (IBUNAM). *Municipio de Mezcala*: Milpillas, 17°48'N 99°33'W, 1 ♀, 1 juv. (IBUNAM). *Municipio de Papalutla*: Totonimitla, Copalillo, 18°1.4700'N 98°53.8092'W, 650 m, 28.i.2011, U. Lonjino and J. Mendoza, 4 ♂, 2 ♀ (AMNH). *Municipio de Tepecoacuilco de Trujano*: Ahuehuepan, 2 km S, 18°0.9108'N 99°31.40'W, 867 m, 17.vi.2011, O. Francke et al., 1 ♀ (IBUNAM); Ahuehuepan, 2 km W, 18°00.911'N 99°31.407'W, 867 m, 14.vi.2007, O. Francke and J. Ponce, 1 subad. ♂ (AMNH [LP 7058]), 18°0.9108'N 99°31.40'W, 15.vi.2011, 1 ♂, (IBUNAM); Cerro de La Coronilla, 18°0.9756'N 99°31.7256'W, 844 m, 28.vi.2012, O. Francke et al., 2 ♀ 1 juv. (IBUNAM), O. Francke, A. Quijano, and C. Santibáñez, 27.vi.2008, 2 ♀ (AMNH); Cerro de La Coronilla, 3.4 km NE Ahuehuepan, 18°0'57"N 99°31'32"W, 857 m, A. Valdez, T. López, and C. Quijano, 2 ♀ (AMNH); Xalitla, 18°0.163'N 99°32.370'W, 580 m, 18.vi.2011, O. Francke, J. Ponce, M. Córdova, H. Montaño, and A. Ballesteros, 1 juv. (IBUNAM). **Morelos:** Unidad Progreso, Jiutepec, 18°52.800'N, 99°90.000'W, 1330 m, 2.viii.2003, M. Córdova, A. Jaimes, and A. Villalba 1 ♂, (IBUNAM); Colonia Miraflores, Jiutepec, 18°52.800'N, 99°90.000'W, 1330 m, 26vi.2005, M. Córdova 1 juv., (IBUNAM).

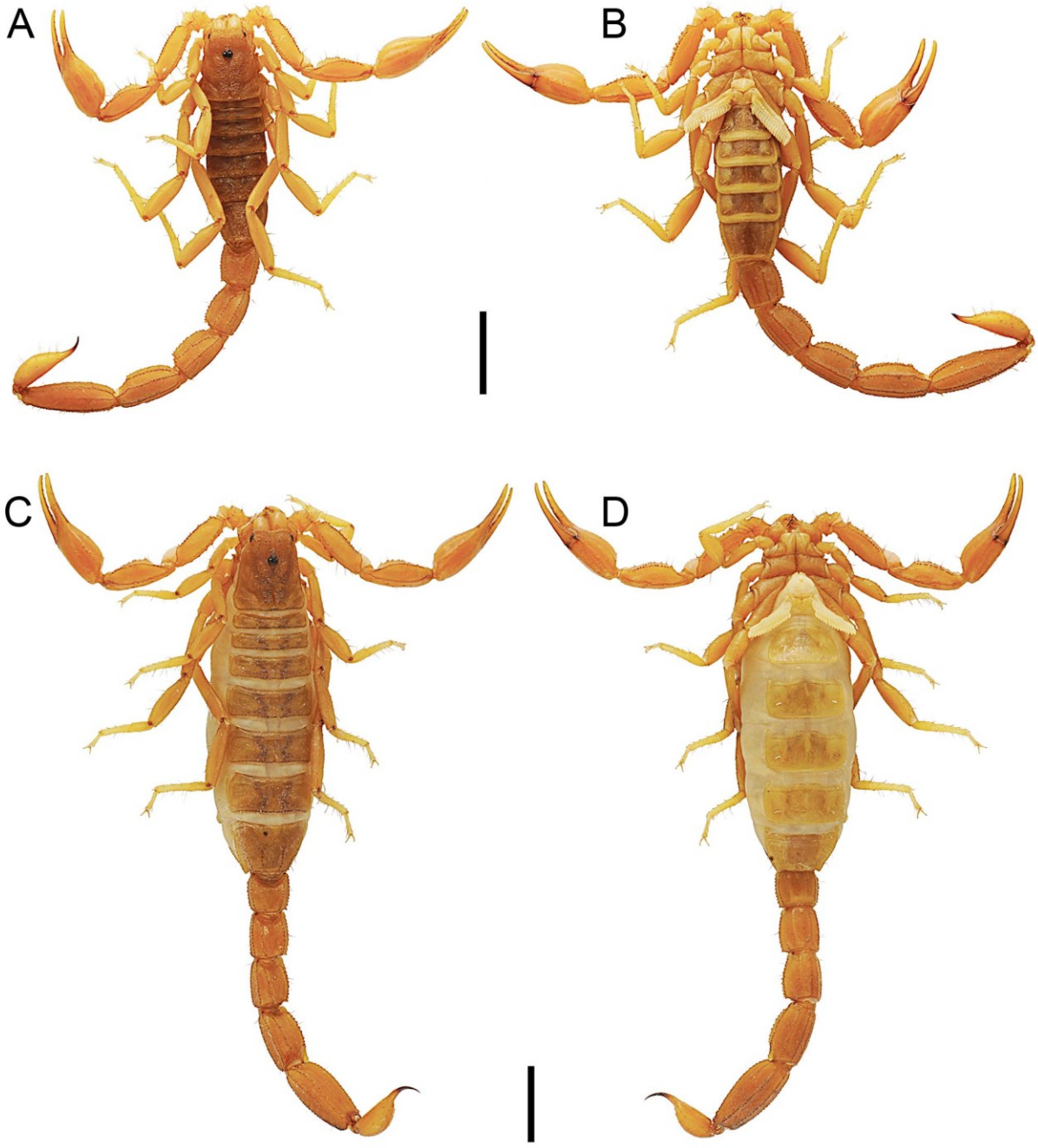


Figure 230. *Mesomexovis atenango* (Francke and González-Santillán, 2007), habitus. **A**, **B**. ♂ (IBUNAM). **C**, **D**. ♀ (IBUNAM). **A**, **C**. Dorsal aspect. **B**, **D**. Ventral aspect. Scale bars = 5 mm.

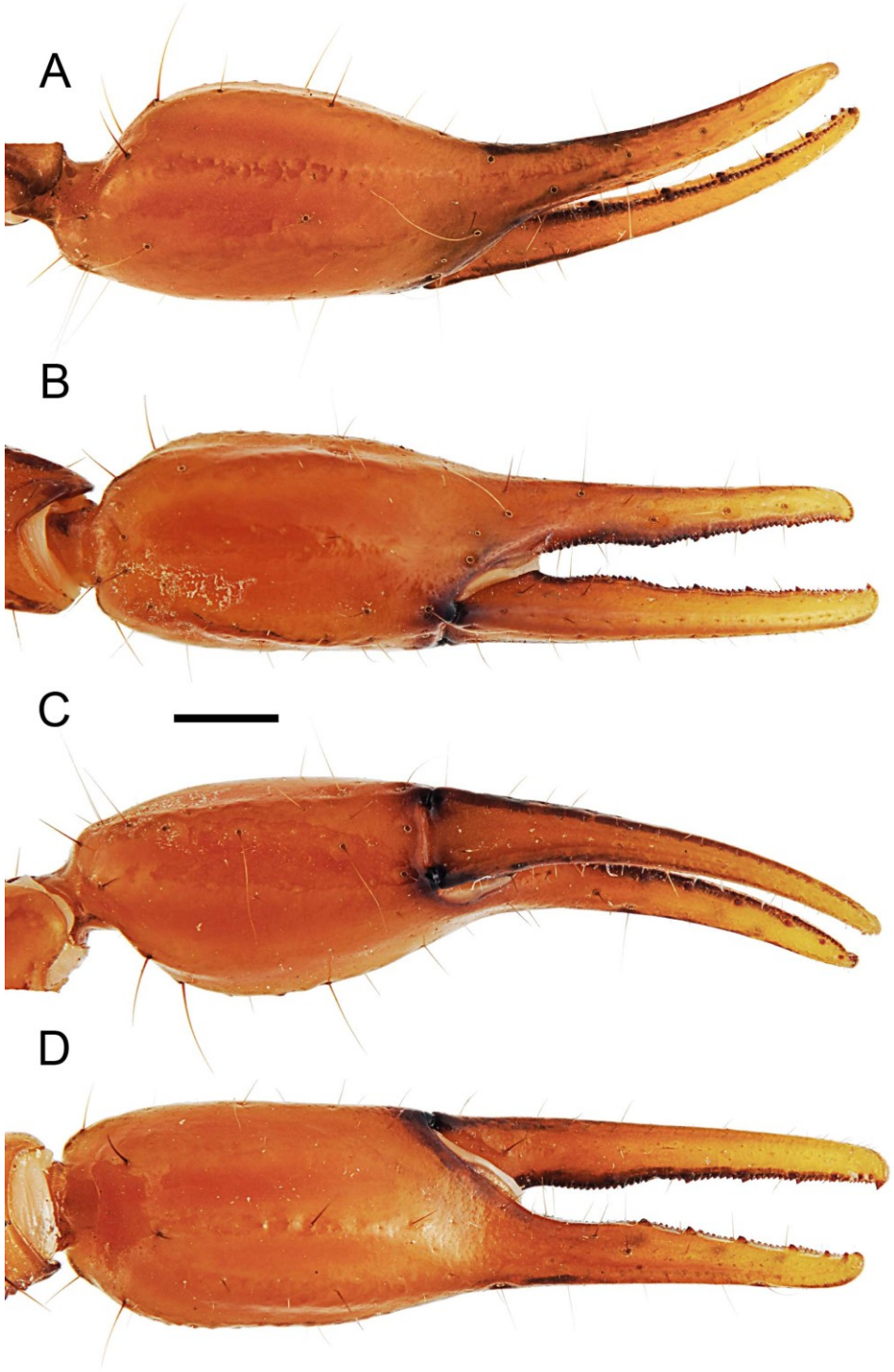


Figure 231. *Mesomexovis atenango* (Francke and González-Santillán, 2007), ♂ (IBUNAM), dextral pedipalp chela. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

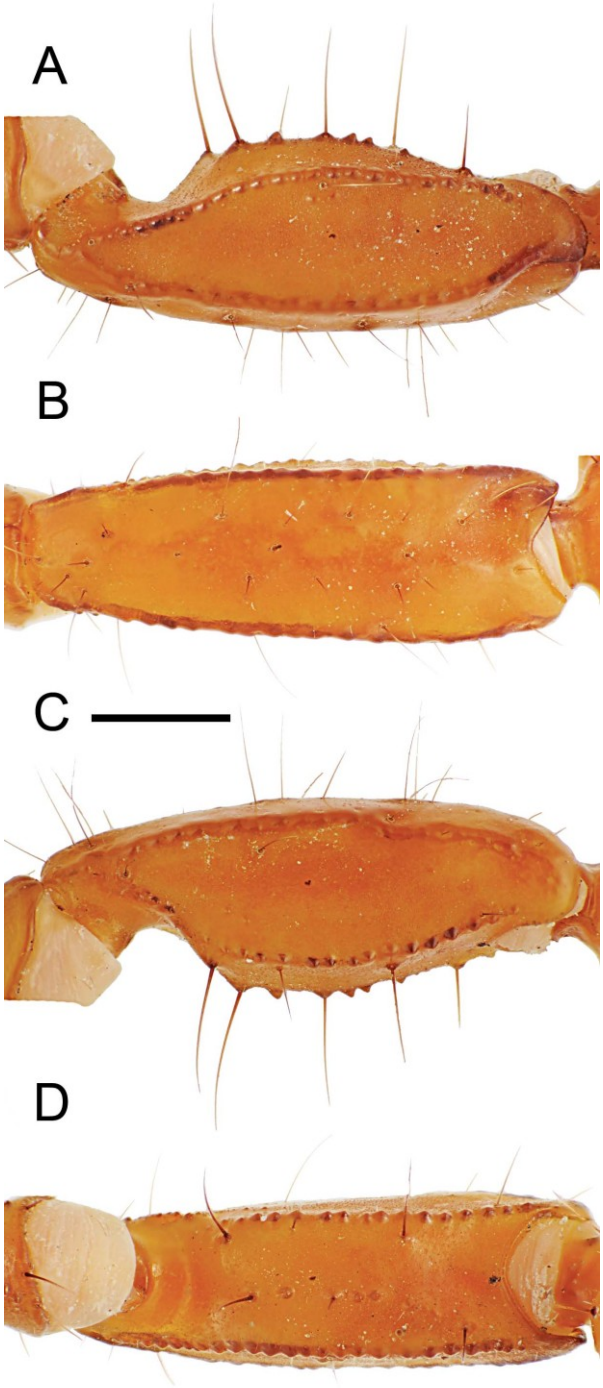


Figure 232. *Mesomexovis atenango* (Francke and González-Santillán, 2007), ♂ (IBUNAM), dextral pedipalp patella. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

Mesomexovis caxcan, **n. sp.**

Figures 229, 233–235, 281B, 287C, 290B, 293B, 296B, 299B, 302B; Table 14

TYPE MATERIAL: **MEXICO: Jalisco:** *Municipio de La Huerta*: Holotype ♂ (IBUNAM) Estación Biológica Chamela, UNAM, Sendero Calandria, 19.50501°N 105.03826°W, 95 m, G. Montiel, R. Paredes, D. Barrales, and G. Contreras. Paratype 1 ♀ (IBUNAM) same locality as holotype.

ETYMOLOGY: The species name *caxcan* is derived from the name of one of the original nomadic group of Chichimeca peoples that occupied the arid land of northern Mexico. The name is a noun in apposition.

DIAGNOSIS: *Mesomexovis caxcan*, **n. sp.** is closely related to *M. occidentalis* and *M. oaxaca*, with which it forms a monophyletic group. These species can be distinguished from the other species in the genus by having the strongest proximal notch and medial lobe of the pedipalp, except for *M. ofeliae*, **n. sp.** and *M. zaragozai*, **n. sp.**, members of another monophyletic group. *M. caxcan*, **n. sp.** may be distinguished from *M. occidentalis* by having carinae of pedipalp chelae obsolete to costate, instead of having dorsal prolateral, dorsal median, prolateral median and ventral retrolateral carinae finely granular, *M. occidentalis* also has posteromedian surface, glandular area of sternite V more developed than *M. caxcan*, **n. sp.** From *M. oaxaca* differs by having ventral lateral carinae of metasomal segments I–IV granular and ventral submedian carinae of segments I–IV costate to granular, instead of having ventral lateral carinae of metasomal segments I–IV costate and ventral submedian carinae of segments I–IV obsolete. *M. oaxaca* also has the telson globose instead of relatively elongated.

DESCRIPTION: The following description is based on types and the specimens listed in material examined.

Color and infuscation (In alcohol): Base color yellow to orange, carapace, tergites and prolateral surface of legs femur, patella, tibia and tarsi infuscate with dusky markings. Pedipalp femur and patella with dorsal, prolateral and retrolateral carinae outlined with diffuse infuscation. Pedipalp chelae with all carinae moderately infuscate. Pectines and genital operculum whitish. Dorsal medina and dorsal submedian carinae in I–VI outlined with intense infuscation. Sternite VII with base of setae on ventral submedian and ventral lateral intensely infuscate, weakly converging in ventral submedian. Ventral lateral and ventral submedian carinae of metasomal segments I–IV and ventral lateral and ventral median of V outlined with intense infuscation. Ventral surface of telson infuscate with two lateral broad and a median longitudinal bands with dusky markings.

Carapace: Carapace sublinear, with a vestigial to obsolete median notch. Entire surface shagreened, minute and moderately large granules combine over most of the surface. Anterior edge with five pairs of major and minor lateral macrosetae and a median macrosetae. Anteromedian, posteromedian, and posterolateral sulci moderate, posterior transverse obsolete. Median ocular tubercle moderately raised, with superciliary carinae smooth, higher than median eyes. Median ocular tubercle positioned on distal half of carapace. Median eyes approximately double size of lateral frontal pair. Three lateral eyes, two frontal pairs same size and posterior reduced approximately in half.

Sternum and coxal region: Sternum pentagonal subequilateral with four pairs of setae, one distal, two median pairs and one pair on the lobes, median notch deep. Anterior margin of coxa II with two oblique slit-like structures, adjacent to a strong and crenular protuberance.

Proximal median margin of coxapophysis II with a deep depression each. Coxa IV 2.03 times longer than coxa II.

Chelicerae: Dorsal surface smooth, dentition of fixed and movable fingers as in typical Syntropinae. Subdistal margin of manus with one median macrosetae, distal margin with costate carinae and base of finger with low crenulation. Serrula with 14 tines.

Pedipalps: Trichobothrial pattern Type C, orthobothriotaxic. Pedipalp segment ratio length/wide, femur 3.8, patella 3.1, chela 6.2. Pedipalp chela moderate, wider than patella, patella wider than femur. Femur: Intercarinal surfaces matte, dorsal and ventral surface with scattered minute to moderate median granules. Dorsal prolateral, dorsal retrolateral, and ventral prolateral carinae moderately granular; retrolateral dorsosubmedian obsolete, smooth with five major macrosetae, distal one reduced, prolateral ventrosubmedian vestigial with an enlarged proximal tubercle positioned at mid surface and four or five moderate to enlarge rounded granules, subdistal, median and distal with a macroseta at the base, the row slanting gently towards median portion of dorsal prolateral carinae; prolateral ventral vestigial, expressed by a proximal tubercle with a macroseta at base and two enlarged rounded granules with a macroseta at base; intercarinal surface between prolateral ventral and ventral prolateral with a row of three macrosetae, first two basal minor, distal major; ventral median and retrolateral ventral vestigial expressed by scattered serrated granules; ventral retrosubmedian vestigial, expressed by irregular granules, present on proximal half.

Patella: All intercarinal surfaces matte. Dorsal prolateral and ventral prolateral complete, moderately granular; dorsal retrolateral and ventral retrosubmedian complete moderately crenulated to smooth; ventral median vestigial expressed as a short proximal row of minute granules; retrolateral dorsosubmedian and retrolateral median carinae obsolete, expressed by

bands of infuscation and a weak median costa; prolateral median complete on a moderate vaulted projection, protruding strongly medially, extending from a proximal tubercle with a major macroseta on top and a five to six coarse subserrated granules, median one with a macroseta on base, the row slanting gently at the level of trichobothrium d_2 towards dorsal prolateral carinae, followed by a gap of smooth surface and ending on one distal major macrosetae, positioned on the distal fifth of dorsal prolateral carinae; prolateral ventral obsolete expressed by a row of three major macrosetae and two intersperse minor macrosetae. Proximal major macrosetae on the top of a low granule.

Chelae: Pedipalp manus moderate and relatively slender (manus 1.18 times longer than fixed finger). Intercarinal surface smooth. Dorsal median, dorsal retrolateral, dorsal prolateral, and prolateral median complete finely crenulated; ventral retrolateral incomplete moderately crenulated, ending by the level of trichobothrium *Est*; ventral median weakly crenular; ventral prolateral moderately costate and weakly matte. Trichobothrium *Db* positioned on dorsal retrolateral carina, subbasal on chelae; *Dt* positioned close to mid manus but on the proximal half.

Fingers: Fixed finger dentition: PD = 6 and RD = 6, MD rows = 6, proximal RD positioned by proximal third. All RD subpaired with corresponding PD. Movable finger PD = 7, RD = 7, MD rows = 7, distal row of one to three denticles missing. Proximal RD positioned by proximal third. Trichobothria *ib* and *it* positioned submedian on fixed finger, in ♂ *ib* positioned adjacent to PD6 and *it* between PD5 and PD6, in ♀ *ib* between PD6 and PD7, PD7 lacking granule and *it* adjacent to PD6. Fingers with moderate to strong scalloping, in ♂ proximal notch of fixed finger strong and medina lobe moderate, proximal notch of movable finger weak and medina lobe moderate, gap created when fingers closed strong fingers fit unevenly, in ♀

proximal notch of fixed finger strong and medina lobe moderate fingers and proximal notch of movable finger obsolete and medina lobe moderate lacking scalloping, gap created when fingers closed weak.

Legs: Basitarsi I–III prolateral ventral, retrolateral ventral and retrolateral dorsal carinae with complete rows of spinules, prolateral ventral in III partial expressed on distal half by scattered spinules, in IV absent; retrolateral ventral in III complete expressed by scattered spinules, in IV absent, retrolateral dorsal in partial, IV vestigial expressed on distal two thirds; retrolateral median rows in I–IV absent. Telotarsi I–IV with two pairs of ventrodistal spinules in I–IV. Setae: Prolateral ventral, 3:4:5:5, median two in III and IV stout; retrolateral ventral, 4:7:8:8; retrolateral ventral, 2:3:3:3; retrolateral dorsal, 3:3:3:3; dorsal, 4:4:4:4; retrolateral dorsal and dorsal series arranged in two independent rows.

Tergites: Pretergites smooth, postergites weakly shagreened, distally matte and proximally shagreened. Tergites I–VI dorsal median and ventral submedian carinae vestigial, expressed by few moderate or minute distal granules. Tergite VII with intercarinal surfaces shagreened; dorsal median carina moderately costate expressed on proximal half of the postergite; dorsal submedian vestigial expressed as a low short oblique proximal short protuberance; dorsal lateral and lateral supramedian strong, distally becoming slightly strong; dorsal lateral carinae projecting and curving laterally approximating to lateral supramedian distal margin, creating a semi ring of strong serrated granulation.

Genital operculum: Male genital operculum: wider than long, with three pairs of macrosetae. Sclerites free on longitudinal edge moving independently but unable to open more than 45°. Genital papillae protruding posteriorly. Female genital operculum: Wider than long, with three macrosetae. Sclerites fuse longitudinal.

Sternites: Sternites I–VI smooth, matte in ♂, in ♀ finely punctuated, and lustrous. Sternite V with distal median glandular spot moderate, not protruding from adjacent surface but whitish, contrasting moderately with darker base color. Sternite VII matte laterally and punctuated smooth ventrally; ventral lateral carinae partial, moderately crenular, expressed on median third; ventral submedian obsolete expressed by three pairs of macrosetae. Distomedian glandular spot weak, weakly protruding from adjacent surface, in ♂, in ♀ obsolete. Spiracle elongated, slit-like, approximately three times longer than wide.

Pectines: Pectines longer than distal edge of coxa IV in ♂, in ♀ at the level of distal edge of coxa IV. Basal piece with median notch deep. Marginal lamella consist of three sclerites, medial lamella proximally fuse distally progressively forming conspicuous 15 beads. Fulcra with 19–21 in ♂, 17–20 in ♀ beads. Pectinal tooth count 20–22 in ♂, 18–21 in ♀.

Hemispermatophore: Lamina 1.9 longer than trunk. Dorsal through margin short, wide tapering and curving proximally, and moderately removed from ventral trough. Hemimating plug developed from the inner lobe, distal barb margin with 14 elongated spinules. Primary and secondary hook positioned on the apex of lateral margin extension of the lamina (flange). Both hooks short and low, separated slightly, forming a shallow notch. Median lobe ental terminus moderate and rounded. Basal plate of inner lobe adjacent to ventral trough. Spine of inner lobe relatively long and strongly sclerotized, secondary spine on ventromedian aspect of neck weaker. Neck relatively long (0.75 times longer than basal plate). Measurements, lamina, 3.42; trunk, 1.80; dorsal trough/laminar hooks, 0.90; ventral trough/laminar hook, 0.48; neck, 0.54; basal plate, 0.72.

Metasoma: Dorsal and lateral intercarinal surface in I–V shagreened, ventral surface of metasomal segment I–IV matte. Ventral surface of metasomal segment V shagreened with coarse

and dense granules on distal third. Metasoma 1.76 times longer than mesosoma. Metasomal segments I–II wider than long. Carinae: Dorsal lateral and lateral median carinae in I–IV moderately crenatoserrated terminating in moderate enlarge spinoid granules pointing backwards; except lateral median in IV distal terminus moderately expanded or flared laterally forming a triangular projection; dorsal lateral in V proximally third strongly serrated, becoming weaker and crenulated with irregular clusters of crenulations medially, becoming moniliform distally. Lateral inframedian in I complete crenatoserrated; in II and III incomplete crenatoserrated, becoming weaker proximally, present in distal third; in VI absent, in V proximally strongly crenatoserrated, becoming weaker distally, present in proximal half; ventral lateral in I–V strongly crenatoserrate; ventral submedian in I costate and smooth, in II costate and smooth on proximal third and weakly crenular on distal third, in III weakly costate and crenulated; in IV moderately crenatoserrated, ventral median in V strongly crenatoserrate. Setae: Dorsal lateral, 1:3:3:3:5; lateral median, 2:3:3:4; lateral inframedian, 2:1:1:0:5; ventral lateral, 3:4:4:4:10, setae in V positioned laterally to the carinae; ventral submedian, 3:3:3:5:8; ventral sublateral, 2. Two to three accessory minor macrosetae in intercarinal surfaces between ventral submedian carinae in segments III and IV.

Telson: Telson vesicle 2.7 times longer than wide. Metasomal segment V 1.40 times wider than telson. Vesicle 1.70 times longer than aculeus. Dorsal surface smooth, ventral carinae weakly crenulated. Ventral surface with four or five macrosetae in each carina. Ventral median carinae with moderate subaculear tubercle, expressed as a moderate broad tubercle. Microserration on laterobasal aculeus numbering 3–5.

DISTRIBUTION: *Mesomexovis caxcan*, **n. sp.** is endemic to the coast of the states of Colima and Jalisco, Mexico.

ECOLOGY: *Mesomexovis caxcan*, **n. sp.** inhabits tropical dry forest, including tropical deciduous forest and tropical broadleaf forest. This species is lapidicolous, having no evident adaptation to any specific substrate (González-Santillán, 2004). At the Biological Station Chamela, it is commonly found under rocks and rotten logs. It is also easily spotted during the night using ultraviolet detection. *M. caxcan*, **n. sp.** has been recorded from 10 to 1344 m altitude.

REMARKS: Williams (1986) reported four species at the Biological Station Chamela, one being the species described here. In a revision of the species *Vaejovis occidentalis* and *V. subcristatus*, Sissom (1989b) identified a new species related to *M. occidentalis* collected by Williams (1986). Sissom mentioned the marked sexual dimorphism with females considerably larger than males. Subsequently González-Santillán (2004) mentioned this same species as *Vaejovis* aff. *occidentalis* and discussed its habitat. These reports correspond to *M. caxca*, **n. sp.** here described.

MATERIAL EXAMINED: **MEXICO: Colima:** *Municipio de Armeria*: Mina la Salada, NW of Ixtlahuacan, 19°1.6800'N 103°47.0358'W, 275 m, Mine staff, mixed deciduous forest, 3 ex. (AMNH [ARA1176]), 1 ex. (CAS [ARA1841]), 1 ex. (IBUNAM [ARA2005]). *Municipio de Comala*: Comala, [19°19'N 103°45'W], 2.viii.2012, P. Berea, 1 ♀ (IBUNAM); Cofradia de Suchitlan, 19°24.7950'N 103°41.8146'W, 1344 m, 26.v.2006, O. Francke, A. Valdez, H. Montaño, and A. Ballesteros, 1 juv. (AMNH [LP 6571]). *Municipio de Manzanillo*: El Habillal, 3 km E, El Veladero de Camotlán, 6 km from Route 98, along gravel road, 1.viii.2005, 20°21.6738'N 105°8.0166'W, 1863 m, forest, 2 ex. (AMNH [ARA1178]), 500 m, collected at night with UV light, 2 juv. (AMNH [LP 4724]), E. González and R. Mercurio. **Jalisco:** *Municipio de La Huerta*: Bahía de Chamela, [19°32'N 105°4'W], 22.x.2005, L. Olguín, S. Reynaud, and E. González, 5 ♀ (IBUNAM); El Pantanal, 2.ix.1981, 1 ♀ (IBUNAM); Estación

Biológica Chamela: 7.iii.1979, 1 ♂ (IBUNAM), S.C. Williams, 13.vi.1989, 2 ♀ (IBUNAM), J. Guzmán, 29.vii.1993, 1 ♂ (IBUNAM), R. Aandala, 4.ix.1993, 1 ♀ (IBUNAM), 14.x.1997, 1 ♂ (IBUNAM), 23.vii.2002, 1 ♀ (IBUNAM), N. Martijea, 24.viii.1994, 1 ♀ (IBUNAM), E. Ramírez, 22.ix.1994, 1 ♀ (IBUNAM), 10.vi.1995, 1 ♀ (IBUNAM), 13.ix.2005, 1 ♀ (IBUNAM), 24.ix.2005, 1 ♂ (IBUNAM), A. López, 19.vi.1998, 1 ♂ (IBUNAM), A. Rodríguez, 20.ix.1996, 1 ♂ (IBUNAM), 21.vi.1998, 1 ♂ (IBUNAM), 11.xi.2002, 1 ♂ (IBUNAM), A.B. López, 17.ix.1998, tropical dry forest, 4 ♂ (IBUNAM), 13.xi.2002, 1 ♀ (IBUNAM), A.M. Corona, 22.iii.2003, 1 ♀ (IBUNAM), 30.iv.2003, 1 ♂ (IBUNAM), D. Verduzco, 10.ix.2005, 1 ♂ (IBUNAM), 26.ix.2005, 1 ♂ (IBUNAM), E. González, 25.x.2005, 1 ♂ (IBUNAM), O. Delgado, vii.2006, 1 ♀ (IBUNAM), 97 m, 2.viii.2009, 1 ♂ (IBUNAM), O. Francke et al., 19°29.8752'N 105°2.6082'W, 31.viii.2011, 1 ♂, 29 ♀, 29 juv. (IBUNAM), S. Soriano et al., 10 m, 14.v.2012, 2 ♀ (IBUNAM), Candelaria trail, 95 m, 4.x.2010, G. Montiel, R. Paredes, D. Barrales, and G. Contreras, 1 ♂, 1 ♀ (AMNH), Chachalacas trail, 19°29.620'N 105°02.799'W, 17.viii.2005, J.L. Castelo and L. Gutierrez, 1 juv. (AMNH [LP 5271]), Cutzmala, 19°29.875'N 105°02.608'W, 97 m, 30.viii.2007, O. Francke et al., 1 ♀, 1 juv. (AMNH [LP 7672]), Vereda Buho, [19°29.8752'N 105°2.6082'W], 22.x.2005, E. González, tropical dry forest, 1 ♀ (IBUNAM), Vereda Tejón-Eje Central, 19°29.8752'N 105°2.6082'W, 23.x.2005, E. González, tropical dry forest, 2 ♂, 4 ♀ (IBUNAM); Pueblo Careyes, [19°26'26.23"N 105°1'44.11"W], A. Rodríguez, 20.xi.1997, 1 ♀ (IBUNAM), F.A. Noguera and A. Rodriguez, 21.vii.2003, 1 ♀ (IBUNAM).

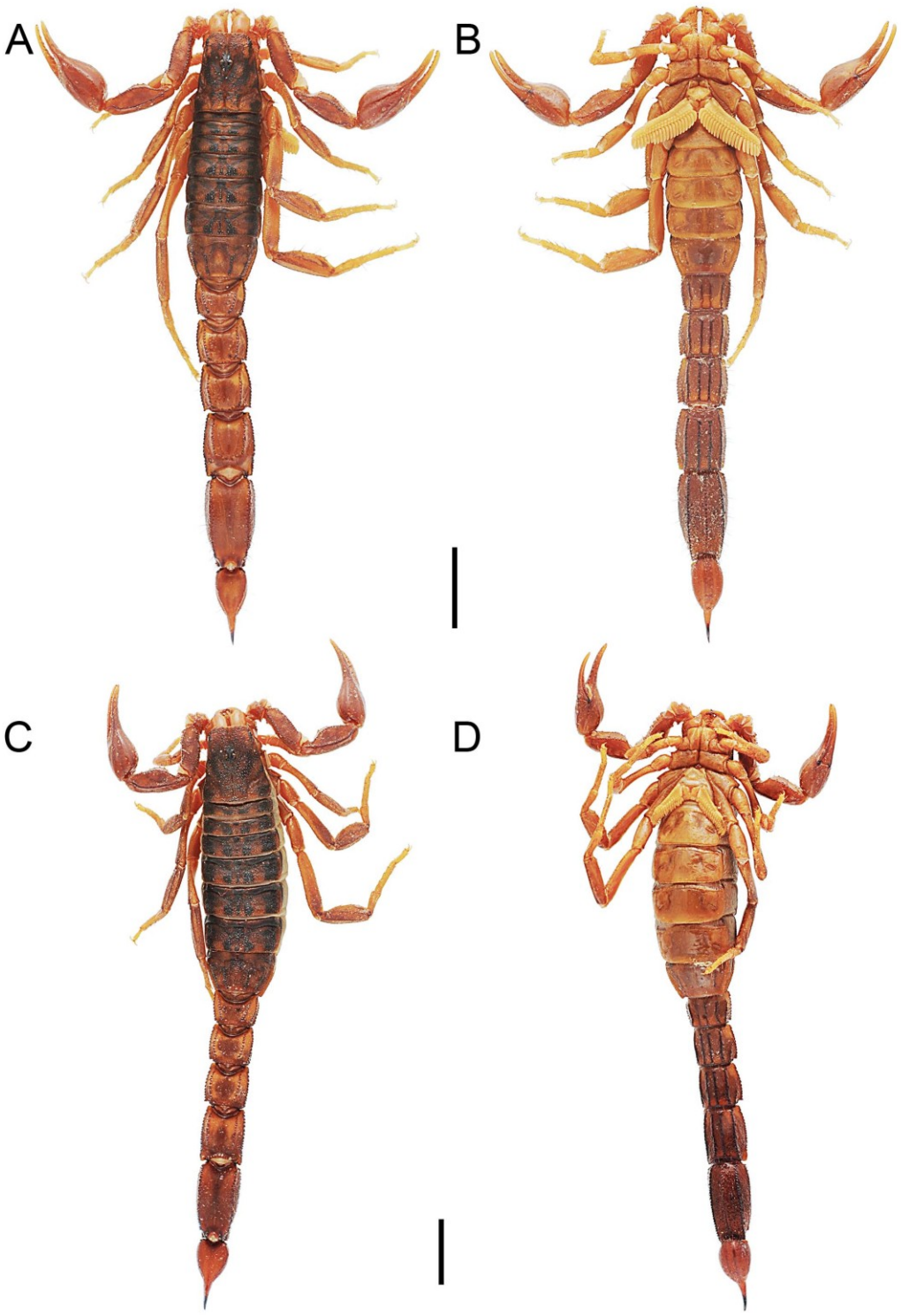


Figure 233. *Mesomexovis caxcan*, **n. sp.**, habitus. **A**, **B**. Holotype ♂ (IBUNAM). **C**, **D**. Paratype ♀ (IBUNAM). **A**, **C**. Dorsal aspect. **B**, **D**. Ventral aspect. Scale bars = 5 mm.

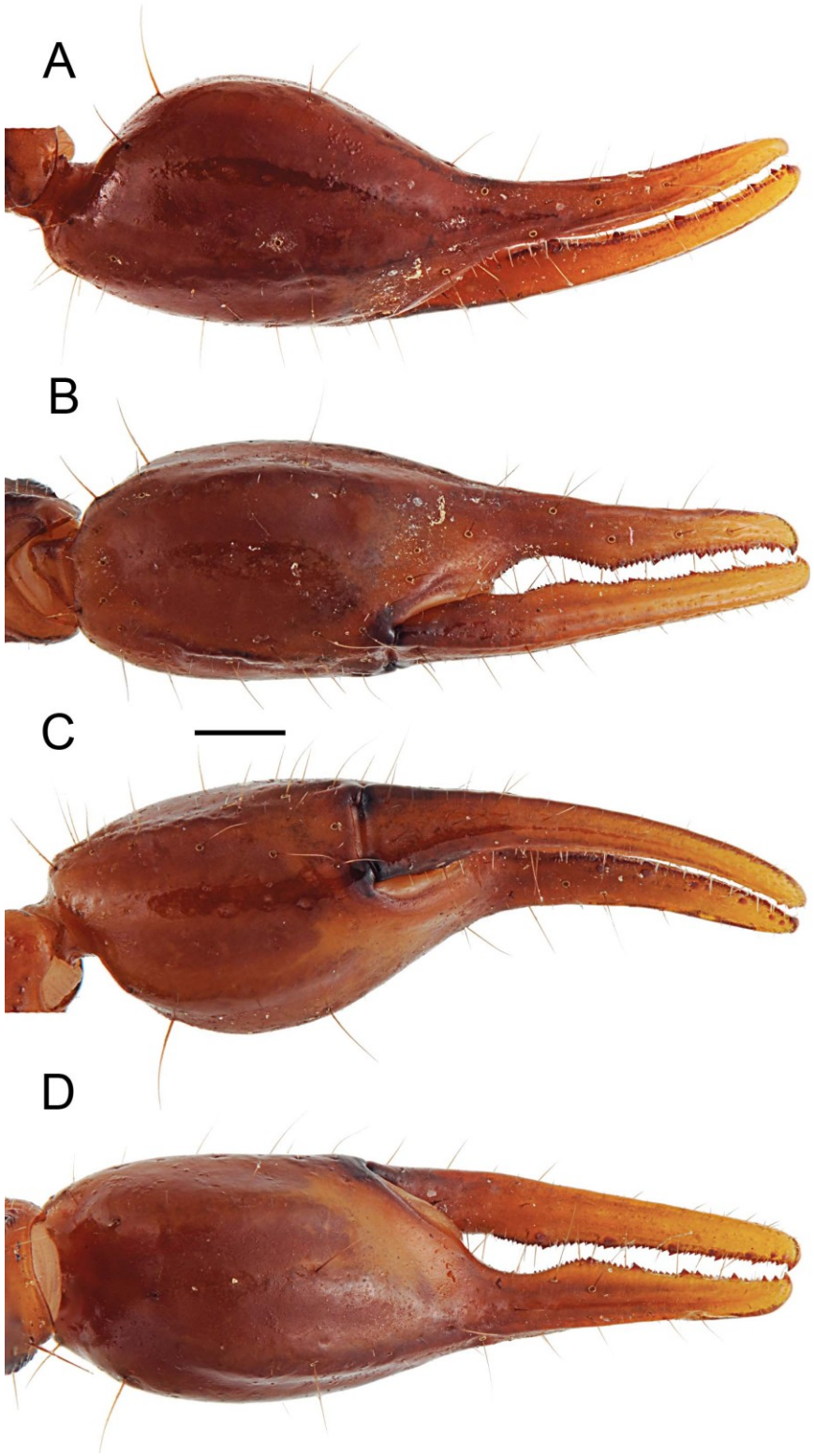


Figure 234. *Mesomexovis caxcan*, **n. sp.**, holotype ♂ (IBUNAM), dextral pedipalp chela. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

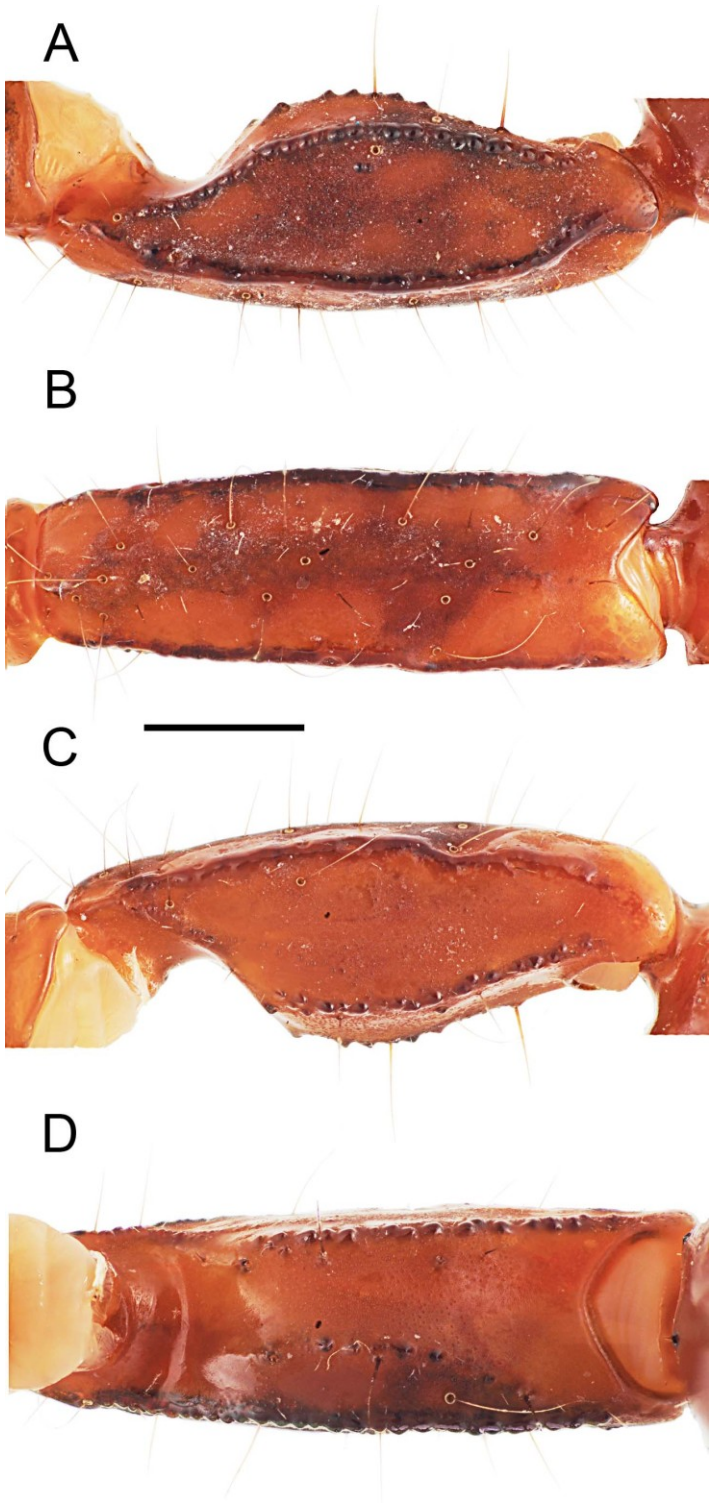


Figure 235. *Mesomexovis caxcan*, **n. sp.**, holotype ♂ (IBUNAM), dextral pedipalp patella. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

Mesomexovis fasciatus Sissom and Hughes, in prep.

Figures 226, 236–238, 281C, 289A, 290C, 293C, 298C, 299C, 302C

TYPE MATERIAL: To be designated by the authors.

ETYMOLOGY: To be specified by the authors.

DIAGNOSIS: *Mesomexovis fasciatus* is closely related to *M. tlayoli*, **n. sp.** and *M. subcristatus*, with which it forms a monophyletic group. *M. fasciatus* may be separated these species by having fixed finger relatively short, with chela manus more than 1.8 times longer than fixed finger, *M. tlayoli*, **n. sp.** more than 1.5 but less than 1.7 and *M. subcristatus* 1.4 times. *M. fasciatus* has trichobothria *ib* and *it* relatively proximal on fixed finger, midway between RD5 and RD6 (being these two denticles absent but macroseta present), instead of having these trichobothria closer to RD5. *M. fasciatus* is less infuscate than *M. tlayoli*, **n. sp.**, the former has prolateral surface of legs with diffuse infuscation, dorsal prolateral and dorsal retrolateral carinae of femur and patella, and ventral carinae of metasomal segments I–V outlined with diffuse infuscation; the later has intense infuscation in all these structures, additionally *M. fasciatus* has sternite VII with base of macrosetae immaculate, and *M. tlayoli*, **n. sp.** has these setae infuscated at the base. *M. fasciatus* has lateral median carinae vestigial with a proximal tubercle and few low crenulation extending one fourth of the length and with three macrosetae, instead of having costate and smooth carinae and five macrosetae, three major and two minor in between. From *M. subcristatus* differs by having five macrosetae on distal margin of carapace, three major and two minor in between, instead of only three macrosetae. Furthermore, *M. fasciatus* has ventral median carinae of metasomal segment V with broad conical serrated granules and distal end bifurcated, instead of having fine serration and distal end moniliform.

DESCRIPTION: To be published by the authors

DISTRIBUTION: *Mesomexovis fasciatus* is endemic to the Tehuacán-Cuicatlán Valley, in the states of Oaxaca and Puebla, Mexico.

ECOLOGY: *Mesomexovis fasciatus* has been recorded from 1435 to 2030 m altitude.

MATERIAL EXAMINED: **MEXICO: Oaxaca:** near Zachio, 8.vii.1970, R.E. Beer, 2 ♂ (AMNH); line border limit between Puebla and Oaxaca, 3 km NW of Teotitlan del Camino, 18°9.5046'N 97°5.36'W, 951 m, 21.ix.2003, R. Paredes, J. Cruz-López, C. Santibáñez, and A. Valdez, 1 ♂, 29 juv. (IBUNAM); road between Oaxaca-Cuacnopala, near to San Miguel Tequixtepec, 17°46.99'N 97°21.67'W, 2000 m, 25.v.2002, J.L. Castelo, 1 juv. (IBUNAM). *Municipio de Coixtlahuaca*: Coixtlahuaca, [17°43'N 97°19'W], 14.vii.2009, W. López-Forment, 1 ♀ (IBUNAM). *Municipio de Cuicatlán*: Cerro Colorado, 8.viii.1975, 3 ♂, 4 ♀ (IBUNAM); Dominguillo, J.L. Castelo, 21.i.1998, 1 ♀ (IBUNAM), 21.viii.2002, 1 ♀ (IBUNAM), 17°37.9998'N 96°54'W, 670 m, 15.ii.2002, F. Alvarez, 9 ♂, 10 ♀ (IBUNAM); Tomellin, 605 m, 23.vii.2002, 17°45.180'N 96°57.237'W, 8 ♂, 3 ♀, 28 juv. (AMNH [LP 2087]), 10 ♂, 17 ♀, 8 juv. (AMNH [LP 2088]), 7 ♂, 29 juv. (AMNH [LP 2089]), 12 ♂, 19 ♀, 5 juv. (AMNH [LP 2090]), 17°45.1800'N 96°57.2298'W, 4 ex. (AMNH [ARA1166]), 4 ex. (AMNH [ARA1167]), 4 ex. (AMNH [ARA1169]), 72 ex. (AMNH [ARA1171]). *Municipio de Huajuapan de León*: El Algodón, Cosoltepec, 18°07'56.6"N 97°48'07.1"W, 1627 m, B. Ribera, 2 ♀ (IBUNAM). *Municipio de San Francisco Telixtlahuaca*: Telixtlahuaca, 6 km N, 17°20.3670'N 96°56.12'W, 1915 m, 22.vii.2002, O. Francke, E. González, and J. Ponce, 2 ex. (AMNH [ARA1162]), 2 ex. (AMNH [ARA1163]). *Municipio de Santa María Ixcatlán*: on the way to Ixcatlán, 5 km NW of Cuicatlán, 17°48.9138'N 97°0.3228'W, 702 m, 8.xi.2005, O. Francke, M. Córdova, A. Jaimes, and G. Montiel, forest, collected at night with UV light, 6 ♂, 7 ♀, 1 subad. ♀ (IBUNAM

[ARA2422]), 2 ♂, 1 ♀, 1 subad. ♂ (AMNH [LP 6491]). *Municipio de Santiago Nacaltepec*: El Moral, 21 km N, 17°34.753'N 96°56.976'W, 1535 m, 23.vii.2002, L. Prendini, O. Francke, E. González, and J. Ponce, 1 ♂, 3 ♀ (AMNH [LP 2081]), 2 ♂, 4 ♀, 1 juv. (AMNH [LP 2083]). *Municipio de Suchixtlahuaca*: road to San Cristobal Sochixtlahuaca-Santiago Tejupan, marker km 2, 17°42.2400'N 97°23.66'W, 2290 m, 28.vi.2006, O. Francke, A. Valdez, G. Villegas, H. Montaño, and C. Santibáñez, forest, collected at night with UV light, 32 ex. (AMNH [ARA1079]). **Puebla:** Cerro del Campanario, 2030 m, 19.xi.2002, E. González, 1 ♂, 4 ♀, 2 juv. (IBUNAM); Tehitzingo, [18°19'55.00"N 98°16'31.99"W], 2.v.1981, J. Julia, 1 ♀ (IBUNAM); Hwy Tehuacán-Huajuapan, marker km 75, 6.ix.1994, A. Cadena and E. Barrera, 1 ♀ (IBUNAM); road between Tehuacán-Orizaba, 30.vii.1952, 8 juv. (IBUNAM). *Municipio de Acatlán de Osorio*: San Pedro Yeloixtlahuaca, [18°7'N 98°5'W], 2.x.1980, 1 ♀ (IBUNAM). *Municipio de Coxcatlán*: Coxcatlán, [18°15'51.38"N 97°9'8.40"W], 18.i.1996, 1 ♂ (IBUNAM). *Municipio de Nicolás Bravo*: Azumbilla, 3 km N, [18°38.61633'N 97°23.820833'W], 20.viii.1988, S.A. Stockwell, 1 ♀ (AMNH). *Municipio de San Sebastian Zinacatepec*: Paraje 5 Mezquites, 8 km S of Zinacatepec, 18°18.1470'N 97°12.91'W, 1075 m, 8.xi.2005, O. Francke, M. Córdova, A. Jaimes, and G. Montiel, 1 ♀ (CAS [ARA1869]), 2 ♂, 1 subad. ♂, 1 subad. ♀ (IBUNAM [ARA2423]), 1 ♂, 2 juv. (AMNH [LP 6429]); San Sebastian Zinacatepec, Paraje 5 Mezquites, 8 km S of Zinacatepec, 18°18.1470'N 97°12.91'W, 1075 m, 9.xi.2009, O. Francke, M. Córdova, A. Jaimes, and G. Montiel, 1 ♀, 1 juv. (IBUNAM). *Municipio de Tehuacán*: Mesa del Riego, [18°27'5.25"N 97°25'28.62"W], 2.ix.1944, 1 ♂, 4 ♀ (IBUNAM), 21.xi.1951, 3 ♀ (IBUNAM), L. Vázquez, 23.i.1968, 3 ♂, 7 ♀, 3 juv. (IBUNAM), 25.v.1972, 2 ♂, 8 ♀, 107 juv. (IBUNAM), 27.v.1972, 2 ♀, 2 juv. (IBUNAM), 1930 m, 21.iv.1973, A. Samano, 4 ♂, 2 ♀, 26 juv. (IBUNAM), 18.xi.2002, E. González, 3 ♂, 24 ♀, 5 juv. (IBUNAM); Mesa del Riego,

Tehuacán, [18°27'5.25"N 97°25'28.62"W], 9.ix.1964, J. Julia, 1 ♂, 2 ♀ (IBUNAM); near Tehuacán, [18°28'N 97°24'W], 5.xii.2006, W. López-Forment, 1 ♀ (IBUNAM); Tehuacán, [18°24.002'N 97°22.867'W], 19.i.1967, 2 ♀, 6 juv. (IBUNAM), A. Samano, 2.i.1968, 4 ♀, 8 juv. (IBUNAM); Tehuacán, 2 km E, 18°24'N 97°22.86'W, 1435 m, 25.vii.2002, L. Prendini, O. Francke, E. González, and J. Ponce, rock turning, 1 ♂, 1 ♀, 4 juv. (AMNH [LP 2046]), 2 ex. (AMNH [ARA1156]), 2 ex. (AMNH [ARA1157]); Tehuacán, 5 km W, [18°24.002'N 97°22.867'W], 11.iii.1996, 6 ♂, 4 ♀, 2 juv. (IBUNAM). *Municipio de Tepanco de López*: Cacaloapan, [18°34'N 97°36'W], 30.vii.2011, 1 ♀ (IBUNAM); San Bartolo Teontepec, [18°30'N 97°31'W], 10.xii.1996, E. Barrera, 1 ♀ (IBUNAM). *Municipio de Xayacatlán de Bravo*: Xayacatlán de Bravo, [18°14'20.06"N 97°58'31.82"W], 2.xii.1977, J. Julia, 5 ♂, 11 ♀ (IBUNAM). *Municipio de Zapotitlán Salinas*: surroundings of Botanical Garden, Zapotitlán Salinas, 18°20'1.4"N 97°27'7.5"W, 1494 m, 30–31.x.2003, R. Paredes, 1 ♂ (IBUNAM); Tierra Amarilla, Llano de Pancho Martínez, 8 km E, 1960 m, 19.ix.2002, E. González, 2 ♂, 6 ♀, 3 juv. (IBUNAM); Zapotitlán Salinas, [18°20'N 97°29'W], 1500 m, 17.ix.2002, E. González, 1 ♂, 1 ♀ (IBUNAM); Zapotitlán Salinas, 4 km N, Cerro Chacatecas, 2030 m, 17.xi.2002, E. González, 3 ♂, 15 ♀ (IBUNAM).

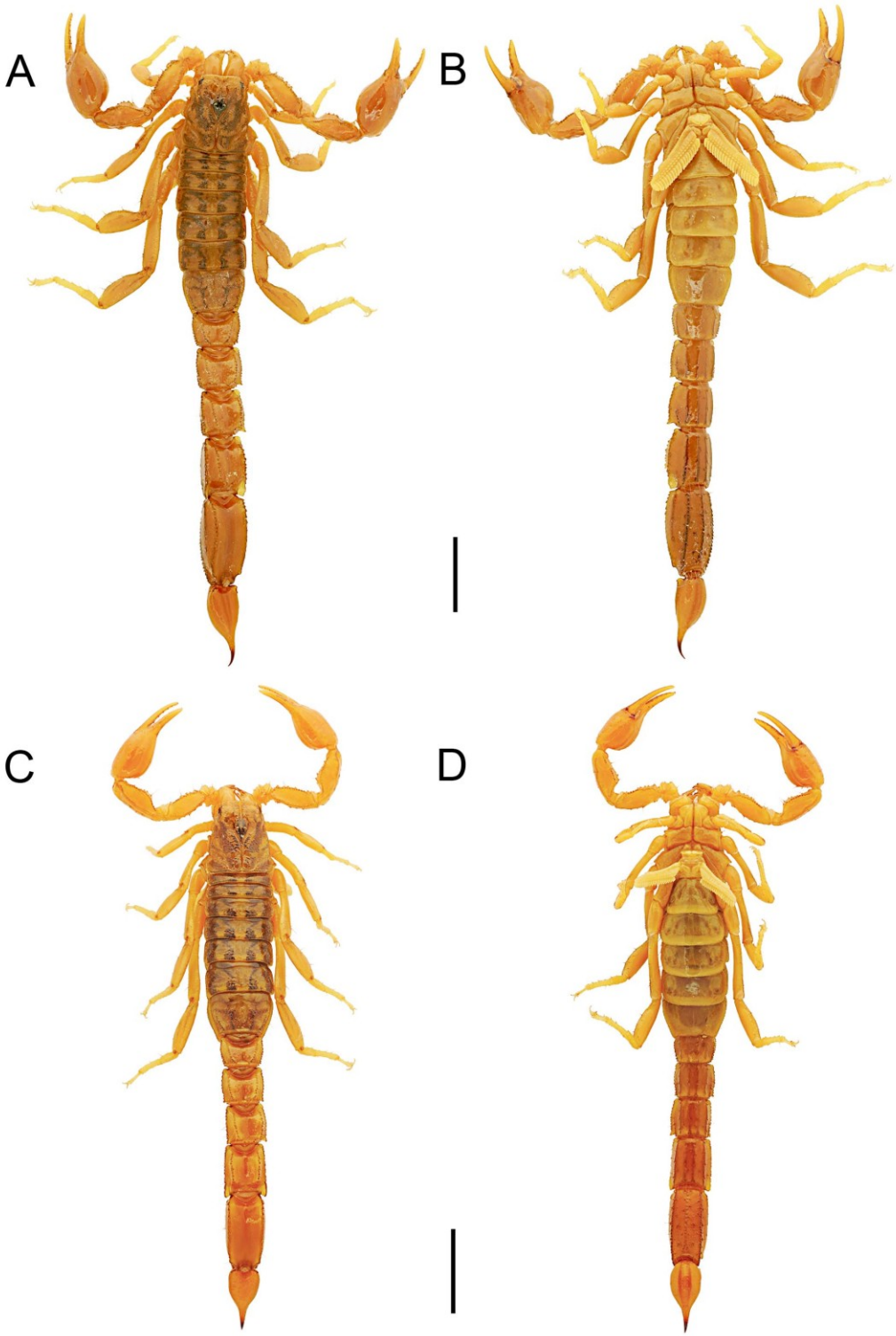


Figure 236. *Mesomexovis fasciatus* Sissom and Hughes, in prep., habitus. **A**, **B**. ♂ (AMNH). **C**, **D**. ♀ (AMNH). **A**, **C**. Dorsal aspect. **B**, **D**. Ventral aspect. Scale bars = 5 mm.

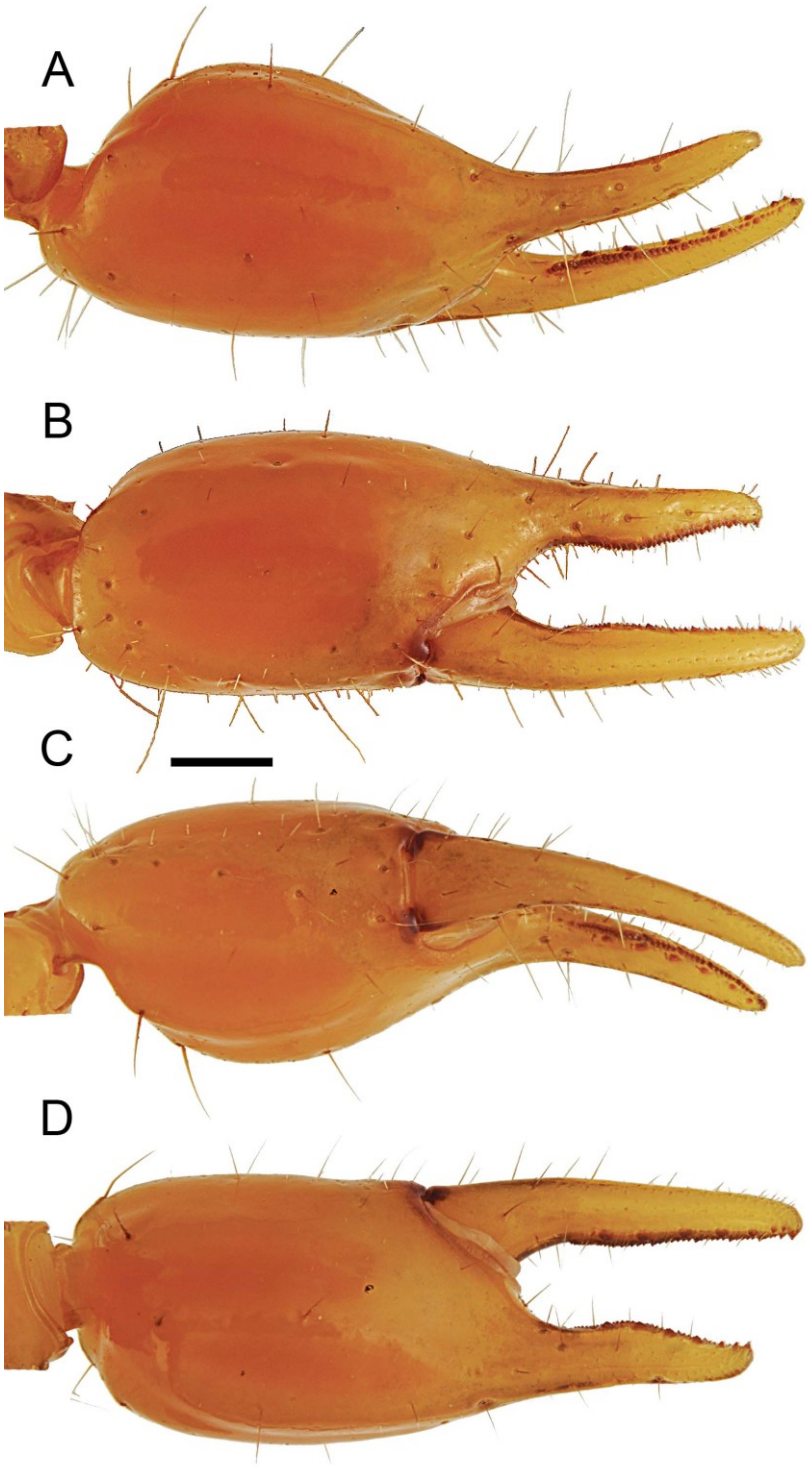


Figure 237. *Mesomexovis fasciatus* Sissom and Hughes, in prep., ♂ (AMNH), dextral pedipalp chela. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

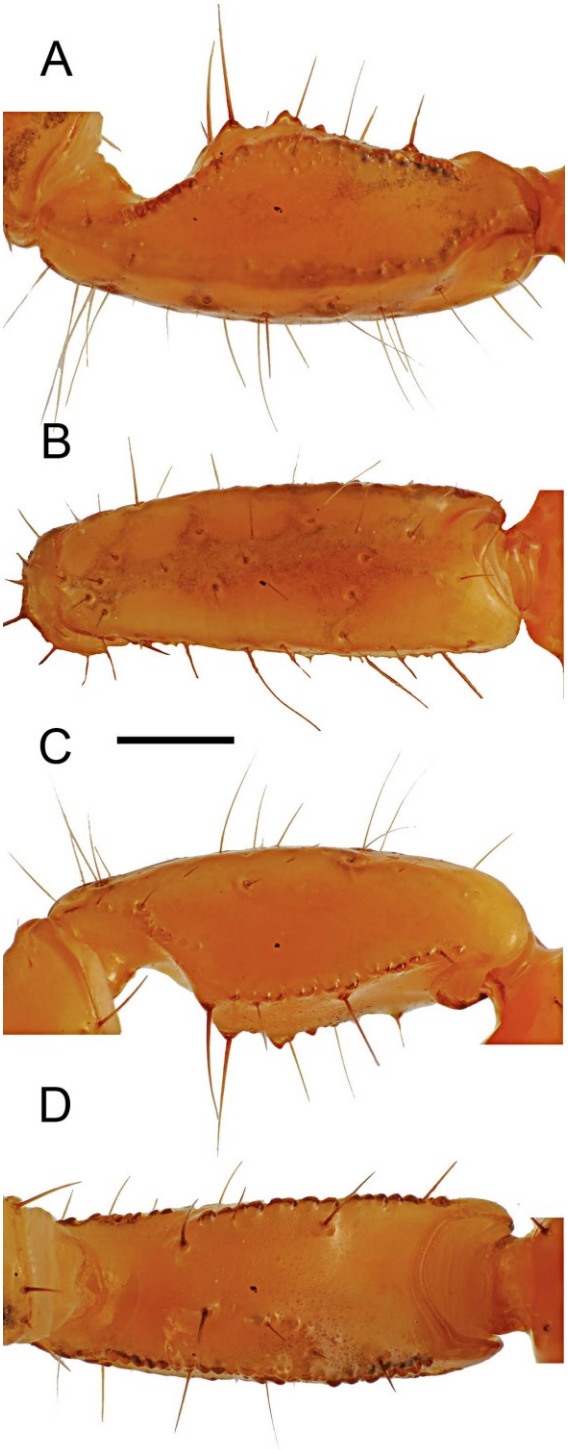


Figure 238. *Mesomexovis fasciatus* Sissom and Hughes, in prep., ♂ (AMNH), dextral pedipalp patella. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

Mesomexovis hesperus Sissom and Hughes, in prep.

Figures 226, 239–241, 281D, 288A, 291A, 293D, 296D, 299D, 302D

TYPE MATERIAL: To be designated by the authors.

DIAGNOSIS: *Mesomexovis hesperus* is closely related to the monophyletic group comprising *M. tinctus*, **n. sp.** and *M. nigropictus*, *M. hesperus* may be distinguished from these two species by having base color dark brownish with pedipalps and legs dark orange-reddish, instead of having base color of body, pedipalps, and legs pale yellowish. *M. hesperus* has proximal notch and median lobe of pedipalp fixed finger obsolete, instead of moderately developed showing an evident gap at base of fingers when closed. *M. hesperus* further differs by having intercarinal surface of pedipalp chelae completely infuscate, whereas *M. nigropictus*, and *M. tinctus*, **n. sp.** have it immaculate. The position of trichobothrium Et_5 relative to Et_4 is longer in *M. hesperus* than in the two related species. *M. hesperus* is strongly infuscate on carapace, tergites and metasomal segments, the markings cover most of the surface, whereas the other two species are infuscate on these areas but not as intense or extensive. The ventral intercarinal surface of the metasomal segments I–V are completely infuscated on the distal half, in *M. nigropictus* only the carinae are outlined with infuscation, and in *M. tinctus*, **n. sp.** is similar but there is also intense infuscation in the intercarinal surface of ventral submedian carinae of segments II–IV. *M. hesperus* has relatively longer fingers than with chela less than 1.3 times longer than fixed finger, in *M. nigropictus* and *M. tinctus*, **n. sp.** the chela is more than 1.4 times. *M. hesperus* has ventral surface of telson cover with broad and low granules and is relatively more globose, in the related species the surface is smooth and relatively more elongated.

DESCRIPTION: To be published by the authors.

DISTRIBUTION: *Mesomexovis hesperus* distributes in the Pacific lowlands of Nayarit.

ECOLOGY: *Mesomexovis hesperus* has been recorded at 274 m altitude.

MATERIAL EXAMINED: **MEXICO: Nayarit:** *Municipio del Nayar*: Reacomodo los Sabinos, 71 km NNE Tepic, [21°56.81664'N 104°32.80002'W], [274 m], 10.x.1991, E. Barrera, 1 ♂, 2 ♀ (IBUNAM); 8.ix.1995, 2 ♂, 2 ♀, (IBUNAM); W. López-Forment, 1 ♂, (IBUNAM); 28.viii.1991, 2 ♂, 2 ♀, (IBUNAM).

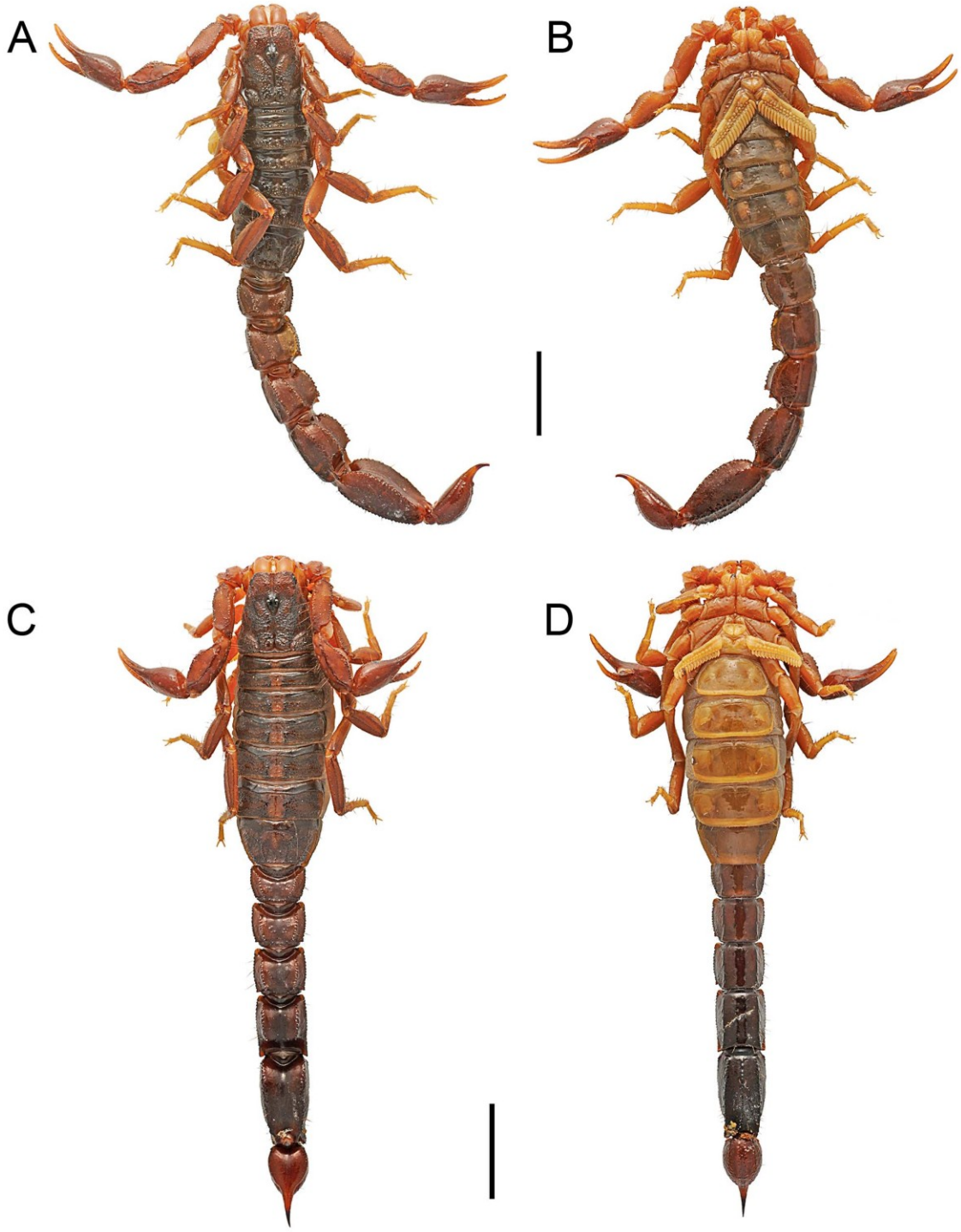


Figure 239. *Mesomexovis hesperus* Sissom and Hughes, in prep., habitus. **A**, **B**. Paratype ♂ (IBUNAM). **C**, **D**. ♀ (IBUNAM). **A**, **C**. Dorsal aspect. **B**, **D**. Ventral aspect**.** Scale bars = 5 mm.

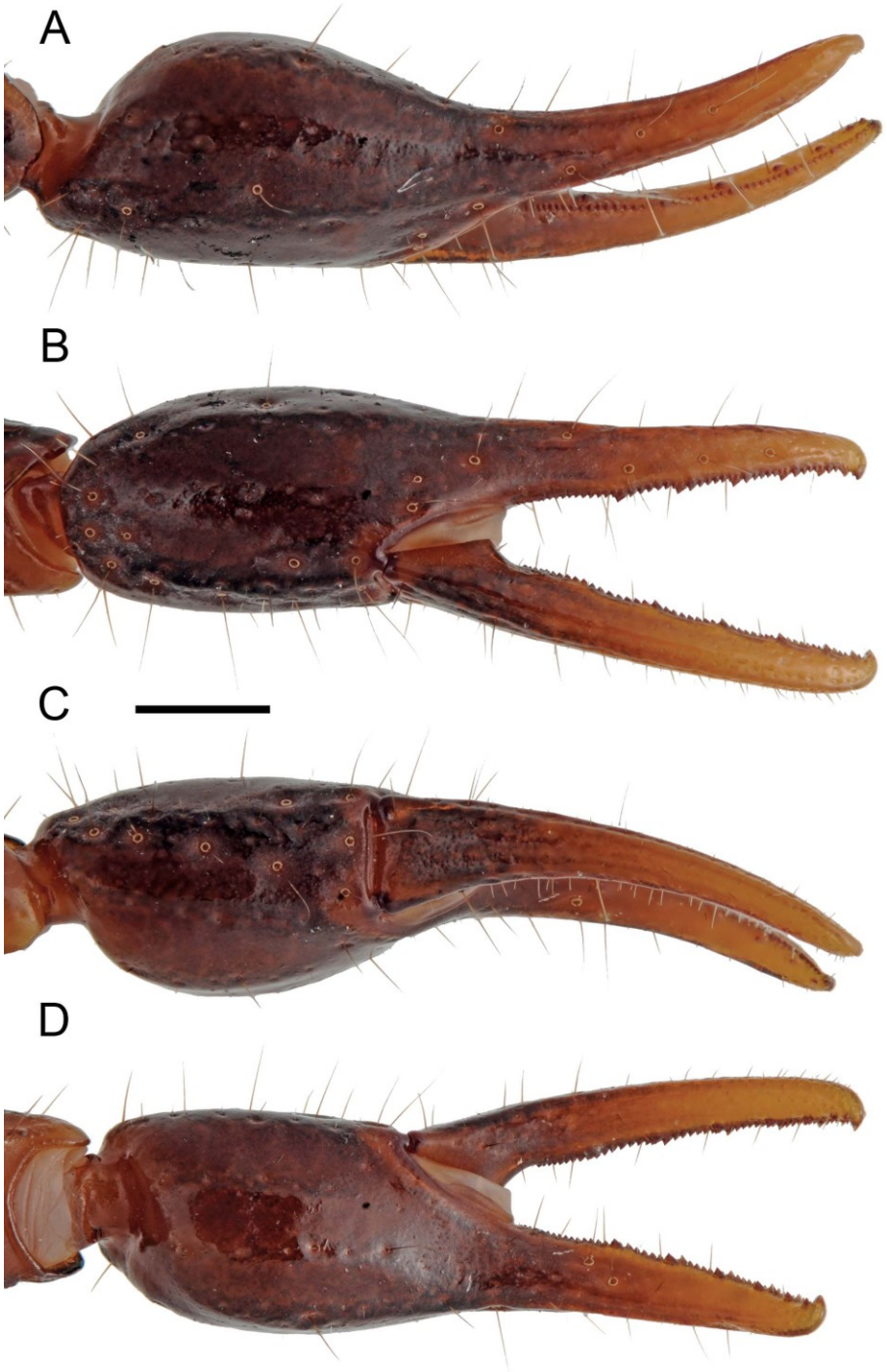


Figure 240. *Mesomexovis hesperus* Sissom and Hughes, in prep., paratype ♂ (AMNH), dextral pedipalp chela. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

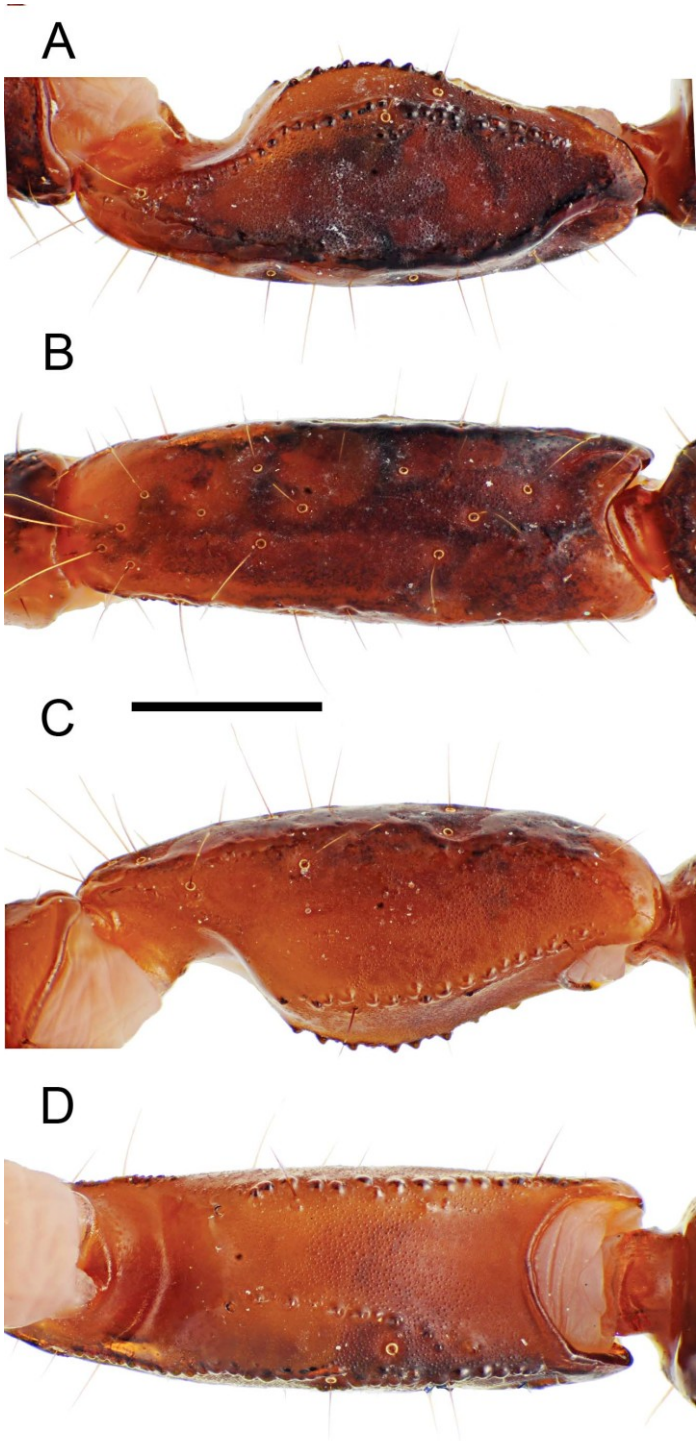


Figure 241. *Mesomexovis hesperus* Sissom and Hughes, in prep., paratype ♂ (AMNH), dextral pedipalp patella. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

Mesomexovis izazagai, **n. sp.**

Figures 225, 242–244, 282A, 287A, 292A, 293E, 296E, 299E, 302E; Table 14

TYPE MATERIAL: **MEXICO: Estado de México:** *Municipio de Tlatlaya*: Holotype ♂ (IBUNAM), San Antonio del Rosario, 5 km N, 18°23.8998'N 100°18.4998'W, 360 m, 7.viii.2006, E. González, 6 ♂, 3 ♀, 5 juv. Paratypes: **Guerrero:** *Municipio de Cutzamala de Pinzón*: 3 ♀ (AMNH [ARA0999]), 2 ♀ (CAS [ARA1855]), Ixtapilla, 3 km N, 18°34.4190'N 100°37.70'W, 297 m, 22.v.2006, O. Francke, A. Valdez, H. Montaño, and A. Ballesteros, collected at night with UV light, 3 ♀ (IBUNAM), 297 m, 23.v.2010.

ETYMOLOGY: The species name *izazagai* derives from José María de la Luz Izazaga Martínez, a forefather of the Mexican Independence, born in Michoacán and active politician and fighter during Independence war in Guerrero and Michoacán. This patronym is dedicated to him in honor of the bicentennial of Mexico's Independence (1810-2010).

DIAGNOSIS: *Mesomexovis izazagai*, **n. sp.** is closely related to *M. variegatus*, *M. ponce* and *M. mintoni*, with which it forms a monophyletic group. *M. izazagai*, **n. sp.** may be separated from the other three species having base color pale yellow, instead of dark brownish to reddish. From *M. mintoni* and *M. variegatus* differs by having seven rows of median denticles and seven retrolateral denticles on pedipalp movable finger, instead of six. *M. izazagai*, **n. sp.** differs further from these two species by having proximal half of lateral median carinae of metasomal segment V granular, instead of being obsolete to weakly costate and smooth. From *M. mintoni* and *M. ponce* differs by having dorsal and retrolateral carinae of pedipalp chela infuscated, instead of immaculate. Furthermore, differs from these species by having six rows of median denticles and six retrolateral denticles on pedipalp fixed finger, instead of five. Ventral lateral

carinae of sternite VII obsolete, instead of costate and smooth. *M. izazagai*, **n. sp.** is readily separated from these two species by having lateral intercarinal surface of metasomal segments I–V smooth and ventral surface of V minutely granular, instead of shagreened in I–V and densely granular in V, covered densely to moderate with strong granules. From *M. variegatus*, *M. izazagai*, **n. sp.**, differs by having lateral median with proximal enlarge tubercle and few granules extending to proximal, instead of having only a small proximal tubercle and smooth proximal third costate.

DESCRIPTION: The following description is based on the types and the specimens listed in material examined.

Color and infuscation (In alcohol): Base color pale yellow to orange brownish, carapace, tergites and prolateral surface of legs femur, patella, tibia and tarsi infuscate with dusky markings. Distal dorsal margin of chelicerae manus and dorsal surface of movable finger infuscate. Pedipalp femur and patella with dorsal, prolateral and retrolateral carinae outlined with diffuse infuscation. Pedipalp chelae with all carinae moderately infuscate. Pectines with a subtle olivaceous tone on whitish base color. Genital operculum whitish. Dorsal medina and dorsal submedian carinae in I–VI outlined with diffuse infuscation. Sternite VII with ventral submedian and ventral lateral moderate to diffusely infuscate, occasionally infuscation extending as a broad band to the level of lateral median carinae. Ventral lateral and ventral submedian carinae of metasomal segments I–IV and ventral lateral and ventral median of V outlined with diffuse infuscation. Base of aculeus slightly infuscate, aculeus reddish to brownish.

Carapace: Carapace sublinear, with a vestigial to obsolete median notch. Entire surface shagreened, minute and moderately large granules combine over most of the surface. Anterior edge with five pairs of major and minor intersperse lateral macrosetae and a median macrosetae.

Anteromedian and posteromedian sulci moderate, posterolateral deep, posterior transverse obsolete. Median ocular tubercle moderately raised and broad, with superciliary carinae strong and smooth, higher than median eyes. Median ocular tubercle positioned on distal half of carapace. Median eyes approximately double size of lateral frontal pair. Three lateral eyes, two frontal pairs same size and posterior reduced approximately in half.

Sternum and coxal region: Sternum pentagonal subequilateral with four pairs of setae, one distal, two median pairs and one pair on the lobes, median notch deep. Anterior margin of coxa II with two oblique slit-like structures, adjacent to a moderate and finely crenular protuberance. Proximal median margin of coxal endite II with a deep depression each. Coxa IV 2.06 times longer than coxa II.

Chelicerae: Dorsal surface smooth, dentition of fixed and movable fingers as in typical Syntropinae. Subdistal margin of manus with one or two median macrosetae, distal margin with costate carinae. Serrula with 14/14 tines.

Pedipalps: Trichobothrial pattern Type C, orthobothriotaxic. Pedipalp segment ratio length/wide, femur 2.48, patella 2.57, chela 2.77. Pedipalp chela relatively incrassate, wider than patella, patella wider than femur. Femur: Intercarinal surfaces matte, dorsal and ventral surface with few minute to moderate median granules. Dorsal prolateral, dorsal retrolateral, and ventral prolateral carinae granular; retrolateral dorsosubmedian obsolete, smooth with four major macrosetae on a moderate tubercle, macrosetae decreasing in size distally; prolateral ventrosubmedian vestigial with an enlarged proximal tubercle positioned at mid surface and two or three moderate rounded granules, and few intersperse moderate granules, median and distal enlarge granules with a macroseta at base; prolateral ventral vestigial, expressed by a proximal tubercle with an adjacent macrosetae and two enlarged rounded granules with a macroseta at

base; ventral median vestigial expressed a proximal short row of granules; retrolateral ventral expressed few scattered proximal serrated granules; ventral retrosubmedian vestigial, expressed by irregular serrate granules, present on proximal third.

Patella: Dorsal, ventral and retrolateral carinae smooth, prolateral matte. Dorsal prolateral and ventral prolateral complete, moderately granular; dorsal retrolateral and ventral retrosubmedian complete moderately smooth; ventral median vestigial expressed as a short proximal row of minute granules; retrolateral dorsosubmedian and retrolateral median carinae obsolete, expressed by bands of infuscation and a weak median costa; prolateral median complete on a moderate vaulted projection, protruding strongly medially, extending from a low proximal tubercle with a major macroseta on top and a three or four coarse crenulations, the row slanting gently towards dorsal prolateral carinae disappearing at the level of trichobothrium d_2, followed by a gap of smooth surface and ending on at one distal major macrosetae, positioned on the distal fifth of dorsal prolateral carinae; prolateral ventral obsolete expressed by a row of two major macrosetae, adjacent to ventral prolateral carinae. Proximal major macrosetae on the top of a low granule.

Chelae: Pedipalp manus moderate and relatively slender (manus 1.43 times longer than fixed finger). Intercarinal surfaces smooth. All carinae obsolete. Trichobothrium *Db* positioned on dorsal retrolateral carina, subbasal on chelae; *Dt* positioned at mid manus.

Fingers: Fixed finger dentition: PD = 6 and RD = 6, MD rows = 6, proximal RD positioned by proximal third. Movable finger PD = 7, RD = 7, MD rows = 7, distal row of one to three denticles missing. Proximal RD positioned by proximal third. All retrolateral denticles paired with corresponding prolateral denticles in both fingers. Trichobothria *ib* and *it* positioned subbasal on fixed finger, positioned between PD6 and PD7, PD7 lacking granule, *it* at the level

of PD6. Fingers with moderate scalloping, in ♂ proximal notch of fixed finger moderate and median lobe weak, proximal notch of movable finger obsolete and medina lobe weak, gap created when fingers closed moderate fingers fit unevenly, in ♀ proximal notch and median lobe of fixed finger vestigial and proximal notch of movable finger obsolete and medina lobe weak, fingers with weak scalloping, gap created when fingers closed vestigial.

Legs: Basitarsi I–II prolateral ventral, retrolateral ventral and retrolateral dorsal carinae with complete rows of spinules, prolateral ventral in III partial expressed on distal half by scattered spinules, in IV absent; retrolateral ventral in III complete expressed by scattered spinules, in IV absent, retrolateral dorsal in IV, partial expressed on distal two thirds by scattered spinules; retrolateral median rows in I–IV vestigial, expressed by few marginal spinules. Telotarsi I–IV with two or three pairs of ventrodistal spinules in I–IV. Setae: Prolateral ventral, 3:4:5:5, median two in III and IV stout; retrolateral ventral, 4:6:7:7; retrolateral dorsal, 2:3:3:3; dorsal, 3:3:3:3; retrolateral dorsal and dorsal series arranged in two independent rows.

Tergites: Pretergites smooth, postergites weakly shagreened, distally matte and proximally shagreened. Tergites I–VI dorsal median and ventral submedian carinae vestigial, expressed by few moderate or minute distal granules. Tergite VII with intercarinal surfaces shagreened; dorsal median carina moderately costate expressed on proximal half of the postergite; dorsal submedian vestigial expressed as a low short proximal blob; dorsal lateral and lateral supramedian strong, distally becoming slightly strong; dorsal lateral carinae projecting and curving laterally approximating to lateral supramedian distal margin, creating a semi ring of strong serrated granulation.

Genital operculum: Male genital operculum: wider than long, with three pairs of macrosetae. Sclerites free on longitudinal edge moving independently but unable to open more

than 45°. Genital papillae protruding posteriorly. Female genital operculum: Wider than long, with three macrosetae. Sclerites fuse longitudinal.

Sternites: Sternites I–VII finely punctuated, and lustrous. Sternite V with distal median glandular spot vestigial, not protruding from adjacent surface weakly contrasting with pale base color. Sternite VII ventral lateral carinae vestigial, weakly costate and smooth; ventral submedian obsolete expressed by three pairs of macrosetae. Distomedian glandular spot weak, weakly protruding from adjacent surface, in ♂, in ♀ obsolete. Spiracle elongated, slit-like, approximately two times longer than wide.

Pectines: Pectines longer than distal edge of coxa IV in ♂, in ♀ at the level of distal edge of coxa IV. Basal piece with median notch deep. Marginal lamella consist of three sclerites, medial lamella proximally fuse distally progressively forming conspicuous 15 beads. Fulcra with 9–10 beads. Pectinal tooth count19–21 in ♂, 17–19 in ♀.

Hemispermatophore: Lamina 1.66 longer than trunk. Dorsal through margin moderate, wide distally, tapering and curving proximally, and removed from ventral trough. Hemimating plug developed from the inner lobe, slightly reduced, distal barb margin with 12 elongated spinules. Primary and secondary hook positioned on the apex of lateral margin extension of the lamina (flange). Both hooks low, slightly separated, forming a shallow notch. Median lobe ental terminus moderate and rounded. Basal plate of inner lobe adjacent to ventral trough. Spine of inner lobe short and weakly sclerotized. Neck relatively short (0.38 times longer than basal plate). Measurements, lamina, 3.00; trunk, 1.08; dorsal trough/laminar hooks, 1.20; ventral trough/laminar hook, 0.72; neck, 0.18; basal plate, 0.48.

Metasoma: Dorsal and lateral intercarinal surface in I–V weakly shagreened to smooth, ventral surface of metasomal segment I–IV smooth. Ventral surface of metasomal segment V

weakly to moderately shagreened with coarse and dense granules on distal two third. Metasoma 1.71 times longer than mesosoma. Metasomal segments I–III wider than long. Carinae: Dorsal lateral and lateral median carinae in I–IV moderately crenatoserrated terminating in moderate enlarge spinoid granules pointing backwards; except lateral median in IV distal terminus moderately expanded or flared laterally forming a triangular projection; dorsal lateral in V proximally third strongly serrated, becoming weaker and crenulated with irregular clusters of crenulations medially, becoming moniliform distally. Lateral inframedian in I complete crenatoserrated; in II and III incomplete crenatoserrated, becoming weaker proximally, present in distal third; in VI absent, in V vestigial, expressed by a proximal tubercle, followed by a costa becoming weaker distally present on proximal third; ventral lateral in I–IV costate to weakly crenulate on distal third; ventral lateral in V moderately crenatoserrate; ventral submedian in I–IV obsolete to weakly costate in III and IV; ventral median in V weakly crenatoserrate. Setae: Dorsal lateral, 0:1:1:2:5; lateral median; 1:2:2:3; lateral inframedian, 1:1:1:1:7; ventral lateral, 3:3:3:4:9, setae in V positioned laterally to the carinae; ventral submedian, 3:3:3:3:4; ventral sublateral, 2. Two to three accessory minor macrosetae in intercarinal surfaces between ventral submedian carinae in segments III and IV.

Telson: Telson vesicle 2.53 times longer than wide. Metasomal segment V 1.44 times wider than telson. Vesicle 1.89 times longer than aculeus. Dorsal and ventral surface smooth. Ventral surface with three or four macrosetae in each carina. Ventral median carinae with weak to moderate subaculear tubercle, expressed as a moderate broad tubercle. Microserration on laterobasal aculeus numbering 3–5.

DISTRIBUTION: *Mesomexovis izazagai*, **n. sp.** is endemic to the western drainage of the Balsas Depression, delimited by several mountain ranges of the TMVB, including the states of México, Guerrero, and Michoacán, Mexico.

ECOLOGY: *Mesomexovis izazagai*, **n. sp.** is a lapidicolous species inhabiting tropical deciduous forest during the day; it can be found resting under rocks or fallen longs and at night is efficiently collected with ultraviolet detection. The altitudes, where this syntropine has been collected range from 198 to 1200 m.

MATERIAL EXAMINED: **MEXICO: Estado de México:** *Municipio de Amantepec*: Palmar Chico, 2–3 km NE, [18°41.34383'N 100°21.55816667'W], 725 m, 10.vi.2006, O. Francke and E. González, tropical dry forest, 2 ♂, 2 ♀, 6 juv. (IBUNAM). *Municipio de Tejupilco*: Mango Matus, 1 km SE, [18°54.05783'N 100°9.0011666'W], 700 m, 22.vi.2002, E. González, tropical dry forest, 1 ♀, 3 juv. (IBUNAM); Pungaracho, 3 km E, 19°01.775'N 100°28.406'W, 17.iii.2006, tropical dry forest, 2 ♀ (IBUNAM); Salitre, 3 km S, 18°46.6998'N 100°14.8002'W, 1200 m, 22.vi.2002, E. González, 3 juv. (IBUNAM). *Municipio de Tlatlaya*: Palos Altos, 37 km NE, [18°43'45"N 100°22'5"W], 630 m, 9.vi.2006, O. Francke and E. González, 1 ♀ (IBUNAM); San Antonio del Rosario, 5 km N, 18°23.8998'N 100°18.4998'W, 360 m, 7.viii.2006, E. González, 6 ♂, 3 ♀, 5 juv. (IBUNAM); San Nicolas del Rosario, 5 km N, [18°36.95100'N 100°12.49633'W], 8.vi.2002, E. González, tropical dry forest, 1 ♀ (AMNH [LP 2020]). **Guerrero:** *Municipio de Coahuayutla*: Matamoros, [18°27'1.61"N 101°50'12.86"W], 377 m, 13.v.2004, J. Baldazo, 2 ♀ (IBUNAM). *Municipio de Cutzamala de Pinzón*: Ixtapilla, 3 km N, 18°34.4190'N 100°37.70'W, 297 m, 22.v.2006, O. Francke, A. Valdez, H. Montaño, and A. Ballesteros, 1 juv. (AMNH [LP 6567]), 3 ex. (AMNH [ARA0999]), collected at night with UV light, 2 ♀ (CAS [ARA1855]), 297 m, 23.v.2010, 3 ♀ (IBUNAM). *Municipio de Guerrero*: Guerrero, [17°26'21.09"N

99°32'42.35"W], 2.i.1945, 1 ♂ (IBUNAM). *Municipio de Plan de Libres*: Plan de Libres, 2.5 km S, 17°50.2104'N 99°34.1322'W, 621 m, 1.v.2004, 1 ♂ (IBUNAM). **Michoacán:** Hwy La Huacaba-Cuatro Caminos, 18.x.2004, 1 ♀ (IBUNAM). *Municipio de Carácuaro*: Carácuaro, [19°0.98367'N 101°7.587333'W], 21.xi.2002, 1 juv. (IBUNAM); El Carrizal, [18°54.50267'N 100°54.507833'W], 24.ix.2004, E.P. Miranda, 1 ♂ (IBUNAM), 1 ♂ (IBUNAM). *Municipio de Churumuco de Morelos*: Churumuco de Morelos, [18°39'23.56"N 101°39'7.41"W], 10.vi.2005, 1 subad. ♂ (IBUNAM). *Municipio de Gabriel Zamora*: El Ranchito, [19°23'57.37"N 102°5'15.49"W], R. Moreno, 11.i.2001, 1 ♀ (IBUNAM), 2.x.2000, 1 ♀ (IBUNAM), 2.xi.2000, 1 ♀ (IBUNAM), 11.vi.2004, 1 ♀ (IBUNAM). *Municipio de Huetamo*: Arua-Huetamo, [18°35'N 100°53'W], 10.ix.2004, J. Ponce, 1 ♂ (IBUNAM); on the way to Baztan, near Rancho Viejo, [18°38.89450'N 100°54.265333'W], 4.iii.2005, 1 juv. (IBUNAM). *Municipio de La Huacana*: El Vado, 18°48.9078'N 101°54.9762'W, 198 m, 21.v.2011, O. Francke et al., 1 ♂, 5 ♀ (IBUNAM). *Municipio de Parácuaro*: Parácuaro, [19°8'53.15"N 102°13'12.60"W], 21.xi.2001, A.M. Ortega, 1 subad. ♂ (IBUNAM). *Municipio de San Lucas*: San Lucas, [18°34'50.96"N 100°47'41.71"W], 24.ix.2004, 1 ♂ (IBUNAM).

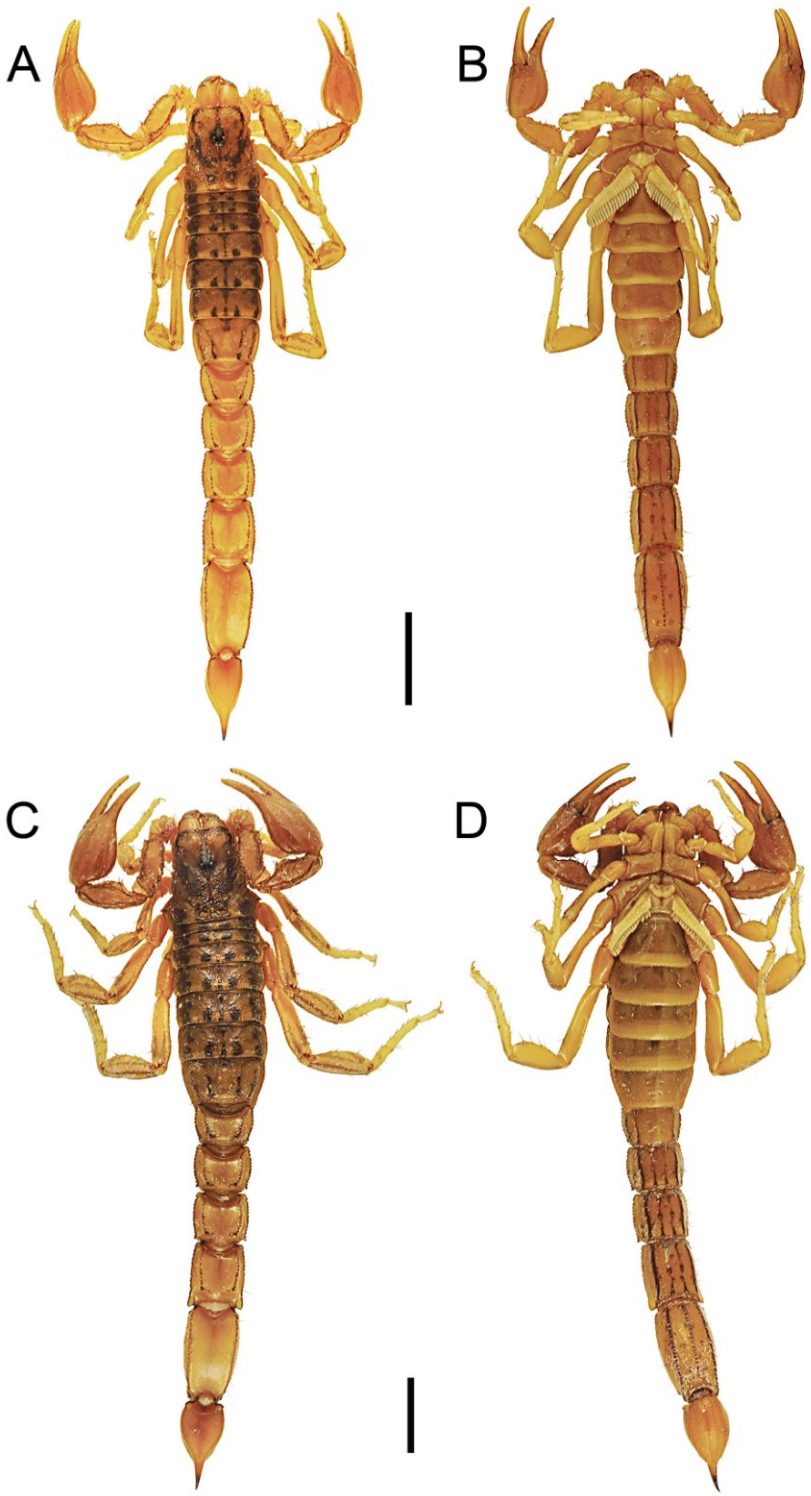


Figure 242. *Mesomexovis izazagai*, **n. sp.**, habitus. **A**, **B**. Paratype ♂ (AMNH). **C**, **D**. ♀ (AMNH). **A**, **C**. Dorsal aspect. **B**, **D**. Ventral aspect. Scale bars = 5 mm.

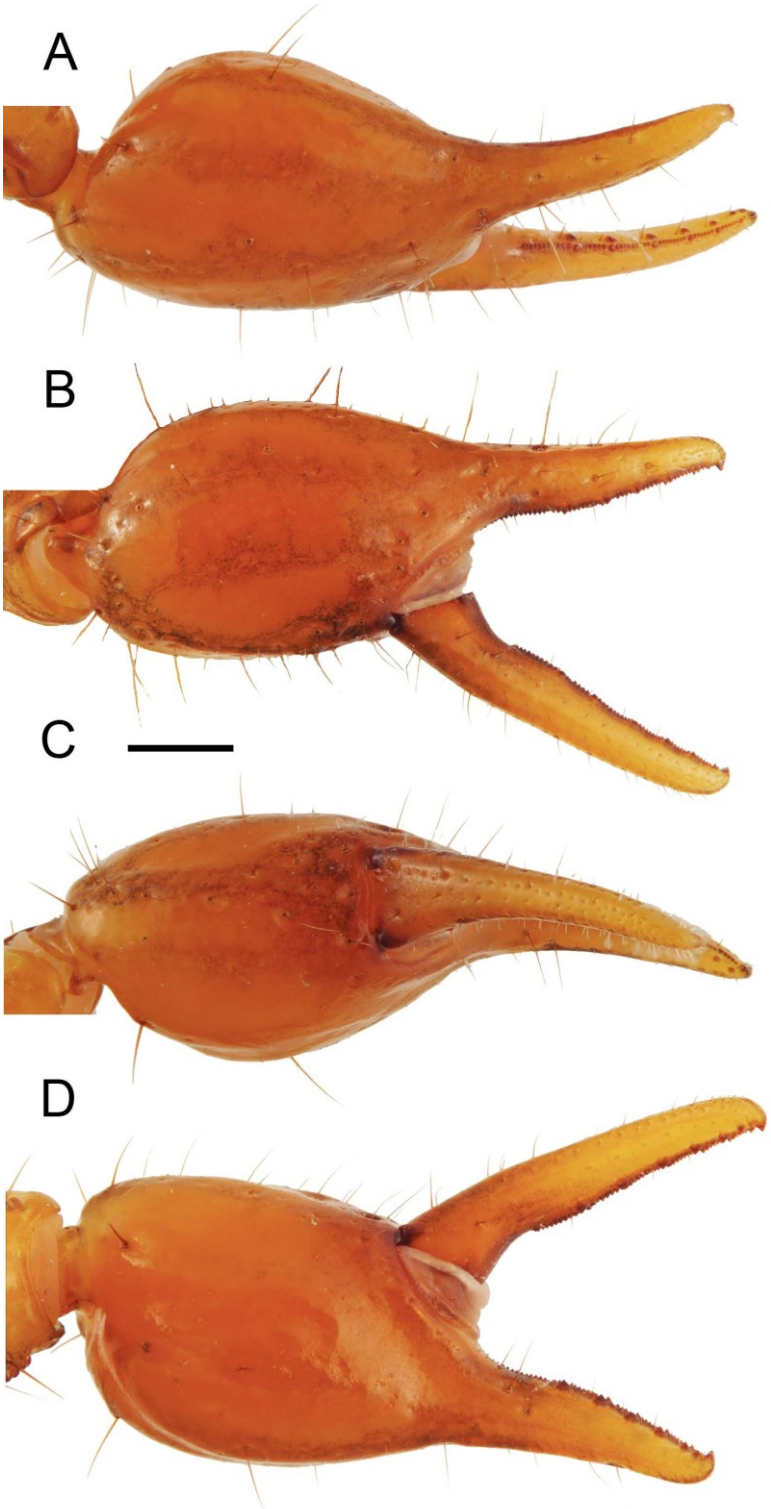


Figure 243. *Mesomexovis izazagai*, **n. sp.**, paratype ♂ (AMNH), dextral pedipalp chela. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

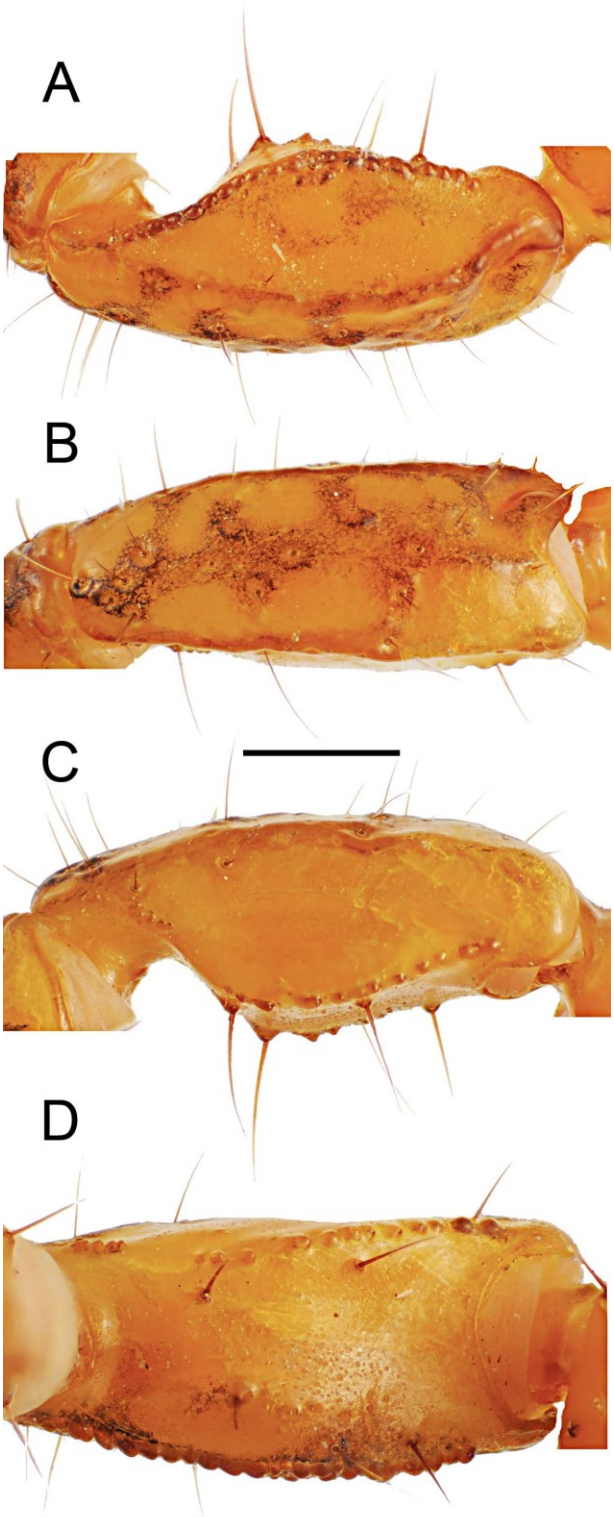


Figure 244. *Mesomexovis izazagai*, **n. sp.**, paratype ♂ (AMNH), dextral pedipalp patella. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

Mesomexovis mintoni Sissom and Hughes, in prep.

Figures 226, 245–247, 282D, 286C, 291B, 293F, 296F, 299F, 303A

TYPE MATERIAL: To be designated by the authors.

ETYMOLOGY: To be specified by the authors.

DIAGNOSIS: *Mesomexovis mintoni* is closely related to *M. izazagai*, **n. sp.**, *M. variegatus*, and *M. ponce*, with which it forms a monophyletic group. *M. mintoni* is readily distinguish from these three species by having dorsal surface of chelicerae densely infuscate, instead of having it weakly infuscate or immaculate. *M. mintoni* also has sternites III–VII and ventral surface of metasomal segments I–V completely infuscated, instead of having all immaculate or only VII infuscate. Among the contrasted species, *M. mintoni* has proximal ventral surface of telson with broad granules, instead of having surface smooth to scattered with low granulations. From *M. izazagai*, **n. sp.** differs by having base color dark brownish to reddish and dorsal and retrolateral carinae of pedipalp chela immaculate, instead of having base color pale yellow and carinae infuscated. *M. mintoni* has dorsal surface of femur covered with scattered enlarged conical tubercles, more densely grouped medially, whereas *M. ponce* has scattered moderate granules, *M. variegatus* has comparatively less and smaller granules and *M. izazagai*, **n. sp.** has weakly matte surface. From *M. izazagai*, **n. sp.** and *M. ponce* differs by having six rows of median denticles and six retrolateral denticles on pedipalp movable finger, instead of having seven. From *M. izazagai*, **n. sp.** and *M. variegatus* differs by having five rows of median denticles and five retrolateral denticles on pedipalp fixed finger, instead of six. Furthermore, these two species differ by having lateral intercarinal surface of metasomal segments I–V and ventral surface of metasomal segment V densely granular, instead of smooth to weakly granular. From *M.*

variegatus differs by having ventral lateral carinae of sternite VII obsolete, instead of being costate and smooth.

DESCRIPTION: To be published by the authors.

DISTRIBUTION: *Mesomexovis mintoni* is endemic to the Bajío region of Mexico including the states of Guanajuato, Querétaro, Michoacán, and Jalisco.

MATERIAL EXAMINED: **MEXICO: Guanajuato:** Hoya de Alvarez, Valle de Santiago, 20°19'44"N 101°12'11"W, 3.x.2012, H. Brailowsky, E. Barrera, and L. Cervantes, 1 juv. (IBUNAM). *Municipio de Acámbaro*: San Luis de Los Agustinos town, 2 km N, 20°12.4650'N 100°41.37'W, 2450 m, 25.iii.2006, 1 ♀ (AMNH [LP 6637]), 26.iii.2010, 1 ♀ (IBUNAM), O. Francke, A. Valdez, G. Villegas, H. Montaño, and C. Santibáñez. *Municipio de Cuerámaro*: Tupátaro, 20°35.339'N 101°39.018'W, 1744 m, 3.vii.2007, E. González, O. Delgado, O. Hernández, and A. Delgado, 2 ♂, 1 subad. ♀, 1 juv. (AMNH [LP 7063]). *Municipio de Guanajuato*: Road Guanajuato-Dolores Hidalgo, marker km 94, 21°3.6126'N 101°13.57'W, 2493 m, 1.vi.2006, O. Francke, A. Valdez, H. Montaño, and J. Ballesteros, 1 juv. (AMNH), 1 juv. (IBUNAM), 1 juv. (AMNH [LP 6473]). *Municipio de Jalpa*: Jaral del Progreso, Cerro Culiacán, 20°19'42"N 100°59'29'W, 2.x.2012, H. Brailowsky, E. Barrera, and L. Cervantes, 1 juv. (IBUNAM). *Municipio de León*: El Saucillo, [20°41'N 101°42'W], P. Berea, 16.ii.2003, 1 ♂, 1 ♀, 1 juv. (IBUNAM), 26.vii.2007, 1 ♂ (IBUNAM); León, [21°7'N 101°41'W], vii.2004, P. Berea, 1 ♂, 3 ♀ (IBUNAM); San Antonio de Padua, [20°34.5167'N 100°57.2167'W], iii.2004, P. Berea, 1 ♂ (AMNH [LP 6376]); San Antonio de Padua, 3 km junction to León, San Felipe, Sierra de Lobo, 2.iii.2008, 1 ♂, 4 ♀ (IBUNAM); Santa Rosa de Lima, 2.iv.2003, P. Berea, 2 ♀, 1 juv. (AMNH), ii.2002, 1 ♂, 2 ♀, 1 juv. (AMNH). **Jalisco:** *Municipio de Degollado*: on the way to Rumbadero Huaxcato, 20°27.729'N 102°15.085'W, 1607 m, 4.vii.2005, O. Francke, J. Ponce,

M. Córdova, A. Jaimes, G. Francke, and V. Capovilla, 2 juv. (AMNH [LP 5288]). **Michoacán:** *Municipio de Buenavista*: La Ruana, [19°9.00'N 102°42.00'W], vi.2002, E. Chavez, 4 juv. (IBUNAM). *Municipio de Carácuaro*: Hwy Carácuaro-Huetamo, marker km 125, 18°56.231'N 101°02.906'W, 724 m, 14.vii.2005, O. Francke, J. Ponce, M. Córdova, A. Jaimes, G. Francke, and V. Capovilla, 3 juv. (AMNH [LP 5287]); Hwy Villa Madero-Nocupetaro, marker km 56, 19°17.822'N 101°21.078'W, 2142 m, 14.vii.2005, O. Francke, J. Ponce, M. Córdova, A. Jaimes, G. Francke, and V. Capovilla, 2 juv. (AMNH [LP 5278]); Las Cocinas, Hwy Nocupetaro-Carácuaro, 19°01.880'N 101°14.067'W, 672 m, 14.vii.2005, O. Francke, J. Ponce, M. Córdova, A. Jaimes, G. Francke, and V. Capovilla, 2 ♀, 2 juv. (AMNH [LP 5293]). *Municipio de La Huacana*: El Vado, 18°48.908'N 101°54.976'W, 198 m, 20.v.2007, O. Francke and J. Ponce, 1 ♂ (AMNH [LP 7067]). *Municipio de Michoacán de Ocampo*: El Ahuijote-Churumuco, [18°49'45.47"N 101°53'19.17"W], 2.x.2001, 1 ♀ (IBUNAM). *Municipio de Salvador Escalante*: Zirahuen, 19°26.704'N 101°44.832'W, 2137 m, 12.vii.2005, O. Francke, J. Ponce, M. Córdova, A. Jaimes, G. Francke, and V. Capovilla, 1 juv. (AMNH [LP 5302]). *Municipio de Tacámbaro*: Tacámbaro, [19°14'7.13"N 101°27'34.76"W], 2.viii.1991, R. Solorzano, 1 ♀ (IBUNAM). *Municipio de Tangancícuaro*: Predio La Beata, 19°55.648'N 102°10.685'W, 1780 m, 3.vii.2005, O. Francke, J. Ponce, M. Córdova, A. Jaimes, G. Francke, and V. Capovilla, 1 ♀ (AMNH [LP 5296]). *Municipio de Tres Puentes*: Tzitzio, [19°34'N 100°55'W], 8.viii.2004, J. Ponce, 2 ♂, 2 ♀, 1 subad. ♀ (IBUNAM); Tzitzio-El Limoncillo, R. Moreno, 10.x.2001, 1 ♀ (IBUNAM), 29.viii.2000, 1 ♂ (IBUNAM). *Municipio de Zacapu*: La Caratacua, [19°45.68617'N 101°43.1425'W], 4.vi.2005, J. Ponce, 2 ♀ (IBUNAM). *Municipio de Zinapécuaro*: Santa Clara del Tule, 8 km E, 19°50.6418'N 100°46.2936'W, 2061 m, 26.iii.2006, O. Francke, A. Valdez, G. Villegas, H. Montaño, and C. Santibáñez, (AMNH [LP 6582]). **Querétaro:** *Municipio de San*

Juan del Río: Galindo, 2 km S, 1970 m, 1.vi.2006, 20°22.6026'N 100°4.7268'W, 4 ♀ (AMNH [ARA1084]), 1 ♀ (CAS [ARA1967]), 1 juv. (AMNH), 1 juv. (IBUNAM), 2 ♀ (CAS [ARA1617]), 20°22.603'N 100°4.727'W, 1 ♂ (AMNH [LP 6419]), O. Francke, A. Valdez, H. Montaño, and A. Ballesteros, collected at night with UV light.

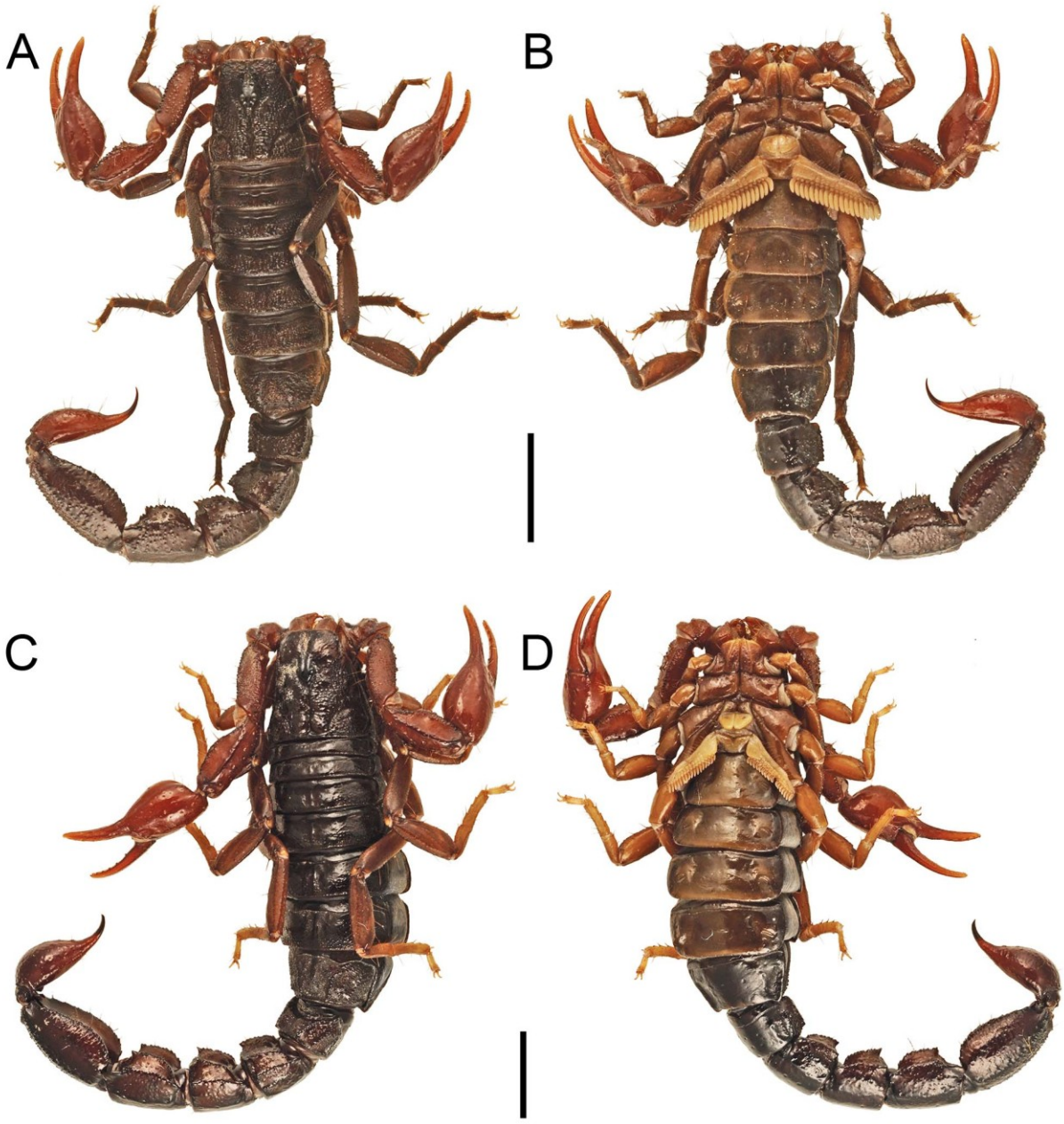


Figure 245. *Mesomexovis mintoni* Sissom and Hughes, in prep., habitus. **A**, **B**. ♂ (IBUNAM). **C**, **D**. ♀ (IBUNAM). **A**, **C**. Dorsal aspect. **B**, **D**. Ventral aspect. Scale bars = 5 mm.

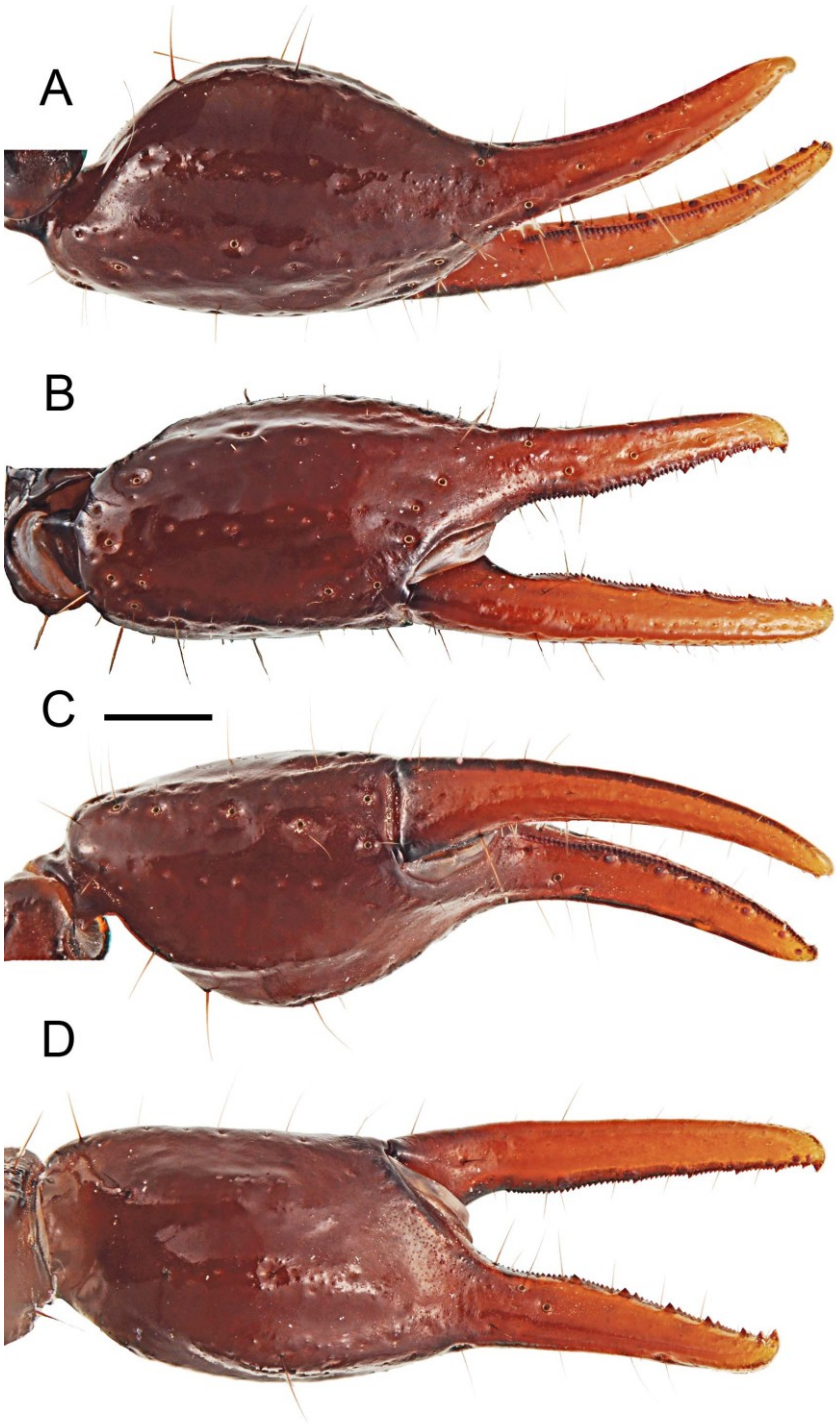


Figure 246. *Mesomexovis mintoni* Sissom and Hughes, in prep., ♂ (IBUNAM), dextral pedipalp chela. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

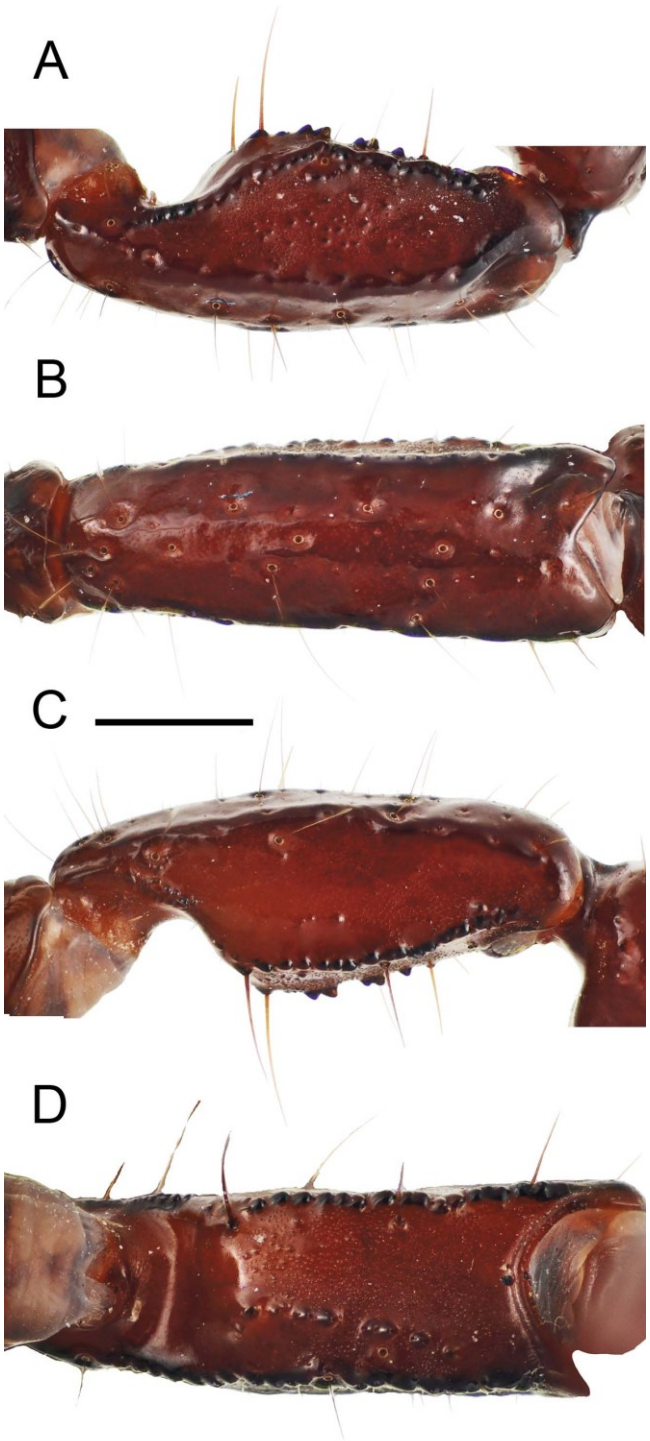


Figure 247. *Mesomexovis mintoni* Sissom and Hughes, in prep., ♂ (IBUNAM), dextral pedipalp patella. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

Mesomexovis nigropictus (Pocock, 1898)

Figures 228, 248–250, 282C, 286B, 292C, 294A, 297A, 300A, 303B

Vaejovis nigropictus Pocock, 1898: 395.

Vaejovis punctatus: 187; Pocock, 1902: 12.

Vejovis spinigerus var. *punctata*: Kraepelin, 1901 (in part).

Vejovis punctatus spadix: Hoffmann, 1931: 357–359, fig. 24; Díaz-Nájera, 1964: 20, 25. NEW SYNONYM.

Vejovis punctatus punctatus: Díaz-Nájera, 1964: 21 (Aguascalientes record only).

Vaejovis punctatus spadix: Díaz-Nájera, 1975: 7, 26, 35; Kovařík, 1998: 147; Beutelspacher, 2000: 103, 136, 141, 148, 154, map 85; Sissom, 2000: 534, 535; González-Santillán, 2004: 26, tab. 1; Ponce-Saavedra and Francke, 2011: 466, tab. 1.

Vaejovis punctatus punctatus: Díaz-Nájera, 1975: 8 (Aguascalientes record only).

Hoffmannius punctatus spadix: Soleglad and Fet, 2008: 91.

TYPE MATERIAL: *Vaejovis nigropictus*: **MEXICO: Jalisco:** Holotype ♀ (BMNH) "Jalisco'', lost, see Sissom 2000.

Neotype: *Vejovis punctatus spadix*: **MEXICO: Zacatecas:** Neotype ♂, Jalpa. (Sissom (2000) reported the code IBUNAM 053, however this has recently changed to: CNAN-T0168).

DIAGNOSIS: *Mesomexovis nigropictus* is closely related to *M. tinctus*, **n. sp.**, with which it forms a monophyletic group. *M. nigropictus* may be distinguished by having six rows of median denticles and six retrolateral denticles on pedipalp fixed finger, instead of five. *M. nigropictus* has lateral median carinae strongly granular, instead of having partially granular in segments I–III and completely smooth in IV and V. *M. nigropictus* has intercarinal surface between lateral

median and lateral inframedian in metasomal segments I and II shagreened, densely cover with minute and moderate granules. *M. nigropictus* has telson compressed dorso-ventrally, instead of relatively globose. Furthermore, the telson of *M. nigropictus* is not as hirsute as the telson of *M. tinctus*, **n. sp.**, with three and five macrosetae per carinae respectively.

DESCRIPTION: The following redescription supplements Pocock's (1898) and Hoffmann's (1931) descriptions and is based on type specimens and freshly collected material deposited in the museums indicate in material examined.

Color and infuscation (In alcohol): Base color pale yellow to orange brownish, carapace, tergites and prolateral surface of legs femur, patella, tibia and tarsi infuscate with dusky markings. Pedipalp femur and patella and chelae immaculate. Tergites with three longitudinal stripes, one median with variegate markings and two laterals that extent to lateral pleura. Pectines and genital operculum whitish. Sternite VII with ventral submedian and ventral lateral weakly and diffusely infuscate to immaculate. Lateral inframedian, ventral lateral, and ventral submedian carinae of metasomal segments I–VI outlined with broad and intense infuscation; ventral median of V outlined with diffuse infuscation. Aculeus reddish to brownish.

Carapace: Carapace anterior margin sublinear, with a vestigial to obsolete median notch. Entire surface shagreened, minute and moderately large granules combine over most of the surface. Anterior margin with five pairs of major and minor intersperse lateral macrosetae and a median macrosetae. Anteromedian, posteromedian, and posterolateral sulci deep, posterior transverse obsolete. Median ocular tubercle moderately raised and broad, with superciliary carinae moderate and smooth, higher than median eyes. Anterior and posterior base of median ocular tubercle moderate to finely crenular. Median ocular tubercle positioned on distal half of

carapace. Median eyes approximately double size of lateral frontal pair. Three lateral eyes, two anterior pairs almost same size and posterior third reduced approximately in half.

Sternum and coxal region: Sternum pentagonal subequilateral with four pairs of setae, one distal, two median pairs and one pair on the lobes, median notch deep. Anterior margin of coxa II with two oblique slit-like structures, adjacent to a moderate and finely granular protuberance. Proximal median margin of coxal endite II with a deep depression each and median margin with fine minute serration. Coxa IV 2.06 times longer than coxa II.

Chelicerae: Dorsal surface smooth, dentition of fixed and movable fingers as in typical Syntropinae. Subdistal margin of manus with one or two median macrosetae, distal margin with costate carinae. Serrula with 14 tines.

Pedipalps: Trichobothrial pattern Type C, orthobothriotaxic. Pedipalp chela relatively incrassate, wider than patella, patella wider than femur. Femur: Intercarinal surfaces matte. Dorsal prolateral, dorsal retrolateral, and ventral prolateral carinae irregularly and strongly granular; retrolateral dorsosubmedian vestigial, finely granular with four major macrosetae on a moderate tubercle, macrosetae decreasing in size distally; prolateral ventrosubmedian vestigial with a double or bicuspid enlarged proximal tubercle positioned at mid surface followed by a row of irregular scattered rounded granules, and few intersperse moderate granules, median and distal enlarge granules with a macroseta at base; prolateral ventral vestigial, expressed by a proximal tubercle with an adjacent macrosetae and two enlarged rounded granules with a macroseta at base; ventral median and retrolateral ventral vestigial expressed as a proximal short row of serrate granules; ventral retrosubmedian vestigial, expressed by irregular serrate granules, present on proximal third.

Patella: Dorsal, ventral and prolateral carinae matte, retrolateral smooth. Dorsal prolateral and ventral prolateral complete, irregularly and strongly granular; dorsal prolateral with accessory granules around macrosetae on carinae and trichobothrium *e*; dorsal retrolateral smooth and strongly costate; ventral retrosubmedian complete strong and weakly crenular; ventral median vestigial expressed as a short proximal row of minute granules; retrolateral dorsosubmedian and retrolateral median carinae obsolete, expressed by bands of infuscation and a weak median costa; prolateral median complete on a moderate vaulted projection, protruding strongly medially, extending from a low proximal tubercle with a major macroseta on top and a row of scattered coarse conical granules slanting gently towards dorsal prolateral carinae, followed by a short gap of smooth surface and ending on at one distal major macrosetae, positioned on the distal fifth of dorsal prolateral carinae; prolateral ventral obsolete expressed by a row of two major macrosetae, adjacent to ventral prolateral carinae. Proximal major macrosetae on the top of a low granule.

Chelae: Pedipalp manus moderate and relatively slender. Intercarinal surface smooth. Dorsal median, dorsal prolateral, dorsal retrolateral, ventral prolateral, prolateral median, ventral retrolateral and ventral median weakly costate with vestigial traces of fine granulation. Trichobothrium *Db* positioned on dorsal retrolateral carina, subbasal on chelae; *Dt* positioned at mid manus.

Fingers: Fixed finger dentition: PD = 6 and RD = 5, MD rows = 5, proximal RD positioned by proximal half. Prolateral denticles smaller than retrolateral denticles. Movable finger PD = 7, RD = 6, MD rows = 6, distal row of one to three denticles missing. Proximal RD positioned by proximal half. All retrolateral denticles paired with corresponding prolateral denticles in both fingers. Trichobothria *ib* and *it* positioned subbasal on fixed finger, positioned

between PD6 and PD7, PD7 lacking granule, *it* at the level of PD6. Fingers with weak scalloping, in ♂ proximal notch of fixed finger weak and median lobe obsolete, proximal notch of movable finger and medina lobe obsolete, gap created when fingers closed weak fingers fit unevenly, in ♀ proximal notch and median lobe of fixed finger vestigial and proximal notch of movable finger obsolete and medina lobe weak, fingers with weak scalloping, gap created when fingers closed vestigial.

Legs: Basitarsi I–II prolateral ventral, retrolateral ventral and retrolateral dorsal carinae with complete rows of spinules, prolateral ventral in III vestigial expressed on distal margin by few spinules, in IV absent; retrolateral ventral in III complete expressed by scattered spinules, in IV absent, retrolateral dorsal in IV, partial expressed on distal two thirds by scattered spinules and proximal third spiniform granules; retrolateral median rows in I–IV vestigial, expressed by few marginal spinules. Telotarsi I–IV with two or three pairs of ventrodistal spinules in I–IV. Setae: Prolateral ventral, 3:4:5:5, median two in III and IV stout; retrolateral ventral, 4:7:7:7, major and minor intersperse macrosetae; retrolateral dorsal, 2:3:3:4; dorsal, 3:3:3:3; dorsal median macrosetae positioned on dorsal prolateral surface offset of the dorsal row. Retrolateral dorsal and dorsal series arranged in two independent rows.

Tergites: Pretergites smooth, postergites shagreened. Tergites I–VI dorsal median and ventral submedian carinae moderate, expressed by few moderate or minute distal granules and weak costa. Tergite VII with intercarinal surfaces shagreened; dorsal median carina strongly costate expressed on proximal half of the postergite; dorsal submedian vestigial expressed as a low short proximal oblique granular costa; dorsal lateral and lateral supramedian strong, distally becoming stronger ending on an enlarged conical granule; dorsal lateral carinae projecting and

curving laterally approximating to lateral supramedian distal margin, creating a semi ring of strong serrated granulation.

Genital operculum: Male genital operculum: wider than long, with three pairs of macrosetae. Sclerites free on longitudinal edge moving independently but unable to open more than 45°. Genital papillae protruding posteriorly. Female genital operculum: Wider than long, with three macrosetae. Sclerites fuse longitudinal.

Sternites: Sternites I–VII finely punctuated, and lustrous. Sternite V with distal median glandular spot moderate occupying distal margin surface between spiracles, not protruding from adjacent surface weakly contrasting with pale base color. Sternite VII ventral lateral carinae vestigial, weakly costate and smooth; ventral submedian obsolete expressed by three pairs of macrosetae. Distomedian glandular spot obsolete, not protruding from adjacent surface, in both sexes. Spiracle elongated, slit-like, approximately two times longer than wide.

Pectines: Pectines longer than distal edge of coxa IV in ♂, in ♀ at the level of distal edge of coxa IV. Basal piece with median notch deep. Marginal lamella consist of three sclerites, medial lamella proximally fuse distally progressively forming conspicuous 15 beads. Fulcra with 9–10 beads. Pectinal tooth count 20–21 in ♂, 16–17 in ♀.

Hemispermatophore: Lamina 1.54 longer than trunk. Dorsal through margin long, narrow, curving proximally, and removed from ventral trough. Hemimating plug developed from the inner lobe, distal barb margin with 12 elongated spinules. Primary and secondary hook positioned on the apex of lateral margin extension of the lamina (flange). Hooks fused forming a minute digitiform hook. Median lobe ental terminus moderate and rounded. Basal plate of inner lobe removed from ventral trough. Spine of inner lobe vestigial, secondary spine on ventromedian aspect of neck absent. Neck relatively short (0.38 times longer than basal plate).

Measurements, lamina, 3.42; trunk, 2.22; dorsal trough/laminar hooks, 1.38; ventral trough/laminar hook, 0.78; neck, 0.30; basal plate, 0.78.

Metasoma: Dorsal intercarinal surface in I–V shagreened to smooth, proximal segments more strongly than distal III and IV, ventral surface of metasomal segment I–IV matte. Ventral surface of metasomal segment V weakly to moderately shagreened with coarse and dense granules on distal two third. Carinae: Dorsal lateral and lateral median carinae in I–IV strongly crenatoserrated terminating in moderate enlarge spinoid granules pointing backwards; except lateral median in IV distal terminus moderately expanded or flared laterally forming a triangular projection; dorsal lateral in V proximally third strongly serrated, becoming weaker and crenulated with irregular clusters of crenulations medially, moniliform distally. Lateral inframedian in I complete crenatoserrated; in II and III incomplete weakly crenatoserrated, becoming weaker proximally, present in distal third; in VI absent, in V vestigial, expressed by a proximal tubercle, followed by a low fine crenulations weakly costate becoming weaker distally present on proximal two third; ventral lateral and ventral submedian in I–IV obsolete to weakly costate; ventral lateral and ventral median in V strongly crenatoserrate. Setae: Dorsal lateral, 0:1:2:3:7; lateral median, 1:2:2:3; lateral inframedian, 1:1:1:0:4; ventral lateral, 2:3:3:4:8; ventral submedian, 3:3:3:4:3; ventral sublateral, 2. One to two accessory minor macrosetae in intercarinal surfaces between ventral submedian carinae in segments I and III.

Telson: Dorsal and ventral surface smooth, all ventral carinae weakly crenular. Ventral surface with three or four macrosetae in each carina. Ventral median carinae with weak to moderate subaculear tubercle, expressed as a moderate broad tubercle. Microserration on laterobasal aculeus numbering 3–5.

DISTRIBUTION: *Mesomexovis nigropictus* is endemic to the ecological region of central Mexico known as Bajío (lowlands), also known as Bajío dry forest ecoregion, which is delimited by marked endemism of flora and fauna. The distribution of this species includes the states of Aguascalientes, Guanajuato, Jalisco, and Zacatecas.

ECOLOGY: *Mesomexovis nigropictus* is a lapidicoluos species inhabiting several plant communities, from the flatlands of intermontane valleys dominated by grasslands and agricultural terrains, to subtropical thorn forest, to oak-pine communities of mountain ranges. The elevations range from 1564 to 2243 m.

REMARKS: The new synonym proposed here is resulted of the observations of Sissom (2000). He suggested that the synonymy proposed by Kraepelin (1899) of *Vaejovis nigropictus* Pocock and *V. punctatus* was incorrect. Following his suggestion, one of the paratypes of *V. punctatus spadix* is here designated as the neotype of *Vaejovis nigropictus*, thus making the latter taxon a junior synonym of the former.

MATERIAL EXAMINED: **MEXICO: Aguascalientes:** *Municipio de Aguascalientes*: Aguascalientes, 39 km W, [21°53'40.12"N 102°20'25.69"W], 4.vi.1956, B. Banta, (AMNH); Aguascalientes, 6.4 km W, 2042 m, 4.vi.1956, B. Banta, 1 subad. ♀ (AMNH); Potrero Los López, 22°05'35.07'N 102°31'19.76'W, 2139 m, 22.viii.2003, F. Pérez, 1 ♀, 1 subad. ♂ (AMNH [LP 2950]). *Municipio de Calvillo*: Calvillo, [21°51'0.00"N 102°43'0.05"W], 22.vi.1984, J. Julia, 2 ♂, 2 ♀ (IBUNAM); near Calvillo, J. Julia, 2 ♀ (IBUNAM). **Guanajuato:** Corralillo Ranch, Victoria, [21°23'N 100°12'W], 20.ii.1989, W. López-Forment, 1 ♀ (IBUNAM). *Municipio de Irapuato*: Marti road, 5 km, to Irapuato, [20°40'N 101°21'W], xi.2002, P. Berea, 2 ♂ (AMNH). *Municipio de León*: Cerro Gordo, NE near of León, [21°10'11.89"N 101°36'10.50"W], 29.v.1975, L. Sandoval and E. Rosas, 4 ♂, 3 ♀ (IBUNAM); El Saucillo, [20°41.00'N

101°42.00'W], 16.ii.2003, P. Berea, 5 ♂, 1 ♀ (AMNH); León, [21°7'N 101°41'W], iv.2004, P. Berea, 9 ♂ (AMNH); San Antonio de Padua, [20°34.5167'N 100°57.2167'W], P. Berea, i.2003, 3 ♂, 16 ♀, 6 juv. (IBUNAM), 1.ii.2004, 4 ex. (AMNH), iii.2004, 20 ex. (AMNH), 29.vii.2004, 1 juv. (AMNH [LP 6373]), G. Torres, i.2004, 2 ♂ (AMNH); San Antonio de Padua, 3 km junction to León, San Felipe, Sierra de Lobos, [20°34.5167'N 100°57.2167'W], 5.vii.2006, E. González and P. Berea, 8 ♂, 13 ♀ (IBUNAM), 2.iii.2008, 32 ♂, 21 ♀ (IBUNAM); Sierra de Lobos, N of León, 21°15.279'N 101°38.344'W, 2243 m, 31.v.2006, O. Francke, A. Valdez, H. Montaño, and A. Ballesteros, 1 juv. (AMNH [LP 6496]); Sierra de Lobos, NE of León, 21°15.279'N 101°38.344'W, 2243 m, 1.vi.2010, O. Francke, H. Montaño, C. Santibáñez, and A. Valdez, 2 ♂ (IBUNAM). **Jalisco:** *Municipio de Mezquitic*: Mezquitic Road, between Mezquitic and Hojuelos, 2089 m, 8–7.vii.2005, 22°21.6012'N 103°38.62'W, pine-oak forest, 2 ♂, 2 ♀, 2 juv. (IBUNAM), 1 ♀, 3 juv. (AMNH [LP 5268]), 22°21.6006'N 103°38.62'W, 6 ex. (AMNH [ARA1173]), collected at night with UV light, 4 ex. (CAS [ARA1846]), 6 ex. (IBUNAM [ARA2008]), O. Francke, J. Ponce, M. Córdova, A. Jaimes, G. Francke, and V. Capovilla. *Municipio de Zapopan*: La Primavera Forest, [20°43'N 103°33'W], 21.viii, J. Mendoza, 1 ♀ (IBUNAM). **Zacatecas:** *Municipio de Jalpa*: Jalpa, 5 km SW, 21°38.5596'N 103°3.42'W, 1564 m, 7.viii.2005, 3 ♀, 1 juv. (AMNH [LP 5280]), 1 ex. (AMNH [ARA1164]), 3 ex. (AMNH [ARA1165]), 21 ex. (AMNH [ARA1175]), 9 ex. (CAS [ARA1848]), 22 ex. (IBUNAM [ARA2006]), O. Francke, J. Ponce, M. Córdova, A. Jaimes, G. Francke, and V. Capovilla. *Municipio de Valparaiso*: El Mirador, Sierra de Valparaiso, [22°43.5'N 103°27'W], 22.ix.2005, M. Espino, R. Martínez, D. García, and E. González, oak forest, 15 ♀, 3 subad. ♂, 8 juv. (IBUNAM).

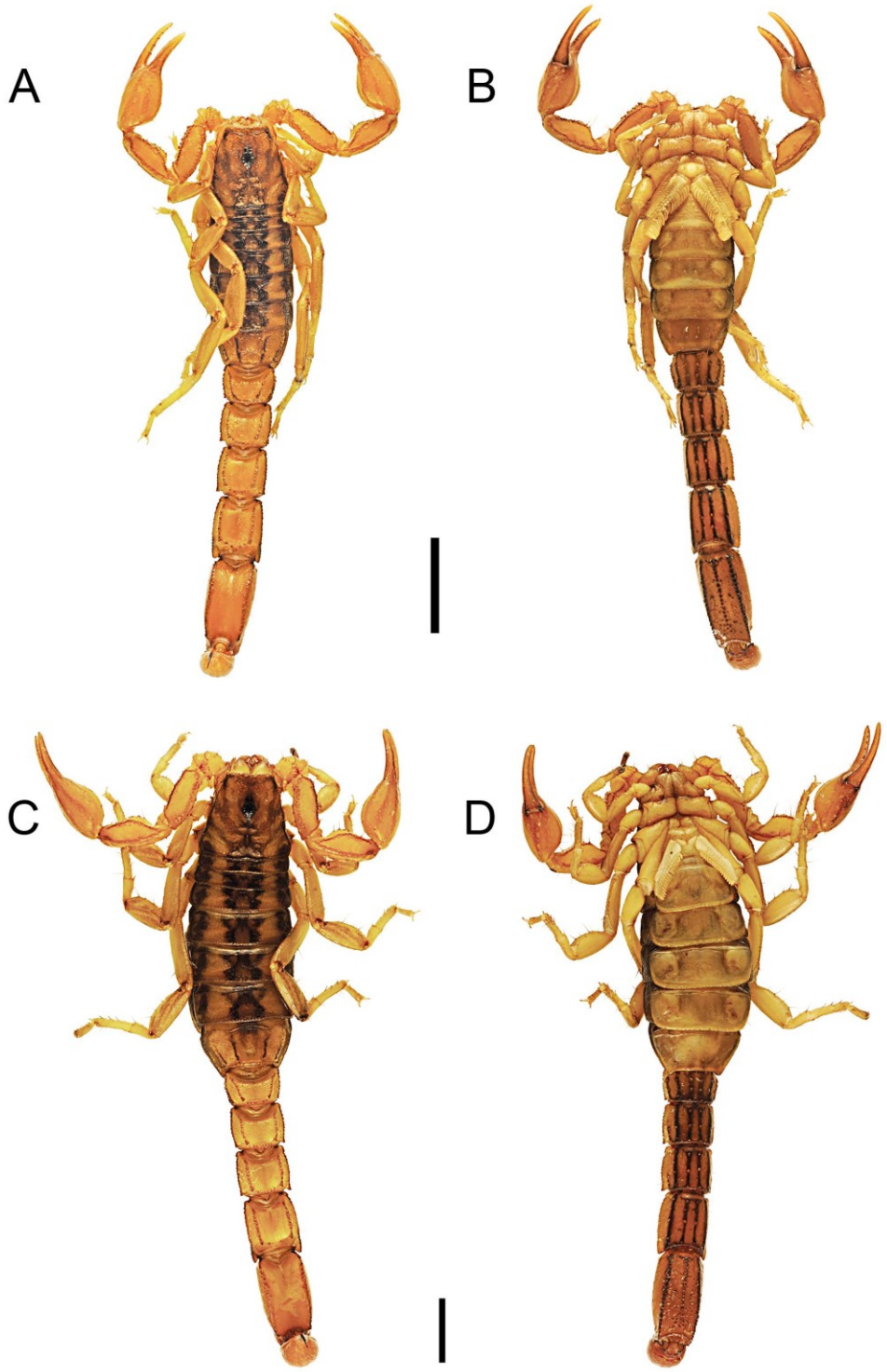


Figure 248. *Mesomexovis nigropictus* (Pocock, 1898), habitus. **A**, **B**. ♂ (IBUNAM). **C**, **D**. ♀ (IBUNAM). **A**, **C**. Dorsal aspect. **B**, **D**. Ventral aspect. Scale bars = 5 mm.

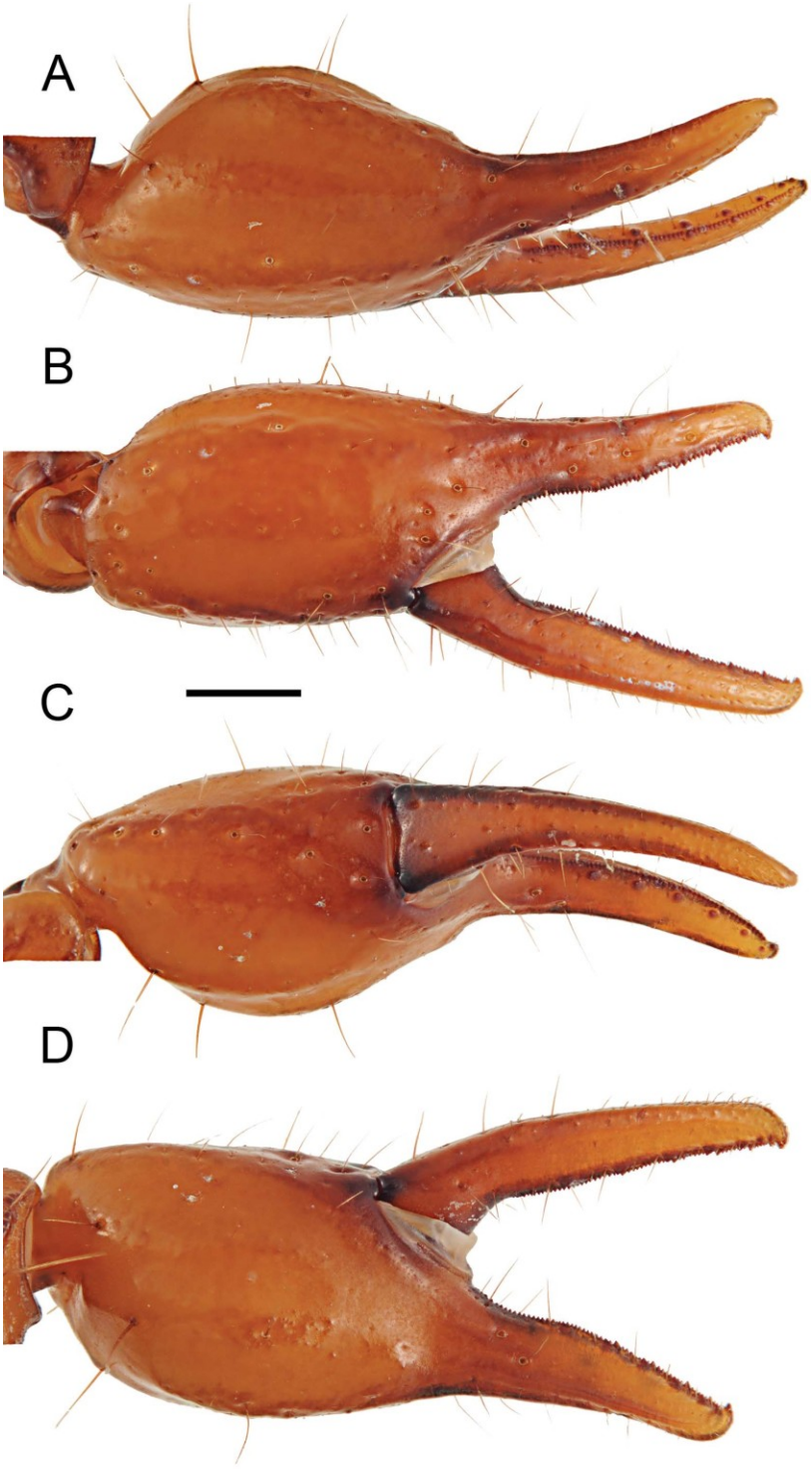


Figure 249. *Mesomexovis nigropictus* (Pocock, 1898), ♂ (IBUNAM), dextral pedipalp chela. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

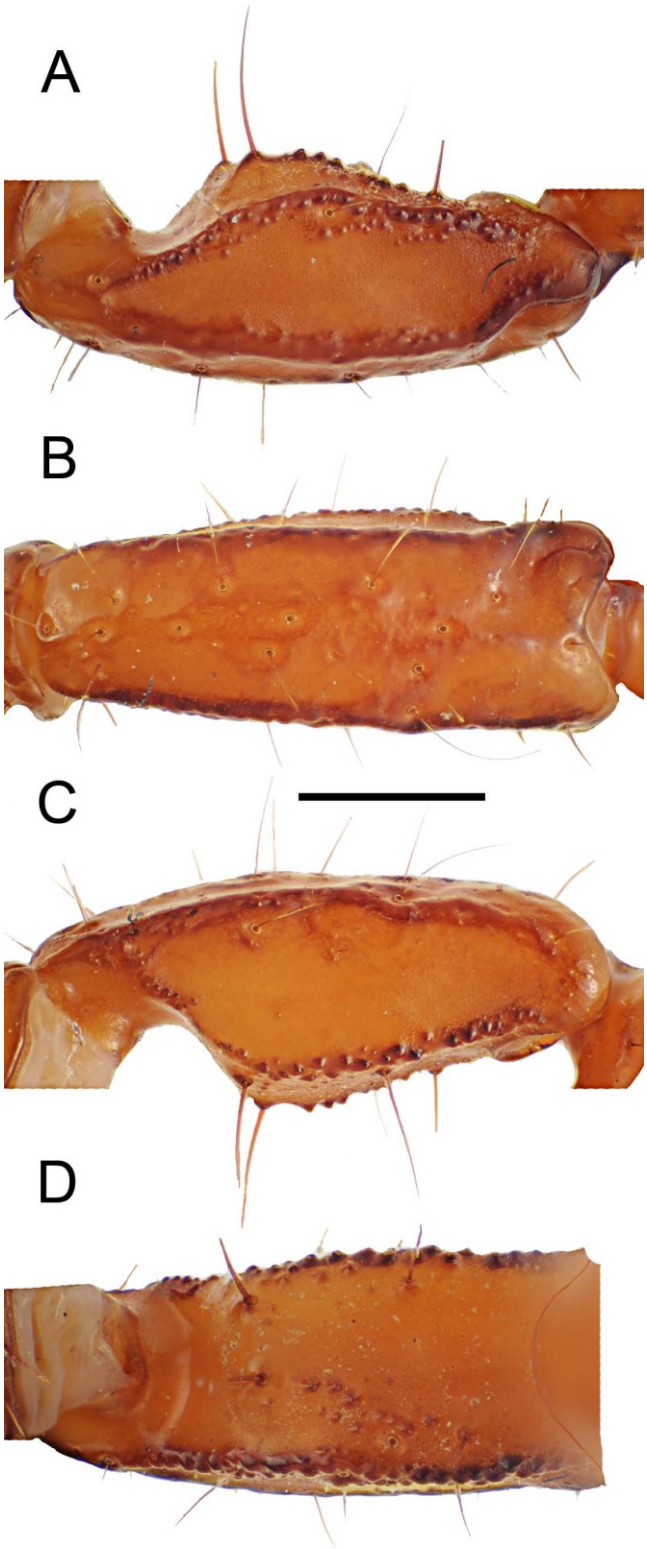


Figure 250. *Mesomexovis nigropictus* (Pocock, 1898), ♂ (IBUNAM), dextral pedipalp patella. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

Table 14. Measurements (mm) of adult holotype of *Mesomexovis caxcan*, **n. sp.**, *Mesomexovis izazagai*, **n. sp.**, *Mesomexovis zaragozai*, **n. sp.**, *Mesomexovis tinctus*, **n. sp.** *Mesomexovis tlayoli*, **n. sp.**, and *Mesomexovis ofeliae*, **n. sp.** All specimens are deposited at IBUNAM.

	M. caxcan,	*M. izazagai*	*M. tinctus*	*M. tlayoli*	*M. ofeliae*	*M. zaragozai*
Length						
Carapace	5.00	4.44	4.50	4.50	5.50	6.00
Pedipalp: femur	3.90	3.12	3.50	3.20	4.30	1.10
Pedipalp: patella	4.20	3.54	3.80	3.70	5.00	2.00
Pedipalp: chela	7.00	5.82	6.20	6.30	8.10	9.00
Fixed finger	3.20	2.40	2.70	2.70	3.50	3.80
Movable finger	4.20	3.30	3.50	3.70	4.80	5.40
Mesosoma	9.80	8.64	10.10	8.60	11.00	12.40
Metasoma	17.30	14.76	16.30	16.30	20.70	23.00
Metasomal segment I	2.20	1.86	2.10	2.00	2.50	2.90
Metasomal segment II	2.70	1.98	2.50	2.50	3.20	3.50
Metasomal segment III	2.90	2.40	2.70	2.70	3.50	3.90
Metasomal segment IV	3.90	3.42	3.60	3.80	4.80	5.20
Metasomal segment V	5.60	5.10	5.40	5.30	6.70	7.50
Telson	5.40	4.86	5.20	5.10	6.10	6.80
Telson: vesicle	3.40	3.18	3.40	3.30	4.00	4.10
Telson: aculeus	2.00	1.68	1.80	1.80	2.10	2.70
Total Length	37.50	32.70	36.10	34.50	43.30	48.20
Width						
Pedipalp: femur	1.30	1.26	1.30	2.20	1.60	5.00
Pedipalp: patella	1.50	1.38	1.60	1.30	1.80	5.20
Pedipalp: chela	2.00	2.10	1.90	1.30	3.00	3.20
Metasomal segment I	2.90	2.82	2.90	2.90	3.60	3.50
Metasomal segment II	2.90	2.82	2.80	2.90	3.50	3.50
Metasomal segment III	2.90	2.76	2.70	2.80	3.40	3.50
Metasomal segment IV	2.80	2.76	2.70	2.80	3.30	3.40
Metasomal segment V	2.80	2.76	2.60	2.80	3.40	3.20
Telson: vesicle	2.00	1.92	1.90	2.00	2.20	2.20
Depth						
Pedipalp: chela	2.00	2.16	1.90	2.20	1.90	3.00
Metasomal segment I	2.40	2.22	2.40	2.40	2.70	3.00
Metasomal segment II	2.40	2.22	2.40	2.40	2.60	3.00
Metasomal segment III	2.40	2.22	2.40	2.40	2.70	3.00
Metasomal segment IV	2.50	2.28	2.50	2.50	3.00	3.00
Metasomal segment V	2.30	2.34	2.40	2.40	2.80	2.70
Telson: vesicle	1.60	1.50	1.70	1.60	1.90	2.00

Mesomexovis oaxaca (Santibáñez-López and Sissom, 2010)

Figures 228, 251–253, 282B, 288B, 290D, 294B, 297B, 300B, 303C

Vaejovis oaxaca Santibáñez-López and Sissom, 2010: 51–57, figs.1–17.

TYPE MATERIAL: **MEXICO: Oaxaca:** Holotype ♂ (CNAN-T0376), 4 km N Totolapam, 16°41'45.9"N 96°18'52.1"W, 1078 m, 1.xi.2004, O. Francke, R. Paredes, and G. Villegas. Numerous paratypes specimens from Chiapas and Oaxaca see discussion in remarks.

DIAGNOSIS: *Mesomexovis oaxaca*, is closely related to *M. occidentalis* and *M. caxcan*, **n. sp.**, with which it forms a monophyletic group. *M. oaxaca* is readily separated from *M. caxcan*, **n. sp.** and *M. occidentalis* by having in general smoother integument, especially intercarinal surfaces of the metasomal segments. *M. oaxaca* is also a more robust scorpion having incrassate pedipalp manus, metasomal segments and noticeable the telson vesicle. *M. oaxaca* has obsolete ventral submedian carinae of metasomal segments I–IV, whereas the other two species have these carinae costate to granular. *M. caxcan*, **n. sp.** and *M. occidentalis* have ventral median carinae of tergites I–VI infuscate, *M. oaxaca* has that carinae immaculate.

DESCRIPTION: The following descriptions supplements Santibáñez-López and Sissom's (2010) original description. It is based on additional freshly collected and museum specimens of the collections mentioned below.

Color and infuscation (In alcohol): Base color carapace pedipalps, mesosoma, and metasomal segments I–V and telson yellow-orange to brownish; leg tarsi, tip of pedipalp fingers and pectines yellowish. Coxosternal region and sternites light orange brown. Carapace, dorsal and retrolateral surface of femur and patella, prolateral femur, tibia and tarsi of legs, tergites, and dorsal carinae of metasomal segments infuscated with dusky markings. Medina and lateral eyes

intensely infuscate. Ventral lateral and ventral submedian in I–IV and ventral median in V carinae underlined with strong and broad infuscation. Telson orange to brownish, aculeus dark brown. Pedipalps fingers base diffusely infuscated.

Carapace: Carapace anterior margin sublinear, with a vestigial to obsolete median notch. Entire surface shagreened, minute and moderately large granules combine over most of the surface. Anterior margin with five pairs of major and minor intersperse lateral macrosetae and a median macrosetae. Anteromedian, posteromedian, and posterolateral sulci moderate, posterior transverse obsolete. Median ocular tubercle moderately raised and broad, with superciliary carinae moderate and weakly crenulated, higher than median eyes. Anterior and posterior base of median ocular tubercle crenular. Median ocular tubercle positioned on distal half of carapace. Median eyes approximately double size of lateral frontal pair. Three lateral eyes, two anterior pairs almost same size and posterior third reduced approximately in half.

Sternum and coxal region: Sternum pentagonal subequilateral with four pairs of setae, one distal, two median pairs and one pair on the lobes, median notch deep. Anterior margin of coxa II with three oblique slit-like structures, adjacent to a strong triangular and finely crenulate protuberance. Proximal median margin of coxal endite II with a moderate depression each. Coxa IV 1.98 times longer than coxa II.

Chelicerae: Dorsal surface smooth, dentition of fixed and movable fingers as in typical Syntropinae. Subdistal margin of manus with one median macrosetae, distal margin with costate carinae and base of fixed finger with weak crenulation. Serrula with 14 tines.

Pedipalps: Trichobothrial pattern Type C, orthobothriotaxic. Pedipalp chela incrassate, wider than patella, patella wider than femur. Femur: Intercarinal surfaces matte. Dorsal prolateral, dorsal retrolateral, and ventral prolateral carinae moderately granular; retrolateral

dorsosubmedian vestigial, expressed by five major macrosetae positioned on a low tubercle each, macrosetae decreasing in size distally; prolateral ventrosubmedian vestigial with a double or bicuspid enlarged proximal tubercle positioned at mid surface followed by a row of four of five irregular scattered conical granules, three distal granules with a macroseta at base; prolateral ventral vestigial, expressed by a proximal tubercle with an adjacent pair of macrosetae and four or five irregular enlarged conical granules the granules with intersperse with seven major macrosetae positioned irregularly but creating a row that slant gently towards ventral prolateral carinae, the row expressed along the length of the segment; ventral median, retrolateral ventral and ventral retrosubmedian vestigial expressed as a proximal short row of serrate to conical granules present on proximal third.

Patella: Dorsal, ventral and prolateral carinae weakly matte, retrolateral smooth. Dorsal prolateral irregularly granular with accessory granules around five to six macrosetae positioned on the carinae; ventral prolateral complete, strongly granular moniliform; dorsal retrolateral weakly crenular but strongly costate with six macrosetae; ventral retrosubmedian complete weakly crenular and costate; ventral median partial expressed on proximal half as a row of moderate granules on first third and becoming scattered and weak distally; retrolateral dorsosubmedian and retrolateral median carinae obsolete, expressed by bands of infuscation and a weak median costa; prolateral median complete on a moderate vaulted projection, protruding strongly medially, extending from a moderate proximal tubercle with a major macroseta on top and a row of three or four coarse subserrate granules slanting gently towards dorsal prolateral carinae, followed by a short gap of smooth surface and ending on at one distal major macrosetae, positioned on the distal fifth of dorsal prolateral carinae; prolateral ventral obsolete expressed by

a row of four major macrosetae, adjacent to ventral prolateral carinae. Proximal major macrosetae on the top of a low granule.

Chelae: Pedipalp manus incrassate (manus 1.4 times longer than fixed finger). Intercarinal surfaces smooth. Dorsal median, dorsal prolateral, dorsal retrolateral, ventral prolateral, prolateral median, ventral retrolateral and ventral median vestigial, weakly costate. Trichobothrium *Db* positioned on dorsal retrolateral carina, subbasal on chelae; *Dt* positioned at mid manus.

Fingers: Fixed finger dentition: PD = 6 and RD = 6, MD rows = 6, proximal RD positioned by proximal third. Prolateral denticles smaller than retrolateral denticles. Movable finger PD = 7, RD = 7, MD rows = 7, distal row of median denticles with one denticles. Proximal RD positioned by proximal third. All retrolateral denticles subpaired with corresponding prolateral denticles in both fingers. Trichobothria *ib* and *it* positioned subbasal on fixed finger, *ib* positioned between PD6 and PD7, PD7 lacking granule and an accessory minor macrosetae between PD6 and PD7, *it* at the level of PD6. Fingers with moderate to strong scalloping, in ♂ proximal notch of fixed finger weak and median lobe moderate, proximal notch of movable finger moderate and medina lobe weak, gap created when fingers closed strong fingers fit unevenly, in ♀ proximal notch and median lobe of fixed finger weak and proximal notch of movable finger obsolete and medina lobe weak, fingers with weak scalloping, gap created when fingers closed vestigial.

Legs: Basitarsi I–III prolateral ventral, retrolateral ventral and retrolateral dorsal carinae with complete rows of spinules, prolateral ventral and retrolateral ventral in IV vestigial; retrolateral dorsal in IV, complete expressed as a scattered row of spinules; retrolateral median rows in I–IV vestigial, expressed by few marginal spinules. Telotarsi I–IV with two or three

pairs of ventrodistal spinules in I–IV. Setae: Prolateral ventral, 3:4:5:5, median two in IV stout; retrolateral ventral, 5:9:9:10, major and minor intersperse macrosetae; retrolateral dorsal, 2:4:5:5, major and minor intersperse macrosetae; dorsal 5:5:5:5; dorsal median macrosetae positioned on dorsal prolateral surface offset of the dorsal row. Retrolateral dorsal and dorsal series arranged in two independent rows.

Tergites: Pretergites smooth, postergites shagreened. Tergites I–VI dorsal median and ventral submedian carinae moderate expressed by few moderate or enlarge distal granules and weak costa. Tergite VII with intercarinal surfaces shagreened; dorsal median carina costate expressed on proximal half of the postergite with few moderate conical granules; dorsal submedian vestigial expressed as a low short proximal granular paired blobs; dorsal lateral and lateral supramedian strong, distally becoming stronger; dorsal lateral carinae projecting and curving laterally approximating to lateral supramedian distal margin, creating a semi ring of strong serrated granulation.

Genital operculum: Male genital operculum: wider than long, with six pairs of macrosetae. Sclerites free on longitudinal edge moving independently but unable to open more than 45°. Genital papillae protruding posteriorly. Female genital operculum: Wider than long, with three macrosetae. Sclerites fuse longitudinal.

Sternites: Sternites I–VII finely punctuated, and lustrous. Sternite V with distal median glandular spot weak occupying distal margin surface between spiracles, not protruding from adjacent surface weakly contrasting with pale base color. Sternite VII ventral lateral carinae vestigial, weakly costate and smooth with three pairs of macrosetae; ventral submedian obsolete expressed by three pairs of macrosetae. Intercarinal surface between ventral lateral and ventral submedian carinae with two or three accessory macrosetae. Distomedian glandular spot obsolete,

not protruding from adjacent surface, in both sexes. Spiracle elongated, slit-like, approximately three times longer than wide.

Pectines: Pectines longer than distal edge of coxa IV in ♂, in ♀ at the level of distal edge of coxa IV. Basal piece with median notch deep. Marginal lamella consist of three sclerites, medial lamella proximally fuse distally progressively forming conspicuous 17 beads. Fulcra with 18–22 in ♂, in ♀ 16–19 beads. Pectinal tooth count 19–23 in ♂, 17–20 in ♀.

Hemispermatophore: Lamina 1.58 longer than trunk. Dorsal through margin long, narrow, curving proximally, and removed from ventral trough. Hemimating plug developed from the inner lobe, distal barb margin with 13 elongated spinules. Primary and secondary hook positioned on the apex of lateral margin extension of the lamina (flange). Both hooks rounded low, separated slightly, forming a shallow notch. Median lobe ental terminus moderate and rounded, slightly protruding towards ental margin. Basal plate of inner lobe removed from ventral trough. Spine of inner lobe long and strongly sclerotized, secondary spine on ventromedian aspect of neck strong. Neck relatively short (0.39 times longer than basal plate). Measurements, lamina, 3.78; trunk, 2.40; dorsal trough/laminar hooks, 1.86; ventral trough/laminar hook, 1.02; neck, 0.42; basal plate, 1.08.

Metasoma: Dorsal and lateral intercarinal surface in I–II shagreened to smooth, ventral surface of metasomal segment I–IV smooth, ventral surface of metasomal segment V weakly to moderately shagreened with coarse and dense granules on distal two third. Carinae: Dorsal lateral and lateral median carinae in I–IV strongly crenatoserrated terminating in enlarged spinoid granule pointing backwards; except lateral median in IV distal terminus strongly expanded or flared laterally forming a rounded triangular projection; dorsal lateral in V proximally third strongly and scattered serrated, becoming weakly crenulated at mid segment

and smooth subdistally, ending in a row of three or four moderate moniliform crenulations. Lateral inframedian in I complete strongly crenatoserrated; in II and III incomplete weakly crenatoserrated, becoming weaker proximally, present in distal third; in VI absent, in V obsolete, expressed by a proximal tubercle; ventral lateral and ventral submedian in I–IV obsolete to weakly costate; ventral lateral and ventral median in V moderately crenatoserrate; ventral median bifurcate on distal end. Setae: Dorsal lateral carinae, 1:3:4:4:10, macrosetae positioned dorsal and lateral to the carinae; lateral median; 1:3:4:5; lateral inframedian, 2:1:1:1:6, ventral lateral, 3:6:6:6:16, macrosetae positioned dorsal and lateral to the carinae; ventral submedian, 3:5:6:6:5, ventral sublateral, 2. Two to three accessory minor macrosetae in intercarinal surfaces between ventral lateral and ventral submedian carinae in segments I and VI.

Telson: Telson vesicle 2.5 times longer than wide. Metasomal segment V 1.3 times wider than telson. Vesicle 2.3 times longer than aculeus. Dorsal and ventral surface smooth, all ventral carinae weakly crenular. Ventral surface with six or seven macrosetae in each carina. Ventral median carinae with subaculear tubercle obsolete. Microserration on laterobasal aculeus numbering 3–6.

DISTRIBUTION: *Mesomexovis oaxaca* is endemic to the central valley of Oaxaca, Mexico.

ECOLOGY: *Mesomexovis oaxaca* has been recorded from 845 to 2900 m altitude. The central valley of Oaxaca is a densely populated area and most of the original vegetation has disappeared, only inaccessible slopes of mountains retain the original vegetation, comprising pine-oak forest and intermingle stripes of transitional vegetation to tropical deciduous forest on canyons and drainages. This is a lapidicolous species, judging by the lack of adaptations to a specific substrate.

REMARKS: Santibáñez-López and Sissom (2010) described this species within the *eusthenura* group of *Vaejovis* that was transferred previously to the genus *Hoffmannius* by Soleglad and Fet (2008). Neither of these hypotheses of relative position agrees with the scheme of relationship retrieved in the phylogenetic analysis conducted here. *M. oaxaca* was found consistently within the monophyletic genus *Mesomexovis* González-Santillán and Prendini, in prep, and particularly within the monophyletic group comprising *M. oaxaca*, *M. occidentalis*, and *M. caxcan*, **n. sp.**

Santibáñez-López and Sissom (2010) designed the following paratypes of this species from Chipas: Arriaga, "4-8-75" (H.L. Stahnke), juv. (CAS); Municipio Arriaga, 4 km NE Arriaga, 16o15.59’ N: 93o51.96’ W, 1 Sept 2005 (O.F. Francke, M. Cordova, A. Jaimes, and H. Montaño), 1 ♂, 1 ♀ (CNAN); Arriaga, near edge of town at Hwy intersection (sandy soil, field burned, UV light), “4-8-75” (H.L. Stahnke), 1 ♂ (CAS). And the following additional localities in the coast of Oaxaca: *Municipio de Ixhuatán*: Aguachil, [16°12.0555'N 94°33.0235'W], 26.vii.1991, W. López-Forment, 1 ♀ (IBUNAM). *Municipio de Juchitán de Zaragoza*: Juchitán, 9.7 km N, 16°20.4'N 95°33.6'W, 4.iv.1967, W. Ivie, 3 juv. (AMNH); La Ventosa Jet, 8 km N, [16°33.16667'N 94°56.833'W], 5.vii.1970, R.E. Beer, 1 ♀ (AMNH). *Municipio de Santa María Colotepec*: El Lagartero, Santa María Colotepec, 15°44.0496'N 96°40.4754'W, 37 m, 13.v.2004, J. Mendoza, E. Hinojosa, S. Lonhora, and E. Goandar, 2 ♂, 4 ♀, 1 subad. ♀ (IBUNAM). *Municipio de Tehuantepec*: Presa Benito Juárez, 15°52'N 96°19'W, R. Paredes, viii.2008, 3 ♀ (IBUNAM), 10.viii.2002, 2 ♂, 1 ♀ (AMNH [LP 2240]); Tehuantepec, [16°13.2'N 95°13.2'W], 27.xii.1947, T. MacDougall, 1 ♂ (AMNH); Tehuantepec, 12.9 km W, 16°13.2'N 95°13.2'W, 29.viii.1966, J. and W. Ivie, 9 ex. (AMNH); Tehuantepec, 19 km WNW, 16°13.2'N 95°13.2'W, 1.ix.1964, J. and W. Ivie, 1 ♂, 1 subad. ♂ (AMNH); Tehuantepec, 32 km W, along Hwy 190,

[16°13.2'N 95°13.2'W], 356 m, 23.vi.1970, R. Reeder, 1 ♂, 3 ♀ (AMNH). *Municipio de Magdalena Tequisistlán*: Tequisistlán, 8 km W, 16°15'N 95°24'W, 1.ix.1964, J. and W. Ivie, 1 ♀ (AMNH). *Municipio de San Pedro Huamelula*: San Pedro Huamelula, 16°01'42.5"N 95°40'6.4"W, 8.vii.2002, R. Cancino, 1 ♂ (AMNH [LP 3116]), 1 ♀ (AMNH [LP 3117]). *Municipio de Santiago Astata*: Barra de La Cruz, [15°57'N 95°38'W], 2.vi.2009, F.H. Carmona, 2 ♀, 1 juv. (IBUNAM). *Municipio de Asunción Ixtaltepec*: Nizanda, 16°39.4902'N 95°0.6342'W, 99 m, 16.ix.2003, A. Valdez, C. Santibáñez, and R. Paredes, tropical dry forest, 8 ♂ (IBUNAM); Nizanda, around the village, 100 m, 22.vii.2004, R. Paredes and N. Burkett, 16 ♂, 2 ♀ (IBUNAM). *Municipio de Santiago Niltepec*: Niltepec, 3.2 km SE, 16°19.2'N 94°19.8'W, 16.viii.1966, J. and W. Ivie, 1 ♂, 1 subad. ♂ (AMNH).

These specimens present a considerable difference in altitude, ranging from sea level to less than 500 m, compared to 845 to 2900 m of the species in the Central Valley of Oaxaca. Thus, these specimens may represent a different species. This is further supported by the consistent monophyly of samples *M. oaxaca*_5275 and *M. oaxaca*_2240, from Chiapas and the coast of Oaxaca. Further molecular analyses are required to test this hypothesis.

MATERIAL EXAMINED: **MEXICO: Oaxaca:** Barranca, km 78 on road to Oaxaca-Tehuantepec, 24.ii.2006, P. Berea, 1 ♂, 1 ♀ (IBUNAM); Juan García, 1.ix.1964, J. and W. Ivie, 1 subad. ♀ (AMNH); *Municipio de Ixtlán of Juárez*: Ixtlán of Juárez, 3.2 km E, [17°19.833'N 96°29.233'W], 2316 m, 20.vii.1962, G. Sluder, 2 ♀ (AMNH). *Municipio de Magdalena Mixtepec*: Magdalena Mixtepec, 16°52.824'N 96°51.056'W, 1710 m, 19–21.vii.2010, 1 ♀, 3 juv. (IBUNAM), 1 ♀ (CAS [ARA1867]), 3 ex. (AMNH [ARA1014]), 2 ex. (IBUNAM [ARA0020]), 1 ♂ (AMNH [LP 6549]), 1 ♂, 1 ♀ (IBUNAM), O. Francke, A. Valdez, G. Villegas, H. Montaño, and C. Santibáñez, collected at night with UV light. *Municipio de Miahuatlán*: Miahuatlán, 12.9

km N, [16°11'N 96°38'W], 3.ix.1966, M.R. Bogert, 5 ex. (AMNH); Miahuatlán, 4 km E, 1638 m, 23–24.vi.2006, 16°19.5036'N 96°32.4606'W, 10 ex. (AMNH [ARA1006]), 9 ex. (IBUNAM [ARA0013]), 5 ex. (CAS [ARA1862]), 16°19.504'N 96°32.46'W, 1 ♂, 1 juv. (AMNH [LP 6413]), 5 ♂, 5 ♀ (IBUNAM), O. Francke, A. Valdez, G. Villegas, H. Montaño, and C. Santibáñez, collected at night with UV light. *Municipio de Mitla*: Mitla, [16°54'52.38"N 96°18'3.09"W], 1962, W.S. Miller, 1 subad. ♀ (AMNH); San José del Paso, 1 km W, 16°56.1042'N 96°17.14'W, 2042 m, 16.iii.2012, 1 ♂, 4 ♀ (IBUNAM). *Municipio de Mixes*: junction to Tepuxtepec, marker 3 km, 16°58.0440'N 96°8.6262'W, 1805 m, 19.vii.2011, O. Francke et al., 1 subad. ♂ (IBUNAM). *Municipio de Mixtepec*: San Lorenzo Mixtepec, 1 km S, 16°17.493'N 96°20.910'W, 2120 m, 24.vii.2010, O. Francke, G. Villegas, H. Montaño, C. Santibáñez, and A. Valdez, pine-oak forest, 1 ♂, 1 ♀ (IBUNAM); San Lorenzo, 1 km N, [16°17.493'N 96°20.910'W], 1925 m, 23.vi.2010, oak forest, 7 ♀ (IBUNAM). *Municipio de Nejapa de Madero*: SE of Nejapa, 16°36'10.26"N 95°58'35.11"W, 29.viii.1966, J. and W. Ivie, 1 ♀ (AMNH); Portillo Nejapa, [16°36'25.54"N 95°58'45.49"W] 1280 m, 20.vii.1966, C.M. Bogert, pine-oak forest, under rocks, 1 subad. ♀ (AMNH). *Municipio de Oaxaca de Juárez*: Oaxaca de Juárez, [17°5'N 96°45'W], 21–22.viii.1965, C.M. Bogert, 3 juv. (AMNH). *Municipio de Ocotlán*: Chichicapan, 4.8 km E, [16°46'N 96°29'W], 1645 m, 23.viii.1966, C.M. Bogert, 1 ♂, 2 ♀ (AMNH). *Municipio de Pedro Juchatengo*: San Pedro Juchatengo, 3 km W, 16°21.8196'N 97°6.5796'W, 845 m, 27.vi.2006, O. Francke, A. Valdez, G. Villegas, H. Montaño, and C. Santibáñez, forest, collected at night with UV light, 1 ex. (AMNH), 3 ex. (IBUNAM). *Municipio de San Bartolo Soyaltepec*: Caballo Blanco, [17°36.28950'N 97°18.8435'W], 12.vii.1963, G. Sluder, 6 ex. (AMNH). *Municipio de San Cristobal Amatlán*: San Lorenzo Mixtepec, 1 km N, 16°17.493'N 96°20.91'W, 2120 m, 23.vi.2006, pine forest, under rock, 1 subad. ♂ (AMNH [LP

6481]), 1 ex. (AMNH), 1 ♂ (IBUNAM), 16°17.5206'N 96°19.98'W, 1925 m, 22.vi.2006, forest, collected at night with UV light, 9 ♂ (AMNH [ARA1009]), 7 ♂ (IBUNAM [ARA0016]), 2 juv. (AMNH [LP 6586]), O. Francke, A. Valdez, G. Villegas, H. Montaño, and C. Santibáñez. *Municipio de San Juan del Río*: San Juan del Río, SE of Mitla, [16°52'59.46"N 96° 9'33.29"W], [1140 m], viii.1961, C.M. and M.R. Bogert, in river bottom, 1 ♀ (AMNH). *Municipio de San Pablo Huitzo*: Huitzo, 1.5 km N, 17°17.4666'N 96° 55.5828'W, 1890 m, 31.x.2004, O. Francke, R. Paredes, and G. Villegas, collected at night with UV light, 2 juv. (AMNH [ARA1154]), 4 ex. (AMNH [ARA1155]), 1 ♀ (AMNH [ARA1147]), 2 ♀ (AMNH [ARA1148]). *Municipio de San Pablo Villa Mitla*: Mitla, 15 km E, 16°56.6058'N 96°17.1138'W, 2881 m, 19.vii.2011, pine-oak forest, 1 ♂, 8 ♀ (IBUNAM), 16°56.606'N 96°17.114'W, 2081 m, 18.vii.2007, 1 ♀ (AMNH [LP 7616]), O. Francke, H. Montaño, A. Valdez, A. Ballesteros, and C. Santibáñez; Mitla, 4.5 km E, 17°15.642'N 96°32.427'W, 23.vii.2002, L. Prendini, O. Francke, E. González, and J. Ponce, collected at night with UV light, 1 ♂, 4 juv. (AMNH [LP 2031]), 1 ♀ (AMNH [ARA1146]); Mitla, 4.8 km NE, [17°15.642'N 96°32.427'W], 1767 m, 13.vii.1966, C.M. Bogert, 3 ♀ (AMNH); Mitla, 8 km NE, on ridge ca. 6800–7200, near ruins called El Crucero, 27.viii.1963, C.M. Bogert, G. Sluder, and N. Bucknall, 2 ♂, 3 ♀ (AMNH); Mitla, 9 km W, 16°55'40.9"N 96°24'44.7"W, 1688 m, x.2004, R. Paredes, O. Francke, and G. Villegas, rock rolling, 2 ♂, 1 subad. ♂ (AMNH [LP 3717]); Mitla, 9.7 km E, above, to the NE of Xaaga, [16°55'40.9"N 96°24'44.7"W], 2300 m, 3.ix.1965, C.M. and M.R. Bogert, 5 ex. (AMNH); Mitla, 9.7 km N, 1889 m, 1.ix.1962, M.R. Bogert, 1 ♂, 1 subad. ♂ (AMNH). *Municipio de Santa Catarina Ixtepeji*: El Punto, 7.2 km S, [17° 9'4.17"N 96°36'27.34"W] 2590 m, 7.vii.1966, C.M. Bogert and P.C. Peckham, 2 ♂, 1 ♀ (AMNH); *Municipio de Santa María Zoquitlán*: Santa María Zoquitlán, [16°33.04950'N 96°21.981833'W], 24.ii.2006, P. Berea, 3 ♀ (AMNH). *Municipio*

Santiago Matatlán: Nueve Puntas, [16°52'52.97"N 96°20'46.70"W] 13.vii.1963, G. Sluder, 3 juv. (AMNH). *Municipio de Tlacolula de Matamoros*: Tlacolula, [16°57.32367'N 96°28.5965'W], 16.vii.1955, C. and P. Vauris, 1 ♂, 1 ♀ (AMNH); Yahuiche, mesa E of Yagul, [16°57.44'N 96°26.94'W], 30.viii.1962, M.R. Bogert, 1 ♂ (AMNH). *Municipio de Tlacolula*: Hierve el Agua, Tlacolula, 16°51.9120'N 96°16.6266'W, 1750 m, 2.ii.2010, J. Mendoza, E. Hinojosa, S. Lonhora, and E. Goandar, 1 juv. (IBUNAM); Yagui, 1 km E, 16°57.2970'N 96°26.4612'W, 1662 m, 14.xi.2006, 1 subad. ♂ (AMNH [LP 6634]), 15.xi.2009, 2 ♂ (IBUNAM), O. Francke, M. Córdova, A. Jaimes, A. Valdez, G. Montiel, and C. Santibáñez. *Municipio de Tlalixtac de Cabrera*: Santa María de Sena (sic), [Santa Catalina de Sena] 17°02'53"N 96°36'34"W, 1580 m, C.R. Antonio-Santiago and J.A. Cruz-López, 1 ♂, 1 subad. ♀ (IBUNAM). *Municipio de Totolapam*: Totolapam, 4 km N, 1078 m, 1.xi.2004, 16°41.7498'N 96°18.8664'W, 5 juv. (AMNH [ARA1149]), 9 juv. (AMNH [ARA1151]), 5 juv. (CAS [ARA1850]), 4 juv. (IBUNAM [ARA2012]), 2 ex. (AMNH [ARA1150]), 16°41'45.9"N 96°18'52.1"W, 1 ♀, 1 subad. ♂ (AMNH [LP 3718]), 1 ♀ (AMNH [LP 3719]), O. Francke, R. Paredes, and G. Villegas, collected at night with UV light. *Municipio de Villa Díaz Ordáz*: Carrizal, 1 km S, [17°1.02617'N 96°49.68233'W], 2900 m, 25.vii.1963, G. Sluder, 2 ♂ (AMNH).

Figure 251. *Mesomexovis oaxaca* (Santibáñez-López and Sissom, 2010), habitus. **A**, **B**. Paratype ♂ (AMNH). **C**, **D**. Paratype ♀ (AMNH). **A**, **C**. Dorsal aspect. **B**, **D**. Ventral aspect. Scale bars = 5 mm.

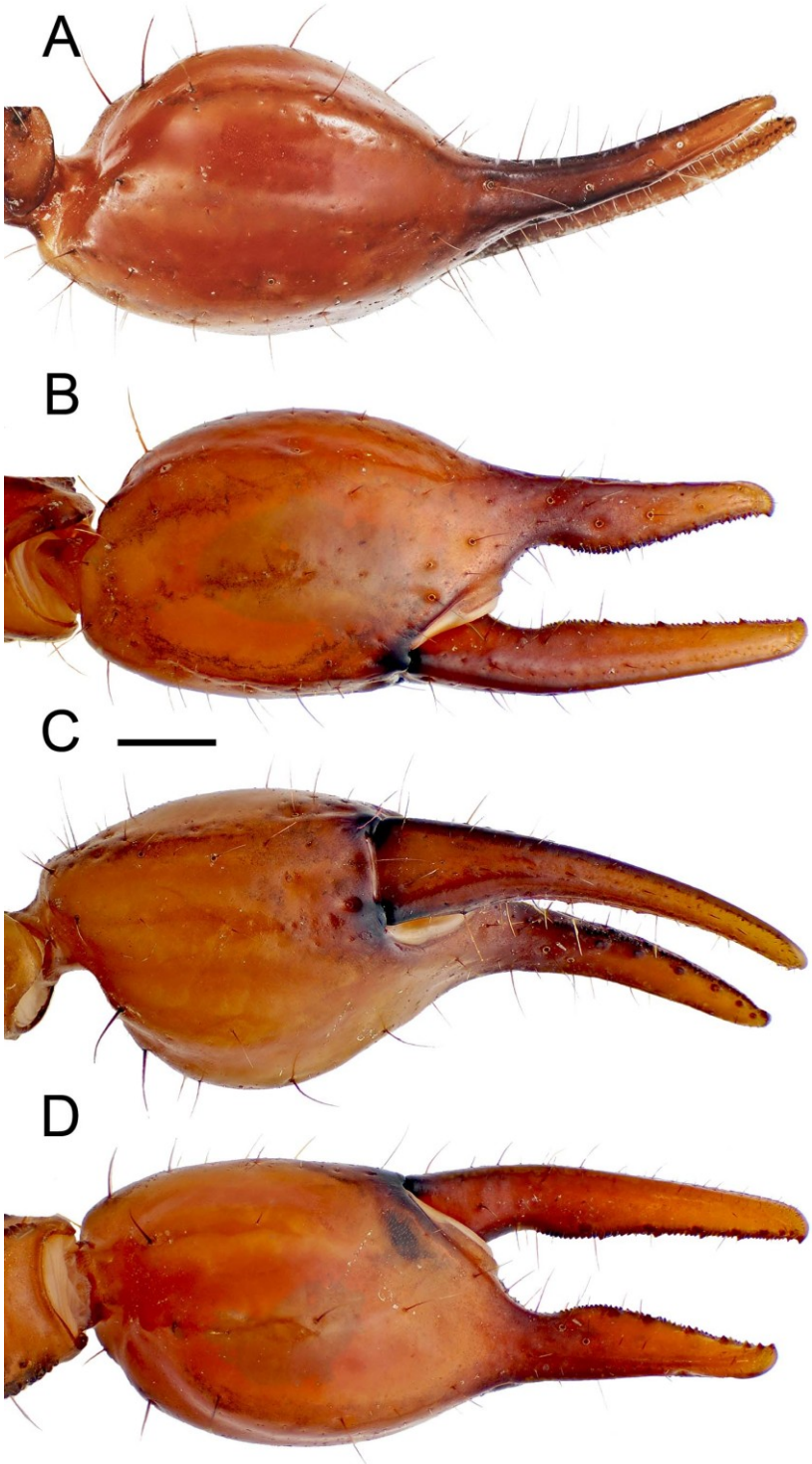


Figure 252. *Mesomexovis oaxaca* (Santibáñez-López and Sissom, 2010), paratype ♂ (AMNH), dextral pedipalp chela. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

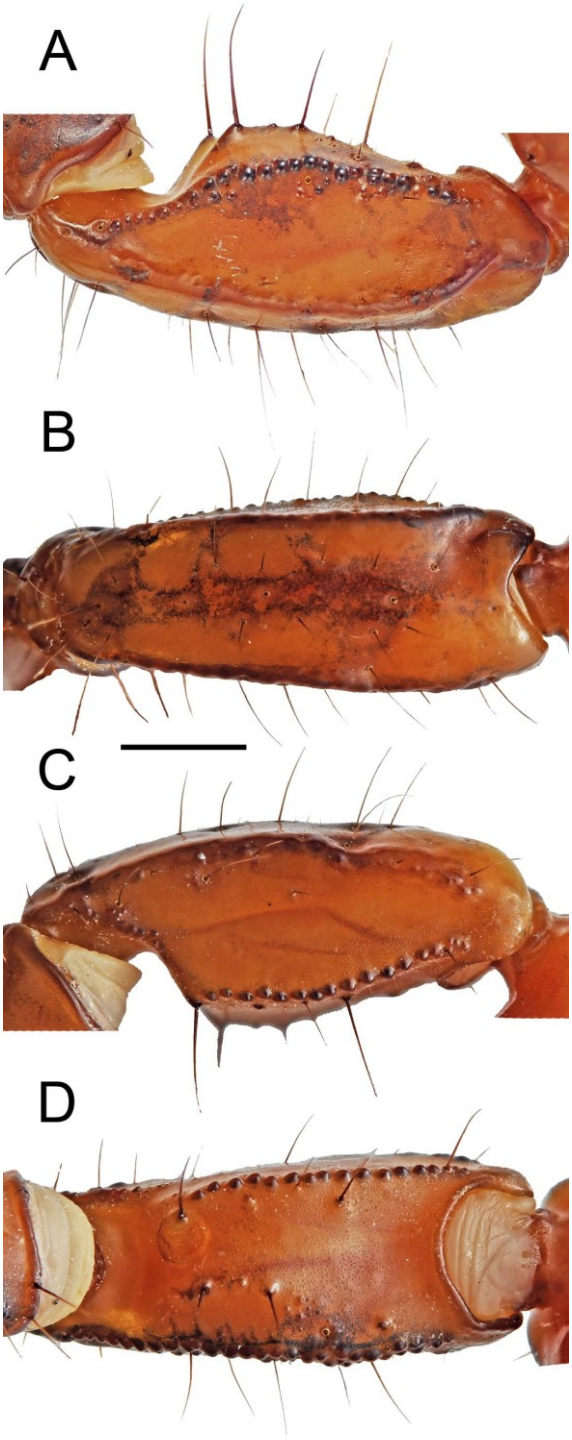


Figure 253. *Mesomexovis oaxaca* (Santibáñez-López and Sissom, 2010), paratype ♂ (AMNH), dextral pedipalp patella. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

Mesomexovis occidentalis (Hoffmann, 1931)

Figures 227, 254–256, 283A, 289C, 291E, 294C, 297C, 300C, 303D

Vejovis subcristatus occidentalis Hoffmann, 1931: 385–388, fig. 36.

Vejovis subcristatus occidentalis: Hoffmann, 1938: 318; Díaz-Nájera, 1964: 20, 26.

Vejovis subcristatus: Penther, 1913: 247 (probable misidentification).

Vejovis punctatus punctatus: Díaz-Nájera, 1964: 24 (part) [probable misidentification].

Vaejovis subcristatus occidentalis: Díaz-Nájera, 1975: 7, 24, 29; Williams, 1986: 355, 358.

Vaejovis punctatus punctatus: Díaz-Nájera, 1975: 24 (in part and probable misidentification).

Vaejovis occidentalis: Sissom, 1989b: 180–185, figs. 1–2, 5–10; Kovařík, 1998: 147; Beutelspacher, 2000: 100, 140, 142, 144, 153, map 80; Ponce-Saavedra and Beutelspacher, 2001: 46, 49, 80, 100, maps 24, 25; Sissom, 2000: 538; Armas and Martín-Frías, 2001: 13; Soleglad and Fet, 2003: 9; González-Santillán, 2004: 31; Francke and González-Santillán, 2007: 590; McWest, 2009: 20, tab. 1, 20, 34, 66, 69, 102, 120, figs. 214–218; Santibáñez-López and Sissom, 2010: 52.

Thorellius occidentalis: Soleglad and Fet, 2008: 5, 26, fig. 26, 28, tab. 1, 30, 35, 53, 67, 94, 95.

TYPE MATERIAL: **MEXICO: Guerrero:** Holotype ♀ (AMNH), Acapulco. Paratypes: 2 ♀, 1 juv. ♀ (AMNH), same locality as holotype.

DIAGNOSIS: *Mesomexovis occidentalis* is closely related to *M. caxcan*, **n. sp.** and *M. oaxaca*, with which it forms a monophyletic group. *M. occidentalis* is readily distinguish from the mentioned species by having dorsal prolateral, dorsal median, prolateral median and ventral retrolateral carinae finely granular, instead of obsolete to costate. *M. occidentalis* has color base pale yellow, whereas *M. caxcan*, **n. sp.**, and *M. oaxaca* tend to have darker brownish to orange

color. From *M. oaxaca* can be further differentiated by having intercarinal surfaces of metasomal segments I–IV cover with dense coarse granulation and more elongated telson vesicle.

DESCRIPTION: The following description supplements Sissom's (1989b) redescription.

Color and infuscation (In alcohol): Base color yellow to orange-brownish. Coxosternal region and sternites light orange brown. Carapace, dorsal and retrolateral surface of femur and patella, prolateral femur, tibia and tarsi of legs, tergites, and dorsal carinae of metasomal segments infuscated with dusky markings. Medina and lateral eyes moderately infuscate. Base of pedipalp fingers intensely infuscate, carinae diffusely to moderately outline with infuscation. Pectines and genital operculum pale yellowish to whitish. Dorsal median and dorsal lateral carinae weakly outline with infuscation; ventral lateral and lateral inframedian in I–V, ventral submedian in I–IV, and ventral median in V carinae underlined with fine but intense infuscation. Ventral surface of telson infuscate with two lateral broad and a median longitudinal bands with dusky markings, dorsal entirely infuscate, aculeus dark brown.

Carapace: Carapace anterior margin sublinear, with a vestigial to obsolete median notch. Entire surface shagreened, minute and moderately large granules combine over most of the surface. Anterior margin with five pairs of major and minor intersperse lateral macrosetae and a median macrosetae. Anteromedian, posteromedian, and posterolateral sulci moderate, posterior transverse obsolete. Median ocular tubercle moderately raised and broad, with superciliary carinae moderate and weakly crenulate, higher than median eyes. Anterior and posterior base of median ocular tubercle crenular. Median ocular tubercle positioned on distal half of carapace. Median eyes approximately double size of lateral first anterior pair. Three lateral eyes, anterior pair slightly larger than second pair third pair reduced approximately half of second pair.

Sternum and coxal region: Sternum pentagonal subequilateral with four pairs of setae, one distal, two median pairs and one pair on the lobes, median notch deep, surface matte. Coxal area moderately matte. Anterior margin of coxa II with three oblique slit-like structures, adjacent to a strong granular protuberance. Proximal median margin of coxal endite II with a deep depression each. Coxa IV 2.03 times longer than coxa II.

Chelicerae: Dorsal surface smooth, dentition of fixed and movable fingers as in typical Syntropinae. Subdistal margin of manus with one median macrosetae, distal margin with costate carinae and base of fixed finger with weak crenulation. Serrula with 14 tines.

Pedipalps: Trichobothrial pattern Type C, orthobothriotaxic. Pedipalp chela incrassate, wider than patella, patella wider than femur. Femur: Prolateral, retrolateral and ventral intercarinal surface matte, dorsal moderately granular medially. Dorsal prolateral, dorsal retrolateral, and ventral prolateral carinae moderately granular; retrolateral dorsosubmedian vestigial, expressed by five major macrosetae positioned on a low tubercle each, macrosetae decreasing in size distally; prolateral ventrosubmedian vestigial with a double or bicuspid enlarged proximal tubercle positioned at mid surface with an adjacent minor macrosetae followed by a row of four of five irregular scattered conical granules, three distal granules with a macroseta at base; prolateral ventral vestigial, expressed by a proximal tubercle with an adjacent pair of macrosetae and two or three irregular enlarged conical granules with a macroseta at base creating an irregular row that slant gently towards the distal fifth of ventral prolateral carinae vestigial with few scatter serrate proximal granules; ventral median vestigial expressed by a strong proximal row of granules; ventral retrosubmedian vestigial expressed as a proximal short row of serrate to conical granules present on proximal third.

Patella: All intercarinal surfaces matte. Dorsal prolateral and ventral prolateral carinae moderately granular; dorsal retrolateral and ventral retrosubmedian smooth but strongly to moderately costate; ventral median vestigial expressed on proximal third as a short row of moderate granules and few moderate and scattered granules on median third; retrolateral dorsosubmedian and retrolateral median carinae obsolete, expressed by bands of infuscation; prolateral median partial on a moderate vaulted projection, protruding strongly medially, extending from a moderate proximal tubercle with a major macroseta on top and a row of three or four coarse subserrate granules slanting gently towards dorsal prolateral carinae, followed by a gap of smooth surface and ending on at one distal major macrosetae positioned on the distal fifth of dorsal prolateral carinae; prolateral ventral obsolete expressed by a row of three major macrosetae, adjacent to ventral prolateral carinae. Proximal major macrosetae on the top of a low granule.

Chelae: Pedipalp manus moderate. Intercarinal surfaces smooth. Dorsal median, dorsal prolateral, dorsal retrolateral, ventral prolateral, prolateral median, ventral retrolateral and ventral median vestigial, weakly costate. Trichobothrium *Db* positioned on dorsal retrolateral carina, subbasal on chelae; *Dt* positioned at mid manus.

Fingers: Fixed finger dentition: PD = 6 and RD = 6, MD rows = 6, proximal RD positioned by proximal third. Prolateral denticles slightly smaller than retrolateral denticles. Movable finger PD = 7, RD = 7, MD rows = 7, distal row of median denticles with one denticles. Proximal RD positioned by proximal third. All retrolateral denticles subpaired with corresponding prolateral denticles in both fingers. Trichobothria *ib* and *it* positioned submedian on fixed finger, in ♂ *ib* positioned adjacent to PD6 and *it* between PD5 and PD6, in ♀ *ib* between PD6 and PD7, PD7 lacking granule and *it* adjacent to PD6. Fingers with moderate

scalloping, in ♂ proximal notch and median lobe of fixed and movable finger moderate, gap created when fingers closed strong to moderate fingers fit unevenly, in ♀ proximal notch and median lobe of fixed and movable finger weak, fingers with weak scalloping, gap created when fingers closed weak.

Legs: Basitarsi I–II prolateral ventral, retrolateral ventral and retrolateral dorsal carinae with complete rows of spinules, prolateral ventral in III vestigial expressed in distal third, in IV absent; retrolateral ventral in III complete in IV absent; retrolateral dorsal in III, in IV complete expressed as a scattered row of spinules; retrolateral median rows in I–IV vestigial, expressed by few marginal spinules. Telotarsi I–IV with two or three pairs of ventrodistal spinules in I–IV. Setae: Prolateral ventral, 3:4:5:5, median two in IV stout; retrolateral ventral, 5:7:9:9, major and minor intersperse macrosetae; retrolateral dorsal, 2:3:3:4, major and minor intersperse macrosetae; dorsal, 4:4:4:4; dorsal median macrosetae positioned on dorsal prolateral surface offset of the dorsal row. Retrolateral dorsal and dorsal series arranged in two independent rows.

Tergites: Pretergites smooth, postergites shagreened. Tergites I–VI dorsal median and ventral submedian carinae moderate expressed by few moderate distal granules and moderate costa. Tergite VII with intercarinal surfaces moderately shagreened; dorsal median carina costate expressed on proximal half of the postergite with few moderate conical granules; dorsal submedian vestigial expressed as a low short proximal oblique short costa with few granules; dorsal lateral and lateral supramedian strong, distally becoming stronger; dorsal lateral carinae projecting and curving laterally approximating to lateral supramedian distal margin, creating a semi ring of strong subserrate granules.

Genital operculum: Male genital operculum: wider than long, with three pairs of major macrosetae. Sclerites free on longitudinal edge moving independently but unable to open more

than 45°. Genital papillae protruding posteriorly. Female genital operculum: Wider than long, with three macrosetae. Sclerites fuse longitudinal.

Sternites: Sternites I–VII finely punctuated, and lustrous. Sternite V with distal median glandular spot weak, not protruding from adjacent surface and weakly contrasting with pale base color. Sternite VII ventral lateral carinae weakly crenulate and costate with two pairs of macrosetae; ventral submedian obsolete expressed by three pairs of macrosetae. Distomedian glandular spot obsolete, not protruding from adjacent surface, in both sexes. Spiracle elongated, slit-like, approximately three times longer than wide.

Pectines: Pectines longer than distal edge of coxa IV in ♂, in ♀ at the level of distal edge of coxa IV. Basal piece with median notch deep. Marginal lamella consist of three sclerites, medial lamella proximally fuse distally progressively forming conspicuous 9–14 beads. Fulcra with 18–21 in ♂, in ♀ 16–18 beads. Pectinal tooth count 19–22 in ♂, 17–19 in ♀.

Hemispermatophore: Lamina 1.71 longer than trunk. Dorsal through margin long, narrow, curving proximally, and removed from ventral trough. Hemimating plug developed from the inner lobe, distal barb margin with 9 elongated spinules. Primary and secondary hook positioned on the apex of lateral margin extension of the lamina (flange). Both hooks rounded low, separated slightly, forming a shallow notch. Median lobe ental terminus moderate and rounded. Basal plate of inner lobe removed from ventral trough. Spine of inner lobe relatively long and strongly sclerotized, secondary spine on ventromedian aspect of neck absent. Neck relatively short (0.36 times longer than basal plate). Measurements, lamina, 3.60; trunk, 2.10; dorsal trough/laminar hooks, 1.32; ventral trough/laminar hook, 0.90; neck, 0.30; basal plate, 0.90.

Metasoma: Dorsal and lateral intercarinal surface in I–V with few scatter granules to smooth, being the smoother III, ventral surface of metasomal segment I–IV smooth, ventral surface of metasomal segment V weakly to moderately shagreened with coarse and dense granules more accentuated on distal two third, lateral surface of V less granular and granules moderate. Metasoma 1.99 times longer than mesosoma. Metasomal segments I–III wider than long. Carinae: Dorsal lateral and lateral median carinae in I–IV strongly crenatoserrated terminating in enlarged spinoid granule pointing backwards; except lateral median in IV distal terminus strongly expanded or flared laterally forming a rounded triangular projection; dorsal lateral in V proximally third strongly and scattered serrated, becoming crenulate at mid segment and more densely crenular subdistally, ending in a short row moderate moniliform crenulations. Lateral inframedian in I complete strongly crenatoserrated; in II incomplete strongly crenatoserrated, becoming weaker proximally, present in distal half; in III incomplete strongly crenatoserrated, becoming weaker proximally, present in distal third, in VI absent, in V incomplete, expressed by a proximal tubercle, weakly granular expressed on proximal two thirds; ventral lateral in I weakly crenular, in II and III moderately crenular, in Iv and V strongly crenular; ventral submedian in I and II smooth but costate, in III proximal half smooth and costate , distal half weakly crenular, in IV strongly crenular; ventral lateral and ventral median in V strongly crenatoserrate. Setae: Dorsal lateral carinae, 0:3:3:3:7; lateral median; 0:3:3:4; lateral inframedian, 2:1:1:0:5; ventral lateral, 3:4:4:5:10; ventral submedian, 3:3:3:4:4; ventral sublateral, 2. Occasionally with one accessory minor or major macrosetae in intercarinal surfaces between ventral lateral and ventral submedian carinae in segments I and VI.

Telson: Telson vesicle 2.50 times longer than wide. Metasomal segment V 1.47 times wider than telson. Vesicle 1.68 times longer than aculeus. Dorsal and ventral surface smooth, all

ventral carinae weakly crenular. Ventral surface with five or six macrosetae in each carina. Ventral median carinae with subaculear tubercle moderate, occasionally bicuspid or with two moderate broad conical granules. Microserration on laterobasal aculeus numbering 3–5.

DISTRIBUTION: *Mesomexovis occidentalis* is endemic to the Pacific coast of central Mexico, including the states of Guerrero, Michoacán, and Oaxaca.

ECOLOGY: *Mesomexovis occidentalis* inhabits tropical deciduous forest of the coastal flatlands of the Pacific at altitudes from 11 to 371 m. This species is lapidicolous commonly found resting under rocks during the day, and encountered during at night by detection with ultraviolet light.

REMARKS: Beutelspacher's (2000) record of *V. occidentalis* from Morelos at La Pera [Toll road 95D, between Mexico City and Cuernavaca city] is undoubtedly an error. The only species that is likely be confounded with *M. occidentalis* in Morelos is *M. ofeliae*, but its distribution is in the far eastern part of the state. The only species found in the area Beutelspacher indicated in his map (map 80, p. 101) is *Vaejovis smithi* Pocock, 1902.

It appears that the specimens from Michoacán may represent a different lineage, however no characters were found that permit a satisfactory diagnosis of these specimens. Further study of microstructures may provide enough evidence to separate and diagnose these two lineages in the future.

MATERIAL EXAMINED: **MEXICO: Guerrero:** *Municipio de Acapulco*: Acapulco, [16°51.81667'N 99°52.95'W], H. Hoffmann, 1 ♂, 1 ♀ (AMNH); Cumbres of Llano Largo, 16°49.505'N 99°49.999'W, 371 m, 16.vi.2007, O. Francke et al., 1 juv. (AMNH [LP 7056]); Llano Grande, [16°49'N 99°28'W], 15.ix.1985, W. López-Forment, 1 ♀ (IBUNAM); Mozimba, [16°51'50.74"N 99°55'42.05"W], 17.iii.1985, W. López-Forment, 1 ♀ (IBUNAM); Viveros de

Huayacán, La Poza, [16°51.74683'N 99°51.34716667'W], 2.xii.1978, 3 ♂, 6 ♀, 1 juv. (IBUNAM). *Municipio de Ayutla*: Tepango, 16°54.1458'N 99°5.69'W, 317 m, 23.vi.2011, 2 ♀ (IBUNAM). *Municipio de Chilpancingo*: Chilpancingo, 37 km S, [17°33.00'N 99°30.00'W], 30.vii.1956, V. Roth and W.J. Gertsch, 1 ♂ (AMNH). *Municipio de Copala*: Microwave Tower Fogos, 16°33.992'N 98°53.301'W, 103 m, 22.vi.2007, 1 ♂ (AMNH [LP 7070]), 16°34.360'N 98°53.423'W, 14 m, 2.xi.2007, 1 juv. (AMNH [LP 8577]), O. Francke, H. Montaño, and A. Ballesteros; Microwaves station Fogos, E of Copala, 16°33.9918'N 98°53.30'W, 103 m, 22–23.vi.2007, O. Francke, H. Montaño, Escalante, and A. Ballesteros, 1 ♂, 1 ♀ (AMNH), 15 subad. ♂, 17 subad. ♀ (IBUNAM), 16°34.0524'N 98°53.2524'W, 139 m, 1.ix.2012, O. Francke, H. Montaño, C. Santibáñez, and A. Valdez, 4 ♀ (IBUNAM); Playa Ventura, Colonia Juan N. Alvarez, 1 km of Casa de Piedra, 16°32.1624'N 98°54.13'W, 22 m, 19.v.2010, M. Córdova and A. Jaimes, 1 ♂, 5 ♀, 4 juv. (IBUNAM). *Municipio de José Azueta*: Colonia Agua de Correa, 17°38.6982'N 101°31.0932'W, 72 m, 3.v.2006, O. Francke, H. Montaño, J. Ponce, A. Quijano, and J. Baldazo, 2 ♀ (IBUNAM). *Municipio de La Unión*: La Unión, [17°59'7.97"N 101°48'22.05"W], 9.xii.2012, V. Quesada, 2 ♂, 3 ♀, 4 juv. (IBUNAM); Majahua, N of Zihuatanejo, 11 m, 24–25.v.2006, 17°47.8308'N 101°44.65'W, 1 ♂, 1 ♀ (AMNH [LP 6559]), 3 ex. (CAS [ARA1856]), 1 ex. (AMNH [ARA1000]), 7 ex. (IBUNAM [ARA0007]), 17°47.831'N 101°44.652'W, (IBUNAM), O. Francke, A. Valdez, H. Montaño, and A. Ballesteros, collected at night with UV light. *Municipio de Ometepec*: Ometepec, [16°41'N 98°25'W], 7.x.1974, J. Julia, 1 ♀ (IBUNAM). *Municipio de Puerto Marqués*: Cumbres of Llano Largo, 16°49.505'N 99°49.999'W, 371 m, 19.vi.2007, O. Francke, H. Montaño, and A. Ballesteros, 1 ♂ (AMNH). **Michoacán:** Río La Soledad, 18°03'4.8"N 102°38'29.2"W, 9.iii.2007, 4 ♂, 1 ♀ (IBUNAM). *Municipio de Aquila*: Colola, [18°18.047'N 103°24.536'W], 10.ii.2005, 1 juv. (IBUNAM), 42 m,

19.v.2007, O. Francke et al., 1 subad. ♂, 1 subad. ♀ (AMNH [LP 7061]), 20.v.2011, O. Francke, J. Ponce, M. Villaseñor, A. Quijano, and A. Ballesteros, 1 ♀ 29 juv. (IBUNAM); El Faro de Bucerías, [18°21'N 103°29'W], J. Ponce and E. González, 12.i.2002, tropical dry forest, 1 ♂ (AMNH [LP 2014]), 14.i.2002, 1 ♀ (AMNH [LP 2015]), 15.i.2002, 1 ♀ (AMNH [LP 2016]), E. González, 13–14.iv.2002, tropical dry forest, 6 ♂, 9 ♀, 1 subad. ♀, 3 juv. (IBUNAM), 13.iv.2006, 2 ♂ (IBUNAM), 17.i.2006, 1 ♂ (IBUNAM); El Faro de Bucerías, near La Llorona, [18°20'40.74"N 103°30'32.04"W], E.P. Miranda, 7.v.2004, 2 ♀, 1 subad. ♂ (IBUNAM), 3.vi.2004, 1 ♀ (IBUNAM), V.S. Moran, 3.vi.2004, 2 ♀ (IBUNAM), J. Ponce, 7.vi.2004, 1 ♂, 1 ♀, 1 juv. (IBUNAM), G. Suarez, 17.i.2006, 1 ♀ (IBUNAM); El Faro, [18°21'N 103°29'W], 19.x.2003, 1 juv. (IBUNAM), 20.x.2003, 1 ♂ (IBUNAM), R. Moreno, 9.xii.2004, 1 subad. ♀, 1 juv. (IBUNAM); El Puerto, by the Chapel, road to San Pedro, [18°35'56.21"N 103°30'7.50"W], 6.viii.2007, 6 ♂, 3 juv. (IBUNAM). *Municipio de Lázaro Cárdenas*: El Arenal, [17°57'15.07"N 102°13'29.75"W], 4–5.viii.2007, 3 ♂, 3 ♀ 2 subad. ♂ 2 juv. (IBUNAM); El Habillo Ranch, [18°0.43332'N 102°22.23336'W], 5.viii.2007, 1 ♀, 1 subad. ♂, 1 subad. ♀ (IBUNAM); on the way to Arenal, [17°57'15.07"N 102°13'29.75"W], 19.viii.2007, 1 ♀ (IBUNAM). **Oaxaca:** *Municipio de Huatulco*: Huatulco, [15°51'N 96°19'W], 20.x.1994, E. Barrera, 1 juv. (IBUNAM); Parque Nacional Huatulco, 0.5 km N, train station El Sabanal, 15°46'19.7"N 96°11'53.9"W, 29 m, 5.ix.2007, E. González, 1 subad. ♀ (IBUNAM); Puerto Escondido, J. Simato, 27.iv.1974, 1 ♀ (IBUNAM), 15°50'40.9"N 97°01'11.9"W, R. Cancino, 11.vii.2002, 1 ♂ (AMNH [LP 3118]), 8.vii.2006, 2 ♂ (IBUNAM). *Municipio de Pedro Juchatengo*: San Pedro Juchatengo, 3 km W, 845 m, 16°21.8238'N 97°6.5838'W, 27–28.vi.2006, O. Francke, A. Valdez, G. Villegas, H. Montaño, and C. Santibáñez, 2 juv. (AMNH [LP 6602]), 1 subad. ♀ (IBUNAM).

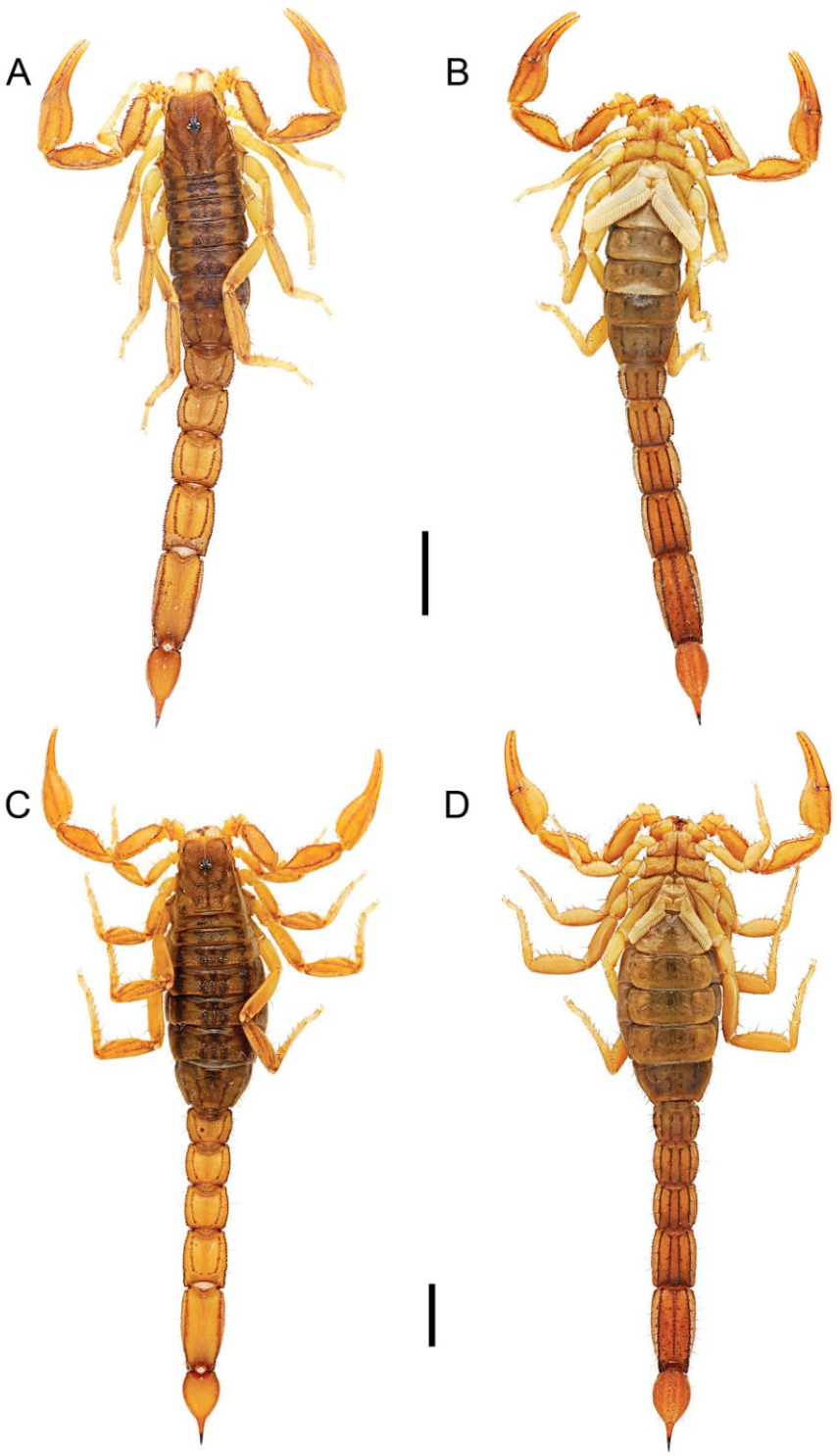


Figure 254. *Mesomexovis occidentalis* (Hoffmann, 1931), habitus. **A**, **B**. ♂ (IBUNAM). **C**, **D**. ♀ (IBUNAM). **A**, **C**. Dorsal aspect. **B**, **D**. Ventral aspect. Scale bars = 5 mm.

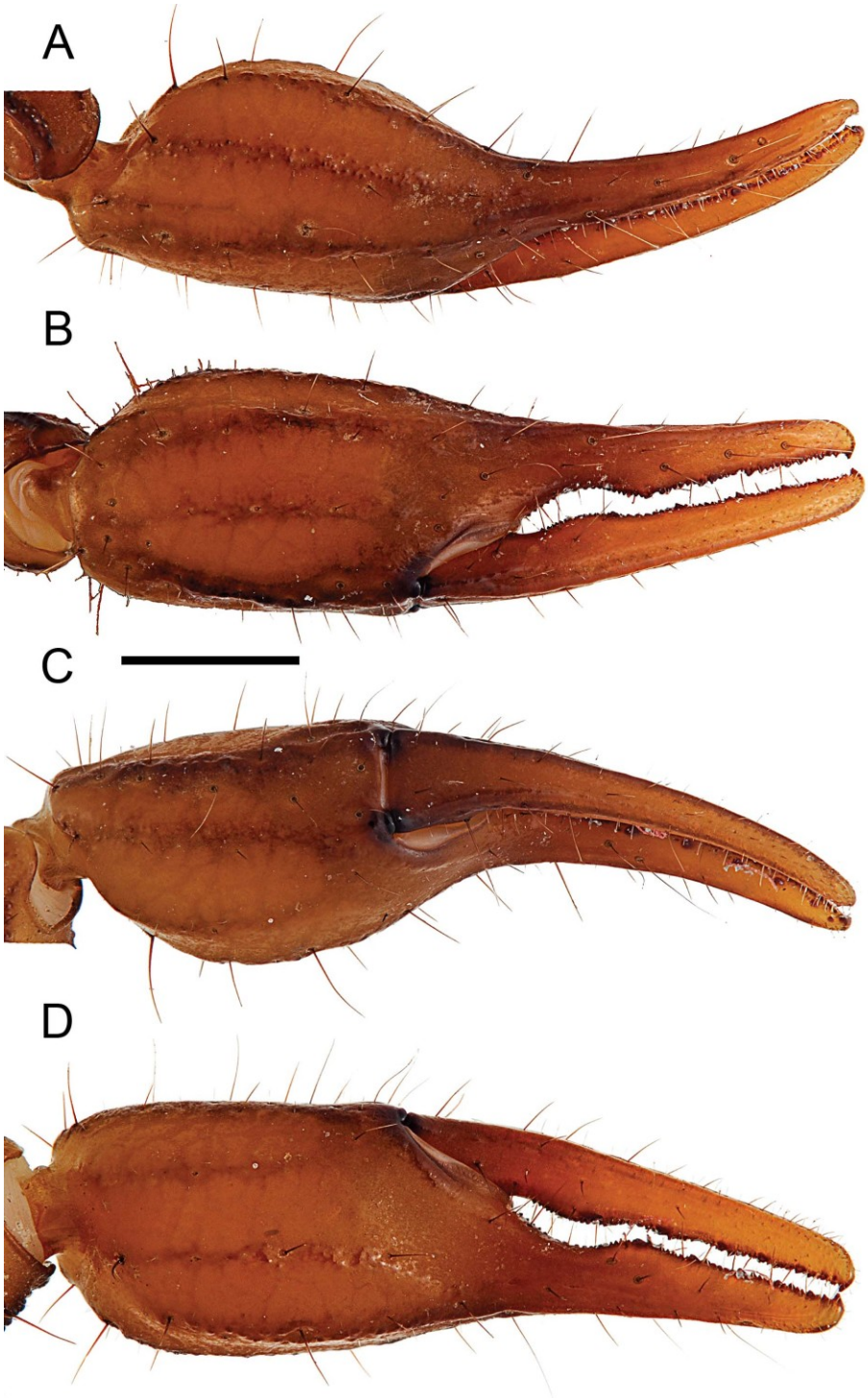


Figure 255. *Mesomexovis occidentalis* (Hoffmann, 1931), ♂ (IBUNAM), dextral pedipalp chela. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

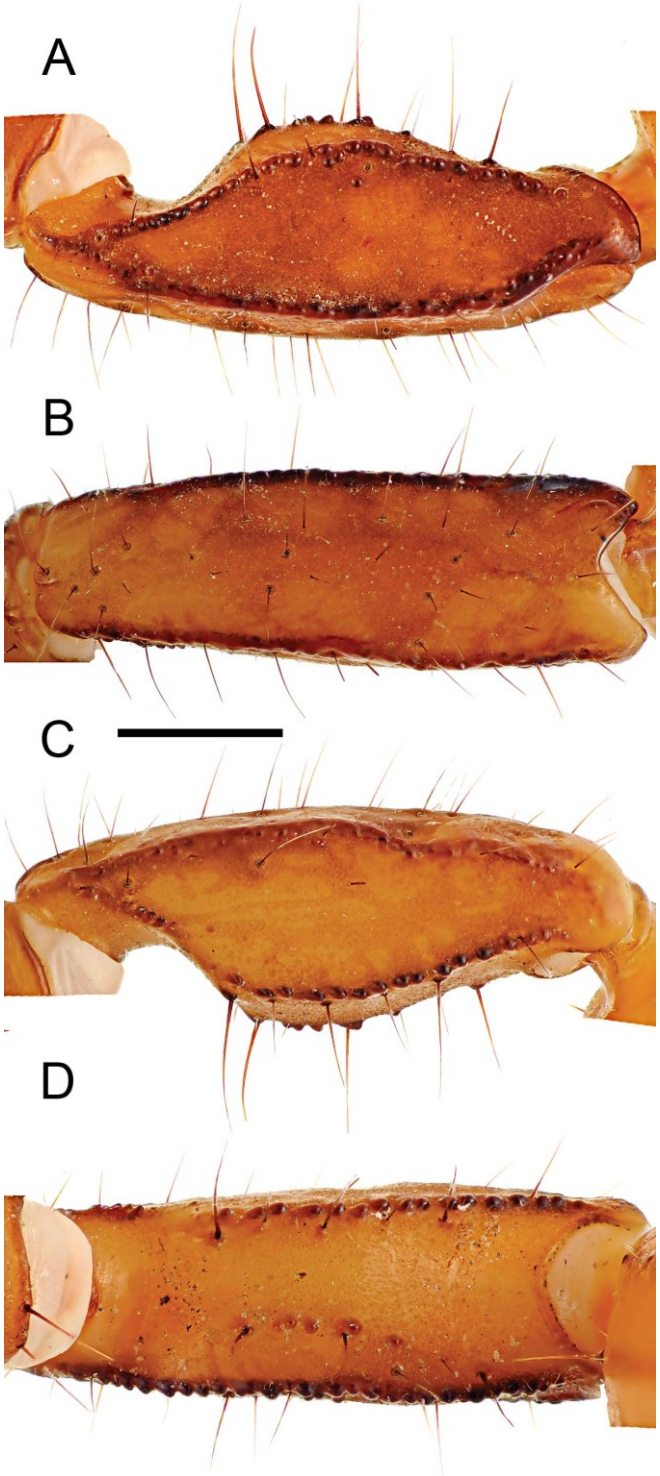


Figure 256. *Mesomexovis occidentalis* (Hoffmann, 1931), ♂ (IBUNAM), dextral pedipalp patella. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

Mesomexovis ofeliae, **n. sp.**

Figures 225, 257–259, 284C, 289C, 292C, 295C, 298C, 301C, 305B; Table 14

TYPE MATERIAL: **MEXICO: Morelos:** *Municipio de Totolapan*: Holotype ♂ (IBUNAM) Nepopualco, Corredor Biológico Chichinautzin, 19°0.6900'N 98°56.2578'W, 2159 m, 1.vii.2007, E. González and O. Delgado, rock turning in an avocado orchard. Paratypes: 1 ♀ (AMNH [ARA3120]), 1 ♂ (CAS [ARA3120]), 2 ♀ (IBUNAM), same locality as holotype. *Municipio de Jonacatepec*: 2 ♀ (IBUNAM), Chalcatzingo, 18°40.8'N 98°46.2'W, 1371 m, 6.vi.2008, M. Córdova. **Estado de Mexico:** *Municipio de Ozumba de Alzate*: 2 ♂, 6 ♀ (IBUNAM), Achichipico (coordinates place the locality in Morelos), 1.5, km N, 2.5 km SW of San Andrés Tlalamac, 18°57.6'N 98°49.8'W, [2000 m], 26.vii.2008, M. Córdova. *Municipio de Tepetixtla*: 3 ♀, 2 ♂ (IBUNAM), San Miguel Nepantla (Nepantla de Sor Juana Inéz de la Cruz), [18°58'48.86"N 98°50'27.08"W], [1975 m], 2.xi.2007, R. Aguilar.

ETYMOLOGY: The species name *ofeliae* is dedicated to Ms. Ofelia Delgado Hernández, one of the collectors of the type series and in acknowledgement of her massive help in the production of this revision.

DIAGNOSIS: *Mesomexovis ofeliae*, **n. sp.** is closely related to *M. zaragozai*, **n. sp.** and *M. punctatus*, with which it forms a monophyletic group. From *M. zaragozai*, **n. sp.** is readily distinguished by having metasomal segment II wider than long and IV less than two times longer than wide, instead of having segment II longer than wide and IV more than two times longer than wide. *M. ofeliae*, **n. sp.** also has relatively hirsute telson, each carinae with a row of five macrosetae, whereas *M. zaragozai*, **n. sp.** has only three. From *M. punctatus* is distinguished by having aculeus relatively elongated, ratio vesicle/aculeus less than two times, instead of more

than two times. *M. punctatus* further differs by having ventral lateral and ventral submedian carinae of metasomal segments III–IV costate to crenulated instead of obsolete and by having ventral median carina of metasomal segment V finely granulated and the distal end not bifurcated, instead of having broad irregular granules and distal end of that carinae bifurcated.

DESCRIPTION: The following description is based on the types and specimens listed in material examined.

Color and infuscation (in alcohol): Base color yellowish. Coxosternal region and sternites light orange. Carapace, retrolateral surface of femur and patella, tibia and tarsi of legs, tergites, and dorsal carinae of metasomal segments infuscated with dusky markings. Medina and lateral eyes intensely infuscate. Base of pedipalp fingers weakly infuscate, manus immaculate. Pectines and genital operculum pale whitish. Lateral inframedian and ventral lateral in I–V, ventral submedian in I–IV, and ventral median in V carinae underlined with broad intense infuscation. Ventral surface of telson weakly infuscate with two lateral broad and a median longitudinal bands with dusky markings, dorsal entirely immaculate, base of aculeus orange, becoming dark brown distally.

Carapace: Carapace anterior margin sublinear, with a vestigial to obsolete median notch. Entire surface shagreened, minute and moderately large granules combine over most of the surface. Anterior margin with three pairs of major macrosetae lacking median macrosetae. Anteromedian, posteromedian, and posterolateral sulci moderate, posterior transverse obsolete. Median ocular tubercle moderately raised and broad, with superciliary carinae strong and smooth, higher than median eyes. Median ocular tubercle positioned on distal half of carapace. Median eyes approximately double size of lateral first anterior pair. Three lateral eyes, anterior pair slightly larger than second pair third pair reduced approximately half of second pair.

Sternum and coxal region: Sternum pentagonal subequilateral with four pairs of setae, one distal, two median pairs and one pair on the lobes, median notch deep, surface matte. Coxal area moderately matte. Anterior margin of coxa II with three oblique slit-like structures, adjacent to a moderate subtriangular finely granular protuberance. Proximal median margin of coxal endite II with a moderate depression each. Coxa IV 2.05 times longer than coxa II.

Chelicerae: Dorsal surface smooth, dentition of fixed and movable fingers as in typical Syntropinae. Subdistal margin of manus with one median macrosetae, distal margin with costate carinae and base of fixed finger with weak crenulation. Serrula with 18–20 tines.

Pedipalps: Trichobothrial pattern Type C, orthobothriotaxic. Pedipalp chela incrassate, wider than patella, patella wider than femur. Femur: Prolateral, retrolateral and ventral intercarinal surface matte, dorsal moderately granular medially. Dorsal prolateral, and ventral prolateral carinae strongly granular, dorsal retrolateral irregularly granular with accessory granules around four macrosetae positioned on the carinae; retrolateral dorsosubmedian vestigial, expressed by few scattered moderate granules and five major macrosetae positioned on a low tubercle each, macrosetae decreasing in size distally; prolateral ventrosubmedian vestigial with a double or bicuspid enlarged proximal tubercle positioned at mid surface followed by a row of three or four irregular scattered conical enlarged granules, median and distal larger with a macroseta at base; prolateral ventral vestigial, expressed by a proximal bicuspid tubercle and two or three irregular enlarged conical granules, subproximal and median granules with a macroseta at base and distal on a low granule, creating an irregular row that slant gently towards the distal fifth of ventral prolateral carinae; retrolateral ventral, ventral median and ventral retrosubmedian vestigial with short row of enlarge and serrate proximal granules.

Patella: All intercarinal surfaces matte. Dorsal prolateral and ventral prolateral carinae strongly granular; dorsal retrolateral and ventral retrosubmedian weakly crenular to smooth and strongly costate; ventral median vestigial expressed on proximal third as a cluster of moderate granules; retrolateral dorsosubmedian and retrolateral median carinae obsolete, expressed by bands of infuscation; prolateral median partial on a moderate vaulted projection, protruding strongly medially, extending from a moderate proximal tubercle with a major macroseta on top and a row of three or four coarse subserrate enlarged granules slanting gently towards dorsal prolateral carinae, followed by a gap of smooth surface and ending on at one distal major macrosetae positioned on the distal fifth of dorsal prolateral carinae; prolateral ventral obsolete expressed by a row of three major macrosetae, adjacent to ventral prolateral carinae. Proximal major macrosetae on the top of a low granule.

Chelae: Pedipalp manus incrassate (manus 1.76 times longer than fixed finger). Intercarinal surfaces smooth. Dorsal median, dorsal prolateral, dorsal retrolateral, ventral prolateral, prolateral median, ventral retrolateral and ventral median vestigial, moderately costate. Trichobothrium *Db* positioned on dorsal retrolateral carina, subbasal on chelae; *Dt* positioned at mid manus.

Fingers: Fixed finger dentition: PD = 6 and RD = 5, MD rows = 5, proximal RD positioned by proximal half. Prolateral denticles noticeably smaller than retrolateral denticles. Movable finger PD = 7, RD = 6, MD rows = 6, distal row of median denticles with one denticles. Proximal RD positioned by proximal half. All retrolateral denticles subpaired with corresponding prolateral denticles in both fingers. Trichobothria *ib* and *it* positioned subbasal on fixed finger, *ib* positioned between PD6 and PD7, PD7 lacking granule, *it* adjacent to PD6. Fingers with strong scalloping, in ♂ proximal notch strong of fixed finger, and median lobe moderate; and proximal

notch and median lobe of movable finger moderate, gap created when fingers closed strong fingers fit unevenly, in ♀ proximal notch and median lobe of fixed and movable finger weak, fingers with weak scalloping, gap created when fingers closed weak.

Legs: Basitarsi I–II prolateral ventral, retrolateral ventral and retrolateral dorsal carinae with complete rows of spinules, prolateral ventral in III vestigial expressed in distal third, in IV absent; retrolateral ventral in III complete expressed by scattered spinules, in IV absent; retrolateral dorsal in III complete expressed by scattered spinules, in IV complete expressed as a scattered row of spinules; retrolateral median rows in I–IV vestigial, expressed by few marginal spinules. Telotarsi I–IV with two or three pairs of ventrodistal spinules in I–IV. Setae: Prolateral ventral, 3:4:5:6, median three in III and IV stout; retrolateral ventral, 6:8:11:11, major and minor intersperse macrosetae; retrolateral dorsal, 4:5:5:5, major and minor intersperse macrosetae; dorsal, 4:4:4:4; dorsal median macrosetae positioned on dorsal prolateral surface offset of the dorsal row. Retrolateral dorsal and dorsal series arranged in two independent rows.

Tergites: Pretergites smooth, postergites shagreened. Tergites I–VI dorsal median and ventral submedian carinae weak expressed by few moderate distal granules and weak costa. Tergite VII with intercarinal surfaces moderately shagreened; dorsal median carina costate expressed on proximal half of the postergite with a cluster of moderate conical granules; dorsal submedian vestigial expressed as a oblique row of enlarge granules; dorsal lateral and lateral supramedian strong, distally becoming stronger ending in a elongate rounded granules; dorsal lateral carinae projecting and curving laterally approximating to lateral supramedian distal margin, creating a semi ring of strong subserrate granules.

Genital operculum: Male genital operculum: wider than long, with six pairs of major macrosetae. Sclerites free on longitudinal edge moving independently but unable to open more

than 45°. Genital papillae protruding posteriorly. Female genital operculum: Wider than long, with three macrosetae. Sclerites fuse longitudinal.

Sternites: Sternites I–VII finely punctuated, and lustrous. Sternite V with distal median glandular spot weak, not protruding from adjacent surface and weakly contrasting with pale base color. Sternite VII ventral lateral carinae smooth and weakly costate with two pairs of macrosetae; ventral submedian obsolete expressed by three pairs of macrosetae. Distomedian glandular spot obsolete, not protruding from adjacent surface, in both sexes. Spiracle elongated, slit-like, approximately three times longer than wide.

Pectines: Pectines longer than distal edge of coxa IV in ♂, in ♀ at the level of distal edge of coxa IV. Basal piece with median notch deep. Marginal lamella consist of three sclerites, medial lamella proximally fuse distally progressively forming conspicuous 12–14 beads. Fulcra with 19–20 in ♂, 16–17 in ♀ beads. Pectinal tooth numbering 20–21 in ♂, 17–18 in ♀.

Hemispermatophore: Lamina 1.63 longer than trunk. Dorsal through margin long, narrow, curving proximally, and removed from ventral trough. Hemimating plug developed from the inner lobe, distal barb margin with 10 elongated spinules. Primary and secondary hook positioned on the apex of lateral margin extension of the lamina (flange). Both hooks rounded low, separated slightly, forming a shallow notch. Median lobe ental terminus moderate and rounded, slightly protruding towards ental margin. Basal plate of inner lobe adjacent to ventral trough. Spine of inner lobe relatively long and strongly sclerotized, secondary spine on ventromedian aspect of neck absent. Neck relatively short (0.62 times longer than basal plate). Measurements, lamina, 3.90; trunk, 2.40; dorsal trough/laminar hooks, 1.56; ventral trough/laminar hook, 1.02; neck, 0.48; basal plate, 0.78.

Metasoma: Dorsal intercarinal surface in I–III with few scatter granules, ventral surface of metasomal segment I–IV smooth, ventral surface of metasomal segment V shagreened with coarse and dense granules. Metasoma 1.88 times longer than mesosoma. Metasomal segments I–II wider than long. Carinae: Dorsal lateral and lateral median carinae in I–IV strongly crenatoserrated terminating in elongate spiniform granule pointing backwards; except lateral median in IV distal terminus strongly expanded or flared laterally forming a rounded triangular projection; dorsal lateral in V proximally third strongly and scattered serrated, becoming finely granular at mid segment and more weakly crenular subdistally, ending in a short row moderate moniliform crenulations; lateral inframedian in I complete strongly crenatoserrate; in II incomplete strongly crenatoserrate, present in distal half; in III incomplete strongly crenatoserrated, becoming weaker proximally, present in distal third, in VI absent, in V incomplete, expressed by a proximal tubercle, and a row or irregular moderate granules expressed on proximal two thirds; ventral lateral in I–III proximal two third smooth, distal third weakly crenular, IV moderately crenular and V strongly crenatoserrate; ventral submedian in I–III obsolete, in VI obsolete in proximal half, weakly to moderately crenular; ventral median in V strongly crenatoserrate. Setae: Dorsal lateral carinae, 1:2:3:4:8; lateral median, 1:1:3:3; lateral inframedian, 2:1:1:0:5; ventral lateral, 3:3:4:5:11, macrosetae on dorsal and lateral sides of carinae; ventral submedian, 3:3:3:4:4, ventral sublateral, 2.

Telson: Telson vesicle 2.77 times longer than wide. Metasomal segment V 1.55 times wider than telson. Vesicle 1.9 times longer than aculeus. Dorsal and ventral surface smooth, all ventral carinae weakly crenular. Ventral surface with four or five macrosetae in each carina. Ventral median carinae with subaculear tubercle vestigial, expressed as a low and broad tubercle with a small conical cap on top

DISTRIBUTION: *Mesomexovis ofeliae*, **n. sp.** is endemic to the southern side of the TMVB in the states of México and Morelos.

ECOLOGY: *Mesomexovis ofeliae*, **n. sp.** was collected between 1371 and 2159 m altitude. All the known specimens were collected under rocks. The original dominant vegetation at the collection sites was oak-pine forest, however most of the terrain has been used for several centuries for cropping and cattle. There are scattered patches of oak-pine forest remaining in this region.

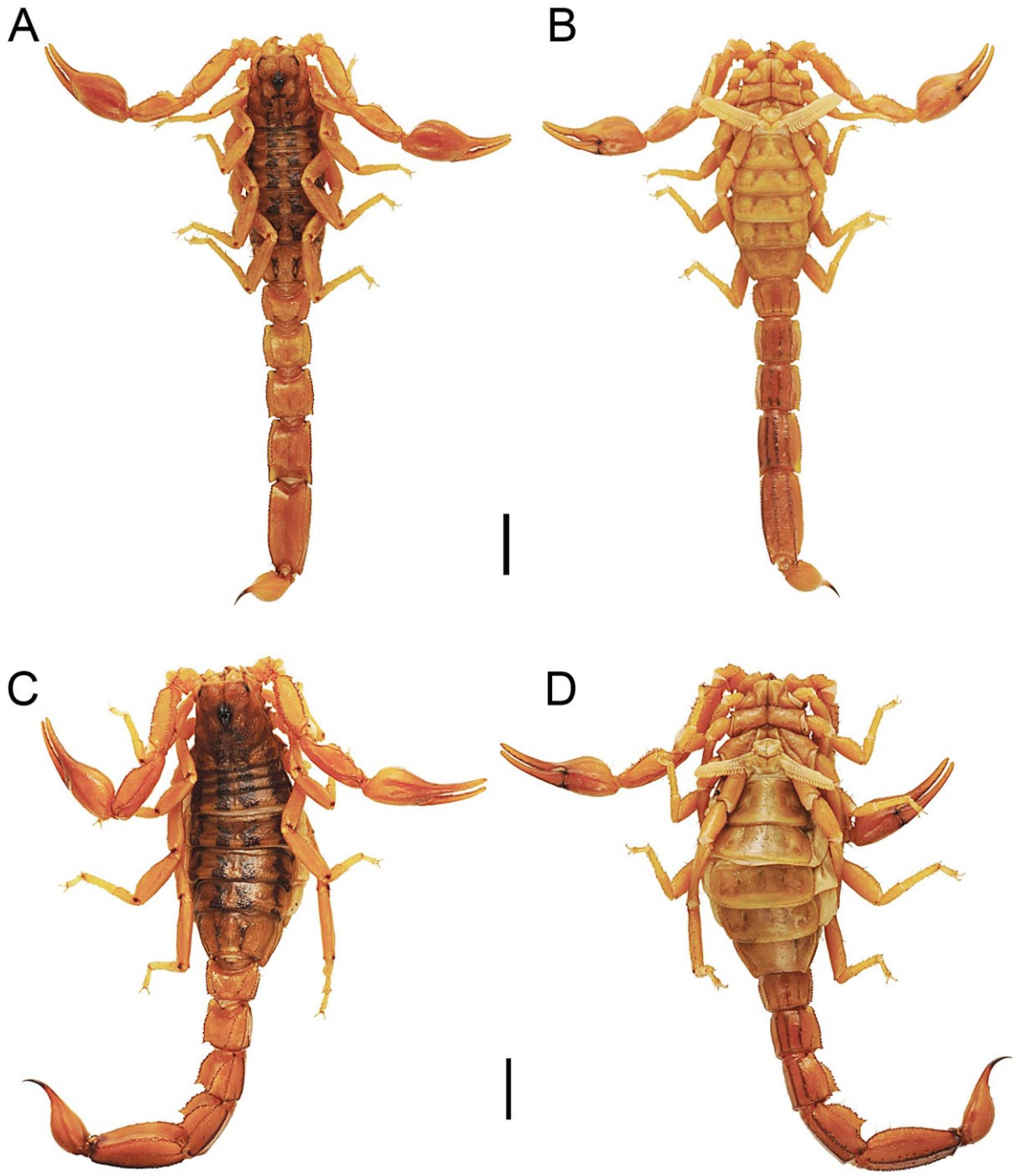


Figure 257. *Mesomexovis ofeliae*, **n. sp.**, habitus. **A**, **B**. Paratype ♂ (IBUNAM). **C**, **D**. ♀ (IBUNAM). **A**, **C**. Dorsal aspect. **B**, **D**. Ventral aspect. Scale bars = 5 mm.

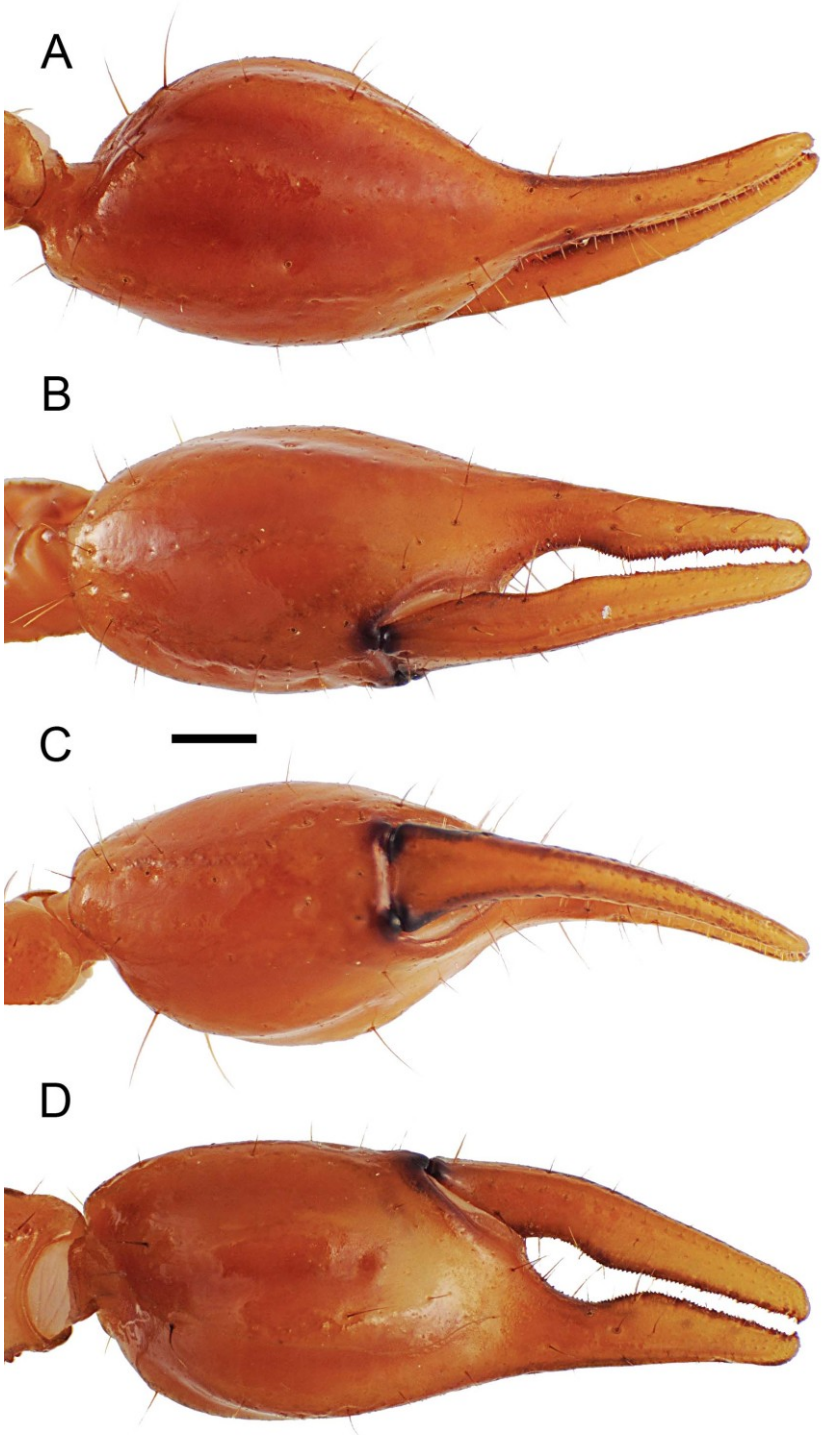


Figure 258. *Mesomexovis ofeliae*, **n. sp.**, paratype ♂ (IBUNAM), dextral pedipalp chela. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

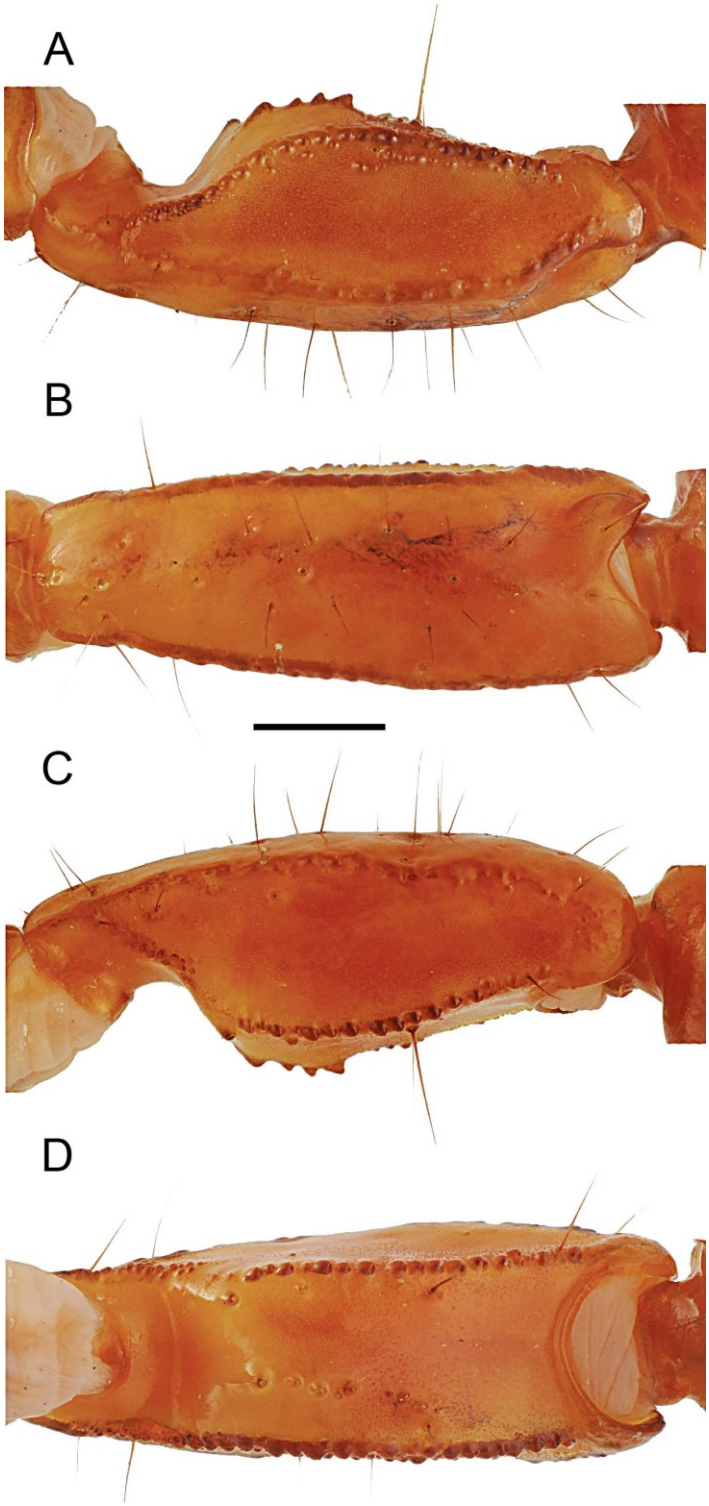


Figure 259. *Mesomexovis ofeliae*, **n. sp.**, paratype ♂ (IBUNAM), dextral pedipalp patella. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

Mesomexovis ponce Sissom and Hughes, in prep.

Figures 227, 260–262, 283B, 287B, 291F, 294D, 397D, 300D, 304A

TYPE MATERIAL: To be designated by the authors.

ETYMOLOGY: To be specified by the authors.

DIAGNOSIS: *Mesomexovis ponce* is closely related to *M. izazagai*, **n. sp.**, *M. variegatus*, and *M. mintoni*, with which it forms a monophyletic group. *M. ponce* is the only species with ventral lateral carinae of metasomal segments IV and V with irregular enlarged conical granules, instead of having uniform and serrated, moderate and irregular, or costate carinae. *M. ponce* is also unique because it has dorsal surface of femur with dense moderate granules, whereas *M. mintoni* has this surface with scattered enlarged conical tubercles densely grouped medially, *M. variegatus* has comparatively less and smaller granules than the first two and *M. izazagai*, **n. sp.** has weakly matte surface. Among the contrasted species, *M. ponce* is the only one with micro serrations at the base of the aculeus. From *M. izazagai*, **n. sp.** and *M. variegatus* is distinguished by having lateral surface of metasomal segments I–V, dorsal of I and II, and ventral of V densely cover by moderate granules. *M. ponce* also differs from these species by having five rows of median denticles and five retrolateral denticles on pedipalp fixed finger, instead of six. From *M. mintoni* and *M. variegatus* differs by having seven rows of median denticles and five retrolateral denticles on pedipalp movable finger, instead of six. From *M. izazagai*, **n. sp.** differs by being darker and having pedipalp chela carinae immaculate, instead of being pale and having carinae infuscate. From *M. mintoni* differs by having dorsal surface of chelicerae weakly infuscate, instead of having it completely infuscate, additionally differs by having sternites III–VI and

ventral surface of metasomal segments I–V partially infuscated, instead of having these surfaces completely and intensely infuscated.

DESCRIPTION: To be published by the authors.

DISTRIBUTION: *Mesomexovis ponce* is endemic to the eastern extreme drainage of the Grande River, affluent of the Balsas Depression in the state of Michoacán, Mexico.

ECOLOGY: *Mesomexovis ponce* has been recorded from 445 to 2140 m altitude.

MATERIAL EXAMINED: **MEXICO: Michoacán:** *Municipio de Alvaro Obregón*: Alvaro Obregón, 19°02.310'N 102°58.405'W, 462 m, 11.vii.2005, O. Francke, J. Ponce, M. Córdova, A. Jaimes, G. Francke, and V. Capovilla, 2 juv. (AMNH [LP 5286]). *Municipio de Parácuaro*: La Berea, 19°08.173'N 102°13.195'W, 445 m, 11.vii.2005, O. Francke, J. Ponce, M. Córdova, A. Jaimes, G. Francke, and V. Capovilla, 1 ♂ (AMNH [LP 5291]). *Municipio de Tancítaro*: Tancítaro, 2 km NW, 19°18.6786'N 102°23.1036'W, 2140 m, 12.vii.2005, O. Francke, J. Ponce, M. Córdova, A. Jaimes, G. Francke, and V. Capovilla, collected at night with UV light, 12 ex. (AMNH [ARA1174]), 19°18.679'N 102°23.104'W, 1 ♀, 6 juv. (AMNH [LP 5347]).

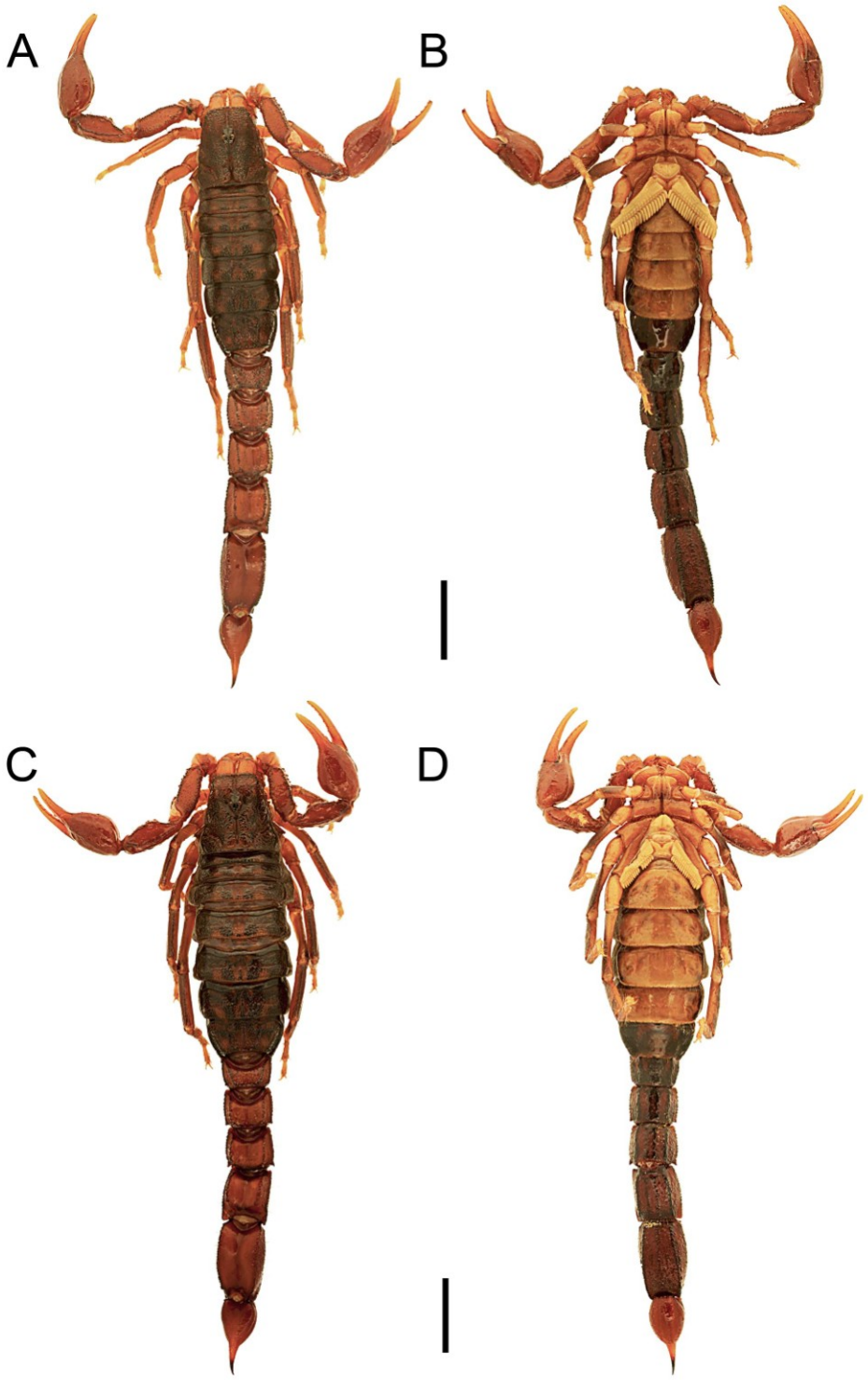


Figure 260. *Mesomexovis ponce* Sissom and Hughes, in prep., habitus. **A**, **B**. ♂ (IBUNAM). **C**, **D**. ♀ (IBUNAM). **A**, **C**. Dorsal aspect. **B**, **D**. Ventral aspect. Scale bars = 5 mm.

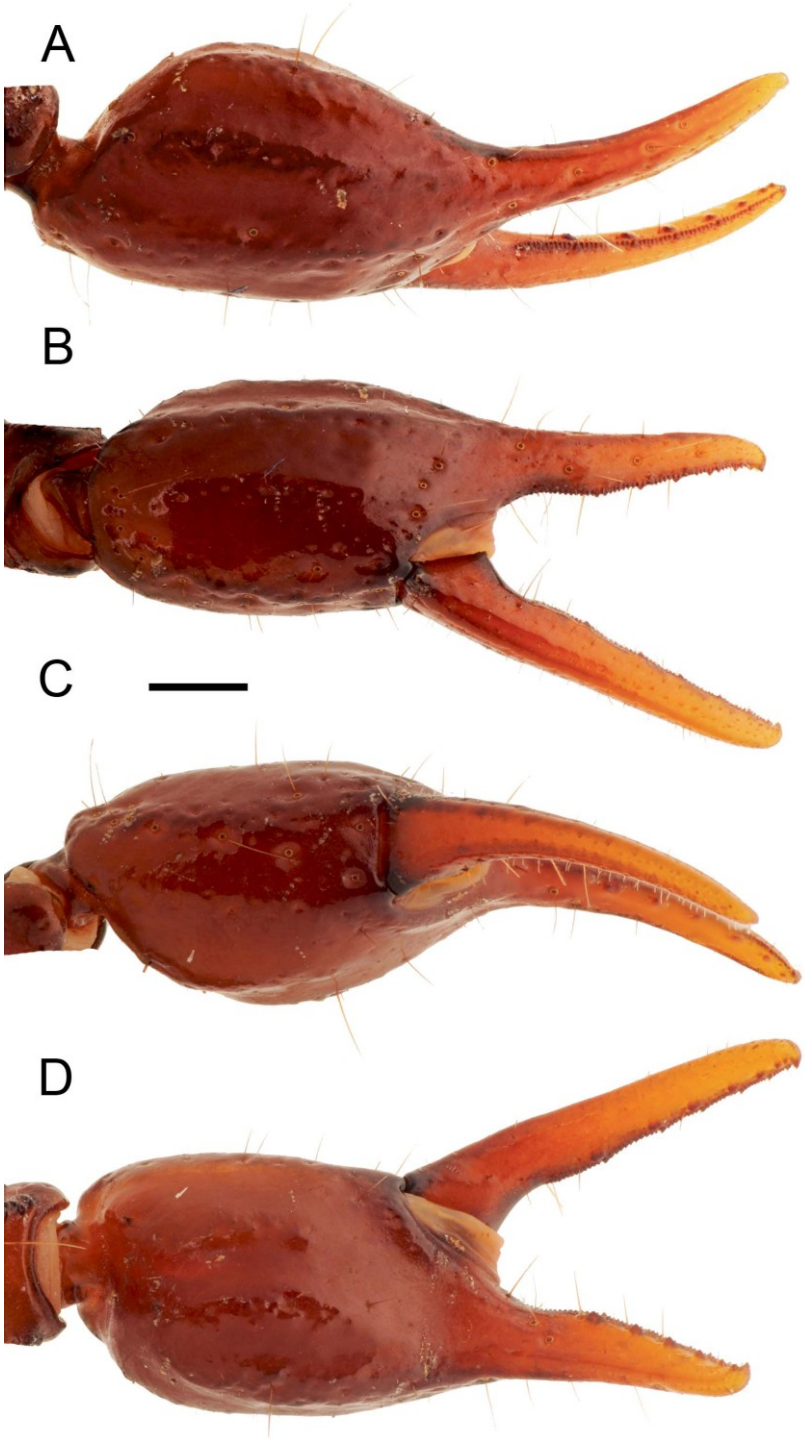


Figure 261. *Mesomexovis ponce* Sissom and Hughes, in prep., ♂ (IBUNAM), dextral pedipalp chela. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

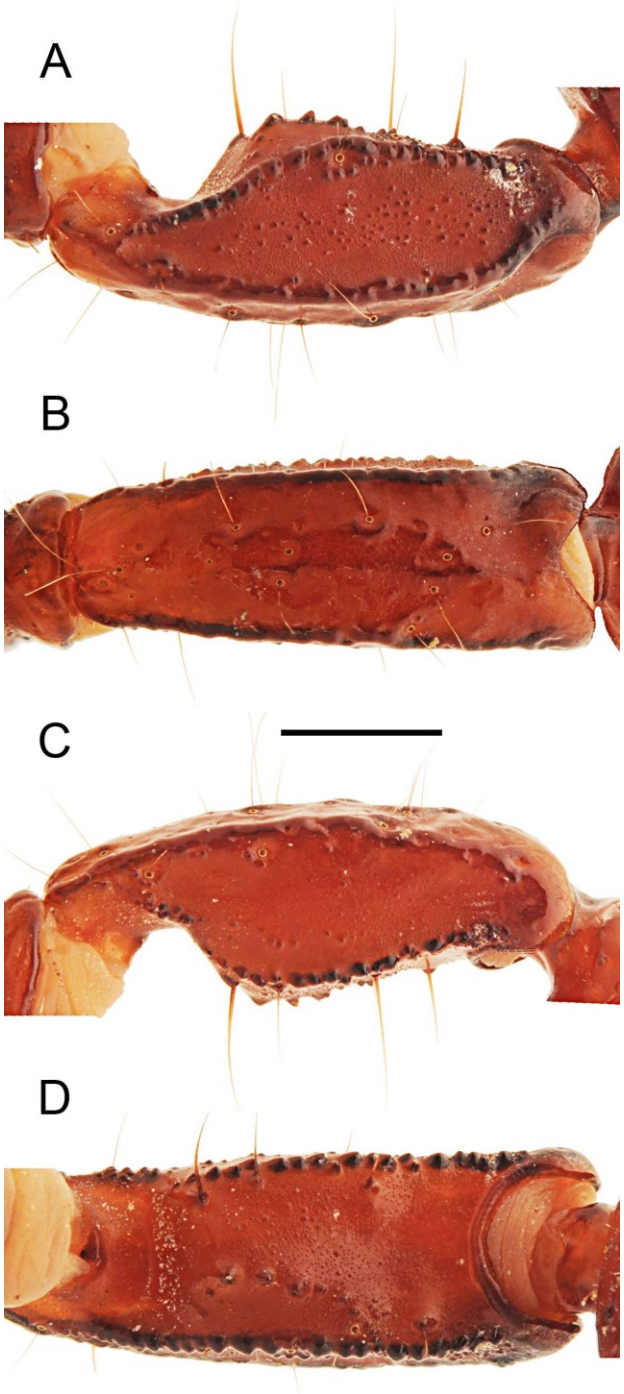


Figure 262. *Mesomexovis ponce* Sissom and Hughes, in prep., ♂ (IBUNAM), dextral pedipalp patella. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

Mesomexovis punctatus (Karsch, 1879)

Figures 227, 263–265, 283C, 287D, 290E, 294E, 297E, 300E, 304B

Vaejovis punctatus Karsch, 1879: 135.

Vaejovis spinigerus var. *punctata*: Kraepelin, 1899: 187; 1901: 274.

Vaejovis punctatus: Yahia and Sissom, 1996: 86; Kovařík, 1998: 147; Beutelspacher, 2000: 103, 136, 140, 141, 142, 144, 147, 154, map 85; Sissom, 2000: 534; Soleglad and Fet, 2003: 9, 28, 161, figs. 35, 69, 104; Mattoni and Peretti, 2004: 81, 82; Ponce-Saavedra and Sissom, 2004: 541; Soleglad and Fet, 2005: 5; Contreras-Garduño et al., 2006; 152, 154, 157, fig. 1, 158, fig. 4, 159–161; Graham and Fet, 2006: 11; Carrera et al., 2009: 334, 336, 339, 341, 342, tab. 3, 344, tab. 4, 345, tab. 5; Santibáñez-López and Sissom, 2010: 52, 56; Ibrahim and Abdel-Rahman, 2011: 82. Ponce-Saavedra and Francke, 2011: 466, tab. 1.

Vejovis punctatus: Borelli, 1909: 225; Hoffmann, 1931: 353, 354; Bücherl, 1971: 329; □

Vejovis punctatus punctatus: Hoffmann, 1931: 354–357, fig. 23; 1937: 204, 205, fig. 1; 1938: 317; Díaz-Nájera, 1964: 20, 21, 24, 26; Williams, 1970a: 290.□

Vaejovis punctatus punctatus: Díaz-Nájera, 1975: 7, 24, 25, 29, 30; Sissom, 2000: 534; Ponce-Saavedra and Beutelspacher, 2001: 46, 48, 82, 100, maps 26, 27.

Hoffmannius punctatus punctatus: Soleglad and Fet, 2008: 4, 50, tab. 3, 91.

TYPE MATERIAL: **MEXICO:** Holotype ♀ (ZMB, No. 11) “México” [not examined].

DIAGNOSIS: *Mesomexovis punctatus* is closely related to *M. ofeliae*, **n. sp.** and *M. zaragozai*, **n. sp.**, with which it forms a monophyletic group. *M. punctatus* may be distinguished from the two related species by having ventral lateral and ventral submedian carinae of metasomal segments III–IV obsolete, pedipalp chela and pedipalp patella carinae of dorsal and

external surfaces infuscated, instead of having costate to granular or partially granular carina of metasomal segments III–IV and diffuse and weakly infuscated to immaculate carinae of chela and patella. *M. punctatus* has moderate proximal notch and medial lobe of pedipalp fixed finger and proximal notch of movable finger, in contrast *M. ofeliae*, **n. sp.** and *M. zaragozai*, **n. sp.** have these structures strongly developed. *M. punctatus* has broad irregular granules on ventral median carina of metasomal segment V and the distal end of that carina is bifurcated. The other two species have this carina finely monilifom and the distal end is not bifurcated. It can further be separated by having dorsal retrolateral carina of pedipalp patella weakly costate and smooth except for the distal end that is weakly crenular, *M. ofeliae*, **n. sp.** and *M. zaragozai*, **n. sp.** have strongly developed and coarsely crenular. Finally, *M. punctatus* tend to be paler than the other tow species.

DESCRIPTION: The following description complements Hoffmann's (1931) redescription, it is based on freshly collected material of adult males and females deposited in the museums indicated below.

Color and infuscation (In alcohol): Base color pale yellow straw. Carapace and tergites with infuscated with dusky markings. Dorsal and retrolateral surface of femur and patella, prolateral femur, and tibia and tarsi of legs diffusely infuscate. Medina and lateral eyes intensely infuscate. Ventral lateral and ventral submedian in I–IV and ventral median in V carinae underlined with a fine band of infuscation. Distal terminus of dorsal lateral carinae of metasomal segments I–IV infuscate. Dorsal lateral carinae of tergite VII infuscate. Aculeus base brownish distally dark brown. Carinae of pedipalp manus diffusely infuscate. Telson with a lateral broad and median band of diffuse infuscation.

Carapace: Carapace anterior margin sublinear, with a vestigial to obsolete median notch. Entire surface shagreened, minute and moderately large granules combine over most of the surface, weakly expressed on sulci. Anterior margin with four pairs of major macrosetae. Anteromedian, posteromedian, and posterolateral sulci moderate, posterior transverse obsolete. Median ocular tubercle moderately raised and broad, with superciliary carinae weakly smooth, higher than median eyes. Median ocular tubercle positioned on distal half of carapace. Median eyes approximately double size of lateral distal pair. Three lateral eyes, two anterior pairs almost same size and posterior third reduced approximately in half.

Sternum and coxal region: Sternum pentagonal subequilateral with four pairs of setae, one distal, two median pairs and one pair on the lobes, median notch deep. Coxal region surface smooth and lustrous. Anterior margin of coxa II with three oblique slit-like structures, adjacent to low to moderate and scattered granular protuberance. Proximal median margin of coxal endite II with a moderate depression each. Coxa IV 2.10 times longer than coxa II.

Chelicerae: Dorsal surface smooth, dentition of fixed and movable fingers as in typical Syntropinae. Subdistal margin of manus with one median macrosetae, distal margin with costate carinae and base of fixed finger with weak crenulation. Serrula with 14/14 tines.

Pedipalps: Trichobothrial pattern Type C, orthobothriotaxic. Pedipalp chela moderate, wider than patella, patella wider than femur. Femur: All intercarinal surfaces matte, except dorsal with few median scattered moderate granules. Dorsal prolateral, dorsal retrolateral, and ventral prolateral carinae moderately granular; retrolateral dorsosubmedian vestigial, expressed on distal two thirds by five major macrosetae positioned on a low tubercle each, macrosetae decreasing in size distally; prolateral ventrosubmedian vestigial with a double or bicuspid enlarged proximal tubercle positioned at mid surface followed by a row of three or four irregular scattered conical

granules, median and distal granules with a macroseta at base; prolateral ventral vestigial, expressed by a proximal tubercle with an adjacent macrosetae and three or four irregular enlarged conical granules, the granules subproximal median and distal granules with a macroseta at base, forming a row that slants gently towards ventral prolateral carinae, the row expressed on proximal two thirds; ventral median vestigial with a proximal row of enlarge crenatoserrate granules; retrolateral ventral obsolete, expressed by two or three moderate crenatoserrate granules; ventral retrosubmedian vestigial expressed on proximal third as a row of serrate to conical granules present on proximal third.

Patella: Dorsal, ventral and prolateral carinae weakly matte, retrolateral smooth. Dorsal prolateral complete irregularly granular; ventral prolateral complete, strongly granular moniliform; dorsal retrolateral and ventral retrosubmedian complete, weakly crenular but moderately costate; ventral median vestigial expressed on proximal third as a costa weakly crenulated; retrolateral dorsosubmedian and retrolateral median carinae obsolete, expressed by bands of infuscation; prolateral median complete on a moderate vaulted projection, protruding strongly medially, extending from a moderate proximal tubercle with a major macroseta on top and a row of four or five coarse subserrate granules, median granule with a macroseta on top, the row slanting gently towards dorsal prolateral carinae, followed by a short gap of smooth surface and ending on at one distal major macrosetae, positioned on the distal fifth of dorsal prolateral carinae; prolateral ventral obsolete expressed by a row of three major macrosetae, proximal major macrosetae on the top of a low granule, median one shorter, adjacent to ventral prolateral carinae.

Chelae: Pedipalp manus moderate. Intercarinal surfaces smooth. All carinae obsolete. Trichobothrium *Db* positioned on dorsal retrolateral carina, subbasal on chelae; *Dt* positioned at mid manus.

Fingers: Fixed finger dentition: PD = 6 and RD = 5, MD rows = 5, proximal RD positioned by proximal half. Prolateral denticles larger than retrolateral denticles. Movable finger PD = 7, RD = 6, MD rows = 6, distal row of median denticles with one denticles. Proximal RD positioned by proximal half. All retrolateral denticles subpaired with corresponding prolateral denticles in both fingers. Trichobothria *ib* and *it* positioned subbasal on fixed finger, *ib* positioned between PD6 and PD7, PD7 lacking granule, *it* at the level of or adjacent to PD6. Fingers with weak scalloping, in ♂ proximal notch and median lobe of fixed and movable finger weak, gap created when fingers closed moderate fingers fit unevenly, in ♀ scalloping obsolete, gap created when fingers closed absent, fingers fit evenly.

Legs: Basitarsi I–II prolateral ventral, retrolateral ventral and retrolateral dorsal carinae with complete rows of spinules, prolateral ventral in III and IV absent; retrolateral ventral in III complete, in IV absent; retrolateral dorsal in IIII partial expressed on distal two thirds as a scattered row of spinules, in IV absent; retrolateral median rows in I–IV vestigial expressed by few distal spinules. Telotarsi I–IV with two or three pairs of ventrodistal spinules in I–IV. Setae: Prolateral ventral, 2:3:4:4, median two in III and IV stout; retrolateral ventral, 6:7:7:7; retrolateral dorsal, 2:3:3:4, major and minor intersperse macrosetae; dorsal, 4:4:4:4; dorsal median macrosetae positioned on dorsal prolateral surface offset of the dorsal row. Retrolateral dorsal and dorsal series arranged in two independent rows.

Tergites: Pretergites smooth, postergites shagreened. Tergites I–VI dorsal median and ventral submedian carinae weak to moderate expressed by few moderate or broad distal granules

and weakly costate. Tergite VII with intercarinal surfaces shagreened; dorsal median carina moderately costate expressed on proximal half of the postergite with few moderate conical granules; dorsal submedian vestigial expressed as a low short proximal granular paired blobs; dorsal lateral and lateral supramedian strong; dorsal lateral carinae projecting and curving laterally approximating to lateral supramedian distal margin, creating a semi ring of strong serrated granulation.

Genital operculum: Male genital operculum: wider than long, with three pairs of macrosetae. Sclerites free on longitudinal edge moving independently but unable to open more than 45°. Genital papillae protruding posteriorly. Female genital operculum: Wider than long, with three macrosetae. Sclerites fuse longitudinal.

Sternites: Sternites I–VII finely punctuated, and lustrous. Sternite V with distal median glandular spot vestigial, not protruding from adjacent surface weakly contrasting with pale base color. Sternite VII carinae obsolete, ventral lateral expressed by three pairs of macrosetae; ventral submedian expressed by two pairs of macrosetae. Intercarinal surface between ventral lateral and ventral submedian carinae with one to two median accessory macrosetae. Distomedian glandular spot obsolete, not protruding from adjacent surface, in both sexes. Spiracle elongated, slit-like, approximately two times longer than wide.

Pectines: Pectines longer than distal edge of coxa IV in ♂, in ♀ at the level of distal edge of coxa IV. Basal piece with median notch deep. Marginal lamella consist of three sclerites, medial lamella proximally fuse distally progressively forming conspicuous 11–12 beads. Fulcra with 17–20 in ♂, in ♀ 15–17 beads. Pectinal tooth numbering 18–21 in ♂, 16–18 in ♀.

Hemispermatophore: Lamina 1.60 longer than trunk. Dorsal through margin long, narrow, curving proximally, and removed from ventral trough. Hemimating plug developed from

the inner lobe, distal barb margin with 15 elongated spinules. Primary and secondary hook positioned on the apex of lateral margin extension of the lamina (flange). Both hooks rounded low, separated slightly, forming a shallow notch. Primary hook tip moderately sharp. Median lobe ental terminus moderate and rounded. Basal plate of inner lobe removed from ventral trough. Spine of inner lobe moderate, secondary spine on ventromedian aspect of neck weaker. Neck relatively short (0.5 times longer than basal plate). Measurements, lamina, 3.18; trunk, 1.98; dorsal trough/laminar hooks, 1.50; ventral trough/laminar hook, 0.84; neck, 0.30; basal plate, 0.60.

Metasoma: Dorsal and lateral intercarinal surface in I–II shagreened to smooth, ventral surface of metasomal segment I–V smooth. Carinae: Dorsal lateral and lateral median carinae in I–IV strongly crenatoserrated terminating in moderate spinoid granule pointing backwards; except lateral median in IV distal terminus moderately expanded or flared laterally forming a rounded triangular projection; dorsal lateral in V proximally third weakly crenulate, becoming smooth distally. Lateral inframedian in I complete moderately crenatoserrated; in II and III incomplete weakly crenatoserrated, becoming weaker proximally, present in distal third; in VI absent, in V partial, expressed as a proximal tubercle followed a costa on proximal two thirds; ventral lateral in I–IV smooth moderately costate; ventral submedian in I–IV obsolete; ventral lateral and ventral median in V moderately crenatoserrate. Setae: Dorsal lateral carinae, 1:3:4:4:7; lateral median, 2:2:3:4; lateral inframedian, 2:1:1:1:5; ventral lateral, 4:4:4:5:12, macrosetae positioned dorsal and lateral to the carinae; ventral submedian, 3:4:4:5:5; ventral sublateral, 2.

Telson: Dorsal and ventral surface smooth, all ventral carinae smooth. Ventral surface with five or six macrosetae in each carina. Ventral median carinae with subaculear tubercle obsolete. Microserration on laterobasal aculeus numbering 3–5.

DISTRIBUTION: *Mesomexovis punctatus* is restricted to the northern side of the TMVB in central Mexico, including the states of Hidalgo and México, Mexico.

ECOLOGY: *Mesomexovis punctatus* is found in deserts; mostly scrublands and cacti dominate the vegetation. It is commonly found resting under rocks during the day and can be efficiently collected during the night using ultraviolet detection. The localities where it was collected ranged from 1900 to 2350 m elevation.

REMARKS: Beulterpacher (2000) considered *M. punctatus* to be widely distributed in the central region of Mexico. Sissom (2000) pointed out several misidentifications and dubious records in Beulterpacher's catalog. Nevertheless, the results of the phylogenetic analyses conducted here and abundant revision of material suggest that several diagnosable species were confounded by those authors. Thus the distribution of *M. punctatus* appears to be restricted to Hidalgo and México, and the records from Distrito Federal, Guanajuato, Oaxaca, Puebla and Queretaro (Sissom, 2000) are either locality errors or refer to different species.

MATERIAL EXAMINED: **MEXICO: Estado de México:** *Municipio de Jocotitlán*: Santa Lucia, [19°39'21.43"N 99°38'26.68"W], 19.v.1961, 3 ♀ (IBUNAM). *Municipio de Otumba*: Santiago Tolman, Cerro Gordo, 19°43.6668'N 98°47.3166'W, 2350 m, 26.ii.2002, S. Reynaud and E. González, 4 ♂, 23 ♀, 17 juv. (IBUNAM), 2 ♀ (AMNH [LP 2241]). *Municipio de Temascalapa*: Temascalapa, [19°49'23.23"N 98°53'53.54"W], 2.i.2004, H. Carmona, 6 ♂, 21 ♀ (IBUNAM). *Municipio de Teotihuacán de Arista*: Teotihuacán, [19°40'52.60"N 98°51'39.42"W], 10.viii.1979, W. López-Forment, 1 ♀ (IBUNAM). *Municipio de Tepetixpla*: Nepantla,

[19°0'30.18"N 98°49'25.50"W], 2.xi.2007, R. Aguilar, 2 ♂, 3 ♀ (IBUNAM). **Hidalgo:** *Municipio de Actopan*: Actopan, 125 km NW, [20°14'N 98°51'W], 29.iii.1974, T.M. Díaz, 2 ♂, 9 ♀ (IBUNAM), 28.xi.2006, W. López-Forment, 4 ♀ (IBUNAM); Cerro Mexe, 20°14.5410'N 98°52.2277'W, 16.ii.1970, 3 ♀ (IBUNAM). *Municipio de Ixmiquilpan*: Ixmiquilpan, 20°29.1446'N 99°14.58'W, 2.x.1959, 5 juv. (IBUNAM); S of Ixmiquilpan, 20°24.5352'N 99°7.65'W, 2003 m, 30.iv.2009, 1 ♂, 2 ♀ (IBUNAM). *Municipio de Pachuca*: Pachuca, 20°7.3796'N 98°44.68'W, 31.x.1997, 1 subad. ♀ (IBUNAM). *Municipio de San Agustín Tlaxiaca*: Puerto México, [20°6.97583'N 98°53.57166667'W], 18.v.1984, I. Cuadriello, 2 ♀, 18 juv. (IBUNAM). *Municipio de Santiago de Anaya*: Santiago de Anaya, 20°2.1841'N 98°21.4835'W, 19.ii.1994, 1 ♀ (IBUNAM). *Municipio de Tasquillo*: La Florida, vi.2002, P. Berea, 3 ex. (AMNH). *Municipio de Tula*: Santa María Lucana, [20°0'0.03"N 99°24'0.14"W], 1.i.1958, 1 ♂, 11 ♀, 1 juv. (IBUNAM), A. Samano, 27.xi.1969, 11 ♂, 7 ♀, 2 juv. (IBUNAM), S. Amelia, 2.v.1969, 1 ♀ (IBUNAM); Tula, [20°0'N 99°24'W], 8.viii.1964, J. Julia, 30 ♂, 1 ♀ (IBUNAM), 27.xi.1969, 4 ♂, 20 ♀ (IBUNAM). *Municipio de Zimapán*: Microwave antenna at Zimapan, 1900 m, 3.viii.2002, 20°44.7828'N 99°20.8998'W, desert, collected at night with UV light, 4 ex. (AMNH [ARA1168]), 21 ex. (AMNH [ARA1170]), 20°44'47"N 99°20'54"W, 21 ♂, 12 ♀ (AMNH [LP 2080]), L. Prendini, O. Francke, E. González, and J. Ponce; road to Pachuca, marker km 32, [20°7'N 98°44'W], 11.iii.1972, S. Guijosa, 3 ♀ (IBUNAM).

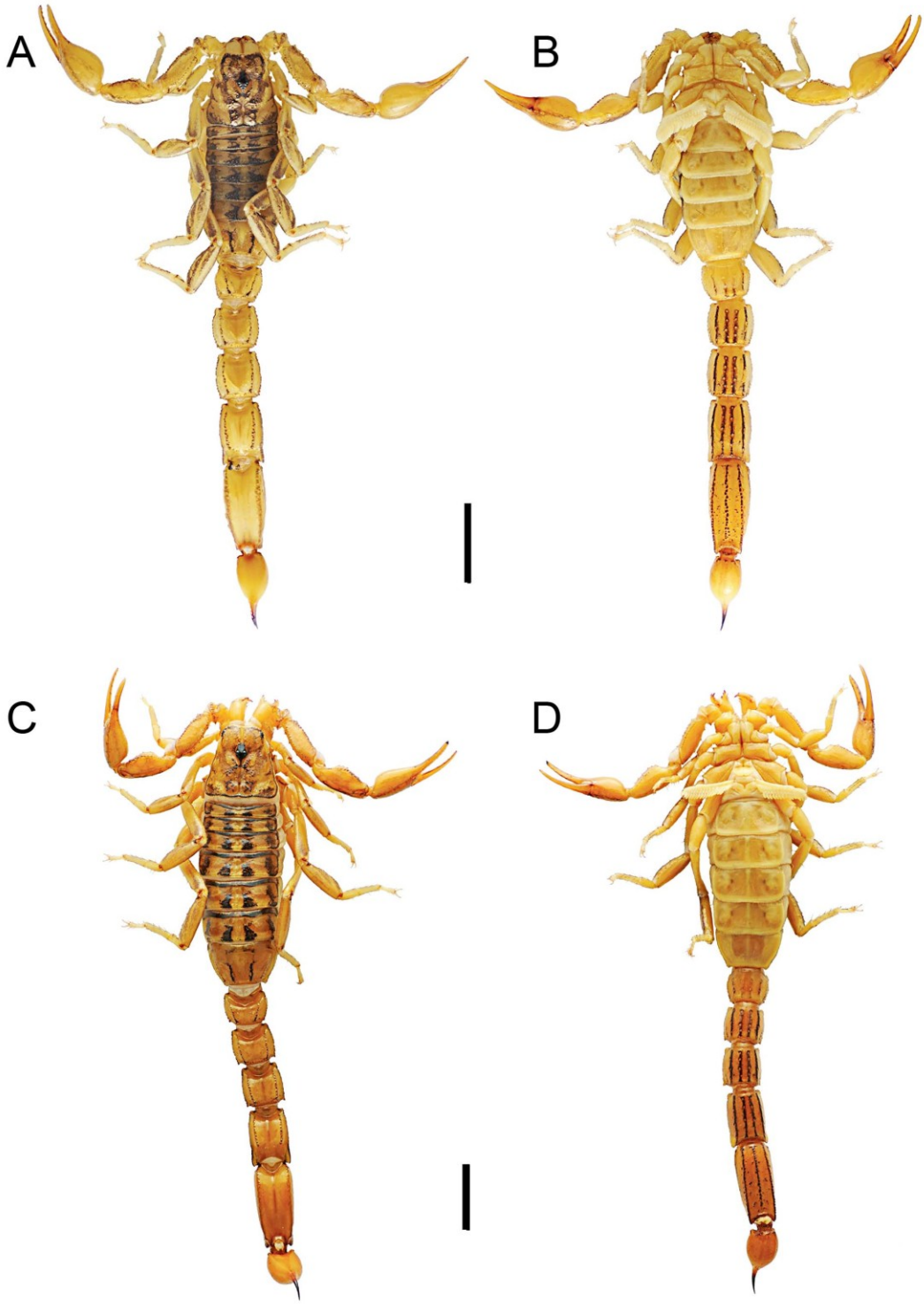


Figure 263. *Mesomexovis punctatus* (Karsch, 1879), habitus. **A**, **B**. ♂ (AMNH). **C**, **D**. ♀ (AMNH). **A**, **C**. Dorsal aspect. **B**, **D**. Ventral aspect. Scale bars = 5 mm.

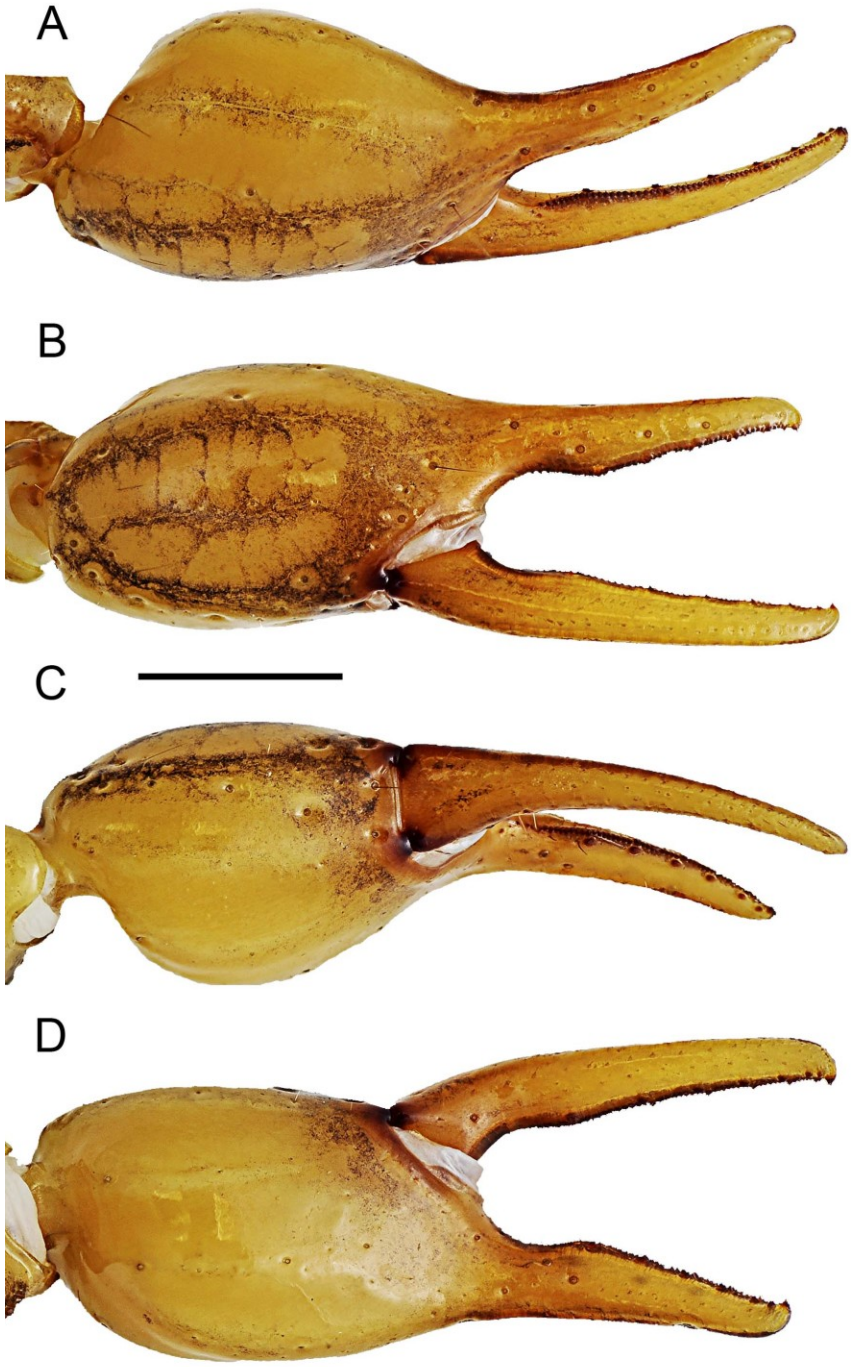


Figure 264. *Mesomexovis punctatus* (Karsch, 1879), ♂ (AMNH), dextral pedipalp chela. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

Figure 265. *Mesomexovis punctatus* (Karsch, 1879), ♂ (AMNH), dextral pedipalp patella. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

Mesomexovis subcristatus (Pocock, 1898)

Figures 229, 266–268, 283D, 288D, 292B, 294F, 297F, 300F, 304C

Vaejovis subcristatus Pocock, 1898: 396; *Vaejovis subcristatus*: Pocock, 1902: 10, 11, tab. II, figs. 6, 6a–b; Herrera, 1917: 271; Ewing, 1928: 14 (in part); Baerg, 1934: 528, 529, 532; Sissom, 1989b: 185–186, figs. 3–4, 11–14; Kovařík, 1998: 148; Beutelspacher, 2000: 112, 144, 148, 154, map 92; Sissom, 2000: 538; Soleglad and Fet, 2005: 5; Graham and Fet, 2006: 6; Francke and González-Santillán, 2007: 590; McWest, 2009: 20, tab. 1, 70, figs. 219–223, 101, 120; Ramírez-Carreto et al., 2012: 290–292.

Vejovis subcristatus: Kraepelin, 1899: 184, 186; Gertsch, 1958: 11; Bücherl, 1971: 328; Stahnke, 1973: 95–99, figs. 1A–C, 2A–C.

Vejovis subcristatus subcristatus: Hoffmann, 1931: 385; 1938: 318.

Thorellius subcristatus: Soleglad and Fet, 2008: 13, 30, 53, 73, 94, 95.

TYPE MATERIAL: **MEXICO: Veracruz:** Lectotype ♂ (BMNH 1890.71.264) (designated by Stahnke, 1973), San Andres (Tuxtla). Paralectotypes: 2 ♀ (BMNH 1890.7.1.247 and 248), same locality [not examined].

DIAGNOSIS: *Mesomexovis subcristatus* is closely related to *M. tlayoli*, **n. sp.** and *M. fasciatus*, with which it forms a monophyletic group. *M. subcristatus* may be separated from its related species by having ventral submedian carinae of metasomal segments I–IV costate to finely granular, instead of obsolete. Furthermore this species has ventral retrolateral carinae of pedipalp patella weakly crenulated, not completely smooth. *M. subcristatus* has an infuscation pattern of the tergites in which the lateral margin is not or weakly infuscated and do not connects with the narrow infuscation of the ventral submedian carinae, whereas in the other two species

the lateral margin has broad blotches of infuscation connecting with the marking on ventral submedian carinae. *M. subcristatus* also differs from these two species by having three major macrosetae on distal margin of carapace, the other species have five macrosetae, three major and two minor in between. *M. subcristatus* has fixed finger relatively elongated, with chela manus 1.4 times longer than fixed finger, *M. tlayoli*, **n. sp.** more than 1.5 but less than 1.7 and *M. fasciatus* more than 1.8 times. *M. subcristatus* also has metasomal segment III longer than wide, instead of wider than long. From *M. fasciatus* differs by having ventral median carinae of metasomal segment V finely serrated and distal end moniliform, instead of having broad conical serrated granules and bifurcated distal end. *M. subcristatus* has distal end of manus and base of pedipalp fingers heavily infuscated, whereas *M. fasciatus* has them diffusely infuscated. *M. subcristatus* has subaculear tubercle obsolete, *M. fasciatus* has it minute, expressed as a low tubercle.

DESCRIPTION: This description supplements Sissom's (1989b) and is based on the material deposited in the collections mentioned below.

Color and infuscation (In alcohol): Base color pale yellow straw. Carapace and tergites with infuscated with dusky markings. Dorsal and retrolateral surface of femur and patella, prolateral femur, and tibia and tarsi of legs diffusely infuscate. Medina and lateral eyes intensely infuscate. Ventral lateral and ventral submedian in I–IV and ventral median in V carinae underlined with a fine band of infuscation. Dorsal lateral carinae of tergite VII infuscate. Aculeus base brownish distally dark brown. Pedipalps fingers base intensely infuscated, contrasting strongly with pale base color of pedipalps. Carinae of pedipalp manus diffusely infuscate.

Carapace: Carapace anterior margin sublinear, with a vestigial to obsolete median notch. Entire surface shagreened, minute and moderately large granules combine over most of the

surface. Anterior margin with four pairs of major and minor intersperse lateral macrosetae. Anteromedian, posteromedian, and posterolateral sulci moderate, posterior transverse obsolete. Median ocular tubercle moderately raised and broad, with superciliary carinae moderate to weakly crenulate, higher than median eyes. Median ocular tubercle positioned on distal half of carapace. Median eyes approximately double size of lateral distal pair. Three lateral eyes, two anterior pairs almost same size and posterior third reduced approximately in half.

Sternum and coxal region: Sternum pentagonal subequilateral with three pairs of setae, one distal, one median pairs and one pair on the lobes, median notch deep. Anterior margin of coxa II with three oblique slit-like structures, adjacent to low to moderate and scattered granular protuberance. Proximal median margin of coxal endite II with a moderate depression each. Coxa IV 2.11 times longer than coxa II.

Chelicerae: Dorsal surface smooth, dentition of fixed and movable fingers as in typical Syntropinae. Subdistal margin of manus with one median macrosetae, distal margin with costate carinae and base of fixed finger with weak crenulation. Serrula with 14 tines.

Pedipalps: Trichobothrial pattern Type C, orthobothriotaxic. Pedipalp chela relatively elongate, wider than patella, patella wider than femur. Femur: Intercarinal surfaces matte. Dorsal prolateral, dorsal retrolateral, and ventral prolateral carinae moderately granular; retrolateral dorsosubmedian vestigial, expressed on distal two thirds by five major macrosetae positioned on a low tubercle each, macrosetae decreasing in size distally; prolateral ventrosubmedian vestigial with a double or bicuspid enlarged proximal tubercle positioned at mid surface followed by a row of four or five irregular scattered conical granules, medina and distal enlarged granules with a macroseta at base; prolateral ventral vestigial, expressed by a proximal tubercle with an adjacent macrosetae and four or five irregular enlarged conical granules the granules

subproximal median and distal granules with a macroseta at base, forming a row that slants gently towards ventral prolateral carinae, the row expressed on proximal two thirds; ventral median vestigial with a proximal row of enlarge crenatoserrate granules; retrolateral ventral obsolete, expressed by two or three moderate crenatoserrate granules; ventral retrosubmedian vestigial expressed as a proximal short row of serrate to conical granules present on proximal third.

Patella: Dorsal, ventral and prolateral carinae weakly matte, retrolateral smooth. Dorsal prolateral complete irregularly granular; ventral prolateral complete, strongly granular moniliform; dorsal retrolateral weakly crenular but strongly costate; ventral retrosubmedian complete smooth and moderately costate; ventral median vestigial expressed on proximal half as a row of minute granules; retrolateral dorsosubmedian and retrolateral median carinae obsolete, expressed by bands of infuscation and a weak median costa; prolateral median complete on a moderate vaulted projection, protruding strongly medially, extending from a moderate proximal tubercle with a major macroseta on top and a row of three or four coarse subserrate granules, median granule with a macroseta on top, the row slanting gently towards dorsal prolateral carinae, followed by a short gap of smooth surface and ending on at one distal major macrosetae, positioned on the distal fifth of dorsal prolateral carinae; prolateral ventral obsolete expressed by a row of three major macrosetae, proximal major macrosetae on the top of a low granule, median one shorter, adjacent to ventral prolateral carinae.

Chelae: Pedipalp manus elongate. Intercarinal surfaces smooth. All carinae obsolete. Trichobothrium *Db* positioned on dorsal retrolateral carina, subbasal on chelae; *Dt* positioned at mid manus.

Fingers: Fixed finger dentition: PD = 6 and RD = 5, MD rows = 5, proximal RD positioned by proximal half. Prolateral denticles larger than retrolateral denticles. Movable finger PD = 7, RD = 6, MD rows = 6, distal row of median denticles with one denticles. Proximal RD positioned by proximal half. All retrolateral denticles subpaired with corresponding prolateral denticles in both fingers. Trichobothria *ib* and *it* positioned subbasal on fixed finger, *ib* positioned between PD6 and PD7, PD7 lacking granule and an accessory minor macrosetae between PD6 and PD7, *it* at the level of or adjacent to PD6. Fingers with moderate to strong scalloping, in ♂ proximal notch and median lobe of fixed finger moderate, proximal notch of movable finger and medina lobe weak, gap created when fingers closed strong fingers fit unevenly, in ♀ proximal notch and median lobe of fixed and movable fingers weak, fingers with weak scalloping, gap created when fingers closed vestigial.

Legs: Basitarsi I–II prolateral ventral, retrolateral ventral and retrolateral dorsal carinae with complete rows of spinules, prolateral ventral in III and IV absent; retrolateral ventral in III complete, in IV absent; retrolateral dorsal in IIII complete expressed as a scattered row of spinules, in IV partial expressed by scattered spinules on distal two thirds; retrolateral median rows in I–IV absent. Telotarsi I–IV with two or three pairs of ventrodistal spinules in I–IV. Setae: Prolateral ventral, 2:4:4:5, median two in III and IV stout; retrolateral ventral, 4:7:9:7, major and minor intersperse macrosetae in III; retrolateral dorsal, 2:3:3:3, major and minor intersperse macrosetae; dorsal, 4:4:4:4; dorsal median macrosetae positioned on dorsal prolateral surface offset of the dorsal row. Retrolateral dorsal and dorsal series arranged in two independent rows.

Tergites: Pretergites smooth, postergites shagreened. Tergites I–VI dorsal median and ventral submedian carinae weak to moderate expressed by few moderate or enlarge distal

granules and weak costa. Tergite VII with intercarinal surfaces shagreened; dorsal median carina moderately costate expressed on proximal half of the postergite with few moderate conical granules; dorsal submedian vestigial expressed as a low short proximal granular paired blobs; dorsal lateral and lateral supramedian strong, distally becoming stronger; dorsal lateral carinae projecting and curving laterally approximating to lateral supramedian distal margin, creating a semi ring of strong serrated granulation.

Genital operculum: Male genital operculum: wider than long, with three pairs of macrosetae. Sclerites free on longitudinal edge moving independently but unable to open more than 45°. Genital papillae protruding posteriorly. Female genital operculum: Wider than long, with three macrosetae. Sclerites fuse longitudinal.

Sternites: Sternites I–VII finely punctuated, and lustrous. Sternite V with distal median glandular spot vestigial, not protruding from adjacent surface weakly contrasting with pale base color. Sternite VII ventral lateral carinae weakly costate with three pairs of macrosetae; ventral submedian obsolete expressed by three pairs of macrosetae. Ventral submedian carinae with three macrosetae. Distomedian glandular spot obsolete, not protruding from adjacent surface, in both sexes. Spiracle elongated, slit-like, approximately two times longer than wide.

Pectines: Pectines longer than distal edge of coxa IV in ♂, in ♀ at the level of distal edge of coxa IV. Basal piece with median notch deep. Marginal lamella consist of three sclerites, medial lamella proximally fuse distally progressively forming conspicuous 13 beads. Fulcra with 18–19 in ♂, in ♀ 15–18 beads. Pectinal tooth numbering 19–20 in ♂, 16–19 in ♀.

Hemispermatophore: Lamina 1.80 longer than trunk. Dorsal through margin long, narrow, curving proximally, and removed from ventral trough. Hemimating plug developed from the inner lobe, distal barb margin with 12 elongated spinules. Primary and secondary hook

positioned on the apex of lateral margin extension of the lamina (flange). Both hooks rounded low, separated slightly, forming a shallow notch. Median lobe ental terminus moderate and rounded. Basal plate of inner lobe removed from ventral trough. Spine of inner lobe relatively long and strongly sclerotized, secondary spine on ventromedian aspect of neck absent. Neck relatively short (0.50 times longer than basal plate). Measurements, lamina, 3.24; trunk, 1.80; dorsal trough/laminar hooks, 1.14; ventral trough/laminar hook, 0.84; neck, 0.30; basal plate, 0.60.

Metasoma: Dorsal and lateral intercarinal surface in I–II shagreened to smooth, ventral surface of metasomal segment I–V smooth. Carinae: Dorsal lateral and lateral median carinae in I–IV strongly crenatoserrated terminating in moderate to enlarged spinoid granule pointing backwards; except lateral median in IV distal terminus moderately expanded or flared laterally forming a rounded triangular projection; dorsal lateral in V proximally third strongly and scattered serrated, becoming crenular. Lateral inframedian in I complete moderately crenatoserrated; in II and III incomplete weakly crenatoserrated, becoming weaker proximally, present in distal third; in VI absent, in V partial, finely crenular expressed on proximal two thirds; ventral lateral in I–IV proximal half, distal half weakly crenular; ventral submedian in I–IV obsolete to weakly costate; ventral lateral and ventral median in V moderately to finely crenatoserrate. Setae: Dorsal lateral carinae, 0:3:4:4:7, minor and major intersperse macrosetae; lateral median; 1:2:3:3; lateral inframedian, 1:1:1:0:4; ventral lateral, 3:3:3:3:14, macrosetae positioned dorsal and lateral to the carinae; ventral submedian, 3:3:3:3:3; ventral sublateral, 2.

Telson: Dorsal and ventral surface smooth, all ventral carinae smooth. Ventral surface with five or six macrosetae in each carina. Ventral median carinae with subaculear tubercle obsolete. Microserration on laterobasal aculeus numbering 3–5.

DISTRIBUTION: *Mesomexovis subcristatus* is endemic to the valley of Tehuacan-Cuicatlán in the states of Oaxaca and Puebla, Mexico (see Remarks for a discussion of the type locality)

ECOLOGY: *Mesomexovis subcristatus* inhabits desert habitats dominated by scrublands including cacti, but is also found in chaparral and oak-pine forest. In flat and moderately compacted soils it can be found in burrows, usually dug by the side of a rock. This species has been recorded from 605 to 2030 m altitude. In its distribution range, at certain localities this species can be found together with *M. fasciatus*, *M. zaragozai*, **n. sp.** or *M. oaxaca*.

REMARKS: Since its inceptions *M. subcristatus* type locality has been referred to San Andres Tuxtla, in the state of Veracruz, Mexico (Pocock, 1898). Subsequent studies on this species accepted this locality (Pocock, 1902; Hoffmann, 1931; Stahnke, 1973; Sissom, 1989b; Soleglad and Fet, 2008). After analysis of the distribution area and comparisons of the dominant vegetation and climatic factors, I conclude that the type locality of this species is incorrect. The possible source of error is mislabeling of the specimens common in material of historical collections. Thus, the distribution area of this species is seemingly restricted to the states of Oaxaca and Puebla.

MATERIAL EXAMINED: **MEXICO: Oaxaca:** Boundaries between Puebla and Oaxaca, 3 km NW of Teotitlan del Camino, 18°9.5046'N 97°5.36'W, 951 m, 21.ix.2003, R. Paredes, J. Cruz-López, C. Santibáñez, and A. Valdez, 2 ♂, 2 juv. (IBUNAM). *Municipio de Cuicatlán*: Cerro Colorado, 8.viii.1975, 4 ♂, 6 ♀, 2 juv. (IBUNAM), 17°37.9998'N 96°54'W, 24.ix.2002, J.L. Castelo, in house, 1 ♂ (IBUNAM); Dominguillo, 17°37.9998'N 96°54'W, 670 m, C. Durán, 2.ix.2002, 1 ♀ (IBUNAM), F. Alvarez, 15.ii.2002, 1 ♀, 2 juv. (IBUNAM); Tomellin, 605 m, 23.vii.2002, 17°45.1800'N 96°57.2298'W, 3 ex. (AMNH [ARA1158]), 4 ex. (AMNH [ARA1159]), 17°45.180'N 96°57.237'W, 2 ♂, 3 ♀, 4 subad. ♀ (AMNH [LP 2086]), L. Prendini,

O. Francke, E. González, and J. Ponce, collected at night with UV light. *Municipio de San Juan Atepec*: Río Grande, 17°24.8370'N 96°34.2648'W, 1327 m, 3.vii.2008, O. Francke, A. Quijano, and C. Santibáñez, 1 subad. ♀ (AMNH [LP 9532]); Río Grande, San Juan Atepec, 1327 m, 7.iv.2012, O. Francke et al., 5 ♂, 5 ♀ (IBUNAM). *Municipio de San Juan Bautista Cuicatlán*: Cuicatlán, 33 km S, Hwy Cuicatlán-Oaxaca, 17°34.9146'N 96°56.9274'W, 1574 m, 9.xi.2005, O. Francke, M. Córdova, G. Montiel, and A. Jaimes, 1 ♀ (AMNH [LP 6633]). *Municipio de Santa María Ixcatlán*: on the way to Ixcatlán, 5 km NW of Cuicatlán, 17°48.9138'N 97°0.3228'W, 702 m, 8.xi.2005, O. Francke, M. Córdova, A. Jaimes, and G. Montiel, collected at night with UV light, 12 ♂, 8 ♀ (IBUNAM [ARA0021]), 3 ♂, 2 ♀, 1 subad. ♀ (AMNH [ARA3147]), 1 ♂ (CAS [ARA1545]); Road to Ixcatlán, 5 km NW Cuicatlán, 17°48.9138'N 97°0.3234'W, 702 m, 8.xi.2005, O. Francke, M. Córdova, A. Jaimes, and G. Montiel, 1 ♂, 1 ♀ (AMNH [LP 6629]). *Municipio de Santiago Nacaltepec*: El Moral, 21 km N, 17°34.753'N 96°56.976'W, 1535 m, 23.vii.2002, L. Prendini, O. Francke, E. González, and J. Ponce, 1 ♂ (AMNH [LP 2082]), 1 ♀, 1 juv. (AMNH [LP 2084]). **Puebla:** Hwy Teotitlán del Camino-Tehuacán, marker 5 km, 19.i.1996, 1 ♂ (IBUNAM). *Municipio de San Sebastian Zinacatepec*: Paraje 5 Mezquites, 8 km S of Zinacatepec, 18°18.147'N 97°12.918'W, 1075 m, 8–9.xi.2005, O. Francke, M. Córdova, A. Jaimes, and G. Montiel, 4 juv. (AMNH [LP 7142]), 1 ♀, 1 juv. (IBUNAM). *Municipio de Tehuacán*: El Riego, [18°27'5.25"N 97°25'28.62"W], 2.ix.1964, 1 ♀ (IBUNAM), 11.iii.1996, 2 juv. (IBUNAM); Mesa del Riego, 1930 m, 9.ix.1964, J. Julia, 7 ♀ (IBUNAM); Mesa del Riego, near Manantial San Lorenzo, 23.i.1968, L. Vázquez, 2 ♀ (IBUNAM); Hwy Tehuacán-Oaxaca, marker km 52, 18°24.0048'N 97°22.8666'W, 1504 m, O. Francke, J. Cruz-López, C. Santibáñez, and A. Valdez, 2 ♀, 1 juv. (IBUNAM); San Juan Raya, [18°18'48.27"N 97°37'30.05"W], 31.iii.1996, E. Barrera, 1 ♂, 1 juv. (IBUNAM); Tehuacán, [18°24.002'N 97°22.867'W], M.R.

Bogert and Vokes, 8.xi.1939, 1 juv. (AMNH), W.J. Gertsch, 24.vii.1956, 3 ex. (AMNH), A. Samano, 2.i.1968, 1 ♂, 1 ♀ (IBUNAM); Tehuacán, 2 km E, 18°24.002'N 97°22.867'W, 1435 m, 25.vii.2002, L. Prendini, O. Francke, E. González, and J. Ponce, 1 ♂, 2 subad. ♀ (AMNH [LP 2048]), 1 ♀, 1 subad. ♀ (AMNH [LP 2049]); Tehuacán, 5 km W, [18°24.002'N 97°22.867'W], 11.iii.1996, 2 ♀ (IBUNAM); Tehuacán, Pueblo, 24.x.1944, H. Wagner, 1 juv. (AMNH). *Municipio de Zapotitlán Salinas*: Zapotitlán Salinas, [18°20'N 97°29'W], 1500 m, 17.ix.2002, E. González, 2 ♂, 1 ♀ (IBUNAM); Zapotitlán Salinas, 4 km N, Cerro Chacatecas, 2030 m, 17.xi.2002, E. González, 2 ♀, 1 juv. (IBUNAM).

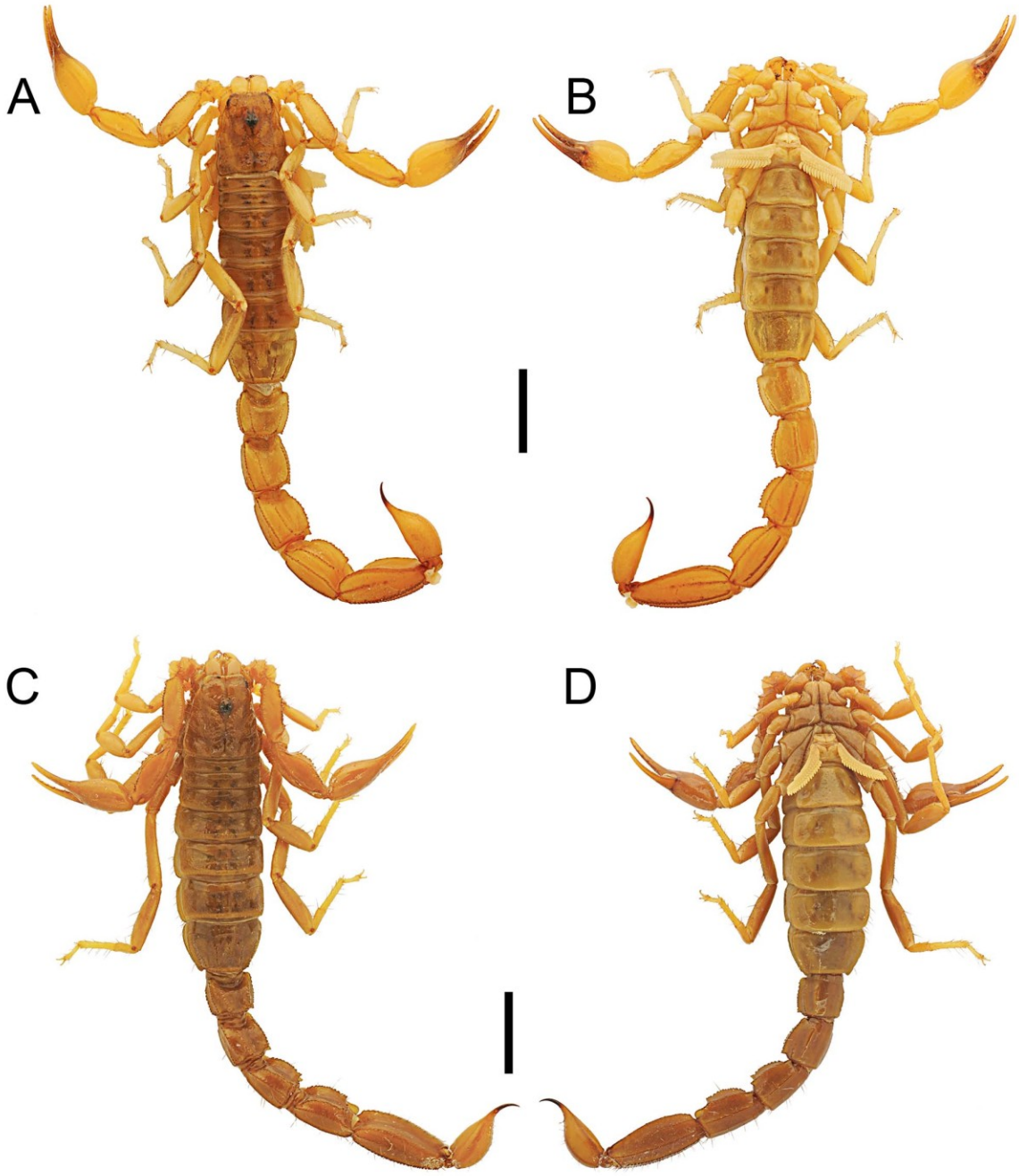


Figure 266. *Mesomexovis subcristatus* (Pocock, 1898), habitus. **A**, **B**. ♂ (AMNH). **C**, **D**. ♀ (AMNH). **A**, **C**. Dorsal aspect. **B**, **D**. Ventral aspect. Scale bars = 5 mm.

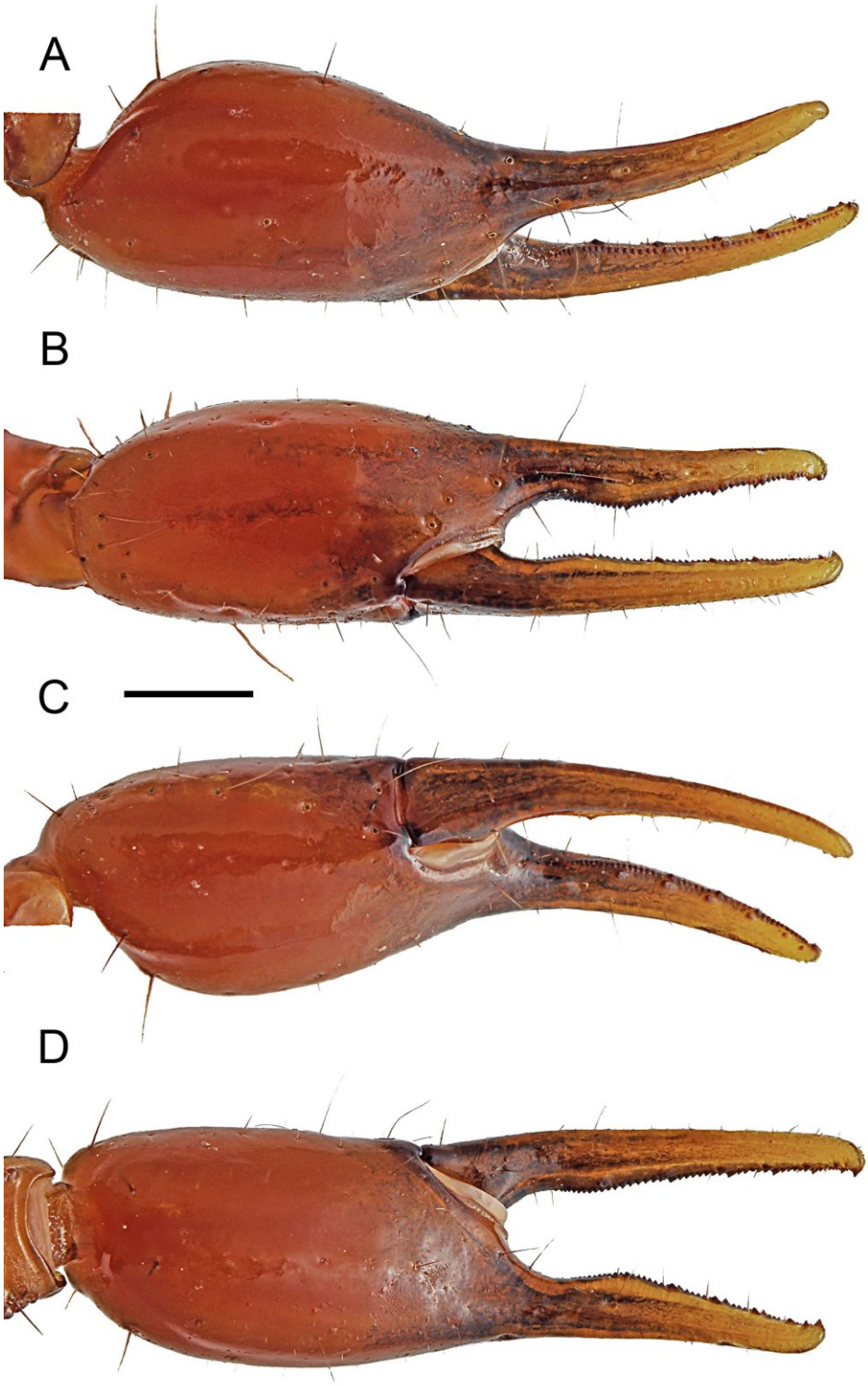


Figure 267. *Mesomexovis subcristatus* (Pocock, 1898), ♂ (AMNH), dextral pedipalp chela. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

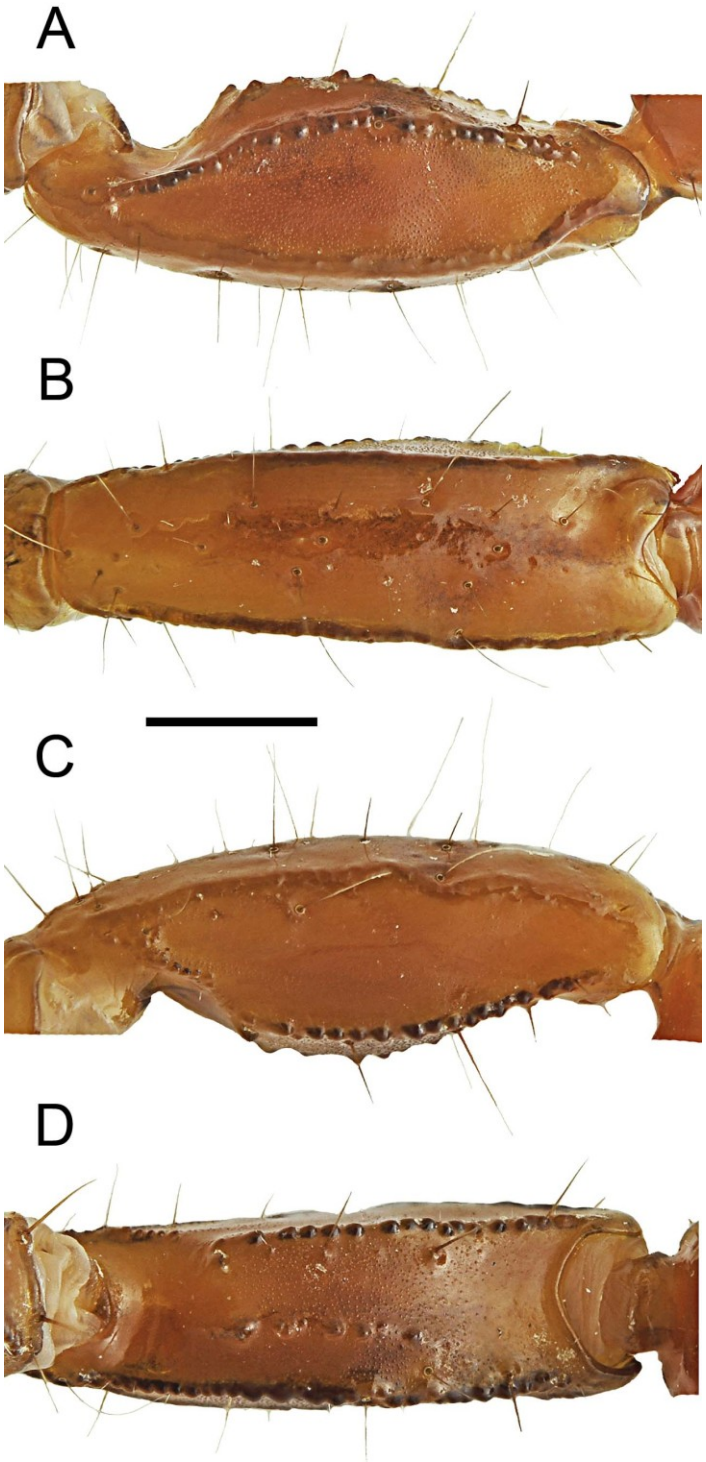


Figure 268. *Mesomexovis subcristatus* (Pocock, 1898), ♂ (AMNH), dextral pedipalp patella. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

Mesomexovis tinctus, **n. sp.**

Figures 228, 269–271, 284A, 286D, 290F, 295A, 298A, 301A, 304D; Table 14

TYPE MATERIAL: **MEXICO: Querétaro:** *Municipio de Querétaro*: Holotype ♂ (IBUNAM), La Joya, 2149 m, 1–2.vi.2010, 20°49.9710'N 100°30.4902'W O. Francke, H. Montaño, A. Valdez, and A. Ballesteros. Paratypes: same locality as holotype, 1 subad. ♂, 6 ex. (IBUNAM), ♂ 6 ex. (AMNH). **Guanajuato:** 1 ♂ (IBUNAM), Corralillo Ranch, Victoria, [21°23'N 100°12'W], 2.ii.1989, W. López-Forment. [*Municipio de Atarjea*]: 1 juv. (IBUNAM), Mangas Cuatas, [21°16.22283'N 99°43.2265'W]. *Municipio de San Luis de la Paz*: 1 ♀ (IBUNAM), San Luis de la Paz-Victoria, 21°17.8002'N 100°24.3'W, 2184 m, 22.iv.2011, L. Cervantes, and E. Barrera. **Querétaro:** 7 ex. (AMNH), Río Blanco. *Municipio de Cadereyta*: 1 ♂ (IBUNAM), Tepozan, [20°11'6.21"N 99°59'46.13"W], 10.iv.2008, A. Bitar, under rocks. *Municipio de Colon*: 4 ♀, 1 juv. (IBUNAM), Nuevo Alamos, 1 km SE, 20°49.4784'N 100°10.94'W, 2352 m, 14.v.2004, O. Francke, C. Santibáñez, A. Valdez, and J. Cruz. *Municipio de Peñamiller*: 1 ♀ (IBUNAM [ARA2010]), Mirador de Camargo, 20°6.3600'N 99°43.3296'W, 933 m, 30.iv.2005, O. Francke, J. Ballesteros, A. Valdez, and H. Montaño; 1 ♂ (IBUNAM), Microwaves station Santa Lucia, road to Peñamiller, 21°3.4716'N 99°47.0316'W, 1453 m, 14.xi.2003, O. Francke, J. Cruz-López, C. Santibáñez, and A. Valdez.

ETYMOLOGY: The species name *tinctus* is a Latin noun that means impregnated with, dipped in, treated, colored, or tinged. This name refers to the particular infuscation pattern on the carapace, tergites, and metasoma in this species.

DIAGNOSIS: *Mesomexovis tinctus*, **n. sp.** is closely related to *M. nigropictus*, with which it forms a monophyletic group. These two species may be distinguished by having five rows of

median denticles and five retrolateral denticles on pedipalp fixed finger in *M. tinctus*, **n. sp.** and six in *M. nigropictus*. Lateral median carinae of metasomal segment IV and Dorsal lateral carinae of V smooth in *M. tinctus*, **n. sp.** and in *M. nigropictus* strongly granular. Intercarinal surface between lateral median and lateral inframedian in metasomal segments I and II smooth in *M. tinctus*, **n. sp.** and in *M. nigropictus* shagreened, densely cover with minute and moderate granules. Ventral surface of metasomal segments II–IV intensely infuscated in *M. tinctus*, **n. sp.** and immaculate in *M. nigropictus*. *M. tinctus*, **n. sp.** may be further separated by having telson relatively globose, instead of being relatively compressed dorso-ventrally, additionally the telson is more hirsute in *M. tinctus*, **n. sp.** than in *M. nigropictus* with five macrosetae per carinae instead of three. Whereas *M. tinctus*, **n. sp.** has dorsal and retrolateral carinae of chelae and patella infuscated; *M. nigropictus* has these carinae immaculate.

DESCRIPTION: The following description is based on the types and the specimens listed in material examined.

Color and infuscation (In alcohol): Base color pale yellow straw to light orange. Carapace and tergites, dorsal and retrolateral surface of femur and patella, prolateral femur, and tibia and tarsi of legs infuscated with dusky markings. Dorsal distal margin of chelicerae and movable finger intensely infuscate. Median and lateral eyes intensely infuscate. Pedipalps fingers base moderately infuscate, contrasting strongly with pale base color of pedipalps. Carinae of pedipalp manus diffusely infuscate. Distal terminus of dorsal lateral carinae of all metasomal segments and median margin of dorsal surface of metasomal segments I–IV infuscate. Ventral lateral and ventral submedian in I–IV and ventral median in V carinae underlined with a broad band of infuscation, intercarinal surface between ventral submedian carinae of metasomal segments II–IV intensely infuscated. Dorsal lateral and base of setae on ventral submedian

carinae and accessory macrosetae of tergite VII infuscate. Aculeus base brownish distally dark brown.

Carapace: Carapace anterior margin sublinear, with a vestigial to obsolete median notch. Entire surface shagreened, minute and moderately large granules combine over most of the surface, except anterior lobes matte. Anterior margin with four or five pairs of major and minor intersperse lateral macrosetae and a median macrosetae. Anteromedian, posteromedian, and posterolateral sulci moderate, posterior transverse obsolete. Median ocular tubercle moderately raised and broad, with superciliary carinae moderate to weakly smooth, higher than median eyes. Median ocular tubercle positioned on distal half of carapace. Median eyes approximately double size of lateral distal pair. Three lateral eyes, two anterior pairs almost same size and posterior third reduced approximately in half.

Sternum and coxal region: Sternum pentagonal subequilateral with four pairs of setae, one distal, two median pairs and one pair on the lobes, median notch deep. Anterior margin of coxa II with three oblique slit-like structures, adjacent to a moderate a smooth protuberance. Subproximal median margin of coxal endite II with a moderate depression each. Coxa IV 2.09 times longer than coxa II.

Chelicerae: Dorsal surface smooth, dentition of fixed and movable fingers as in typical Syntropinae. Subdistal margin of manus with two median macrosetae, distal margin with costate carinae. Serrula with 14/14 tines.

Pedipalps: Trichobothrial pattern Type C, orthobothriotaxic. Pedipalp segment ratio length/wide, femur 2.69, patella 2.38, chela 3.26. Pedipalp chela moderate, wider than patella, patella wider than femur. Femur: Intercarinal surfaces matte. Dorsal prolateral and dorsal retrolateral irregularly granulate; ventral prolateral carinae moderately granular; retrolateral

dorsosubmedian vestigial, expressed on distal two thirds by four major macrosetae positioned on a low tubercle each, macrosetae decreasing in size distally; prolateral ventrosubmedian vestigial with a double or bicuspid enlarged proximal tubercle positioned at mid surface followed by a row of four or five irregular scattered conical granules, medina and distal enlarged granules with a macroseta at base; prolateral ventral vestigial, expressed by a proximal tubercle with an adjacent macrosetae and three or four irregular enlarged conical granules the granules subproximal median and distal granules with a macroseta at base, forming a row that slants gently towards ventral prolateral carinae, the row expressed on proximal two thirds; ventral median vestigial with a proximal row of enlarge crenatoserrate granules; retrolateral ventral obsolete, expressed by two or three moderate crenatoserrate granules; ventral retrosubmedian obsolete expressed by four or five minute proximal granules present on proximal fourth.

Patella: Dorsal, ventral and prolateral carinae weakly matte, retrolateral smooth. Dorsal prolateral complete irregularly granular; ventral prolateral complete, strongly granular moniliform; dorsal retrolateral and ventral retrosubmedian costate and smooth; ventral median vestigial expressed on proximal third as a row of minute granules; retrolateral dorsosubmedian and retrolateral median carinae obsolete; prolateral median complete on a moderate vaulted projection, protruding strongly medially, extending from a moderate proximal tubercle with a major macroseta on top and a row of three or four coarse scattered granules, median granule with a macroseta on top, the row slanting gently towards dorsal prolateral carinae, followed by a short gap of smooth surface and ending on at one distal major macrosetae, positioned on the distal fifth of dorsal prolateral carinae; prolateral ventral obsolete expressed by a row of three major macrosetae, proximal major macrosetae on the top of a low granule, median one shorter, adjacent to ventral prolateral carinae.

Chelae: Pedipalp manus moderate (manus 1.4 times longer than fixed finger). Intercarinal surfaces smooth. All carinae obsolete. Trichobothrium *Db* positioned on dorsal retrolateral carina, subbasal on chelae; *Dt* positioned at mid manus.

Fingers: Fixed finger dentition: PD = 6 and RD = 5, MD rows = 5, proximal RD positioned by proximal half. Prolateral denticles larger than retrolateral denticles. Movable finger PD = 7, RD = 6, MD rows = 6, distal row of median denticles with one denticles. Proximal RD positioned by proximal half. All retrolateral denticles subpaired with corresponding prolateral denticles in both fingers. Trichobothria *ib* and *it* positioned subbasal on fixed finger, *ib* positioned between PD6 and PD7, PD7 lacking granule and an accessory minor macrosetae between PD6 and PD7, *it* at the level of or adjacent to PD6. Fingers with weak scalloping, in ♂ proximal notch of fixed finger weak, and median lobe obsolete, proximal notch and median lobe of movable finger obsolete, gap created when fingers closed moderate fingers fit unevenly, in ♀ fingers with scalloping obsolete, gap created when fingers absent vestigial.

Legs: Basitarsi I–II prolateral ventral, retrolateral ventral and retrolateral dorsal carinae with complete rows of spinules, prolateral ventral in III vestigial expressed by few distal spinules, in IV absent; retrolateral ventral in III complete expressed as a scattered row of spinules, in IV absent; retrolateral dorsal in IIII and IV complete expressed as a scattered row of spinules; retrolateral median rows in I–IV vestigial expressed by distal few spinules. Telotarsi I–IV with two or three pairs of ventrodistal spinules in I–IV. Setae: Prolateral ventral 2:4:4:5; median two in III and IV stout; retrolateral ventral 4:7:7:7; major and minor intersperse macrosetae in III; retrolateral dorsal 2:3:3:3, major and minor intersperse macrosetae; dorsal 4:4:4:4; dorsal median macrosetae positioned on dorsal prolateral surface offset of the dorsal row. Retrolateral dorsal and dorsal series arranged in two independent rows.

Tergites: Pretergites smooth, postergites shagreened. Tergites I–VI dorsal median and ventral submedian carinae weak to moderate expressed by few moderate or enlarge distal granules and weak costa. Tergite VII with intercarinal surfaces shagreened; dorsal median carina weak costate expressed on proximal half of the postergite with few low granules; dorsal submedian vestigial expressed as a low short proximal granular paired blobs; dorsal lateral and lateral supramedian strong, distally becoming stronger; dorsal lateral carinae projecting and curving laterally approximating to lateral supramedian distal margin, creating a semi ring of strong serrated granulation.

Genital operculum: Male genital operculum: wider than long, with three pairs of macrosetae. Sclerites free on longitudinal edge moving independently but unable to open more than 45°. Genital papillae protruding posteriorly. Female genital operculum: Wider than long, with three macrosetae. Sclerites fuse longitudinal.

Sternites: Sternites I–VII finely punctuated, and lustrous. Sternite V with distal median glandular spot obsolete, not protruding from adjacent surface or contrasting with pale base color. Sternite VII ventral lateral and ventral submedian carinae obsolete with three pairs of macrosetae. Distomedian glandular spot obsolete, not protruding from adjacent surface, in both sexes. Spiracle elongated, slit-like, approximately two times longer than wide.

Pectines: Pectines longer than distal edge of coxa IV in ♂, in ♀ at the level of distal edge of coxa IV. Basal piece with median notch deep. Marginal lamella consist of three sclerites, medial lamella proximally fuse distally progressively forming conspicuous 13 beads Fulcra with 18–20 in ♂, 14–17 in ♀ beads. Pectinal tooth count 20–21 in ♂, 15–18 in ♀.

Hemispermatophore: Lamina 1.66 longer than trunk. Dorsal through margin long, narrow, curving proximally, and removed from ventral trough. Hemimating plug developed from

the inner lobe, distal barb margin with 12 elongated spinules. Primary and secondary hook positioned on the apex of lateral margin extension of the lamina (flange). Both hooks moderately sharp and low, separated slightly, forming a shallow notch. Hooks rotated to the dorsal surface. Median lobe ental terminus moderate and rounded, slightly protruding towards the ental margin. Basal plate of inner lobe removed from ventral trough. Spine of inner lobe moderate. Neck relatively short (0.50 times longer than basal plate). Measurements, lamina, 2.70; trunk, 1.62; dorsal trough/laminar hooks, 1.32; ventral trough/laminar hook, 0.84; neck, 0.30; basal plate, 0.30.

Metasoma: Dorsal and lateral intercarinal surface in I–VI matte, ventral surface of metasomal segment I–IV smooth, in V densely shagreened. Metasoma 1.61 times longer than mesosoma. Metasomal segments I–II wider than long, III as long as wide. Carinae: Dorsal lateral and lateral median carinae in I–IV strongly crenatoserrated terminating in strong and enlarged spiniform granule pointing backwards; except lateral median in IV distal terminus moderately expanded or flared laterally forming a rounded triangular projection; dorsal lateral in V vestigial proximally with three or four strongly serrate granules the rest obsolete. Lateral inframedian in I complete strongly crenatoserrated; in II and III incomplete weakly crenatoserrated, becoming weaker proximally, present in distal third; in VI absent, in V obsolete, expressed by a proximal tubercle only; ventral lateral in I–IV smooth, weakly costate; ventral submedian in I–IV obsolete; ventral lateral and ventral median in V moderately to finely crenatoserrate. Setae: Dorsal lateral carinae, 0:2:4:5:12, minor and major intersperse macrosetae on dorsal and lateral surface; lateral median; 1:3:4:5; lateral inframedian, 2:1:1:0:9, minor and major intersperse macrosetae in V, ventral lateral, 3:5:5:6:14, macrosetae positioned ventral and lateral to the carinae; ventral

submedian, 3:4:4:4:6, ventral sublateral, 2. One to two accessory minor or major macrosetae in intercarinal surfaces between ventral submedian carinae in segments I and III.

Telson: Telson vesicle 2.5 times longer than wide. Metasomal segment V 1.3 times wider than telson. Vesicle 2.3 times longer than aculeus. Dorsal and ventral surface smooth, all ventral carinae smooth. Ventral surface with six or seven macrosetae in each carina. Ventral median carinae with subaculear tubercle obsolete. Microserration on laterobasal aculeus numbering 3–5.

DISTRIBUTION: *Mesomexovis tinctus*, **n. sp.** is distributed in the states of Guanajuato and Queretaro, Mexico.

ECOLOGY: *Mesomexovis tinctus*, **n. sp.** inhabits the deserts of central Mexico, most particularly within the limits of the Biosphere Reserve Sierra Gorda. The specimens were taken during the day under rocks, which may be an indication that this species is lapidicolous. The altitude of these localities varied from 933 to 2352 m.

REMARKS: It is probable that the records from Queretaro and Guanajuato of *V. punctatus punctatus* presented by Sissom (2000) correspond to this species.

MATERIAL EXAMINED: **MEXICO: Querétaro:** Río Blanco, 7 ex. (AMNH). *Municipio de Peñamiller*: Mirador de Camargo, 20°6.3600'N 99°43.3296'W, 933 m, 30.iv.2005, O. Francke, J. Ballesteros, A. Valdez, and H. Montaño, 2 ♀, 4 juv. (AMNH [LP 5298]). *Municipio de Querétaro*: La Joya, 2149 m, 1–2.vi.2010, 20°49.9710'N 100°30.4902'W, 1 juv. (AMNH [LP 6418]), O. Francke, H. Montaño, A. Valdez, and A. Ballesteros.

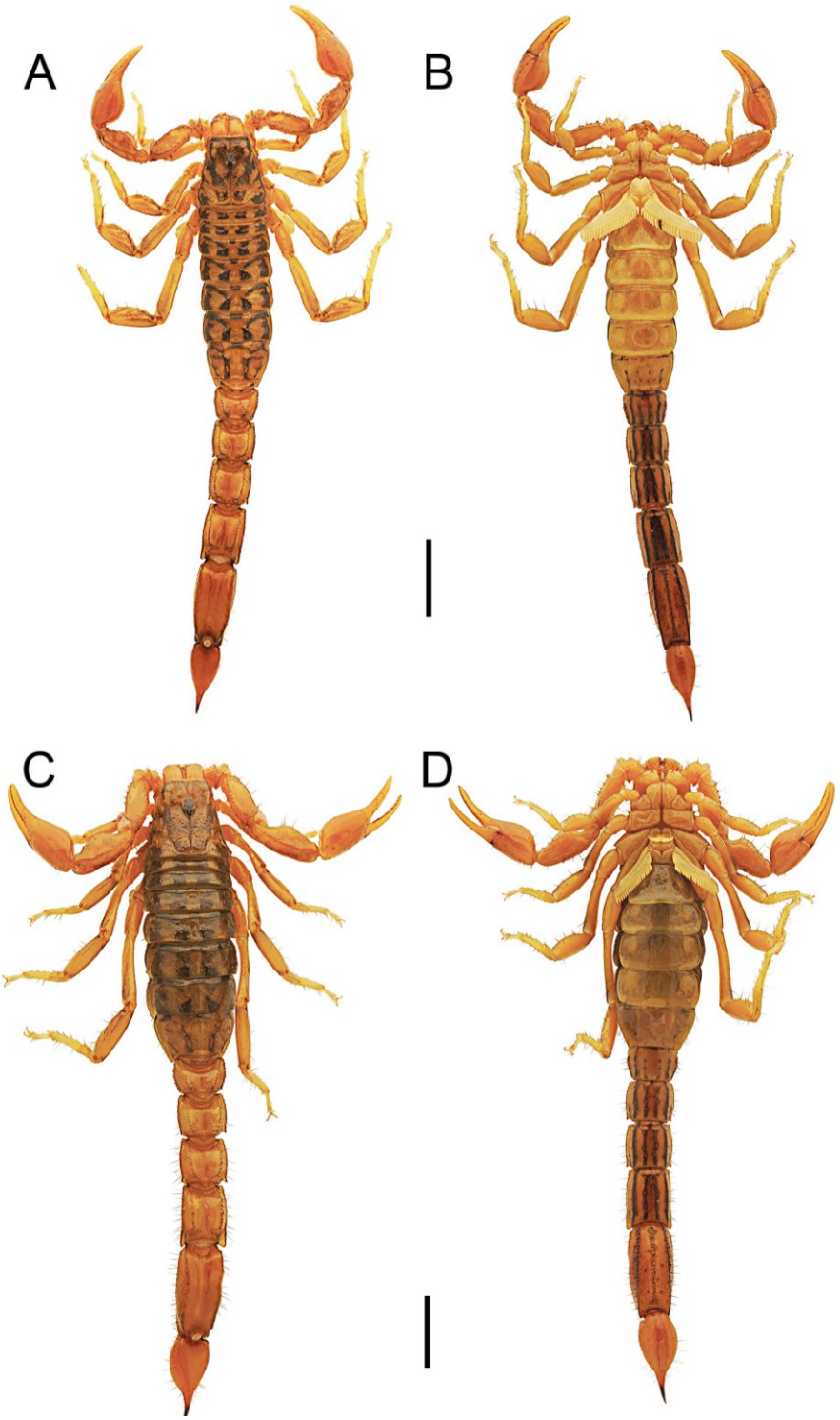


Figure 269. *Mesomexovis tinctus*, **n. sp.**, habitus. **A**, **B**. ♂ (AMNH). **C**, **D**. ♀ (AMNH). **A**, **C**. Dorsal aspect. **B**, **D**. Ventral aspect. Scale bars = 5 mm.

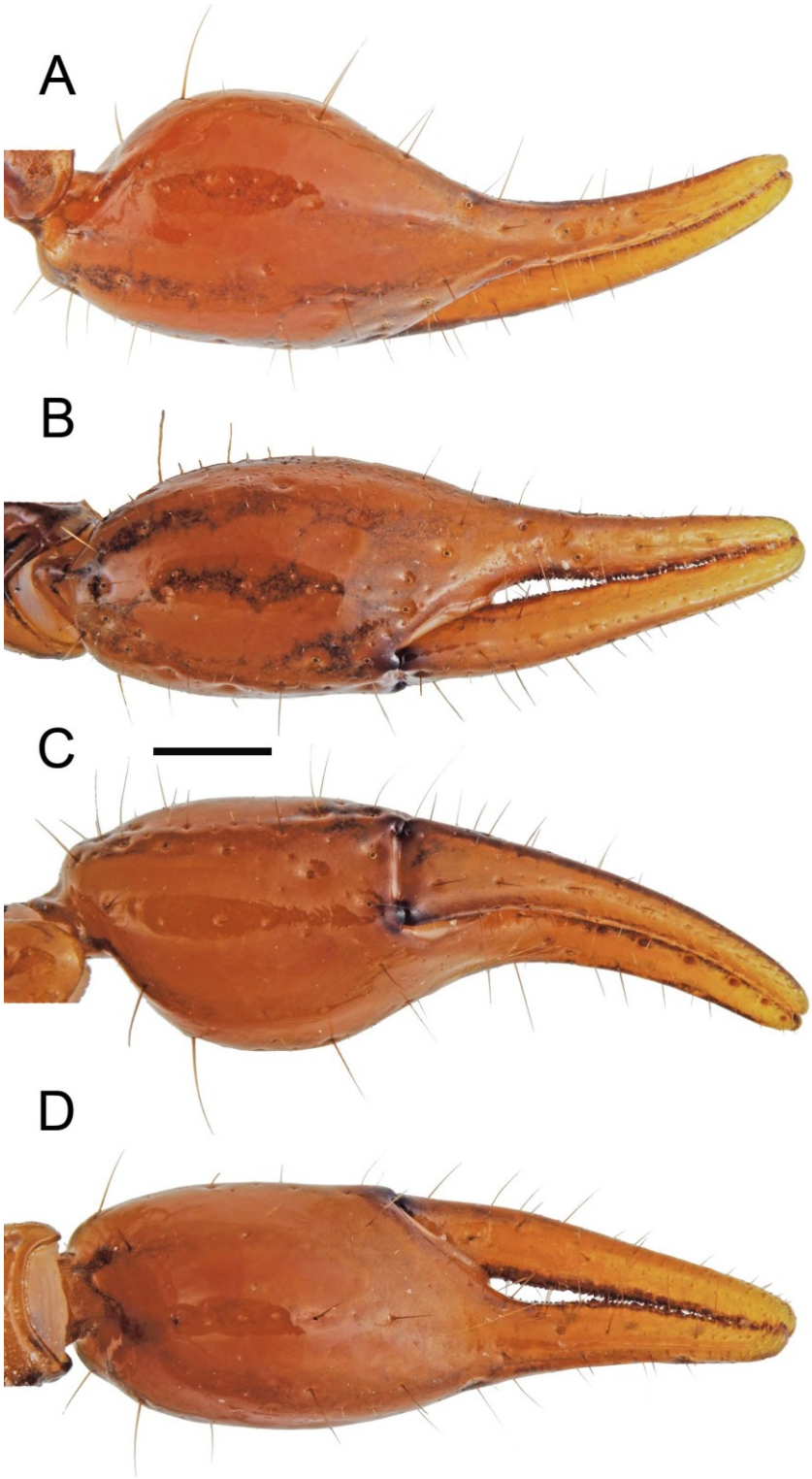


Figure 270. *Mesomexovis tinctus*, **n. sp.**, paratype ♂ (AMNH), dextral pedipalp chela. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

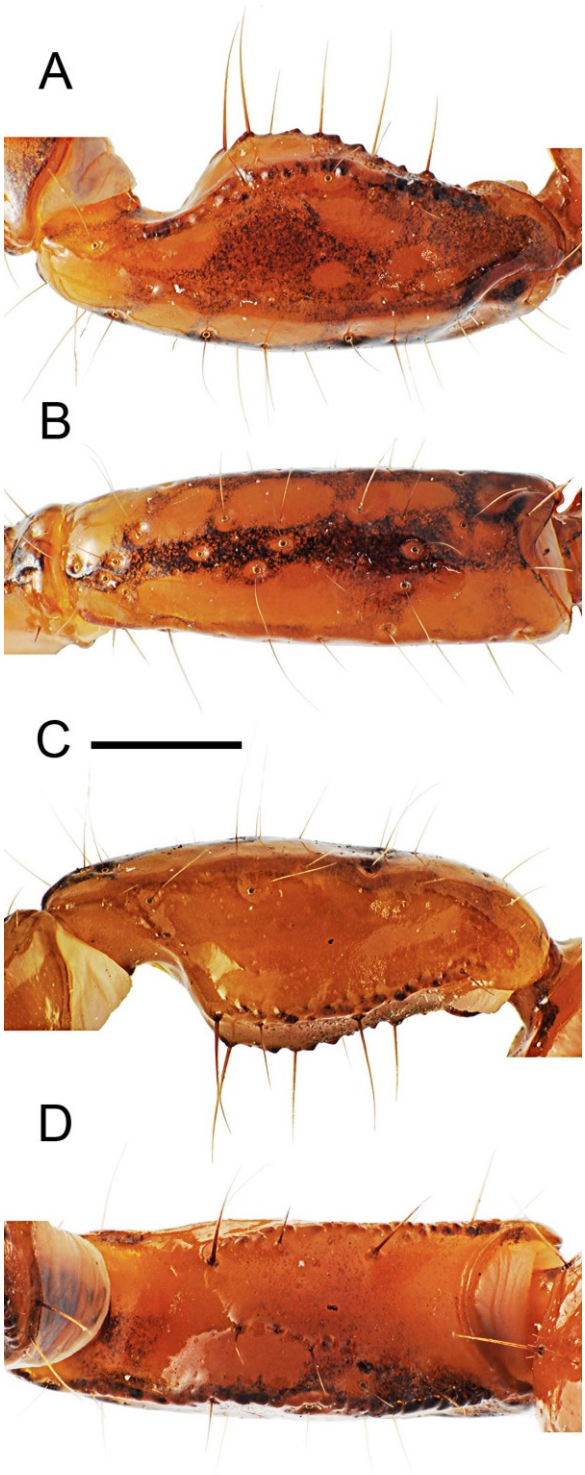


Figure 271. *Mesomexovis tinctus*, **n. sp.**, paratype ♂ (AMNH), dextral pedipalp patella. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

Mesomexovis tlayoli, **n. sp.**

Figures 229, 272–274, 284B, 289B, 291C, 295B, 298B, 301B, 305A; Table 14

TYPE MATERIAL: **MEXICO: Puebla:** *Municipio de San Pedro Cuayuca*: Holotype ♂ (IBUNAM) Tlacotepec, 13 km NE, 1117 m, 29–30.vi.2006, 18°25.8408'N 98°14.0148'W, O. Francke, A. Valdez, H. Montaño, and G. Villegas, forest, collected at night with UV light. Paratypes: 17 ♂ (AMNH [ARA1081]), 8 ♂ (CAS [ARA1965]), 7 subad. ♂, 10 subad. ♀ (IBUNAM), same locality as holotype.

ETYMOLOGY: The species name *tlayoli* is the name of maize plant in the Nahuatl language, literally meaning 'our livelihood'. The name refers to the distribution of this species, which has been recorded at one of the potential sites where maize was first domesticated.

DIAGNOSIS: *Mesomexovis tlayoli*, **n. sp.** is closely related to *M. subcristatus* and *M. fasciatus*, with which it forms a monophyletic group. *M. tlayoli*, **n. sp.** is readily distinguish from these species by having fixed finger intermediate in length, with pedipalp manus more than 1.5 but less than 1.7 times longer than fixed finger, *M. subcristatus* more than 1.4 times, and *M. fasciatus* 1.8 times. From *M. subcristatus* differs by having ventral submedian carinae of metasomal segments I–IV obsolete, instead of costate to finely granular. *M. tlayoli*, **n. sp.** also differs from *M. subcristatus* by having five macrosetae, three major and two minor in between, instead of only three. Whereas *M. tlayoli*, **n. sp.** has ventral median carinae of metasomal segment V with broad conical serrated granules, *M. subcristatus* has it finely serrated. From *M. fasciatus* differs by having trichobothria *ib* and *it* relatively distal on fixed finger, these trichobothria closer to RD5, instead of having them midway between RD5 and RD6 (being these two denticles absent but macroseta present). *Mesomexovis tlayoli*, **n. sp.** tend to have broad and

intense infuscation, prolateral surface of legs with intense infuscation, dorsal prolateral and dorsal retrolateral carinae of femur and patella, and ventral carinae of metasomal segments I–V outlined with broad and intense infuscation, instead of being diffuse and weaker. Additionally, *M. tlayoli*, **n. sp.** has sternite VII with base of macrosetae infuscate, instead of immaculate.

DESCRIPTION: The following description is based on the types and the specimens listed in material examined.

Color and infuscation (in alcohol): Base color pale yellow straw. Carapace and tergites infuscate with dusky markings. Dorsal, retrolateral and prolateral carinae of pedipalp femur and patella outlined with intense and broad infuscation. Carinae of pedipalp manus diffusely infuscate. Retrolateral surface of patella, prolateral femur, and tibia and tarsi of legs intensely infuscate. Median and lateral eyes intensely infuscate. Ventral median carinae of tergites immaculate. Dorsal lateral and lateral median carinae of tergite VII infuscate. Ventral lateral outlined by broad and intense infuscation in metasomal segments in I–IV; ventral submedian in I–IV and ventral median in V with blotches of infuscation around macrosetae sparse or convergent forming a mottled pattern along the carinae. Lateral inframedian infuscate. Macrosetae on ventral submedian and lateral ventral carinae infuscate around base as well as accessory intercarinal macrosetae. Aculeus base brownish distally dark brown. Telson with a lateral broad and median band of diffuse infuscation.

Carapace: Carapace anterior margin linear, with median notch obsolete. Entire surface shagreened, minute and moderately large granules combine over most of the surface, weakly expressed on sulci. Anterior margin with five pairs of major macrosetae with major and minor intersperse and a median macrosetae. Anteromedian, posteromedian, and posterolateral sulci moderate, posterior transverse obsolete, all sulci matte. Median ocular tubercle moderately raised

and broad, with superciliary carinae weak and smooth, higher than median eyes. Median ocular tubercle positioned on distal half of carapace. Median eyes approximately double size of lateral distal pair. Three lateral eyes, two anterior pairs same size and posterior third reduced approximately in half.

Sternum and coxal region: Sternum pentagonal subequilateral with four pairs of setae, one distal, two median pairs and one pair on the lobes, median notch deep. Coxal region surface matte. Anterior margin of coxa II with three oblique slit-like structures, adjacent to low to finely and scattered granular protuberance. Proximal median margin of coxal endite II with a moderate depression each. Coxa IV 1.91 times longer than coxa II.

Chelicerae: Dorsal surface smooth, dentition of fixed and movable fingers as in typical Syntropinae. Subdistal margin of manus with one median macrosetae, distal margin with costate carinae. Serrula with 14/14 tines.

Pedipalps: Trichobothrial pattern Type C, orthobothriotaxic. Pedipalp segment ratio length/wide, femur 1.45, patella 2.85, chela 4.85. Pedipalp chela moderate, wider than patella, patella wider than femur. Femur: All intercarinal surfaces matte, except dorsal with few median scattered moderate granules. Dorsal prolateral, dorsal retrolateral, and ventral prolateral carinae moderately granular; retrolateral dorsosubmedian vestigial, expressed on distal two thirds by five major macrosetae positioned on a low tubercle each, macrosetae decreasing in size distally; prolateral ventrosubmedian vestigial with a double or bicuspid enlarged proximal tubercle positioned at mid surface followed by a row of three or four irregular scattered conical granules, median and distal granules with a macroseta at base; prolateral ventral vestigial, expressed by a proximal tubercle with an adjacent macrosetae and three irregular enlarged conical granules, the granules subproximal median and distal with a macroseta at base, forming a row that slants

gently towards ventral prolateral carinae, the row expressed on proximal two thirds; ventral median vestigial with a proximal row of moderate crenatoserrate granules; retrolateral ventral obsolete; ventral retrosubmedian vestigial expressed by few proximal serrate to conical granules.

Patella: Dorsal, ventral and prolateral carinae weakly matte, retrolateral smooth. Dorsal prolateral complete irregularly granular with cluster or accessory granules around macrosetae; ventral prolateral complete, moderately granular moniliform; dorsal retrolateral weakly crenulated but strongly costate; ventral retrosubmedian complete, weakly crenular to smooth but moderately costate; ventral median vestigial expressed on proximal third with minute irregular granules; retrolateral dorsosubmedian and retrolateral median carinae obsolete, expressed by bands of infuscation; prolateral median complete on a moderate vaulted projection, protruding strongly medially, extending from a moderate proximal tubercle with a major macroseta on top and a row of four or five moderate subserrate granules, median granule with a macroseta on top, the row slanting gently towards dorsal prolateral carinae, followed by a short gap of smooth surface and ending on at one distal major macrosetae, positioned on the distal fifth of dorsal prolateral carinae; prolateral ventral obsolete expressed by a row of three major macrosetae, proximal major macrosetae, median one shorter, on the top of a low granule, adjacent to ventral prolateral carinae.

Chelae: Pedipalp manus incrassate (manus 1.33 times longer than fixed finger). Intercarinal surfaces smooth. Intercarinal surfaces smooth. Dorsal median, dorsal prolateral, dorsal retrolateral, ventral prolateral, prolateral median, ventral retrolateral and ventral median vestigial, moderately costate. Trichobothrium *Db* positioned on dorsal retrolateral carina, subbasal on chelae; *Dt* positioned at mid manus.

Fingers: Fixed finger dentition: PD = 6 and RD = 5, MD rows = 5, proximal RD positioned by proximal half. Prolateral denticles larger than retrolateral denticles. Movable finger PD = 7, RD = 6, MD rows = 6, distal row of median denticles with one denticles. Proximal RD positioned by proximal half. All retrolateral denticles subpaired with corresponding prolateral denticles in both fingers. Trichobothria *ib* and *it* positioned subbasal on fixed finger, *ib* positioned between PD6 and PD7, PD7 lacking granule, *it* at the level of or adjacent to PD6. Fingers with moderate to strong scalloping, in ♂ proximal notch of fixed finger strong, median lobe weak, proximal notch of movable finger weak, median lobe moderate, gap created when fingers closed strong fingers fit unevenly, in ♀ scalloping vestigial, proximal of fixed finger vestigial, medina lobe absent, proximal notch of movable finger obsolete, median lobe weak, proximal gap created when fingers closed weak, fingers fit evenly.

Legs: Basitarsi I–II prolateral ventral, retrolateral ventral and retrolateral dorsal carinae with complete rows of spinules, prolateral ventral in III and IV absent; retrolateral ventral in III complete, in IV absent; retrolateral dorsal in IIII complete, in IV partial, expressed on distal two thirds; retrolateral median rows in I–IV vestigial expressed by few distal spinules. Telotarsi I–IV with two or three pairs of ventrodistal spinules in I–IV. Setae: Prolateral ventral 2:4:4:4; median two in III and IV stout; retrolateral ventral 3:6:8:8, major and minor intersperse macrosetae; retrolateral dorsal 2:3:4:4, major and minor intersperse macrosetae; dorsal 4:4:4:4; dorsal median macrosetae positioned on dorsal prolateral surface offset of the dorsal row. Retrolateral dorsal and dorsal series arranged in two independent rows.

Tergites: Pretergites smooth, postergites shagreened. Tergites I–VI dorsal median and ventral submedian carinae weak to moderate expressed by few moderate distal granules and weakly costate. Tergite VII with intercarinal surfaces shagreened; dorsal median carina

moderately costate expressed on proximal half of the postergite with few moderate conical granules; dorsal submedian vestigial expressed as a low short proximal granular paired blobs; dorsal lateral and lateral supramedian strong; dorsal lateral carinae projecting and curving laterally approximating to lateral supramedian distal margin, creating a semi ring of strong serrated granulation.

Genital operculum: Male genital operculum: wider than long, with three pairs of macrosetae. Sclerites free on longitudinal edge moving independently but unable to open more than 45°. Genital papillae protruding posteriorly. Female genital operculum: Wider than long, with three macrosetae. Sclerites fuse longitudinal.

Sternites: Sternites I–VII finely punctuated, and lustrous. Sternite V with distal median glandular spot vestigial, not protruding from adjacent surface weakly contrasting with pale base color. Sternite VII carinae obsolete, ventral lateral expressed by three pairs of macrosetae; ventral submedian expressed by two pairs of macrosetae. Intercarinal surface between ventral lateral and ventral submedian carinae with one to two median accessory macrosetae. Distomedian glandular spot vestigial, protruding weakly from adjacent surface and contrasting moderately with slightly tan base color in ♂, in ♀ obsolete. Spiracle elongated, slit-like, approximately two times longer than wide.

Pectines: Pectines longer than distal edge of coxa IV in ♂, in ♀ at the level of distal edge of coxa IV. Basal piece with median notch deep. Marginal lamella consist of three sclerites, medial lamella proximally fuse distally progressively forming conspicuous 12–14 beads. Fulcra with 17–18 in ♂, 14–16 in ♀. beads. Pectinal tooth count18–19 in ♂, 15–17 in ♀.

Hemispermatophore: Lamina 1.50 longer than trunk. Dorsal through margin long, narrow, curving proximally, and removed from ventral trough. Hemimating plug developed from

the inner lobe, distal barb margin with 18 elongated spinules. Primary and secondary hook positioned on the apex of lateral margin extension of the lamina (flange). Both hooks rounded low, separated slightly, forming a shallow notch. Median lobe ental terminus moderate and rounded slightly protruding towards ental margin. Basal plate of inner lobe removed from ventral trough. Spine of inner lobe moderate, secondary spine on ventromedian aspect of neck absent. Neck relatively short (0.51 times longer than basal plate). Measurements, lamina, 2.70; trunk, 1.80; dorsal trough/laminar hooks, 1.20; ventral trough/laminar hook, 0.72; neck, 0.24; basal plate, 0.42.

Metasoma: All intercarinal surfaces in I–V shagreened to smooth. Metasoma 1.89 times longer than mesosoma. Metasomal segments I–III wider than long. Carinae: Dorsal lateral and lateral median carinae in I–IV strongly crenatoserrated terminating in moderate spinoid granule pointing backwards; except lateral median in IV distal terminus strongly expanded or flared laterally forming a rounded triangular projection; dorsal lateral in V proximally third strongly crenatoserrate, becoming weakly crenulate, ending with a row or low crenatoserrate granules. Lateral inframedian in I complete moderately strongly; in II incomplete weakly crenatoserrated, becoming weaker proximally, present in distal half, in III incomplete weakly crenatoserrated, becoming weaker proximally, present in distal third; in VI absent, in V partial, expressed as a proximal tubercle followed by a weak costa on proximal half; ventral lateral in I and II weakly crenular, moderately costate, in III–IV smooth moderately costate; ventral submedian in I–IV obsolete; ventral lateral and ventral median in V moderately crenatoserrate. Setae: Dorsal lateral carinae, 0:1:2:3:5; lateral median; 1:2:2:4; lateral inframedian, 2:2:1:1:5, ventral lateral, 3:3:4:4:10, macrosetae positioned dorsal and lateral to the carinae; ventral submedian, 3:3:3:4:3, ventral sublateral, 2.

Telson: Telson vesicle 1.65 times longer than wide. Metasomal segment V 1.40 times wider than telson. Vesicle 1.83 times longer than aculeus. Dorsal and ventral surface smooth, all ventral carinae smooth. Ventral surface with four macrosetae in each carina. Ventral median carinae with subaculear tubercle vestigial. Microserration on laterobasal aculeus numbering 3–6.

DISTRIBUTION: *Mesomexovis tlayoli*, **n. sp.** is distributed in the Tehuacán-Cuicatlan Valley and the eastern extreme of the Balsas Depression, including the states of Guerrero, Puebla and Oaxaca, Mexico.

ECOLOGY: *Mesomexovis tlayoli*, **n. sp.** has been recorded from 1117 to 2290 m altitude. The collection sites were dominated by oak-pine forest, tropical deciduous forest and scrublands. Most specimens were collected by ultraviolet detection; a few were taken by turning rocks during the day. This species is considered lapidicolous because of the absence of morphological modifications and the habitat where it was collected.

REMARKS: It is probable that some of the records from Puebla and Oaxaca presented for *P. punctatus punctatus* by Sissom (2000) correspond to this new species.

MATERIAL EXAMINED: **MEXICO: Guerrero:** *Municipio de Tlapa de Comonfort*: Olinalá, 30 km S, 17°36.524'N 98°44.156'W, 2063 m, 15.vi.2007, O. Francke et al., 1 juv. (AMNH [LP 7065]). **Oaxaca:** *Municipio de San Francisco Telixtlahuaca*: Telixtlahuaca, 6 km N, 17°20.367'N 96°56.121'W, 1915 m, 22.vii.2002, O. Francke, E. González, and J. Ponce, 2 ♂, 4 ♀ (AMNH [LP 2037]). *Municipio de San Pablo Huitzo*: Huitzo, 1.5 km N, 31.x.2004, 17°17'28.5"N 96°55'35.9"W, 1890 m, 1 ♂, 8 ♀, 3 juv. (AMNH [LP 3714]), 1078 m, 2 ♀, 1 subad. ♀ (AMNH [LP 3716]), O. Francke, R. Paredes, and G. Villegas, collected at night with UV light. *Municipio de Suchixtlahuaca*: Road San Cristobal Sochixtlahuaca-Santiago Tejupan, marker km 2, 2290 m, 17°42.2400'N 97°23.66'W, 2290 m, 28.vi.2006, forest, collected at night

with UV light, 32 ex. (IBUNAM [ARA0093]), 6.vi.2006, 2 juv. (AMNH [LP 6466]), O. Francke, A. Valdez, G. Villegas, H. Montaño, and C. Santibáñez; Suchixtlahuaca, 8 km NE, 17°42.1242'N 97°23.7756'W, 2030 m, 26.iii.2004, O. Francke, J. Cruz-López, C. Santibáñez, and A. Valdez, 1 ♂, 4 ♀ (IBUNAM). **Puebla:** *Municipio de San Pedro Cuayuca*: Tlacotepec, 13 km NE, 1117 m, 29–30.vi.2006, 18°25.841'N 98°14.015'W, 1 ♂ (AMNH [LP 6522]), O. Francke, A. Valdez, H. Montaño, and G. Villegas, forest, collected at night with UV light.

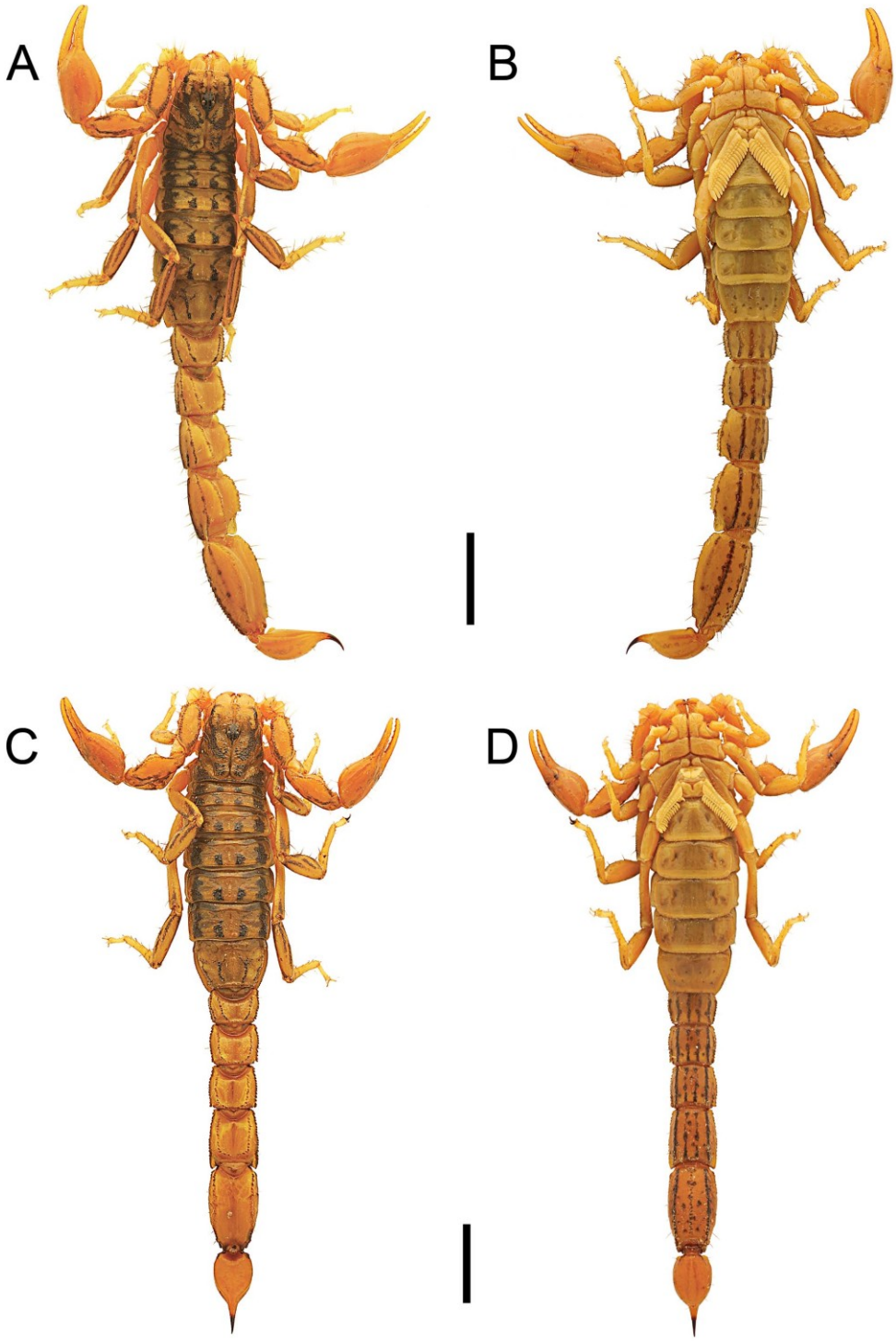


Figure 272. *Mesomexovis tlayoli*, **n. sp.**, habitus. **A**, **B**. Paratype ♂ (AMNH). **C**, **D**. ♀ (AMNH). **A**, **C**. Dorsal aspect. **B**, **D**. Ventral aspect. Scale bars = 5 mm.

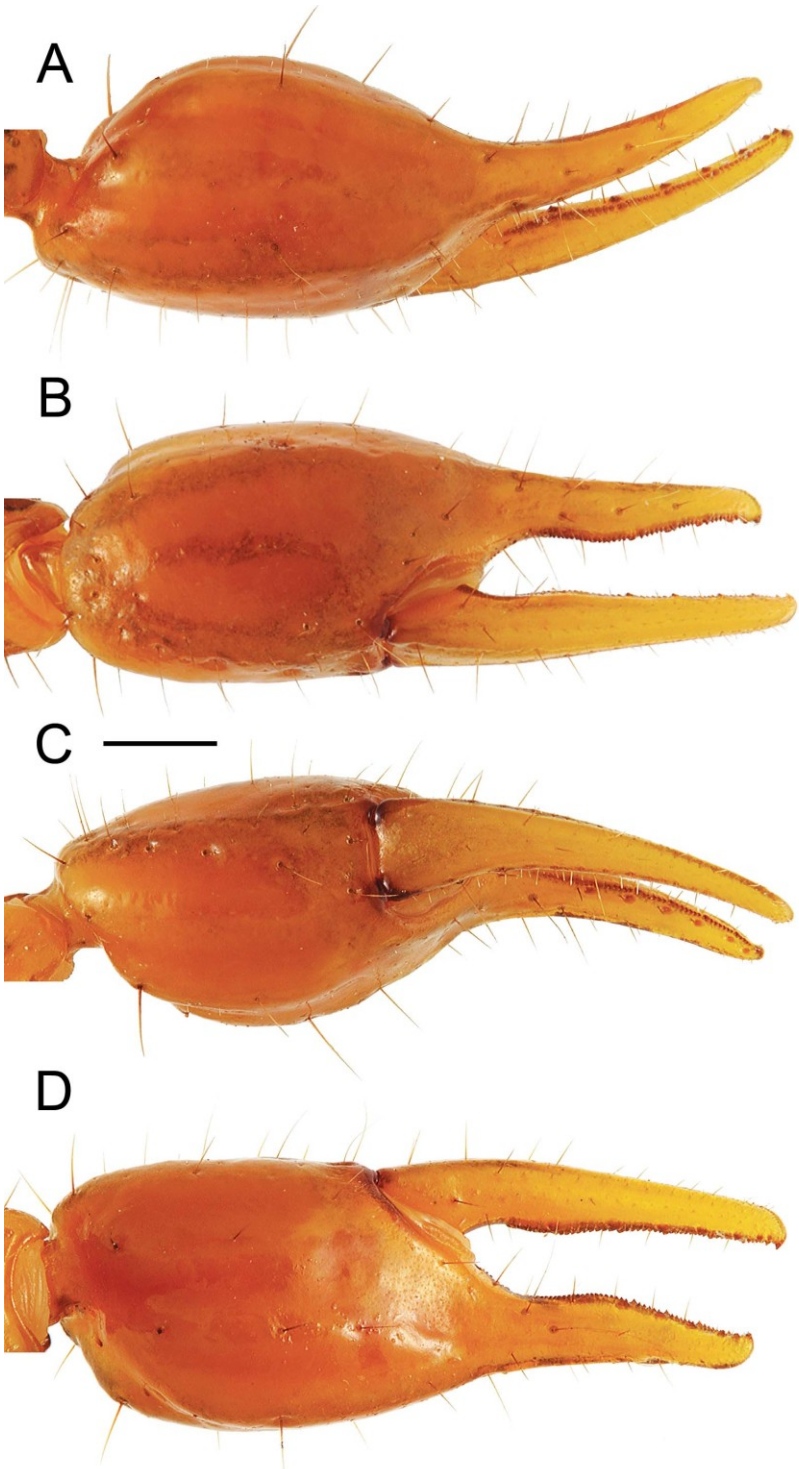


Figure 273. *Mesomexovis tlayoli*, **n. sp.**, paratype ♂ (AMNH), dextral pedipalp chela. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

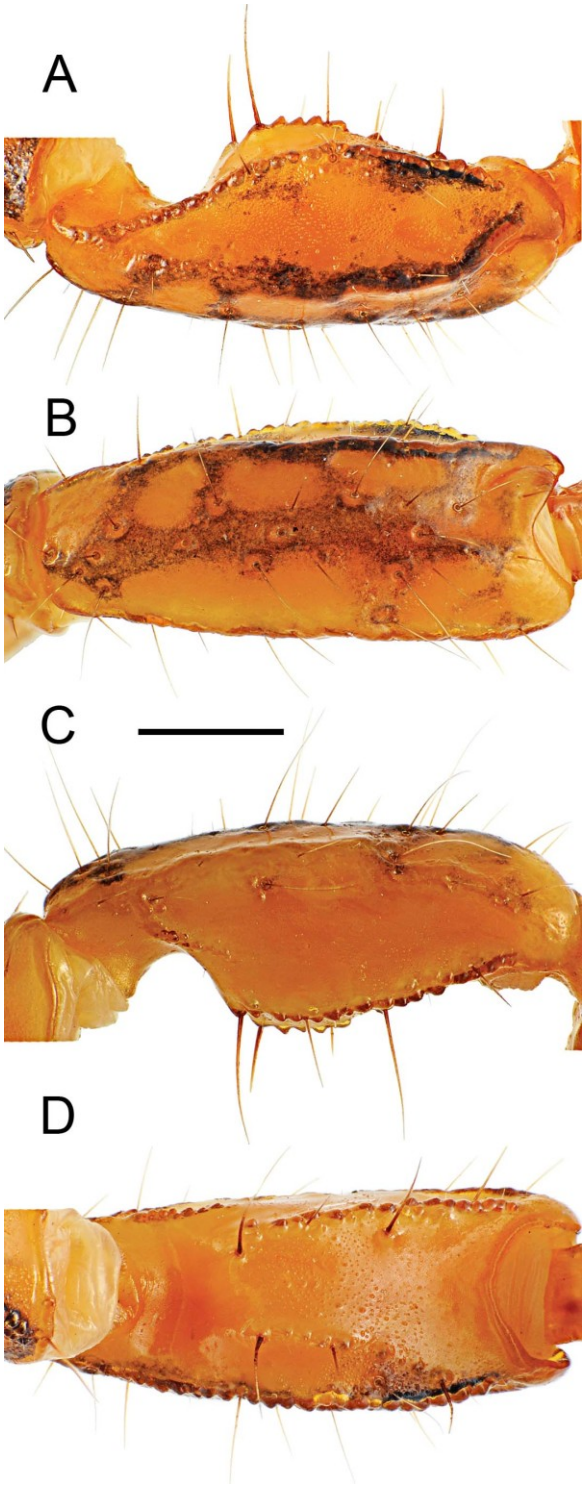


Figure 274. *Mesomexovis tlayoli*, **n. sp.**, paratype ♂ (AMNH), dextral pedipalp patella. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

VOLUME III

Mesomexovis variegatus (Pocock, 1898)

Figures 229, 275–277, 284D, 298D, 291D, 295D, 298D, 301D, 305C

Vaejovis variegatus Pocock, 1898: 394; Pocock, 1902: 11, 12, tab. III, figs. 2a–h; Baerg, 1934: 528; Beutelspacher, 2000: 112, 140, 142, 144, 154, map 94; Ponce-Saavedra and Beutelspacher, 2001: 46, 48, 86, 100, maps 30, 31; Quijano-Ravel et al., 2011: 133,134; Vrech et al., 2011: 465, 468, 483.

Vejovis spinigerus var. *variegata*: Kraepelin, 1899: 187.

Vejovis punctatus variegatus: Hoffmann, 1931: 347, 359–361; Díaz-Nájera, 1964: 20, 24, 26.

Vejovis variegatus: Bücherl, 1971: 329.

Vaejovis punctatus variegatus: Díaz-Nájera, 1975: 7, 24, 26 (in part); Kovařík, 1998: 147; Sissom, 2000: 535.

Hoffmannius punctatus variegatus: Soleglad and Fet, 2008: 91.

TYPE MATERIAL: **MEXICO: Guerrero:** Syntypes: ♂, ♀ (BMNH), Amula, [not examined].

DIAGNOSIS: *Mesomexovis variegatus* is closely related to *M. izazagai*, **n. sp.**, *M. ponce*, and *M. mintoni*, with which it forms a monophyletic group. *M. variegatus* may be distinguished by having ventral lateral carinae of metasomal segments I–IV costate smooth with few weak scattered low crenulations, instead of being moderately crenulated to strongly crenatoserrate. Among these species, *M. variegatus* has the median ocular tubercle broad, distinctly higher than the other species and lacking superciliary carinae, instead of having superciliary smooth. Additionally, *M. variegatus* differs from these species by having ventral surface of pedipalp

femur shagreened, densely covered with moderate and minute granulation, instead of having smooth or weakly granulated. From *M. izazagai*, **n. sp.** and *M. ponce*, *M. variegatus* differs by having six rows of median denticles and six retrolateral denticles on pedipalp movable finger, instead of seven. From *M. ponce* and *M. mintoni* differs by having six rows of median denticles and six retrolateral denticles on pedipalp fixed finger, instead of five. *M. izazagai*, **n. sp.** differs by having base color dark brownish, instead of having pale yellow. From *M. ponce*, differs by having dorsal surface of pedipalp femur moderately shagreened, instead of having densely granulated especially medially. From *M. mintoni* differs by having ventral surface of chelicerae immaculate, instead of having it densely infuscate.

DESCRIPTION: The following redescription complements Hoffmann's (1931) redescription, it is based on the material deposited in the collections indicated in material examined.

Color and infuscation (In alcohol): Base color pale dark orange to brownish, carapace, tergites, prolateral surface of leg femur, patella, tibia and tarsi; dorsal, prolateral and retrolateral surface of pedipalp femur and patella infuscate with dusky markings. Carinae of pedipalp chelae diffusely outlined with infuscation. Distal dorsal margin of chelicerae manus and dorsal surface of movable finger infuscate. Pectines with a subtle olivaceous tone on whitish base color. Genital operculum whitish to light yellowish. Sternite III–VI with proximal margin and sometimes, lateral margin moderately infuscate, occasionally in VI infuscation extends to distal half. Sternite VII with ventral submedian intensely infuscate on distal two thirds and ventral lateral with a complete broad band of infuscation, merging with ventral median band on distal half. Lateral inframedian, dorsal medina, dorsal submedian carinae in I–VI outlined with broad bands of infuscation, intercarinal surfaces between ventral lateral carinae in I almost completely infuscate,

except a narrow median band of immaculate surface; from II–VI the infuscation resides forming narrower bands of pigmentation restricted to the carinae. Ventral surface of telson infuscate with four longitudinal lateral bands of infuscation, two broad bands on lateral surface and two submedian narrow diffuse bands. Base of aculeus slightly infuscate, aculeus dark brownish to blackish.

Carapace: Carapace sublinear, with a vestigial to obsolete median notch. Entire surface shagreened, minute and confluent broad large granules combine over most of the surface. Anterior edge with three pairs of major macrosetae and a median short major macrosetae. Anteromedian, posterolateral, and posteromedian sulci moderate, posterior transverse obsolete. Median ocular tubercle moderately raised and broad, with superciliary carinae weak and smooth, slightly higher than median eyes. Median ocular tubercle positioned on distal half of carapace. Median eyes approximately double size of lateral frontal pair. Three lateral eyes, two distal pairs same size and posterior reduced approximately in half.

Sternum and coxal region: Sternum pentagonal subequilateral with three pairs of setae, one distal, one median pairs and one pair on the lobes, median notch deep. Anterior margin of coxa II with three oblique slit-like structures, adjacent to a strong and smooth protuberance. Proximal median margin of coxal endite II with a deep depression each. Coxa IV 2.00 times longer than coxa II.

Chelicerae: Dorsal surface smooth, dentition of fixed and movable fingers as in typical Syntropinae. Subdistal margin of manus with two or three median macrosetae, distal margin with costate carinae. Serrula with 14 tines.

Pedipalps: Trichobothrial pattern Type C, orthobothriotaxic. Pedipalp chela relatively moderate, wider than patella, patella wider than femur. Femur: Intercarinal surfaces matte.

Dorsal prolateral and ventral prolateral carinae strong and irregularly granulated; dorsal retrolateral moderately granular, moniliform; retrolateral dorsosubmedian obsolete, smooth with four major macrosetae on a moderate tubercle, macrosetae decreasing in size distally; prolateral ventrosubmedian vestigial with an enlarged proximal tubercle positioned at mid surface and two or three moderate rounded granules, and few intersperse moderate granules, median and distal enlarge granules with a macroseta at base; prolateral ventral vestigial, expressed by a proximal tubercle with an adjacent macrosetae and two enlarged rounded granules with a macroseta at base; ventral median vestigial expressed a proximal short row of granules; retrolateral ventral obsolete expressed by a subdistal granule; ventral retrosubmedian vestigial, expressed by irregular low granules, present on proximal third.

Patella: Intercarinal surface matte, retrolateral smooth. Dorsal prolateral irregularly and strongly crenulate to granulate; ventral prolateral complete, strongly granular and moniliform; dorsal retrolateral weakly crenulate to smooth but strongly costate; ventral retrosubmedian complete smooth moderately costate; ventral median vestigial expressed as a short proximal row of minute granules; retrolateral dorsosubmedian and retrolateral median carinae obsolete, expressed by bands of infuscation; prolateral median complete on a moderate vaulted projection, protruding strongly medially, extending from a low proximal tubercle with a major macroseta on top and a row of coarse crenatoserrate granules, the row slanting gently towards dorsal prolateral carinae becoming weaker and disappearing, followed by a gap of smooth surface and ending on at one distal major macrosetae, positioned on the distal fifth of dorsal prolateral carinae; prolateral ventral obsolete expressed by a row of two major macrosetae, adjacent to ventral prolateral carinae. Proximal major macrosetae on the top of a low granule.

Chelae: Pedipalp manus moderate. Intercarinal surface smooth. Dorsal median, dorsal prolateral, dorsal retrolateral, ventral prolateral, prolateral median, ventral retrolateral and ventral median vestigial, weakly costate. Trichobothrium *Db* positioned on dorsal retrolateral carina, subbasal on chelae; *Dt* positioned at mid manus.

Fingers: Fixed finger dentition: PD = 6 and RD = 5, MD rows = 5, proximal RD positioned by proximal half. Movable finger PD = 7, RD = 6, MD rows = 6, distal row with one denticle. Proximal RD positioned by proximal half. All retrolateral denticles paired with corresponding prolateral denticles in both fingers. Trichobothria *ib* and *it* positioned subbasal on fixed finger, *ib* positioned between PD6 and PD7, PD7 lacking granule, *it* at the level of PD6. Fingers with vestigial scalloping, in ♂ proximal notch of fixed finger vestigial and median lobe obsolete, proximal notch of movable finger obsolete and medina lobe weak, gap created when fingers closed weak fingers fit unevenly, in ♀ fingers with obsolete scalloping, gap created when fingers closed absent.

Legs: Basitarsi I–II prolateral ventral, retrolateral ventral and retrolateral dorsal carinae with complete rows of spinules, prolateral ventral in III partial expressed on distal half by scattered spinules, in IV absent; retrolateral ventral in III complete expressed by scattered spinules, in IV absent, retrolateral dorsal in III and IV, complete, expressed by scattered spinules; retrolateral median rows in I–IV vestigial, expressed by few marginal spinules. Telotarsi I–IV with two or three pairs of ventrodistal spinules in I–IV. Setae: Prolateral ventral, 3:4:5:5, median two in III and median three in IV stout; retrolateral ventral, 5:6:7:7; retrolateral dorsal, 2:3:3:3; dorsal, 3:3:3:3; retrolateral dorsal and dorsal series arranged in two independent rows. Dorsal median in I–IV occasionally expressed by a minor macrosetae.

Tergites: Pretergites smooth, postergites weakly shagreened, from submedian to lateral surface, proximal median surface matte. Tergites I–VI dorsal median and ventral submedian carinae moderate, expressed by few moderate or minute distal granules and a weak costa. Tergite VII with intercarinal surfaces strongly shagreened with moderate to enlarge granules intersperse with minute granules; dorsal median carina strongly costate, expressed on proximal half of the postergite; dorsal submedian vestigial expressed as a low short proximal cluster of enlarge rounded granules; dorsal lateral and lateral supramedian strong; dorsal lateral carinae projecting and curving laterally approximating to lateral supramedian distal margin, creating a semi ring of strong serrated granulation.

Genital operculum: Male genital operculum: wider than long, with three pairs of macrosetae. Sclerites free on longitudinal edge moving independently but unable to open more than 45°. Genital papillae protruding posteriorly. Female genital operculum: Wider than long, with three macrosetae. Sclerites fuse longitudinal.

Sternites: Sternites I–VII finely punctuated, and lustrous. Sternite V with distal median glandular spot vestigial, whitish, not protruding from adjacent surface strongly contrasting with darker base color. Sternite VII ventral lateral carinae vestigial, weakly costate and smooth; ventral submedian obsolete expressed by three pairs of macrosetae. Distomedian glandular spot absent. Spiracle elongated, slit-like, approximately two times longer than wide.

Pectines: Pectines longer than distal edge of coxa IV in ♂, in ♀ at the level of distal edge of coxa IV. Basal piece with median notch deep. Marginal lamella consist of three sclerites, medial lamella proximally fuse distally progressively forming conspicuous 12 beads. Fulcra with 17–19 in ♂, in ♀ 13–16 beads. Pectinal tooth count 18–20 in ♂, 14–17 in ♀.

Hemispermatophore: Lamina 1.63 longer than trunk. Dorsal through margin long, narrow, curving proximally, and removed from ventral trough. Hemimating plug developed from the inner lobe, distal barb margin with 12 elongated spinules. Primary and secondary hook positioned on the apex of lateral margin extension of the lamina (flange). Hooks completely fuse forming a digitiform hook, lacking notch. Median lobe ental terminus moderate and rounded, slightly protruding. Basal plate of inner lobe removed from ventral trough. Spine of inner lobe moderate, secondary spine on ventromedian aspect of neck absent. Neck relatively short (0.33 times longer than basal plate). Measurements, lamina, 3.42; trunk, 2.10; dorsal trough/laminar hooks, 1.80; ventral trough/laminar hook, 1.20; neck, 0.24; basal plate, 0.72.

Metasoma: Dorsal and lateral intercarinal surface in I–III shagreened strongly shagreened, with intersperse moderate and minute granules, IV and V matte, ventral surface of metasomal segment I–IV smooth. Ventral surface of metasomal segment V weakly to moderately shagreened with dense coarse granules on distal two third. Metasoma 1.4 times longer than mesosoma. Metasomal segments I–III wider than long. Carinae: Dorsal lateral and lateral median carinae in I–IV strongly crenatoserrated terminating in moderate enlarge spinoid granules pointing backwards; except lateral median in IV distal terminus strongly expanded or flared laterally forming a triangular projection; dorsal lateral in V proximally serrate, becoming weaker and crenulated with irregular clusters of crenulations medially, becoming moniliform distally, ending in a broad protuberance. Lateral inframedian in I complete strongly and irregularly crenatoserrate; in II and III incomplete strongly crenatoserrated, becoming weaker proximally, present in distal third; in VI absent, in V vestigial, expressed by a proximal tubercle, followed by a weak costa becoming weaker distally present on proximal third; ventral lateral in I–IV costate; ventral lateral in V moderately crenatoserrate; ventral submedian in I–IV obsolete

except in IV with distal third weakly crenulate; ventral median in V moderately crenatoserrate. Setae: Dorsal lateral carinae, 0:1:1:2:6; lateral median; 0:1:1:4; lateral inframedian, 2:1:1:1:5; ventral lateral, 3:3:3:3:7, median macrosetae in I dislocate of the row positioned in intercarinal surface between dorsal lateral and dorsal submedian; setae in V positioned laterally to the carinae; ventral submedian, 3:3:3:5:3; ventral sublateral, 2. Macrosetae in III in both sides of the carinae. One to two accessory minor or major macrosetae in intercarinal surfaces between ventral submedian carinae in segments I–IV.

Telson: Dorsal and ventral surface smooth. Ventral surface with three or four macrosetae in each carina. Ventral median carinae with weak subaculear tubercle, expressed as a moderate broad tubercle. Microserration on laterobasal aculeus absent to vestigial, with two low and minute serrations.

DISTRIBUTION: *Mesomexovis variegatus* is distributed in the extreme eastern of the drainage of the Balsas Depression comprising the states of Guerrero, México, and Morelos, Mexico.

ECOLOGY: *Mesomexovis variegatus* is commonly found under rocks in tropical deciduous forest, although it reaches transitional zones with oak-pine forest. The altitude recorded for the collection sites varied from 506 to 1972 m.

REMARKS: *Vejovis variegatus* = [*Mesomexovis variegatus*] was synonymized with *Vaejovis punctatus*=[*Mesomexovis punctatus*] by Hoffmann and reassigned to *Vaejovis punctatus variegatus*. Subsequently, Beutelspacher (2000) reverted this action without justification. Soleglad and Fet (2008) failed to recognize that final emendation and transferred create *Hoffmannius punctatus variegatus*. The results of the analyses conducted here demonstrate that

Mesomexovis variegatus is a valid species as there are enough characters to satisfactorily diagnose it.

MATERIAL EXAMINED: **MEXICO: Estado de México:** *Municipio de Ixtapan de la Sal*: La Laguna, 18°47.8836'N 99°33.1668'W, 1572 m, 27.x.2006, E. González and Santamaria, 2 ♂, 3 ♀ (IBUNAM); La Laguna, 2 km W, 18°47.8836'N 99°33.1668'W, 1572 m, 2.iii.2006, E. González and S. Reynaud, 2 ♀ (IBUNAM). *Municipio de Malinalco*: Chichicasco, 2 km NW, 18°51.3642'N 99°28.1166'W, 1374 m, 6.xi.2006, S. Reynaud, O. Salvatore, and E. González, 2 ♂, 8 ♀, 1 juv. (IBUNAM); Chichicasco, 2 km NW, cave entrance, [18°50'48.44"N 99°27'54.33"W], 7.x.2006, S. Reynaud, O. Salvatore and E. González, 1 ♂, 1 ♀, 1 juv. (IBUNAM); La Cañada, Chalma, [18°55'54.25"N 99°26'30.59"W], 2.ix.1988, W. López-Forment, 2 ♀, 2 juv. (IBUNAM); La Planta, 5 km N, 18°52.0488'N 99°27'W, 1545 m, 3.v.2006, E. González, under rocks, 1 ♀ (IBUNAM); Malinalco, 4 km NW, [18°57'N 99°'W], 1250 m, 9.viii.1947, 1 ♀ (IBUNAM), D. Pelaez, 3.viii.2005, 6 ♂, 21 ♀, 5 juv. (IBUNAM); Malinalco, ca. 19 km S, on gravel road off State Route 4, 18°52.197'N 99°26.990'W, 1530 m, 25.vii.2005, E. González and R. Mercurio, collected at night with UV light, 1 ♂, 1 ♀ (AMNH [LP 5185]). *Municipio de Sultepec*: junction to Sultepequito, 4 km S, [18°48'N 100'W], 3.ii.2007, S. Reynaud and E. González, under rocks, 2 ♂, 2 ♀ (IBUNAM); Tehuilotepec, 2 km N, [18°38'54.57"N 99°55'13.90"W], S. Reynaud and E. González, 3.ii.2006, 1 ♀ (IBUNAM), E. González, 18.ii.2006, pine-oak forest, 2 ♀ (IBUNAM), E. González and O. Francke, 9.vi.2006, 3 ♀ (IBUNAM). *Municipio de Tejupilco*: Bejucos, [18°46'42.14"N 100°25'9.74"W], 26.vii.1985, 1 ♀ (IBUNAM); Parque de Nanchititla, 12 km E entrance, [19°24.81833'N 100°8.390333'W], 17.ii.2005, pine-oak forest, 3 ♂, 4 ♀, 6 juv. (IBUNAM); Parque Sierra de Nanchititla, 21 km E, 17.xii.2005, E. González and O. Francke, 1 juv. (IBUNAM). *Municipio de Temascaltepec*:

Temascaltepec, 4 km E, [19°2'N 100°3'W], 5.viii.2005, 3 juv. (IBUNAM). *Municipio de Toluca*: Toluca, [19°17.3'N 99°40.0333'W], 2.i.1977, 1 ♀ (IBUNAM). *Municipio de Tonatico*: Tonatico, 7 km SE, 18°49.0080'N 99°38.8002'W, 1840 m, 26.x.2002, I. Santamaría and E. González, under rocks, 6 ♀ (IBUNAM). **Guerrero:** Mirador del Río Balsas, [17°59'N 99°47'W], 26.viii.2006, Gadaand, 1 ♀ (IBUNAM). *Municipio de Atenango del Río*: Atenango del Río, [18°9'30.95"N 99°4'9.74"W], E. González, 21–24.vii.2000, tropical dry forest, 3 ♀, 3 juv. (IBUNAM), 20.viii.2004, 3 ♂, 9 ♀ (IBUNAM), 17.viii.2006, 3 ♂, 9 ♀, 5 juv. (IBUNAM); Cerro de la Víbora, [18°9'30.95"N 99°4'9.74"W], 7.vi.2004, E. González, E. Charco, O. Delgado, C. Durán, F. Álvarez, and J.L. Castelo, 1 ♂, 2 ♀, 5 juv. (IBUNAM); Cerro de la Víbora, Santa Cruz, 18°13.9998'N 99°4.0002'W, 1011 m, 6.vii.2004, 1 ♂, 3 ♀, 7 juv. (IBUNAM). *Municipio de Buenavista de Cuellar*: El Comal, 18°27.086'N 99°17.139'W, 1749 m, 13.vi.2007, O. Francke et al., 16 ex. (AMNH [ARA1911]), 30 ex. (AMNH [ARA2623]), 16 ex. (AMNH). *Municipio de Chilpancingo*: Amojileca, 17°34.090'N 99°34.145'W, 1484 m, 20.vi.2007, O. Francke et al., 1 juv. (AMNH [LP 7068]); Chilpancingo, [17°33'N 99°'W], 2.x.1978, D. Pelaez, Botanical Garden ECQ-B, 2 ♀ (IBUNAM). *Municipio de Copalillo*: Totonimitla, Papalutla, 18°1.4700'N 98°53.8092'W, 650 m, 28.i.2011, U. Lonjino and J. Mendez, 3 ♂, 7 ♀ (IBUNAM). *Municipio de Iguala*: Iguala, [17°51'N 100°22'W], 18.iii.1965, 1 ♀ (IBUNAM); La Cumbre, 18°24.0306'N 99°29.1198'W, 1212 m, 29.viii.2003, O. Francke, E. Miranda, and C. Santibáñez, 2 ♂, 1 ♀ (IBUNAM). *Municipio de Taxco de Alarcón*: Las Granadas, [18°33.38333'N 99°36.3'W], 17.vii.1966, 1 ♀ (IBUNAM), 29.vi.1968, 1 ♂, 3 ♀, 1 juv. (IBUNAM), 3.ii.2000, 1 subad. ♂ (IBUNAM), C. Beultespacher, 27.vi.1970, 6 ♂, 6 ♀, 13 juv. (IBUNAM), J.S. Flores, 2.x.1973, 4 ♀, 11 juv. (IBUNAM), A. Aguilar, 28.i.1993, 1 ♂ (IBUNAM); on the way to Las Granadas, 27.vi.1970, 4 ♂, 2 ♀ (IBUNAM), 12.x.1974, 1 ♂, 10 ♀, 93 juv. (IBUNAM), C. Gerardo,

5.iv.2000, 1 subad. ♂ (IBUNAM), 3.viii.2000, 1 ♂, 1 ♀ (IBUNAM), 6.x.2000, 1 ♀ (IBUNAM); Ojo de agua de Mexicapán, W of Teloloapan, [18°21'5.35"N 99°52'1.61"W], 14.x.1977, W. López-Forment, 1 ♀ (IBUNAM). *Municipio de Taxco*: Taxco, [18°33.38333'N 99°36.3'W], xii.1975, R.E. Beer, 14 ex. (AMNH). *Municipio de Tepecoacuilco de Trujano*: Oapan, 17°58'58"N 99°27'07"W, 548 m, 25.viii.2005, 1 subad. ♂ (AMNH), 17°57'53"N 99°27'10"W, 506 m, 25.vii.2007, 1 ♀ (AMNH), 18°02'00"N 99°26'57"W, 906 m, 11.xii.2007, 1 ♀ (AMNH), 654 m, 29.vi.2008, 3 ♀ (AMNH), 18°01'57"N 99°27'05"W, 931 m, 10.viii.2009, 1 ♂, 1 subad. ♂ (AMNH), 18°01'36.2"N 99°27'23.6"W, 877 m, 24.vi.2010, 2 ♂, 4 ♀, 1 subad. ♀ (AMNH), J. Amith and P. Pantaleon. **Morelos:** Entrance of Cueva del Diablo, 6.vii.1985, J.M. Elizondo, 1 ♀ (IBUNAM); Jicotepec, 20.ix.2008, A. Bitar, 1 ♀ (IBUNAM). *Municipio de Amacuzac*: San Gabriel de Las Palmas, 18°36.6'N 99°21'W, 1420 m, 9.v.2008, M. Córdova, 3 ♀, 4 juv. (IBUNAM). *Municipio de Axochiapan*: Quebrantadero, 18°31.8'N 98°47.4'W, 1280 m, 3.iv.2009, M. Córdova and D. Morán, 1 ♂, 4 ♀, 1 juv. (IBUNAM). *Municipio de Ayala*: Moyotepec, [18°43'N 98°59'W], 8.vii.1994, 1 ♀ (IBUNAM); Villa de Ayala, [18°42'38.47"N 98°59'24.34"W], 6.ix.1980, R. Sanchez, 2 ♂, 1 ♀ (IBUNAM). *Municipio de Coatlán del Río*: El Oyanco, 18°43.8'N 99°25.8'W, 1022 m, 8.vii.2008, M. Córdova and O. Sotelo, 3 ♂, 6 ♀, 3 juv. (IBUNAM). *Municipio de Cuautla*: Cuautla, [18°48'N 98°57'W], 24.iv.1976, M. García, 1 ♀ (IBUNAM). *Municipio de Cuernavaca*: Barranca del Sur, 14.vii.1945, C.C. Hoffmann, 1 juv. (IBUNAM); Cuernavaca, [18°55'N 99°15'W], E. Galguera, 4 ♂ (IBUNAM), W. López-Forment, 2.iv.1989, 1 ♂ (IBUNAM); Xiultepec, Hwy to Cuernavaca, [18°55'N 99°15'W], 2.v.1979, 1 ♀ (IBUNAM). *Municipio de Jiutepec*: La Quebradora, 18°50.4'N 99°8.4'W, 1540 m, 12.viii.2008, M. Córdova, 3 ♂, 3 ♀ (IBUNAM), 5 ♀, 1 juv. (IBUNAM). *Municipio de Jonacatepec*: Chalcatzingo, 18°40.8'N 98°46.2'W, 1371 m, 6.vi.2008, M. Córdova and D. Morán, 2 ♀, 2 juv.

(IBUNAM). *Municipio de Miacatlán*: Miacatlán, 18°51'N 99°25.2'W, 1587 m, 16.vii.1995, W. López-Forment, 2 ♂ (IBUNAM); Palpan, 18°51'N 99°25.2'W, 1587 m, M. Córdova and O. Vázquez, 7.viii.2004, 1 ♂ (IBUNAM), 8.viii.2008, 4 ♂, 10 ♀ (IBUNAM), 859 m, O. Francke, A. Valdez, C. Santibáñez, J. Ponce, and A. Quijano, 4.iii.2012, tropical dry forest, 4 ♂, 10 ♀ (IBUNAM), W. López-Forment, 4.vi.1992, 3 ♂, 5 ♀, 4 juv. (IBUNAM); Xochicalco, 18°49.2'N 99°17.4'W, 1972 m, 9.ii.2007, M. Córdova and O. Sotelo, 5 ♂, 7 ♀ (IBUNAM). *Municipio de Temixco*: Aeropuerto, [18°51'N 99°14'W], 20.vii.2006, P. Berea, 1 ♀ (IBUNAM); Los Sabinos, 18°51'N 99°17.4'W, 1540 m, 11.ix.2007, M. Córdova and O. Sotelo, 6 ♀, 25 juv. (IBUNAM); Pueblo Viejo, 18°52.2'N 99°15'W, 1378 m, 12.vi.2008, M. Córdova, 1 ♂, 5 ♀, 13 juv. (IBUNAM). *Municipio de Tepalcingo*: Cerro del Venado, 18°36.6'N 98°51.72'W, 1380 m, 9.ii.2007, M. Córdova and D. Morán, 2 ♂, 9 ♀, 4 juv. (IBUNAM). *Municipio de Tepoztlán*: San Andres, 18°57.6'N 99°7.2'W, 1509 m, 10.viii.2007, M. Córdova, 2 ♂, 6 ♀, 1 juv. (IBUNAM); Tepoztlán, [18°58'54.70"N 99°6'25.67"W], A. Hoffmann and A. Sandoval, 9.ix.1974, 2 ♂, 9 ♀, 2 subad. ♂, 10 juv. (IBUNAM), A. Sandoval, 17.ix.1974, 5 ♀, 3 juv. (IBUNAM), G. Halffter, 2.v.1975, 1 ♀ (IBUNAM); road to Tepoztlán, Cerro La Herradura, [18°58'54.70"N 99°6'25.67"W], 19.iv.1975, J.L. Castelo, 1 ♂ (IBUNAM). *Municipio de Tlaltizapan*: Barranca Honda, 18°49.2'N 99°6.6'W, 1200 m, 21.vi.2008, M. Córdova, 3 ♂, 6 ♀ (IBUNAM). *Municipio de Tlaquiltenango*: Chimalacatlan, 18°27.6'N 99°6'W, 1066 m, 12.vii.2008, M. Córdova and O. Sotelo, 6 ♀, 6 juv. (IBUNAM); Estación del CEAMISH, 2 km NE, Quilamula, 18°30.657'N 99°0.798'W, 1086 m, 26.i.2006, M. Córdova and A. Jaimes, 1 ♂, 1 subad. ♂, 1 subad. ♀, 3 juv. (AMNH [LP 6536]); Quilamula, 18°50.4'N 99°0.6'W, 1100 m, 16.viii.2007, M. Córdova, 6 ♂, 11 ♀, 6 juv. (IBUNAM); Xicatlacotla, 18°33.6'N 99°13.8'W, 742 m, 27.vi.2008, M. Córdova, 7 ♀, 1 juv. (IBUNAM); Huautla, 18°23.4'N 99°4.8'W, 976 m, 13.vii.2008, M. Córdova and A.

Jaimes, 1 ♂, 8 ♀, 2 juv. (IBUNAM). *Municipio de Yautepec*: Cañón de Lobos, [18°52'5.95"N 99°1'56.45"W], G. Perez, 1.ix.1961, 1 ♀ (IBUNAM), T. Cibrian, 26.x, 3 ♀ (IBUNAM); Oaxtepec, 2 km E, [18°54'N 98°58'W], H. Baragan, 9.i.1987, 1 ♂, 1 ♀ (IBUNAM), L. Aguilar and P. Huerta, 28.vi.1975, 1 ♀ (IBUNAM); San Isidro, 18°49.2'N 99°6'W, 1378 m, 21.vi.2008, M. Córdova, 1 ♂, 4 ♀, 7 juv. (IBUNAM). *Municipio de Yecapixtla*: Achichipico, 18°56'37.32"N 98°49'43.15"W, 1448 m, 26.vii.2008, M. Córdova, 1 ♂ (IBUNAM); Xochitlán, [18°53.69883'N 98°51.099833'W], 8.vi.2008, A. Bitar, 1 ♂, 1 ♀, 1 juv. (IBUNAM). *Municipio de Zacualpan*: El Curiel, 18°47'10.78"N 98°45'52.55"W, 1668 m, 1.viii.2008, M. Córdova and O. Sotelo, 1 ♀ (IBUNAM).

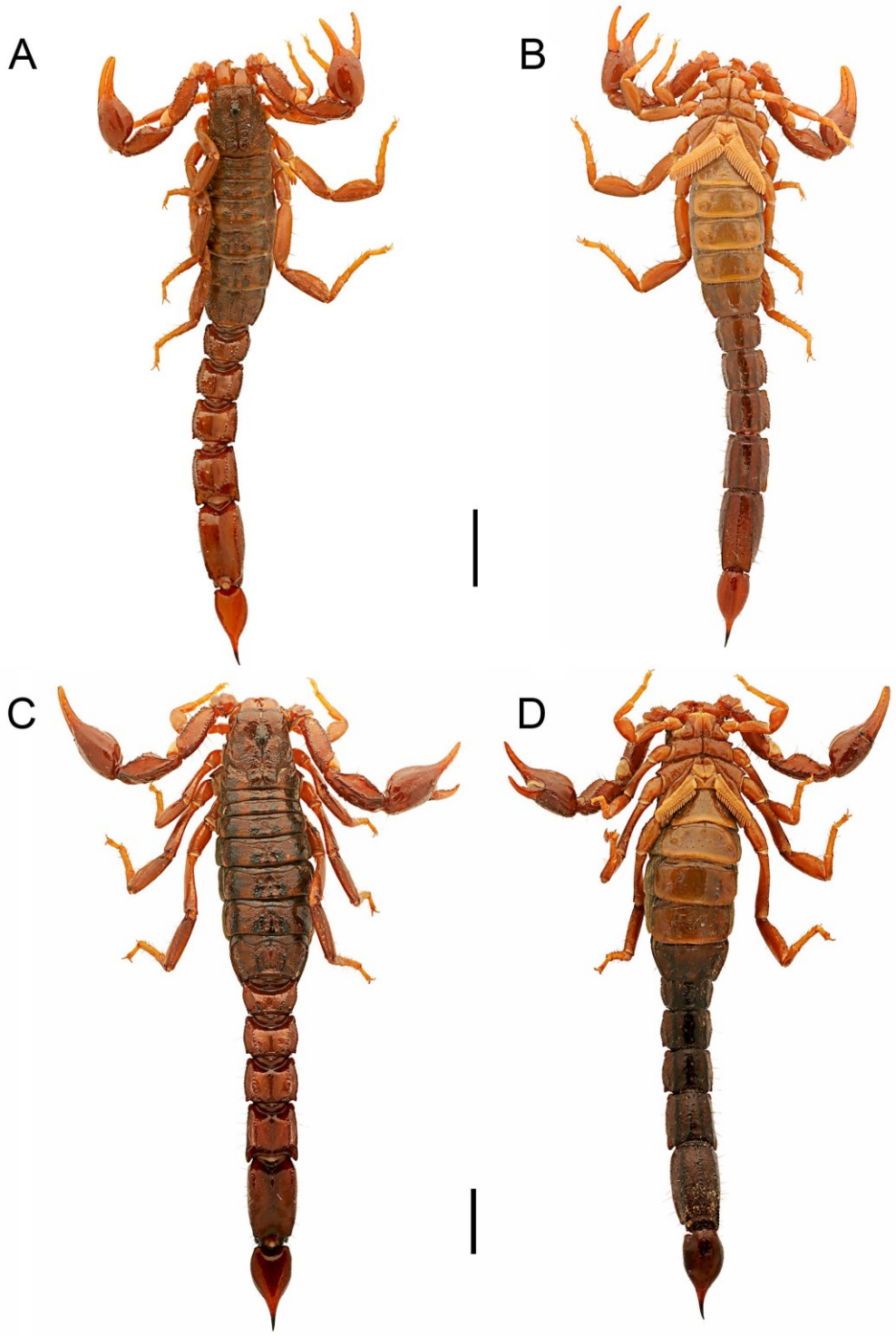


Figure 275. *Mesomexovis variegatus* (Pocock, 1898), habitus. **A**, **B**. ♂ (AMNH). **C**, **D**. ♀ (AMNH). **A**, **C**. Dorsal aspect. **B**, **D**. Ventral aspect. Scale bars = 5 mm.

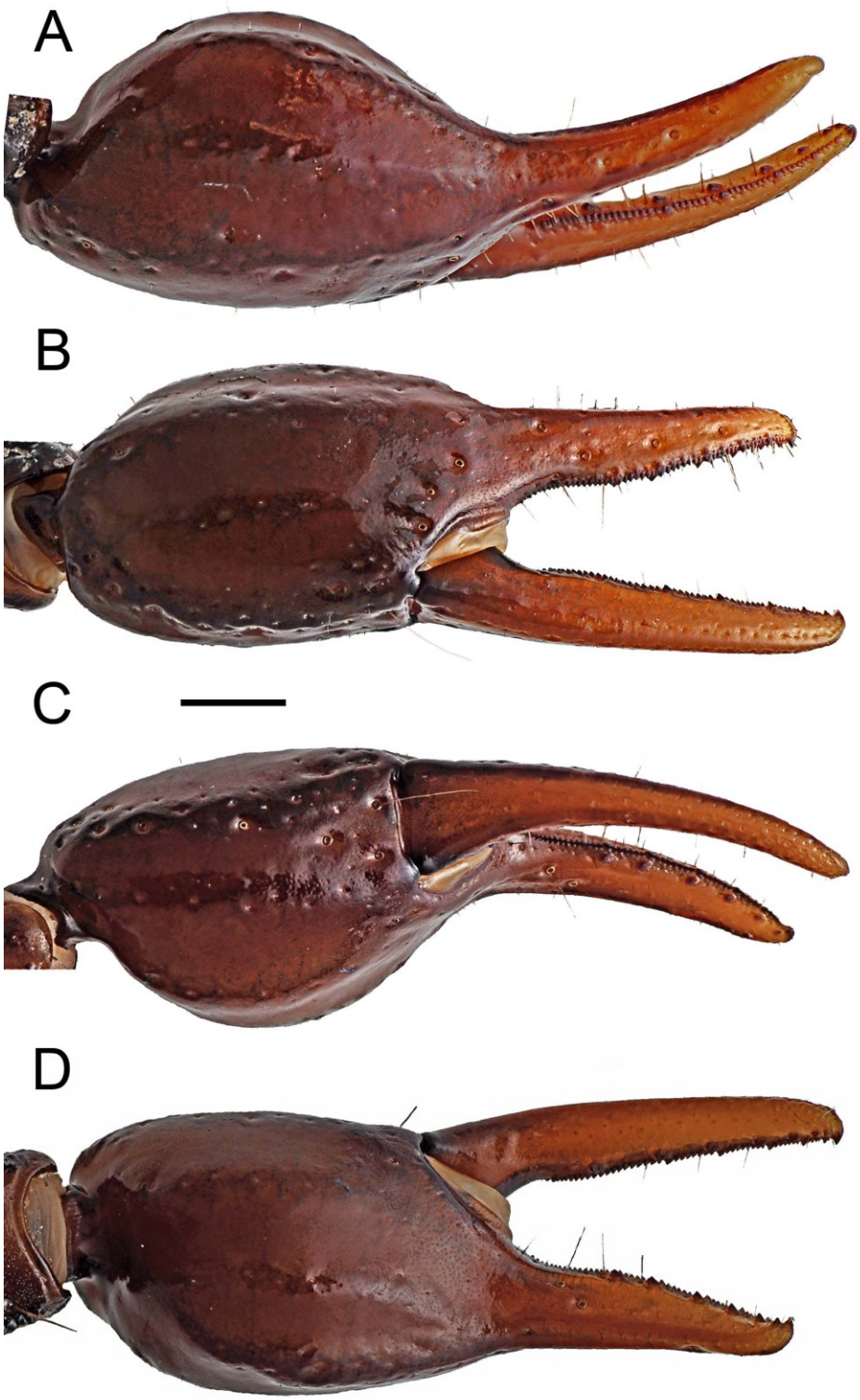


Figure 276. *Mesomexovis variegatus* (Pocock, 1898), ♂ (AMNH), dextral pedipalp chela. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

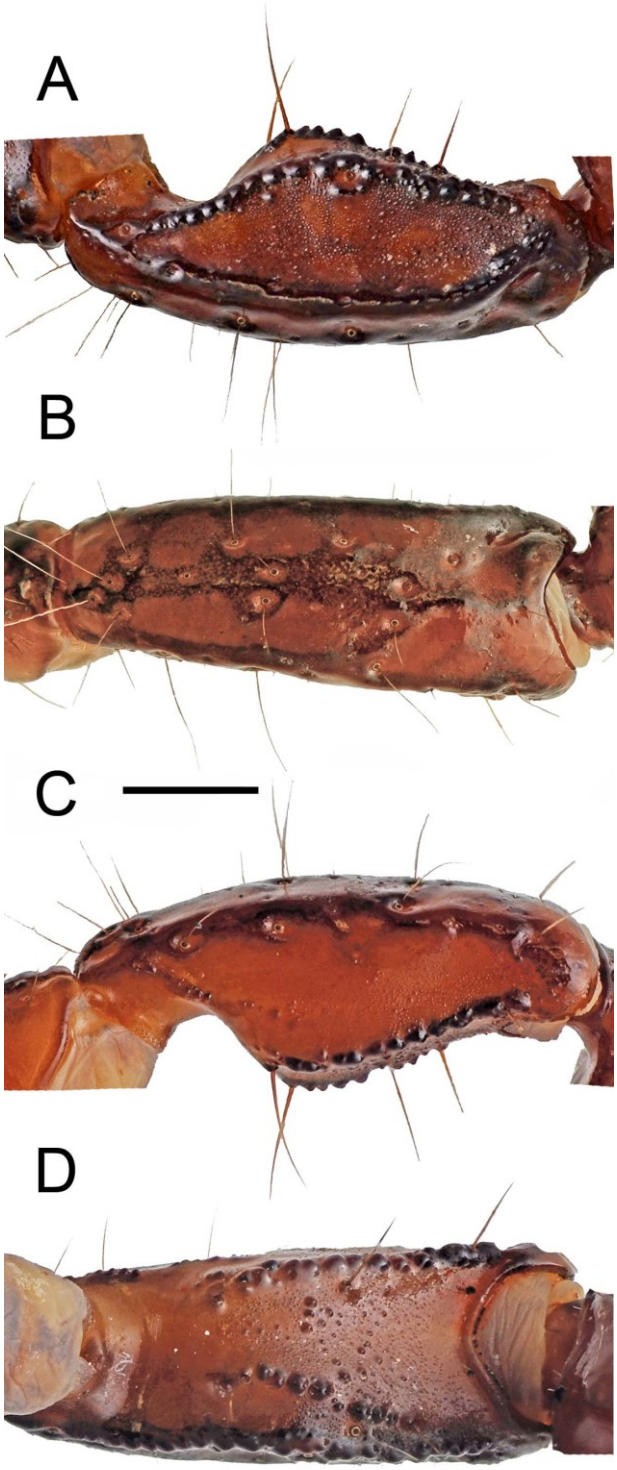


Figure 277. *Mesomexovis variegatus* (Pocock, 1898), ♂ (AMNH), dextral pedipalp patella. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

Mesomexovis zaragozai, **n. sp.**

Figures 225, 278–280, 285, 292D, 295E, 298E, 301E, 305D; Table 14

TYPE MATERIAL: **MEXICO: Puebla:** *Municipio de San Pedro Cuayuca*: Holotype ♂ (IBUNAM), Tlacotepec, 13 km NE, 18°25.8408'N 98°14.0148'W, 1117 m, 29–30.vi.2006, O. Francke, A. Valdez, H. Montaño, and G. Villegas, collected at night with UV light. Paratypes: same locality as holotype, 3 ♂ (AMNH [ARA1082]), 2 ♂ (CAS [ARA1083]), 1 ♂ (AMNH), 2 ♂, 1 subad. ♂, 1 juv. (IBUNAM).

ETYMOLOGY: The species name *zaragozai* honors General Ignacio Zaragoza Seguin, who led the Army of the East (Ejército de Oriente) against the invading army of Napoleon III in 1862. Zaragoza defeated the French army in the City of Puebla May 5th, 1862. Nowadays, a massive immigration of people from Puebla into the U.S.A., popularized that date celebrating *Cinco de Mayo* festivities.

DIAGNOSIS: *Mesomexovis zaragozai*, **n. sp.**, is closely related to *M. ofeliae*, **n. sp.** and *M. punctatus*, with which it forms a monophyletic group. *M. zaragozai*, **n. sp.** may be distinguished from *M. ofeliae*, **n. sp.** by having metasomal segment II as long or slightly longer than wide, segment IV more than two times longer than wide, instead of having metasomal segment II wider than long and segment IV less than two times longer than wide. They also differ by having ventral submedian carinae of metasomal segment II and III costate and weakly crenulated on the distal fourth in *M. zaragozai*, **n. sp.**, and obsolete to weakly costate on distal fourth in *M. ofeliae*, **n. sp.**, *M. zaragozai*, **n. sp.** has ventral surface of metasomal segment V finely granular, *M. ofeliae*, **n. sp.** has that surface shagreened, with a mix of dense moderate and minute granulation. From *M. punctatus* is distinguished by having ventral lateral and ventral submedian carinae of

metasomal segments III–IV costate to crenulated instead of obsolete, further more *M. zaragozai* has strong proximal notch and medial lobe of pedipalp fixed finger and proximal notch of movable finger, instead of having these structures moderate. Finally, *M. zaragozai*, **n. sp.** has fine granulation on ventral median carina of metasomal segment V and the distal end of that carina is not bifurcated, and *M. punctatus* has broad irregular granules and distal end is bifurcated.

DESCRIPTION: The following description is based on the types and the specimens listed in material examined.

Color and infuscation (In alcohol): Base color pale yellow straw to light orange. Carapace and tergites with infuscated with dusky markings. Dorsal and retrolateral surface of femur and patella, prolateral femur, and tibia and tarsi of legs diffusely infuscate. Medina and lateral eyes moderately infuscate. Ventral lateral and ventral submedian in II–IV and ventral median in V carinae underlined with a fine band of infuscation. Aculeus base brownish distally dark brown. Carinae of pedipalp manus diffusely infuscate. Telson with a lateral broad and median band of diffuse infuscation.

Carapace: Carapace anterior margin sublinear, with a vestigial to obsolete median notch. Entire surface shagreened, minute and moderately large granules combine over most of the surface. Anterior margin with three pairs of major macrosetae lacking median macrosetae. Anteromedian, posteromedian, and posterolateral sulci moderate, posterior transverse obsolete. Median ocular tubercle moderately raised and broad, with superciliary carinae strong and smooth, higher than median eyes. Median ocular tubercle positioned on distal half of carapace. Median eyes approximately double size of lateral first anterior pair. Three lateral eyes, two anterior pairs same size, third pair reduced slightly.

Sternum and coxal region: Sternum pentagonal subequilateral with three pairs of setae, one distal, two median pairs and one pair on the lobes, median notch deep, surface matte. Coxal area moderately matte. Anterior margin of coxa II with three oblique slit-like structures, adjacent to a moderate smooth protuberance. Proximal median margin of coxal endite II with a moderate depression each and median margin with fine granulation on proximal third. Coxa IV 2.05 times longer than coxa II.

Chelicerae: Dorsal surface smooth, dentition of fixed and movable fingers as in typical Syntropinae. Subdistal margin of manus with two median macrosetae, distal margin with costate carinae and base of fixed finger with weak crenulation. Serrula with 16–19 tines.

Pedipalps: Trichobothrial pattern Type C, orthobothriotaxic. Pedipalp segment ratio length/wide, femur 4.55, patella 2.60, chela 2.81. Pedipalp chela moderate to incrassate, wider than patella, patella wider than femur. Femur: Prolateral, retrolateral and ventral intercarinal surface matte, dorsal moderately granular medially. Dorsal prolateral, dorsal retrolateral, and ventral prolateral carinae strongly granular; retrolateral dorsosubmedian vestigial, smooth with five major macrosetae positioned on a low tubercle each, macrosetae decreasing in size distally; prolateral ventrosubmedian vestigial with a enlarged proximal tubercle positioned at mid surface followed by a row of three or four irregular scattered conical enlarged granules, subproximal, median and distal larger with a macroseta at base; prolateral ventral vestigial, expressed by a proximal tubercle and an adjacent macrosetae followed of four or five irregular enlarged conical granules, each granule with a macroseta at base, creating an irregular row that slants gently towards the distal fifth of ventral prolateral carinae; retrolateral ventral, ventral median and ventral retrosubmedian vestigial with short row of enlarge and serrate proximal granules.

Patella: All intercarinal surfaces matte, expect retrolateral surface smooth. Dorsal prolateral carinae granular to crenular, moderate; ventral prolateral and dorsal retrolateral moderately crenular; ventral retrosubmedian weakly crenular to smooth and strongly costate; ventral median vestigial expressed on proximal third by a cluster of moderate granules becoming weak distally; retrolateral dorsosubmedian and retrolateral median carinae obsolete; prolateral median partial on a moderate vaulted projection, protruding strongly medially, extending from a moderate proximal tubercle with a major macroseta on top and a row of three or four coarse subserrate enlarged granules slanting gently towards dorsal prolateral carinae median granule with a macroseta at base, followed by a gap of smooth surface and ending on at one distal major macrosetae positioned on the distal fifth of dorsal prolateral carinae; prolateral ventral obsolete expressed by a row of three major macrosetae, adjacent to ventral prolateral carinae. Proximal major macrosetae on the top of a low granule.

Chelae: Pedipalp manus moderate to incrassate (manus 1.4 times longer than fixed finger). Intercarinal surface smooth. Dorsal median, dorsal prolateral, dorsal retrolateral, ventral prolateral, prolateral median, ventral retrolateral and ventral median vestigial, moderately costate. Trichobothrium *Db* positioned on dorsal retrolateral carina, subbasal on chelae; *Dt* positioned at mid manus.

Fingers: Fixed finger dentition: PD = 6 and RD = 5, MD rows = 5, proximal RD positioned by proximal half. Prolateral denticles noticeably smaller than retrolateral denticles. Movable finger PD = 7, RD = 6, MD rows = 6, distal row of median denticles with one denticles. Proximal RD positioned by proximal half. All retrolateral denticles subpaired with corresponding prolateral denticles in both fingers. Trichobothria *ib* and *it* positioned subbasal on fixed finger, *ib* positioned between PD6 and PD7, PD7 lacking granule, *it* adjacent to PD6. Fingers with strong

scalloping, in ♂ proximal notch strong of fixed finger, and median lobe strong; and proximal notch and median lobe of movable finger moderate, gap created when fingers closed strong fingers fit unevenly, in ♀ proximal notch and median lobe of fixed and movable finger weak, fingers with weak scalloping, gap created when fingers closed weak.

Legs: Basitarsi I–II prolateral ventral, retrolateral ventral and retrolateral dorsal carinae with complete rows of spinules, prolateral ventral in III and IV absent; retrolateral ventral in III partial expressed by scattered spinules on distal two thirds, in IV absent; retrolateral dorsal in III complete expressed by scattered spinules, in IV partial expressed as a scattered row of spinules on distal third; retrolateral median rows in I–IV vestigial, expressed by few marginal spinules. Telotarsi I–IV with two or three pairs of ventrodistal spinules in I–IV. Setae: Prolateral ventral, 3:4:5:6, median three in III and IV stout; retrolateral ventral, 4:8:10:10, major and minor intersperse macrosetae; retrolateral dorsal, 2:3:3:5, major and minor intersperse macrosetae; dorsal, 3:4:4:3. Retrolateral dorsal and dorsal series arranged in two independent rows.

Tergites: Pretergites smooth, postergites shagreened. Tergites I–VI dorsal median and ventral submedian carinae weak expressed by few moderate distal granules and weak costa. Tergite VII with intercarinal surfaces moderately shagreened; dorsal median carina costate expressed on proximal half of the postergite with a cluster of moderate conical granules; dorsal submedian vestigial expressed as a oblique row of enlarge granules; dorsal lateral and lateral supramedian strong, distally becoming stronger ending in an moderate rounded granule; dorsal lateral carinae projecting and curving laterally approximating to lateral supramedian distal margin, creating a semi ring of strong subserrate granules.

Genital operculum: Male genital operculum: wider than long, with three pairs of major macrosetae. Sclerites free on longitudinal edge moving independently but unable to open more

than 45°. Genital papillae protruding posteriorly. Female genital operculum: Wider than long, with three macrosetae. Sclerites fuse longitudinal.

Sternites: Sternites I–VII matte in ♂, in ♀ finely punctuated, and lustrous. Sternite V with distal median glandular spot weak, not protruding from adjacent surface and weakly contrasting with pale base color. Sternite VII ventral lateral carinae smooth and weakly costate with two pairs of macrosetae; ventral submedian obsolete expressed by three pairs of macrosetae. Distomedian glandular spot obsolete, not protruding from adjacent surface, in both sexes. Spiracle elongated, slit-like, approximately three times longer than wide.

Pectines: Pectines longer than distal edge of coxa IV in ♂, in ♀ at the level of distal edge of coxa IV. Basal piece with median notch deep. Marginal lamella consist of three sclerites, medial lamella proximally fuse distally progressively forming conspicuous 12 beads. Fulcra with 19–20 in ♂, 18–19 in ♀ beads. Pectinal tooth count 20–21 in ♂, 19–20 in ♀.

Hemispermatophore: Lamina 2.2 longer than trunk. Dorsal through margin long, moderate, curving proximally, and removed from ventral trough. Hemimating plug developed from the inner lobe, distal barb margin with 15 strong and elongated spinules. Primary and secondary hook positioned on the apex of lateral margin extension of the lamina (flange). Both hooks rounded low, slightly separated, forming a shallow notch. Median lobe ental terminus moderate and rounded. Basal plate of inner lobe relatively close to ventral trough. Ventral trough with a quadrangular extension/folding of ental margin slightly distal of flexure of trunk. Spine of inner lobe relatively long and strongly sclerotized. Neck relatively short (0.46 times longer than basal plate).

Metasoma: Dorsal intercarinal surface in I–III with few scatter granules, ventral surface of metasomal segment I–IV smooth, ventral surface of metasomal segment V finely granular

with few coarse granules. Metasoma 1.85 times longer than mesosoma. Metasomal segments I wider than long, II as wide as long and III longer than wide. Carinae: Dorsal lateral and lateral median carinae in I–IV strongly crenatoserrated terminating in elongate spiniform granule pointing backwards; except lateral median in IV distal terminus moderate expanded or flared laterally forming a rounded triangular projection; dorsal lateral in V proximally third scattered and strongly serrated, becoming finely granular at mid segment and more weakly crenular distally, ending weakly crenular; lateral inframedian in I complete strongly crenatoserrate; in II and III incomplete strongly crenatoserrate, present in distal third, in VI absent, in V partial, expressed on proximal two thirds by row of finely crenatoserrate becoming weaker distally; ventral lateral in I–III weakly crenular, IV and V moderately to strongly crenatoserrate; ventral submedian in I–II obsolete, in III and IV proximal two thirds smooth, distal third weakly crenular; ventral median in V moderately crenatoserrate. Setae: Dorsal lateral carinae, 0:3:3:5:10, macrosetae on dorsal and lateral sides of carinae in V; lateral median, 1:2:3:4; lateral inframedian, 2:1:1:0:5; ventral lateral, 2:4:4:4:11; ventral submedian, 3:3:3:4:3; ventral sublateral, 2.

Telson: Telson vesicle 3.09 times longer than wide. Metasomal segment V 1.45 times wider than telson. Vesicle 1.52 times longer than aculeus. Dorsal and ventral surface smooth, all ventral carinae weakly crenular. Ventral surface with three or four macrosetae in each carina. Ventral median carinae with subaculear tubercle vestigial, expressed as a low and broad tubercle. Microserration on laterobasal aculeus numbering 3–5.

DISTRIBUTION: *Mesomexovis zaragozai*, **n. sp.** is distributed in the plateau of highlands south of the eastern extreme of the TMVB, comprising the states of Oaxaca, Puebla, Tlaxcala, and Veracruz, Mexico.

ECOLOGY: *Mesomexovis zaragozai*, **n. sp.** has been recorded in arid and mesic environments. The former is dominated by scrublands and cacti and the latter by oak-pine forest and agriculture terrains. Collections sites varied from 1075 to 2579 m altitude. This species is commonly found under rocks and easily collected using ultraviolet detection.

REMARKS: The records of *Vaejovis subcristatus*=[*M. subcristatus*] from Veracruz Sissom (2000) and some from Oaxaca and Puebla (Sissom 1989b) probably correspond to *Mesomexovis zaragozai*, **n. sp.**, these species share many characteristics and thus can be confounded.

MATERIAL EXAMINED: **MEXICO: Oaxaca:** Santa María de Sena, 17°02'53"N 96°36'34"W, 1580 m, C.R. Antonio-Santiago and J.A. Cruz-López, 1 ♂, 1 ♀ (IBUNAM). *Municipio de Huajuapan de León*: El Algodón, Cosoltepec, 18°7.9332'N 97°48.1164'W, 1627 m, B. Rivera, 2 ♀ (IBUNAM). *Municipio de San Pablo Huitzo*: Huitzo, 1.5 km N, 17°17'28.5"N 96°55'35.9"W, 1890 m, 31.x.2004, G. Villegas, O. Francke, and R. Paredes, collected at night with UV light, 1 ♂ (AMNH [LP 3715]). *Municipio de Santa María Atzompa*: Montealbán, [17°2.633'N 96°46.06666'W], iii.1968, O. Rourke, 3 ♀ (AMNH); Ruinas de Montealbán, [17°3'36.41"N 96°45'8.93"W], 31.i.1944, 1 ♂, 3 ♀ (IBUNAM). *Municipio de Santiago Huajolotitlán*: Huajolotitlán, [17°49.02'N 97°43.98'W], 14.vii.1996, E. Barrera and C. Maandorga, 2 ♀, 1 juv. (IBUNAM). *Municipio de Santiago Nacaltepec*: Area of El Moral, [17°28.67483'N 96°56.233'W], 2194 m, 10.vii.1966, C.M. Bogert et al., 1 ♀ (AMNH). *Municipio de Santo Tomás Tamazulapan*: Tamazulapan, [16°17'N 96°35'W], 19.vi.1969, 1 ♀ (IBUNAM). **Puebla:** *Municipio de Acatlán de Osorio*: Acatlán de Osorio, [18°12'4.22"N 98°3'42.41"W], 26.x.1976, 1 ♀ (IBUNAM), R. Soto, 26.xii.1976, 1 ♀ (IBUNAM), R. Soto, 2.x.1977, 2 juv. (IBUNAM), Z. Vera, 4.iv.1977, 1 ♀ (IBUNAM), J. Julia and C. Julia, 2.xi.1980, 1 ♀ (IBUNAM); San Pedro Yeloixtlahuaca, [18°7'N 98°5'W], 2.x.1980, L.D. Possani, 1 ♂, 2 ♀

(IBUNAM). *Municipio de Atlixco*: Trinidad Atlixco, 2 km S, [18°51'N 98°25'W], 29.i.1998, G. Ortega and E. Barrera, 1 ♀ (IBUNAM). *Municipio de Guadalupe Victoria*: junction to Guadalupe Victoria on Hwy MEX 140, 19°21.0708'N 97°27.0858'W, 2434 m, 6.v.2010, J. Ballesteros, 1 ♀ (IBUNAM); Road 140, junction to Guadalupe Victoria, 19°21.0708'N 97°27.0858'W, 2434 m, 5.v.2006, O. Francke and A. Ballesteros, 1 ♀, 1 juv. (AMNH [LP 6489]). *Municipio de Izucar de Matamoros*: San Martín Alchichica, 12.v.1976, under rocks, 1 ♂ (IBUNAM). *Municipio de Libres*: Route El Carmen-La Casita, 19°18'33.2"N 97°36'11.9"W, 2343 m, P. Berea, 1 ♂, 1 ♀ (AMNH [LP 6371]). *Municipio de Puebla*: Puebla, [19°2'28.67"N 98°12'22.32"W], H. Carmona, 1 ♀ (IBUNAM). *Municipio de San Pedro Cuayuca*: Tlacotepec, 13 km NE, 18°25.8408'N 98°14.0148'W, 1117 m, 29–30.vi.2006, O. Francke, A. Valdez, H. Montaño, and G. Villegas, collected at night with UV light, 1 ♀ (AMNH [LP 6500]). *Municipio de San Sebastian Zinacatepec*: Paraje 5 Mezquites, 8 km S of Zinacatepec, 18°18.1470'N 97°12.91'W, 1075 m, 8.xi.2005, O. Francke, M. Córdova, A. Jaimes, and G. Montiel, collected at night with UV light, 1 ♀ (IBUNAM [ARA0024]), 4 ex. (AMNH [ARA1022]), 1 ex. (CAS [ARA1871]), 4 ex. (IBUNAM [ARA0027]). *Municipio de Tehuacán*: Mesa del Riego, [18°27'5.25"N 97°25'28.62"W], 7.ix.1964, 2 ♂, 23 ♀ (IBUNAM), 27.v.1983, 1 ♂ (IBUNAM), J. Julia, xi.1964, 5 ♂, 14 ♀, 2 juv. (IBUNAM), E. González, 18.xi.2002, 1930 m, 3 ♀, 2 juv. (IBUNAM); Tehuacán, [18°24.002'N 97°22.867'W], 25.v.1972, 1 juv. (IBUNAM), 1 ♂, 3 ♀ (IBUNAM); toll road to Tehuacán, km 21, N of town, 18°38'41.1"N 97°27'22.9"W, 2249 m, 31.x.2004, O. Francke, R. Paredes, and G. Villegas, rock rolling, 2 ♀ (AMNH [LP 3713]). *Municipio de Tepanco de López*: Cacaloapan, [18°34'N 97°36'W], 1800 m, 22.viii.1969, desert, in limestone, 1 ♀ (AMNH), 30.vii.2011, 1 ♀ (IBUNAM). *Municipio de Tepexi de Rodríguez*: Tepexi de Rodríguez, [19°5'17.99"N 98°8'29.29"W], S. Rodríguez, 3.xi.1994, 1 ♀ (IBUNAM),

E. Barrera and G. Ortega, 24.iii.1998, 1 ♂ (IBUNAM), C. García, 22.i.2000, 1 ♂, 1 ♀ (IBUNAM). *Municipio de Tepeyahualco*: Ruinas de Contonac, Tepeyahualco, [19°29'N 97°'W], 25.viii.1979, W. López-Forment, 1 ♂, 2 ♀ (IBUNAM). *Municipio de Tzicatlacoyan*: Tepenene, near La Presa de Valsequillo, 18°54.2298'N 98°6.23'W, 2115 m, 27.ii.2004, S. Lonhora, E. Goander, E. Hinojosa and J. Mendez, 1 ♂, 2 ♀ (IBUNAM). *Municipio de Vicente Guerrero*: San Luis del Pino, 12 km N of Ayalalpan, [18°27.00367'N 97°9.523666'W], 13.x.1974, Díaz-Moreno, 1 ♂, 1 ♀ (IBUNAM). *Municipio de Xayacatlán de Bravo*: Xayacatlán de Bravo, [18°14'20.06"N 97°58'31.82"W], 2.xii.1977, J. Julia, 1 ♀ (IBUNAM). *Municipio de Zapotitlán Salinas*: San Antonio Texcala, [18°24'N 97°26'W], 12.ii.2003, E. González and O. Delgado, under rocks, 3 ♂, 13 ♀, 12 juv. (IBUNAM); Tierra Amarilla, Llano de Pancho Martínez, 8 km E, Zapotitlán Salinas, [18°20'N 97°29'W], 1960 m, 13.iii.2003, E. González, 1 ♂, 1 juv. (IBUNAM); Zapotitlán Salinas, 4 km N, Cerro Chacatecas, [18°20'N 97°29'W], 2030 m, 17.xi.2002, E. González, 2 ♀, 1 juv. (IBUNAM). **Tlaxcala:** *Municipio de Lázaro Cárdenas*: Lázaro Cárdenas, 19°32'39.2"N 97°59'0.7"W, 2579 m, 26.v.2005, P. Berea, 6 ex. (IBUNAM), 1 ♂, 1 ♀ (AMNH [LP 6368]). *Municipio de Nativitas*: Cerro Xochitécatl, [19°14.68983'N 98°20.9633'W], 2270 m, 2.ii.1997, L. Beuteslpacher, 4 ♀ (IBUNAM). *Municipio de Terrante*: Toluca de Guadalupe, 19°31.8534'N 98°14.4962'W, 16.vii.1995, F. Cruz, 1 ♀ (IBUNAM). *Municipio de Tlaxcala*: Tlaxcala, [19°25'N 98°'W], 2.iii.1997, L. Beutelspacher, 1 ♂, 4 ♀, 1 juv. (IBUNAM). **Veracruz:** *Municipio de Acultzingo*: Acultzingo, [18°43'N 97°19'W], 10.iii.1978, J. Julia, 1 ♀ (IBUNAM). *Municipio de Perote*: Totalco, [19°33.7200'N 97°14.52'W], P. Berea, 15.vi.2005, 11 ex. (IBUNAM), ii.2009, 1 ♀ (IBUNAM).

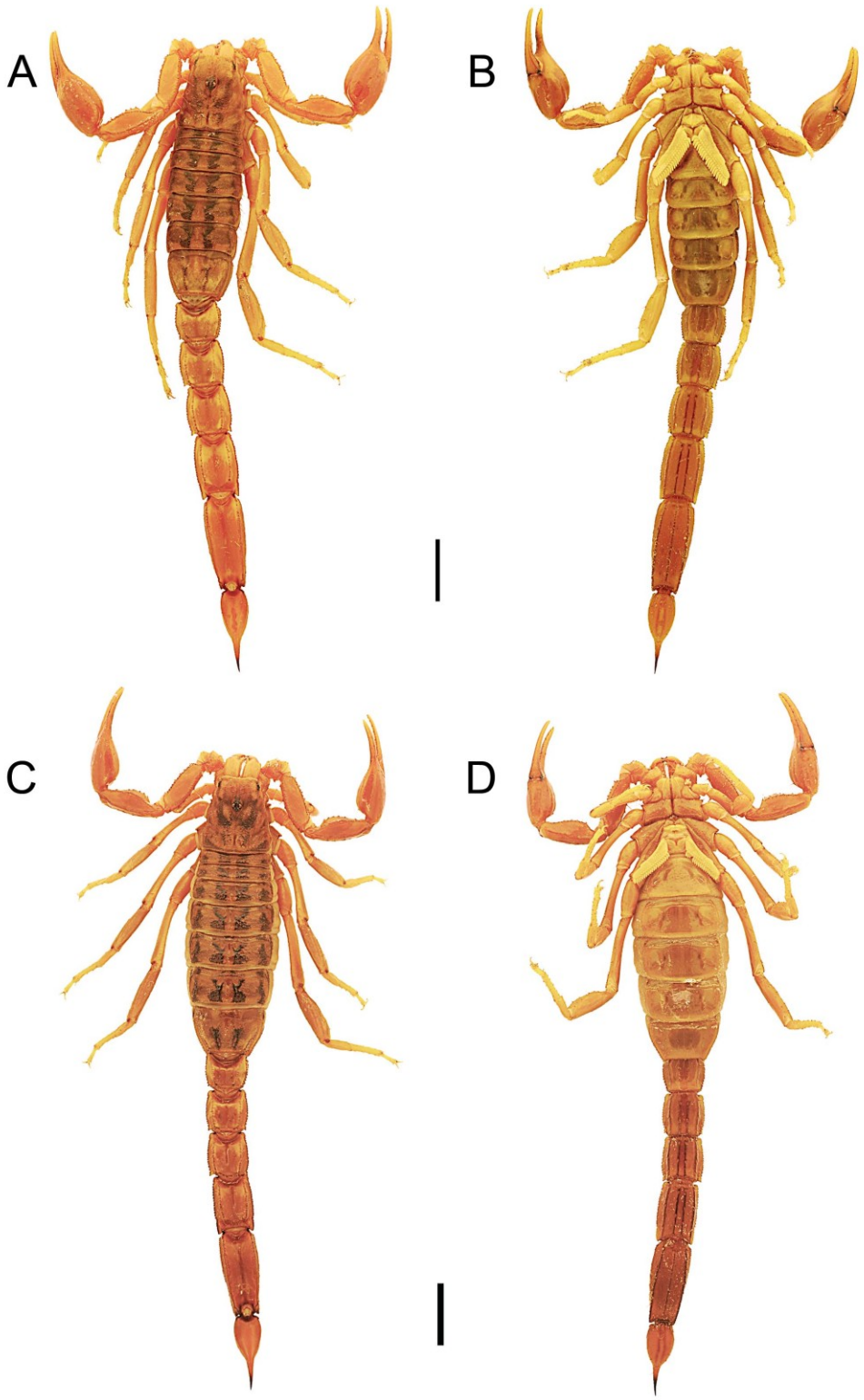


Figure 278. *Mesomexovis zaragozai*, **n. sp.**, habitus. **A**, **B**. Paratype ♂ (AMNH). **C**, **D**. ♀ (AMNH). **A**, **C**. Dorsal aspect. **B**, **D**. Ventral aspect**.** Scale bars = 5 mm.

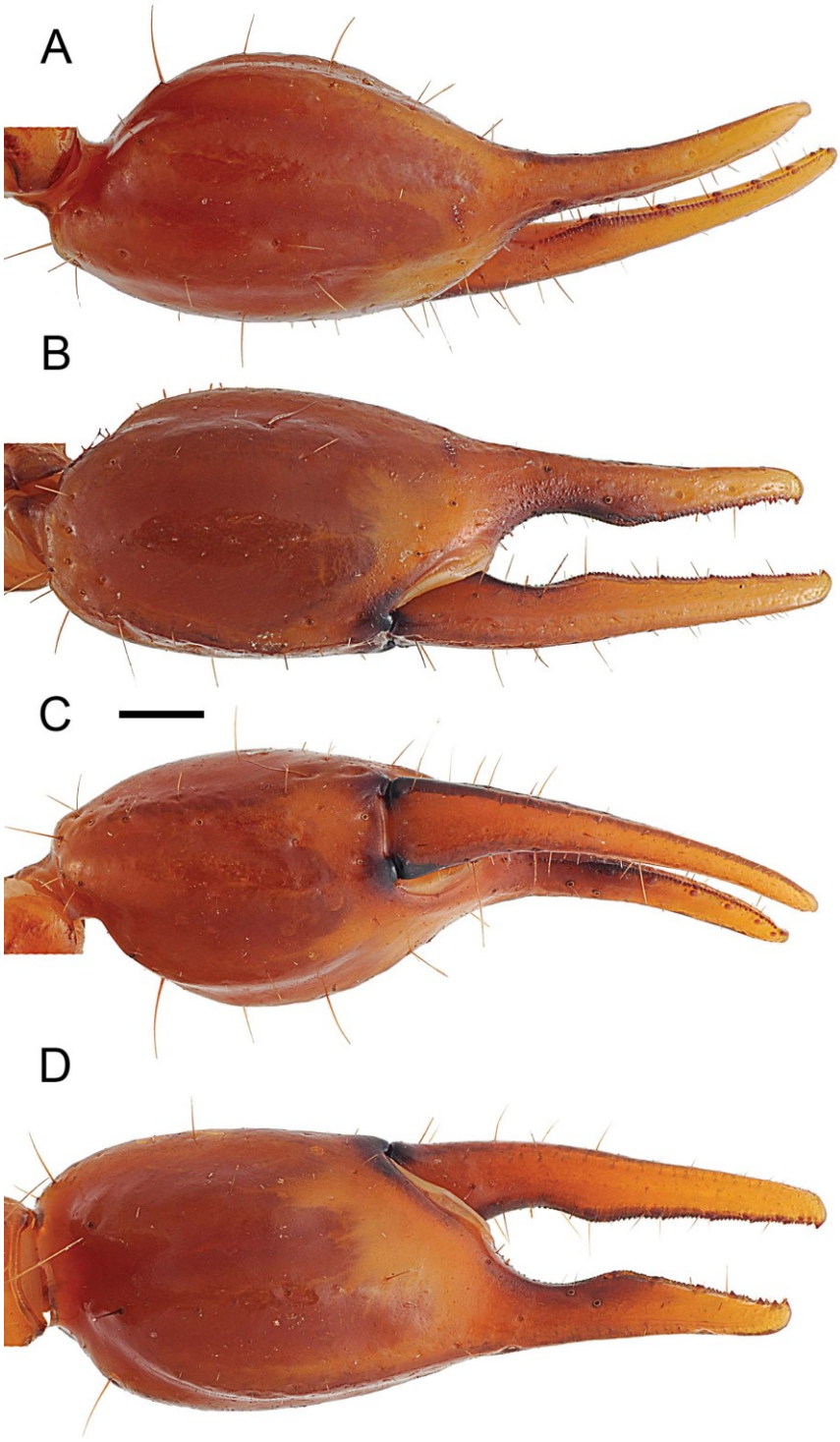


Figure 279. *Mesomexovis zaragozai*, **n. sp.**, paratype ♂ (AMNH), dextral pedipalp chela. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

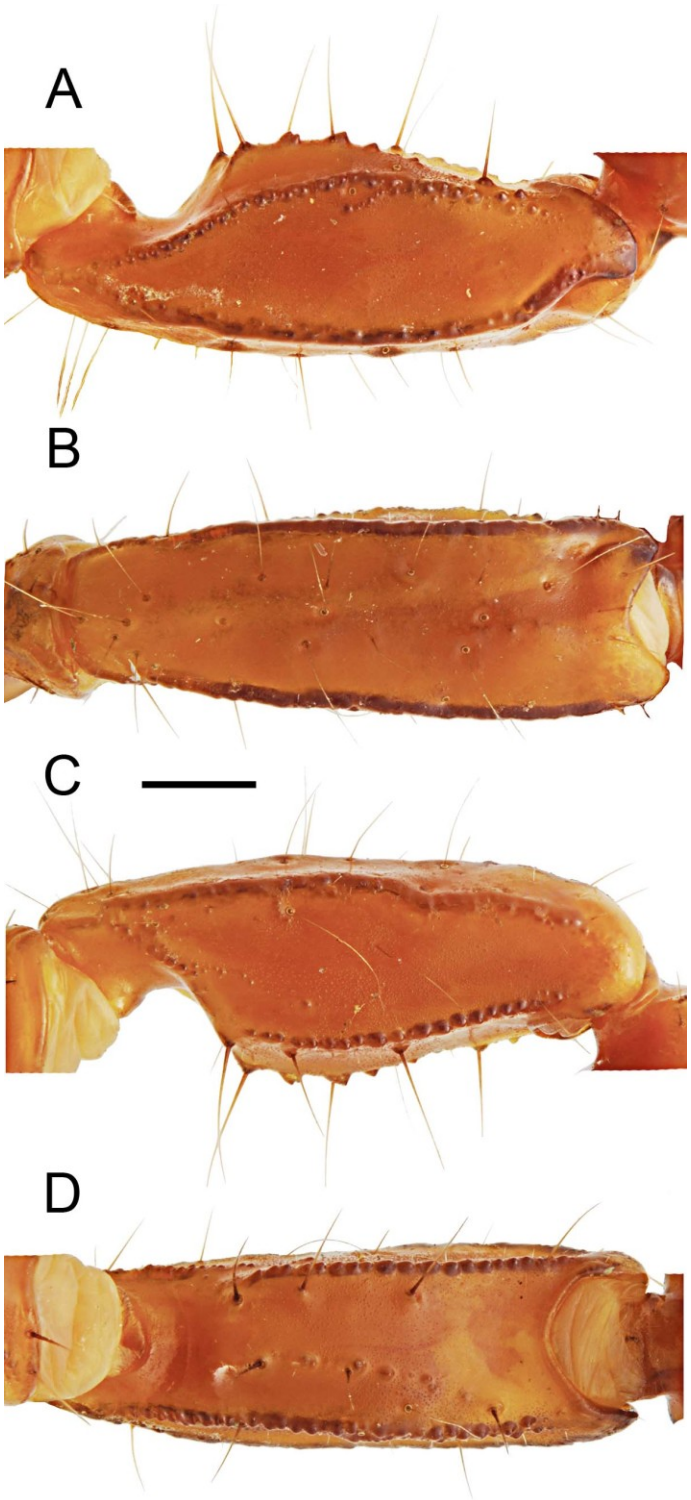


Figure 280. *Mesomexovis zaragozai*, **n. sp.**, paratype ♂ (AMNH), dextral pedipalp patella. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

Figure 281. *Mesomexovis* González-Santillán and Prendini, in prep. Carapace. **A**. *Mesomexovis atenango* (Francke and González-Santillán, 2007), ♂ (IBUNAM). **B**. *Mesomexovis caxcan*, **n. sp.**, paratype ♂ (AMNH). **C**. *Mesomexovis fasciatus* Sissom and Hughes, in prep., ♂ (AMNH). **D**. *Mesomexovis hesperus* Sissom and Hughes, in prep., ♂ (AMNH). Scale bars = 1 mm.

Figure 282. *Mesomexovis* González-Santillán and Prendini, in prep. Carapace. **A**. *Mesomexovis izazagai*, **n. sp.**, paratype ♂ (AMNH). **B**. *Mesomexovis oaxaca* (Santibáñez-López and Sissom, 2010), ♂ (AMNH). **C**. *Mesomexovis nigropictus* (Pocock, 1898), ♂ (AMNH). **D**. *Mesomexovis mintoni* Sissom and Hughes, in prep., ♂ (AMNH). Scale bars = 1 mm.

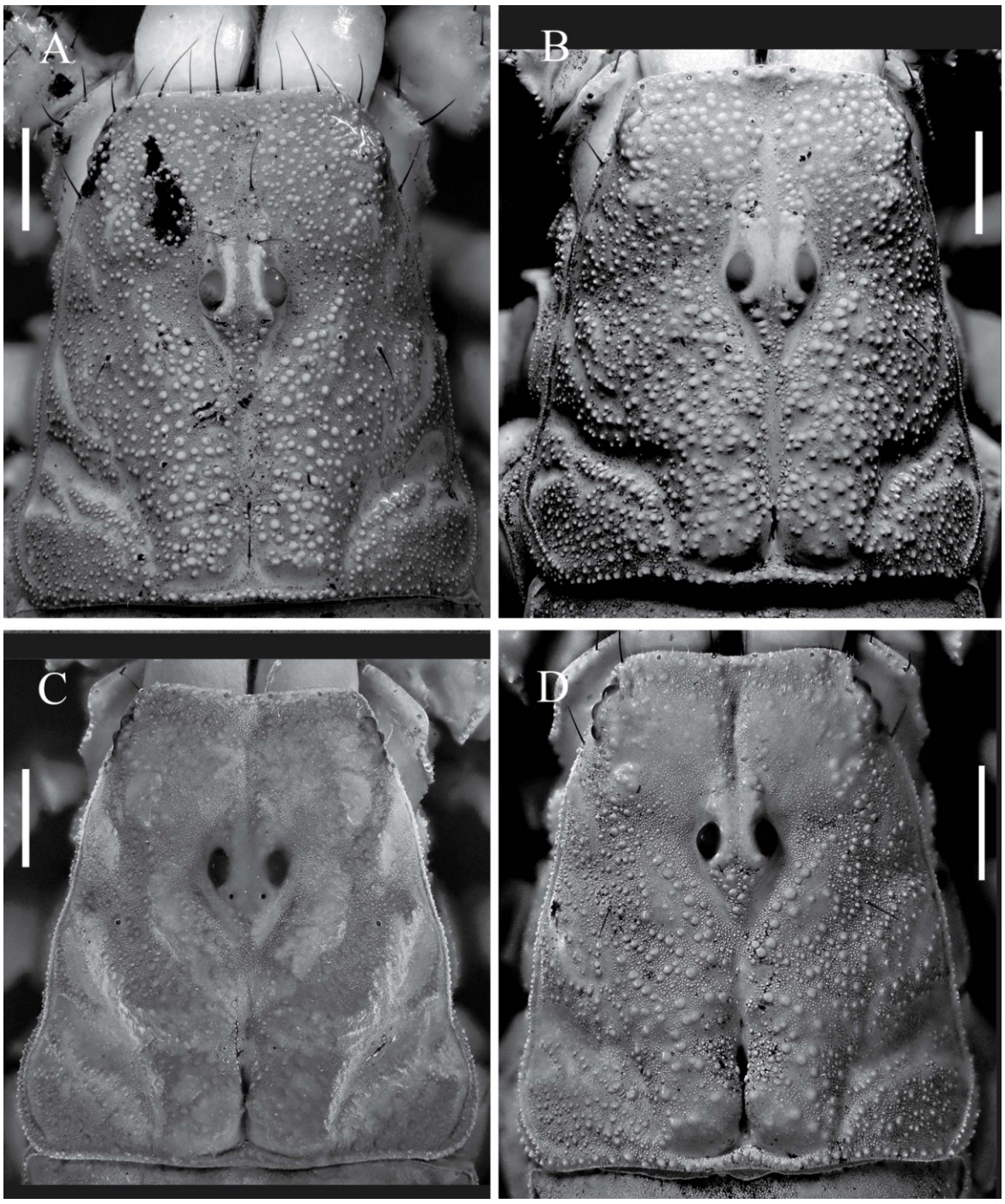


Figure 283. *Mesomexovis* González-Santillán and Prendini, in prep. Carapace. **A**. *Mesomexovis occidentalis* (Hoffmann, 1931), paratype ♂ (AMNH). **B**. *Mesomexovis ponce* Sissom and Hughes, in prep., ♂ (AMNH). **C**. *Mesomexovis punctatus* (Karsch, 1879), ♂ (AMNH). **D**. *Mesomexovis subcristatus* (Pocock, 1898), ♂ (AMNH). Scale bars = 1 mm.

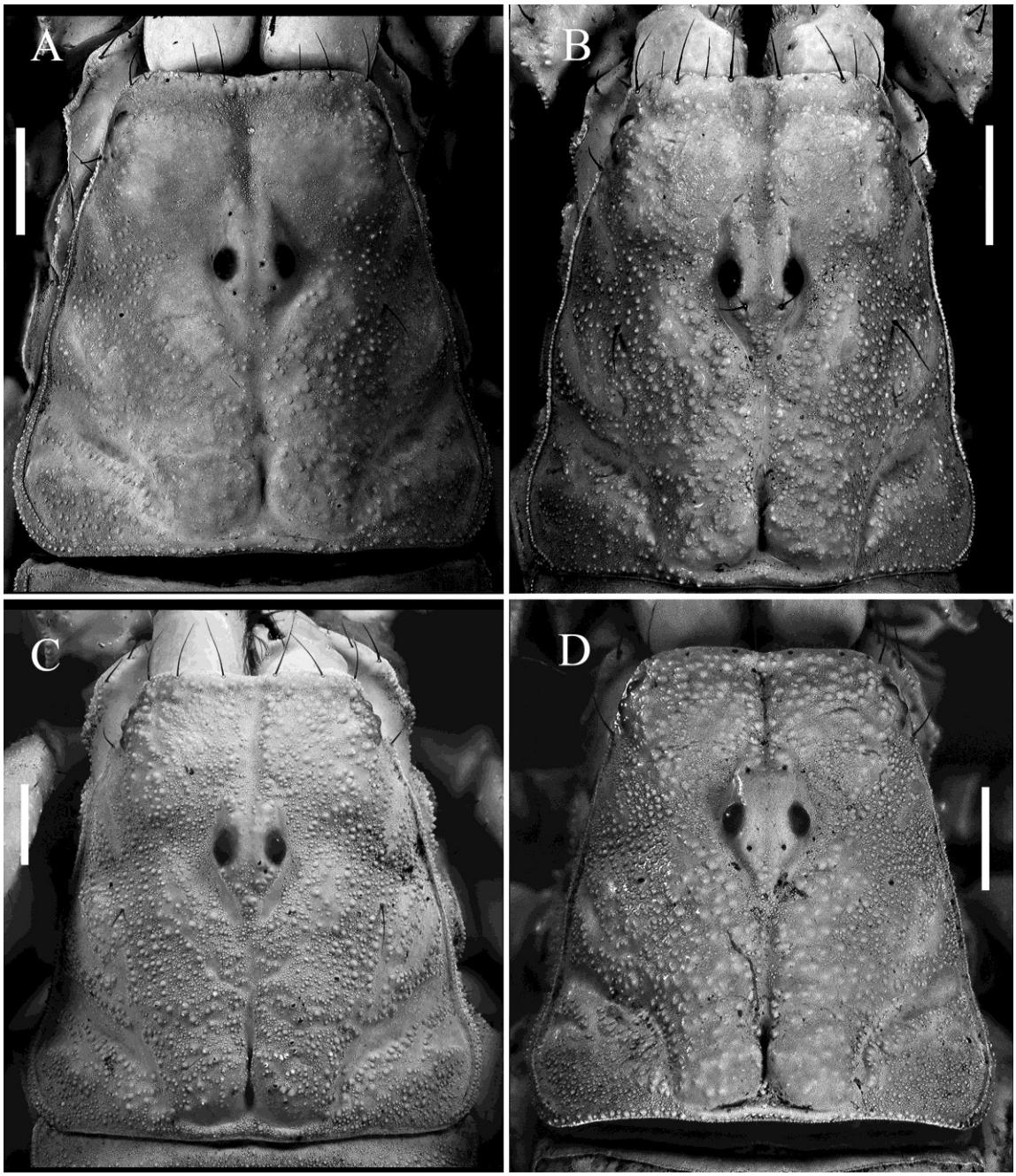


Figure 284. *Mesomexovis* González-Santillán and Prendini, in prep. Carapace. **A**. *Mesomexovis tinctus*, **n. sp.**, paratype ♂ (AMNH). **B**. *Mesomexovis tlayoli*, **n. sp.**, paratype ♂ (AMNH). **C**. *Mesomexovis ofeliae*, **n. sp.**, paratype ♂ (AMNH). **D**. *Mesomexovis variegatus* (Pocock, 1898), ♂ (AMNH). Scale bars = 1 mm.

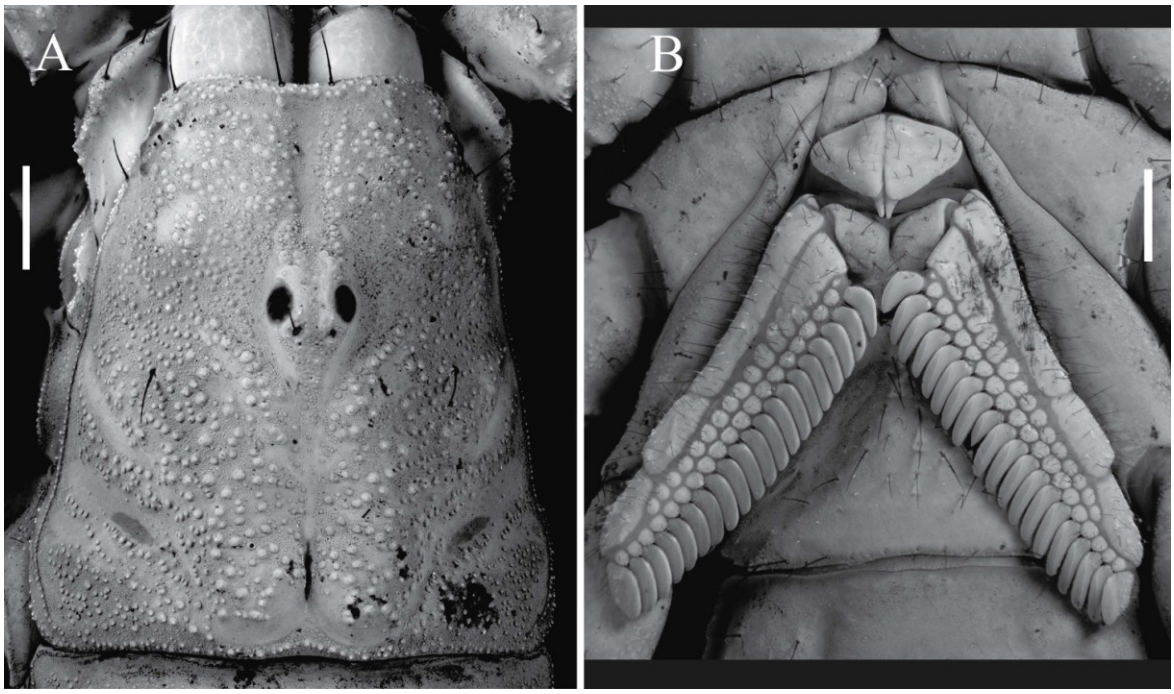


Figure 285. *Mesomexovis zaragozai*, **n. sp.**, paratype ♂ (AMNH). **A**. Carapace. **B**. Sternum, genital operculum and pectines, ventral aspect. Scale bars = 1 mm.

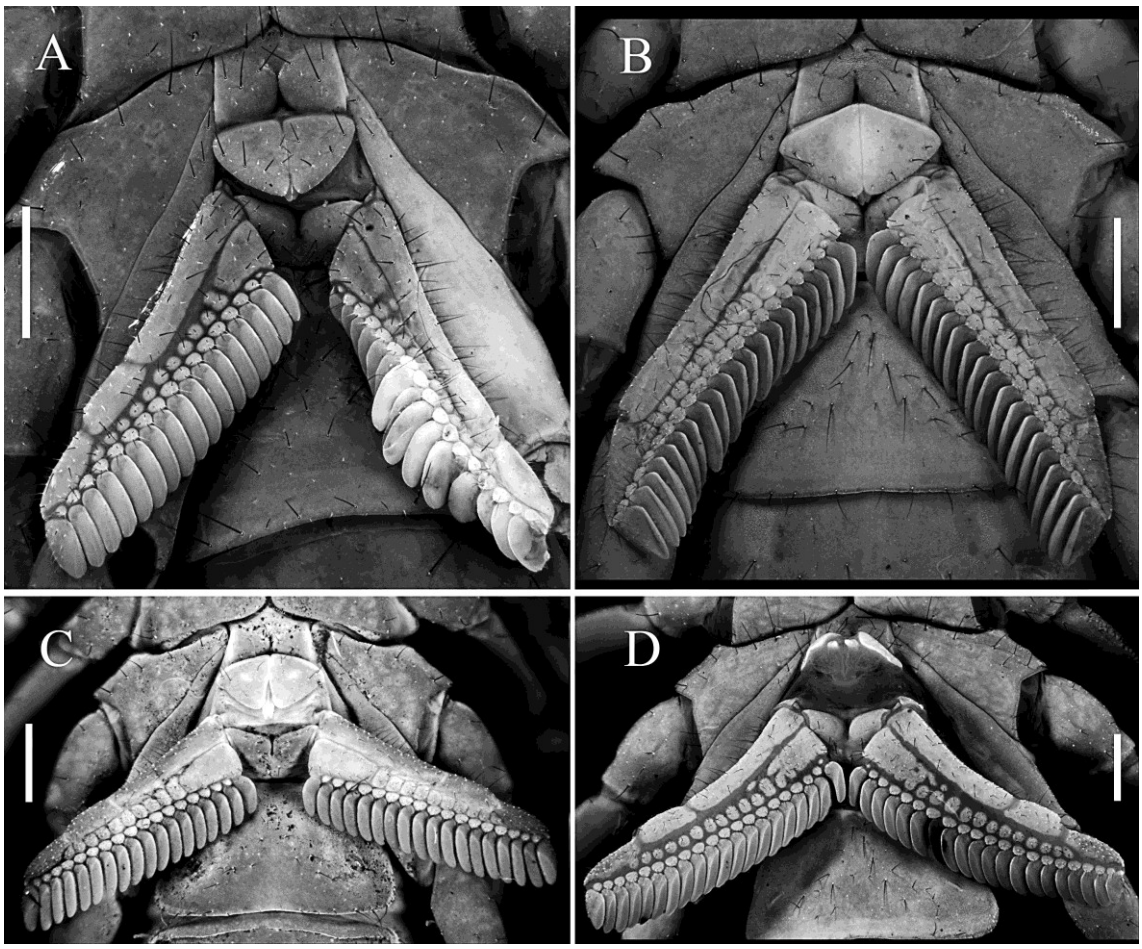


Figure 286. *Mesomexovis* González-Santillán and Prendini, in prep. Sternum, genital operculum and pectines. **A**. *Mesomexovis atenango* (Francke and González-Santillán, 2007), ♂ (IBUNAM). **B**. *Mesomexovis nigropictus* (Pocock, 1898), ♂ (AMNH). **C**. *Mesomexovis mintoni* Sissom and Hughes, in prep., ♂ (AMNH). **D**. *Mesomexovis tinctus*, **n. sp.**, paratype ♂ (AMNH). Scale bars = 1mm.

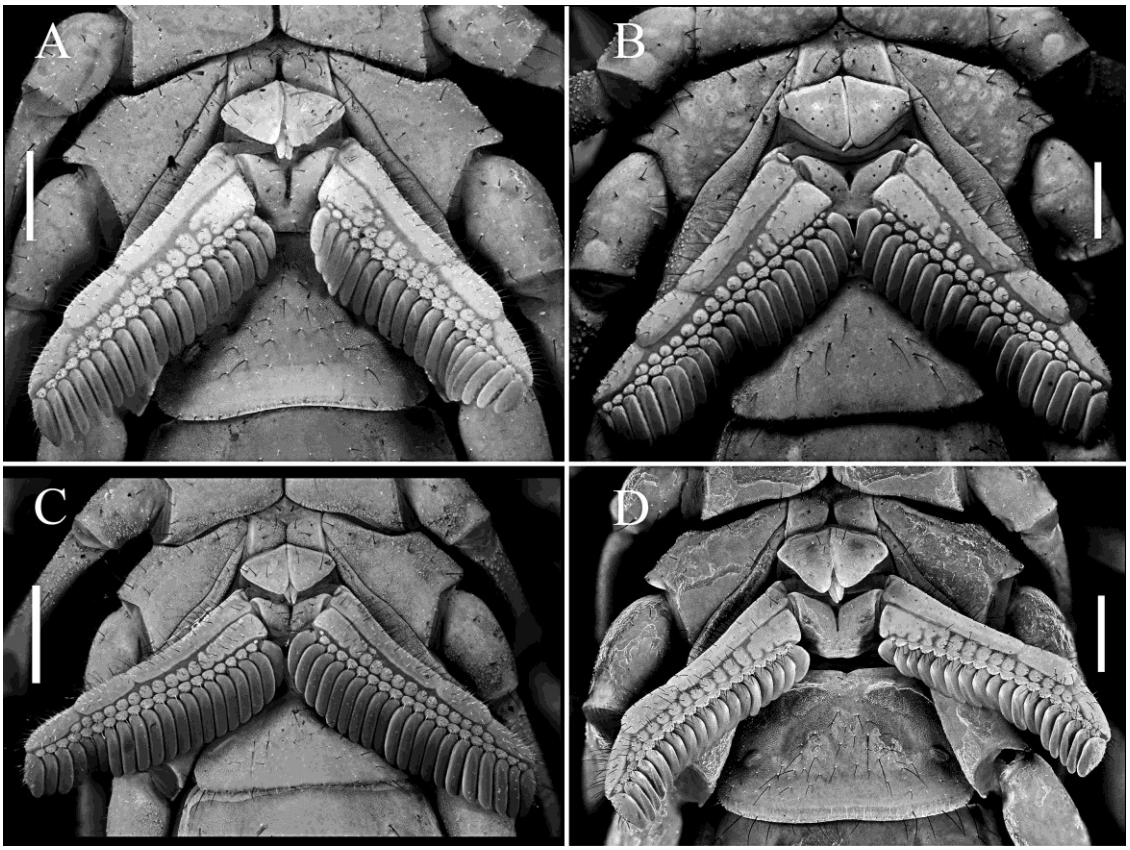


Figure 287. *Mesomexovis* González-Santillán and Prendini, in prep. Sternum, genital operculum and pectines, ventral aspect. **A**. *Mesomexovis izazagai*, **n. sp.**, paratype ♂ (AMNH). **B** *Mesomexovis ponce* Sissom and Hughes, in prep., ♂ (AMNH). **C**. *Mesomexovis caxcan*, **n. sp.**, paratype ♂ (AMNH). **D**. *Mesomexovis punctatus* (Karsch, 1879), ♂ (AMNH). Scale bars = 1 mm.

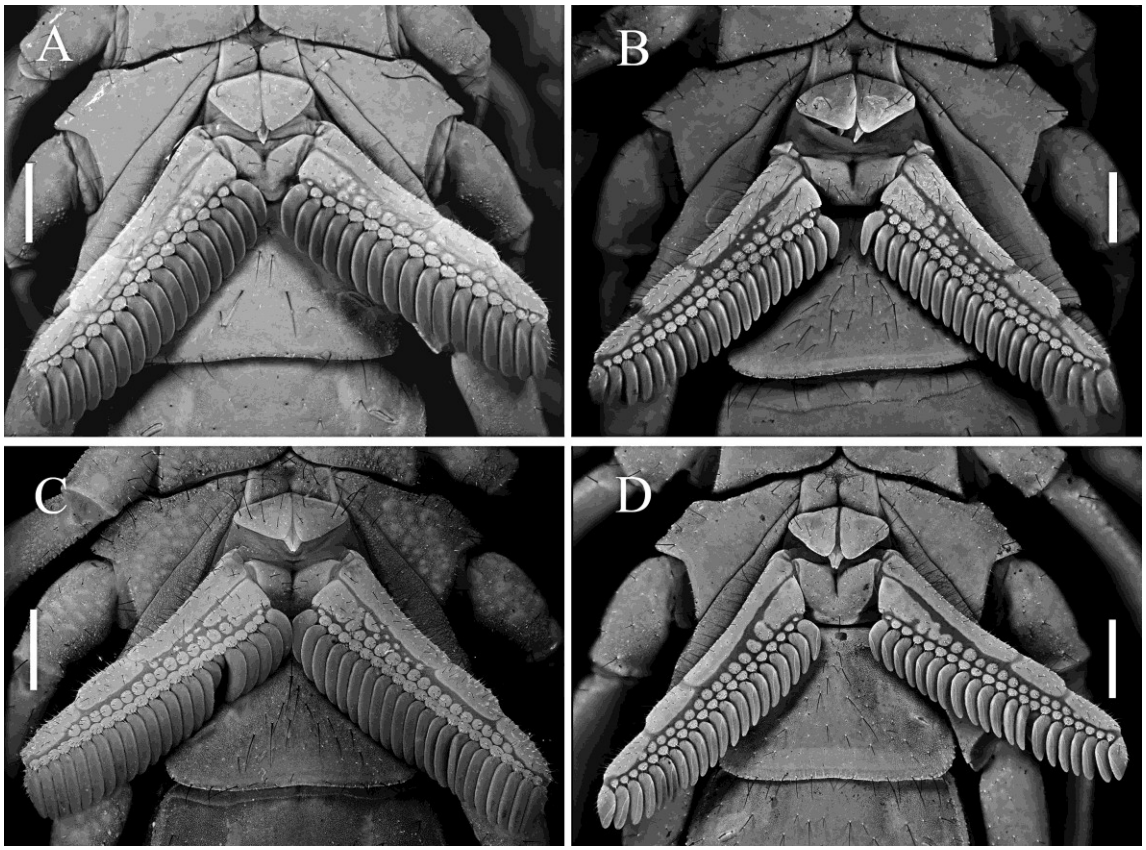


Figure 288. *Mesomexovis* González-Santillán and Prendini, in prep. Sternum, genital operculum and pectines, ventral aspect. **A**. *Mesomexovis hesperus* Sissom and Hughes, in prep., ♂ (AMNH). **B**. *Mesomexovis oaxaca* (Santibáñez-López and Sissom, 2010), ♂ (AMNH). **C**. *Mesomexovis occidentalis* (Hoffmann, 1931), paratype ♂ (AMNH). **D**. *Mesomexovis subcristatus* (Pocock, 1898), ♂ (AMNH). Scale bars = 1 mm.

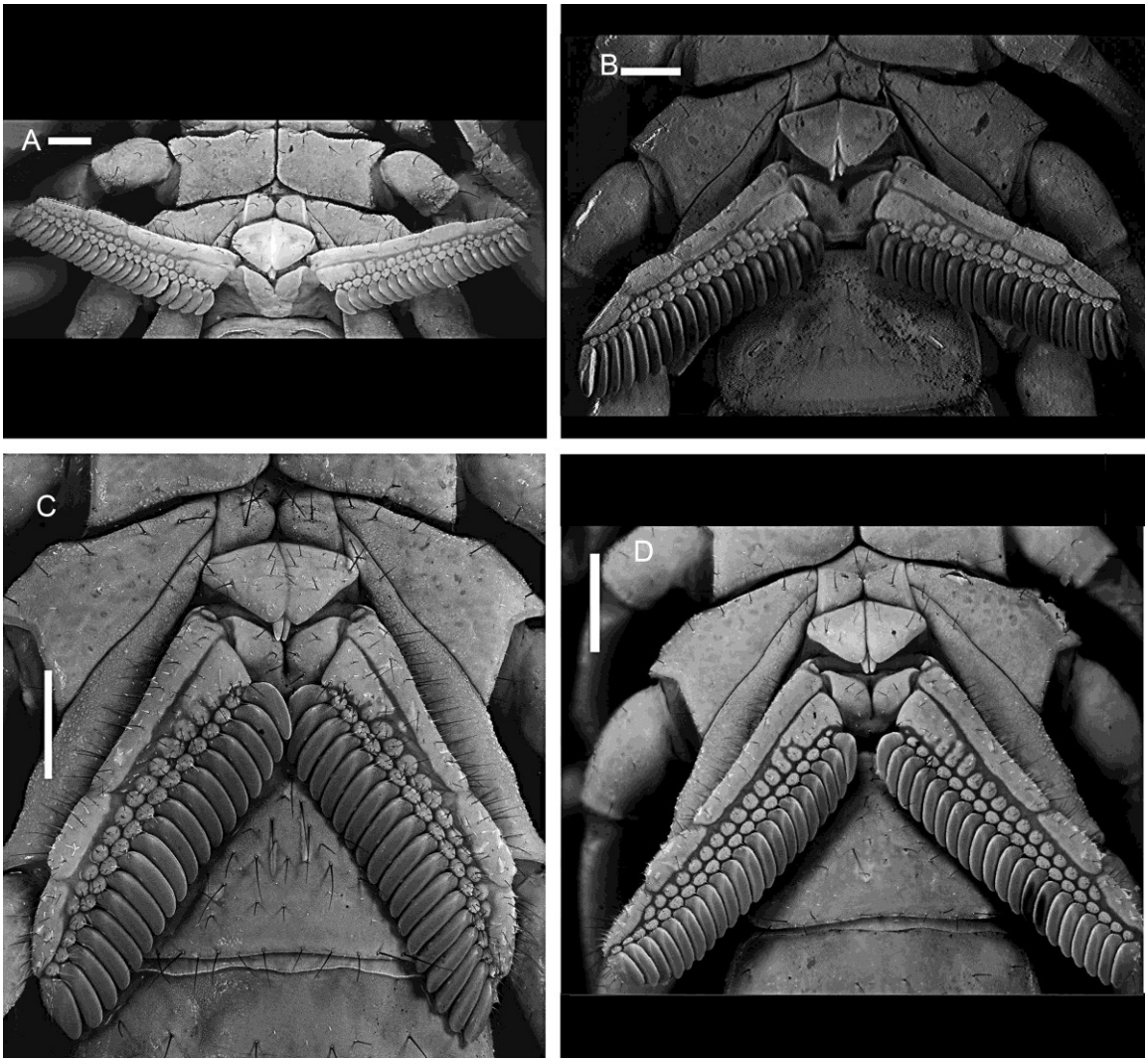


Figure 289. *Mesomexovis* González-Santillán and Prendini, in prep. Sternum, genital operculum and pectines. **A**. *Mesomexovis fasciatus* Sissom and Hughes, in prep., ♂ (AMNH). **B**. *Mesomexovis tlayoli*, **n. sp.**, paratype ♂ (AMNH). **C**. *Mesomexovis ofeliae*, **n. sp.**, paratype ♂ (AMNH). **D**. *Mesomexovis variegatus* (Pocock, 1898), ♂ (AMNH). Scale bars = 1 mm.

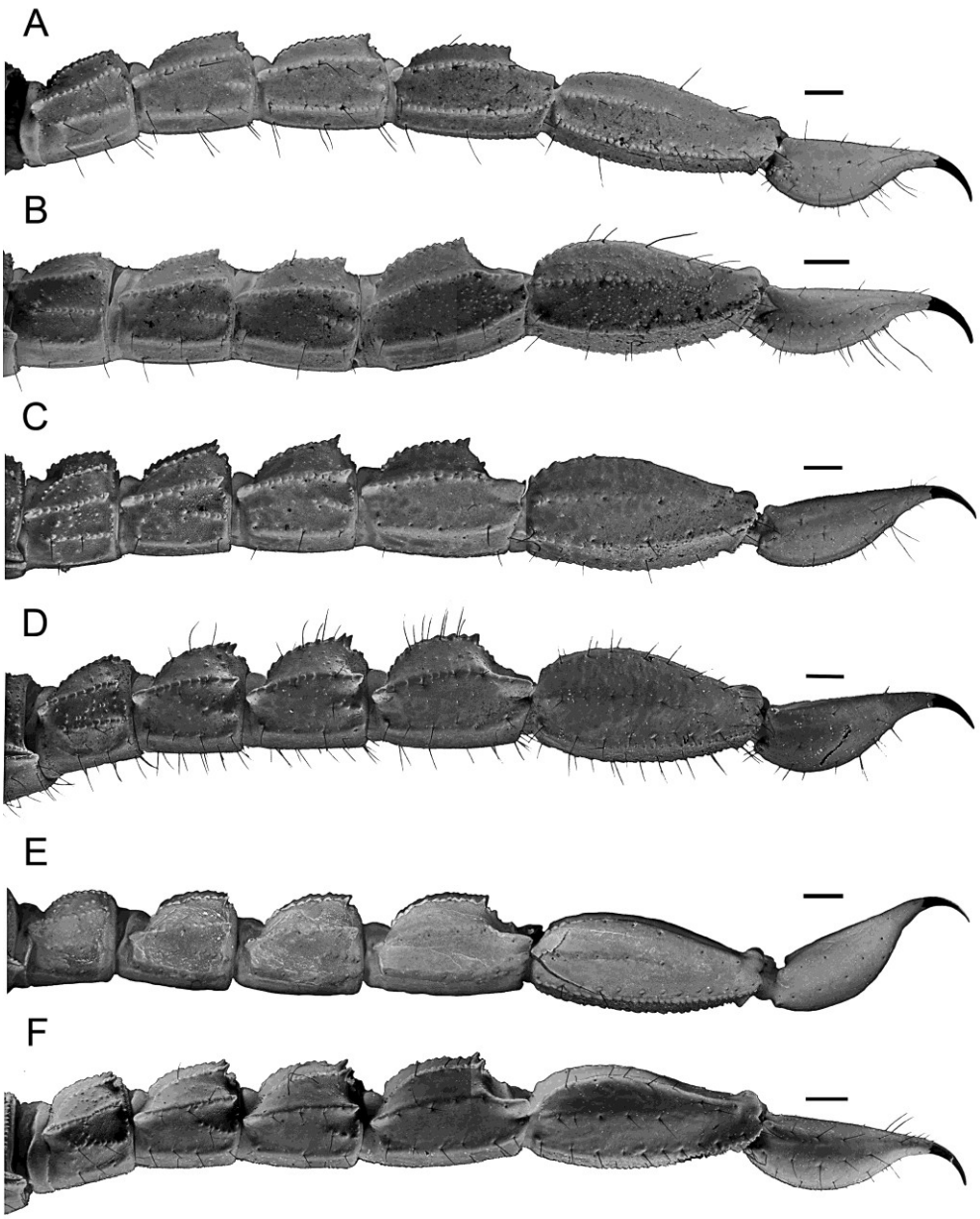


Figure 290. *Mesomexovis* González-Santillán and Prendini, in prep. Metasomal segments I–V, lateral aspect. **A**. *Mesomexovis atenango* (Francke and González-Santillán, 2007), ♂ (IBUNAM). **B**. *Mesomexovis caxcan*, **n. sp.**, paratype ♂ (AMNH). **C**. *Mesomexovis fasciatus* Sissom and Hughes, in prep., ♂ (AMNH). **D**. *Mesomexovis oaxaca* (Santibáñez-López and Sissom, 2010), ♂ (AMNH). **E**. *Mesomexovis punctatus* (Karsch, 1879), ♂ (AMNH). **F**. *Mesomexovis tinctus*, **n. sp.**, paratype ♂ (AMNH). Scale bars = 1 mm.

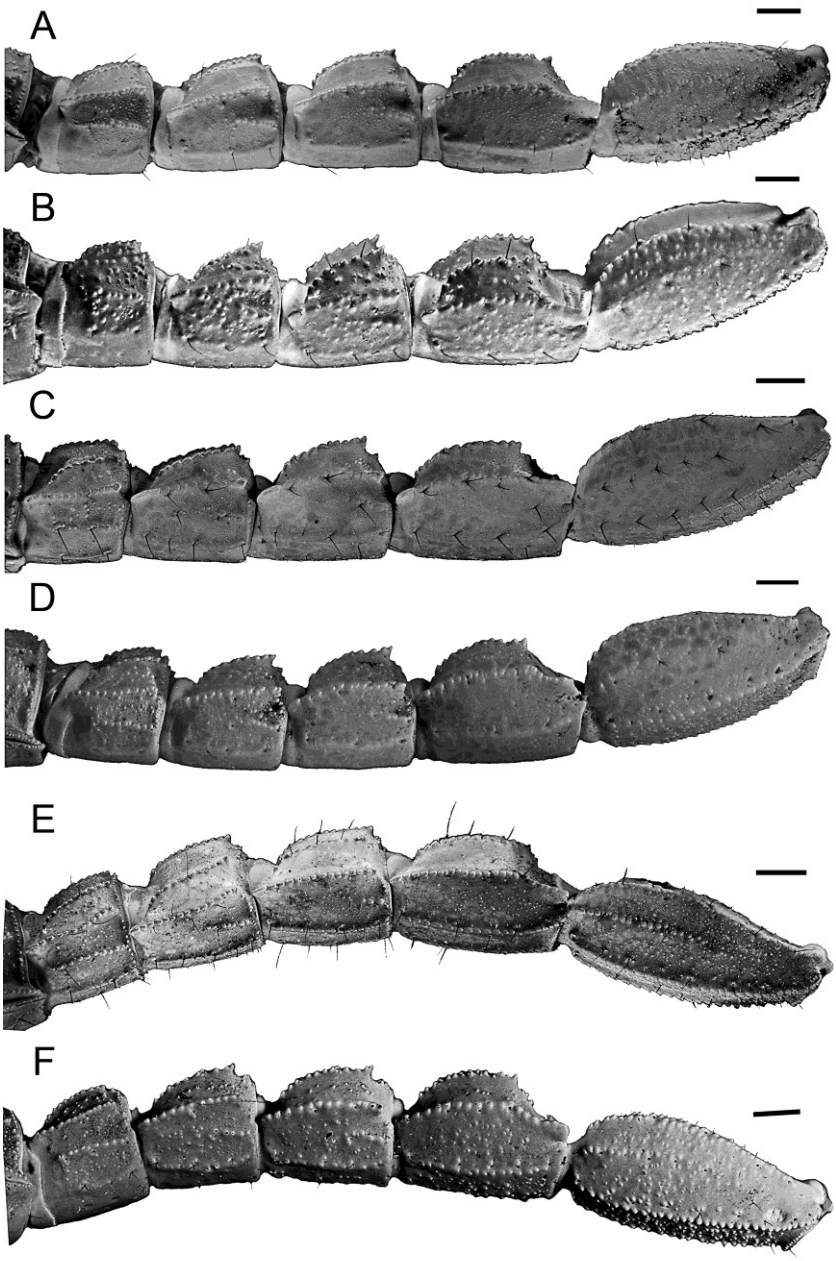


Figure 291. *Mesomexovis* González-Santillán and Prendini, in prep. Metasomal segments I–V, lateral aspect. **A**. *Mesomexovis hesperus* Sissom and Hughes, in prep., ♂ (AMNH). **B**. *Mesomexovis mintoni* Sissom and Hughes, in prep., ♂ (AMNH). **C**. *Mesomexovis tlayoli*, **n. sp.**, paratype ♂ (AMNH). **D**. *Mesomexovis variegatus* (Pocock, 1898), ♂ (AMNH). **E**. *Mesomexovis occidentalis* (Hoffmann, 1931), paratype ♂ (AMNH). **F**. *Mesomexovis ponce* Sissom and Hughes, in prep., ♂ (AMNH). Scale bars = 1 mm.

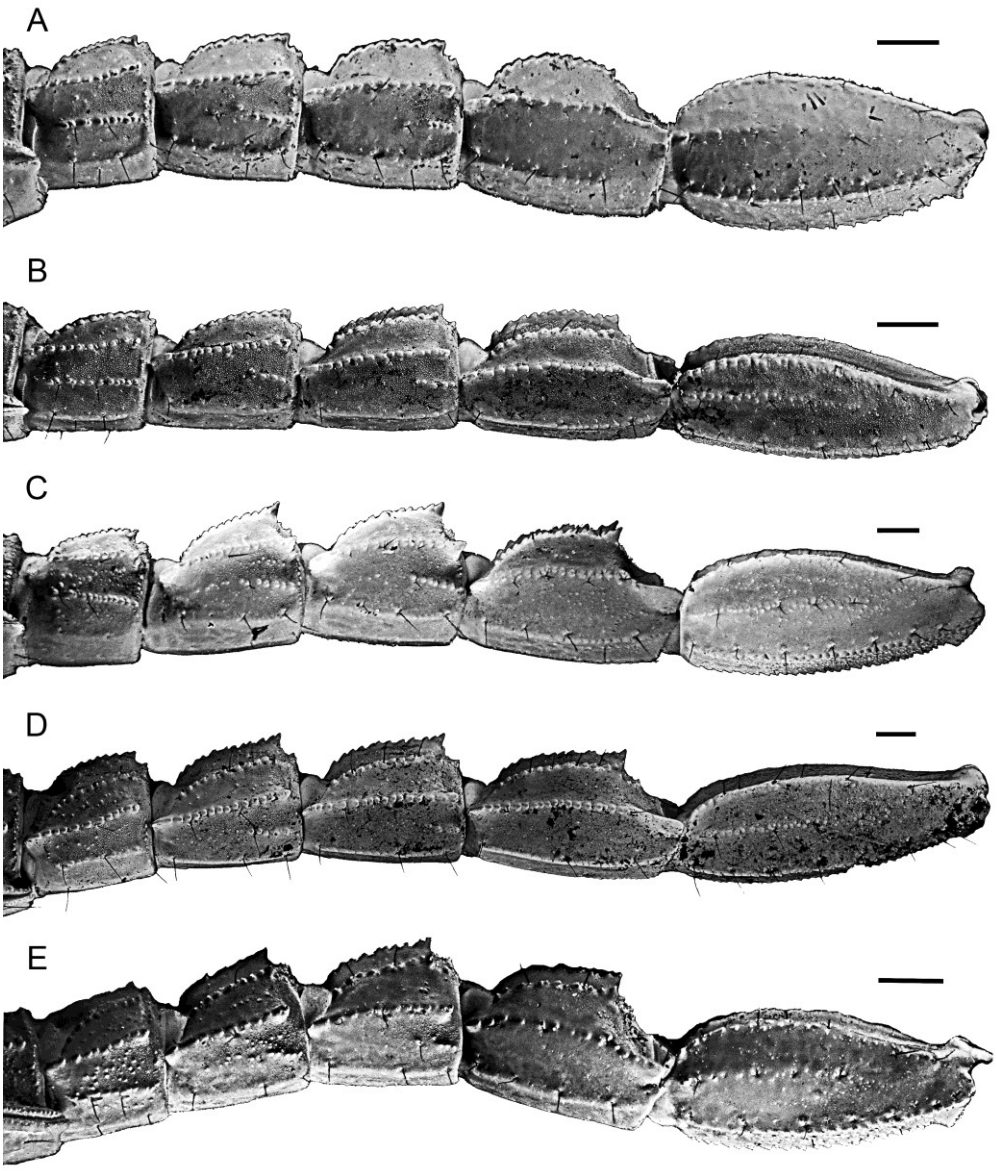


Figure 292. *Mesomexovis* González-Santillán and Prendini, in prep. Metasomal segments I–V, lateral aspect. **A**. *Mesomexovis izazagai*, **n. sp.**, paratype ♂ (AMNH). **B**. *Mesomexovis subcristatus* (Pocock, 1898), ♂ (AMNH). **C**. *Mesomexovis ofeliae*, **n. sp.**, paratype ♂ (AMNH). **D**. *Mesomexovis zaragozai*, **n. sp.**, paratype ♂ (AMNH). **E**. *Mesomexovis nigropictus* (Pocock, 1898), ♂ (AMNH). Scale bars = 1 mm.

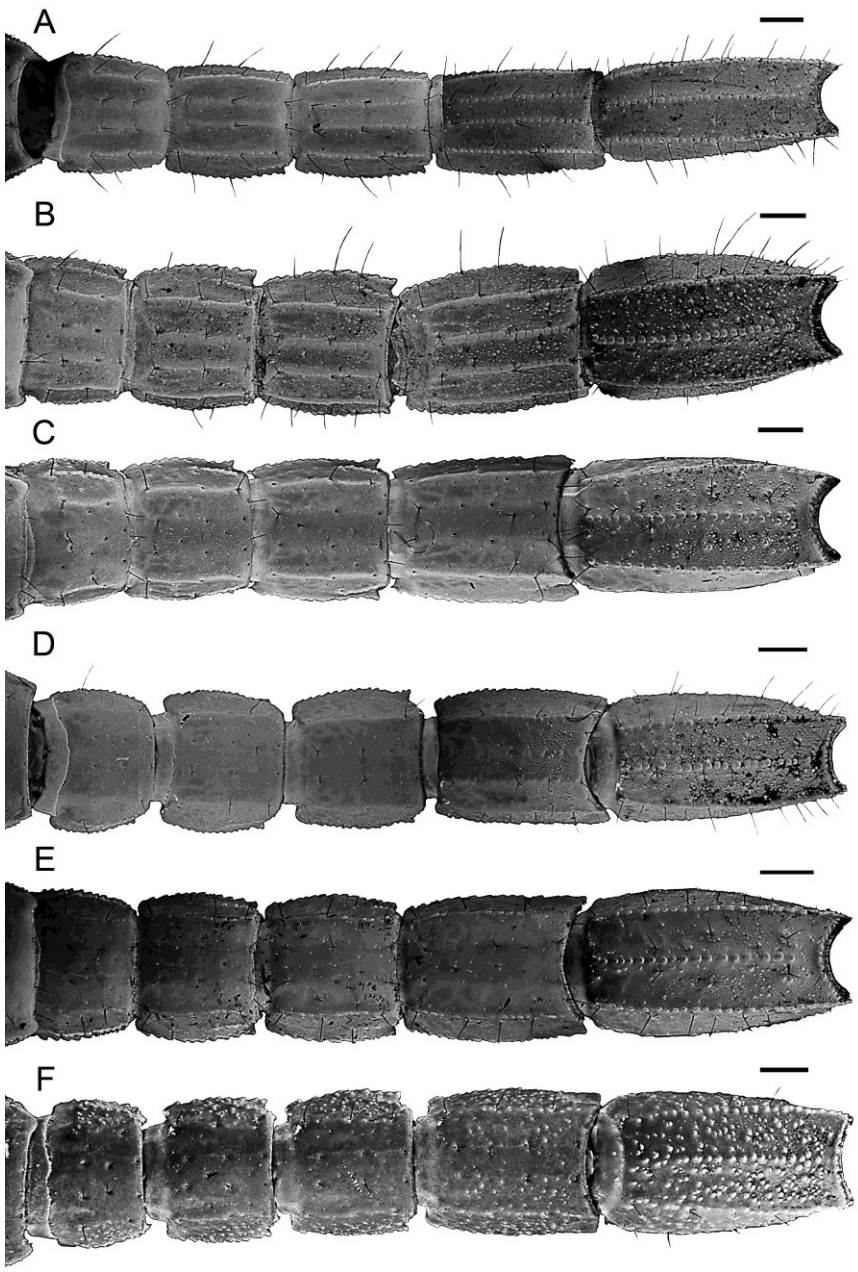


Figure 293. *Mesomexovis* González-Santillán and Prendini, in prep. Metasomal segments I–V, dorsal aspect. **A**. *Mesomexovis atenango* (Francke and González-Santillán, 2007), ♂ (IBUNAM). **B**. *Mesomexovis caxcan*, **n. sp.**, paratype ♂ (AMNH). **C**. *Mesomexovis fasciatus* Sissom and Hughes, in prep., ♂ (AMNH). **D**. *Mesomexovis hesperus* Sissom and Hughes, in prep., ♂ (AMNH). **E**. *Mesomexovis izazagai*, **n. sp.**, paratype ♂ (AMNH). **F**. *Mesomexovis mintoni* Sissom and Hughes, in prep., ♂ (AMNH). Scale bars = 1 mm.

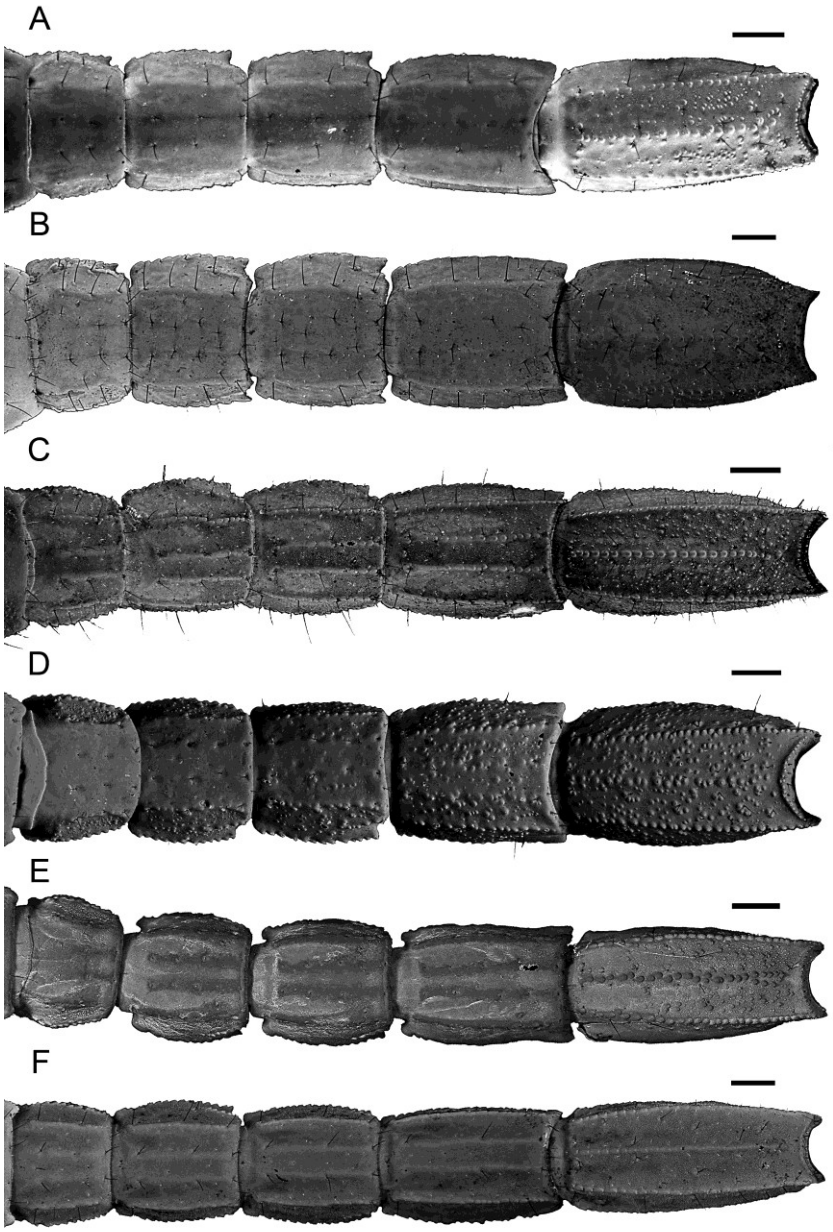


Figure 294. *Mesomexovis* González-Santillán and Prendini, in prep. Metasomal segments I–V, dorsal aspect. **A**. *Mesomexovis nigropictus* (Pocock, 1898), ♂ (AMNH). **B**. *Mesomexovis oaxaca* (Santibáñez-López and Sissom, 2010), ♂ (AMNH). **C**. *Mesomexovis occidentalis* (Hoffmann, 1931), paratype ♂ (AMNH). **D**. *Mesomexovis ponce* Sissom and Hughes, in prep., ♂ (AMNH). **E**. *Mesomexovis punctatus* (Karsch, 1879), ♂ (AMNH). **F**. *Mesomexovis subcristatus* (Pocock, 1898), ♂ (AMNH). Scale bars = 1 mm.

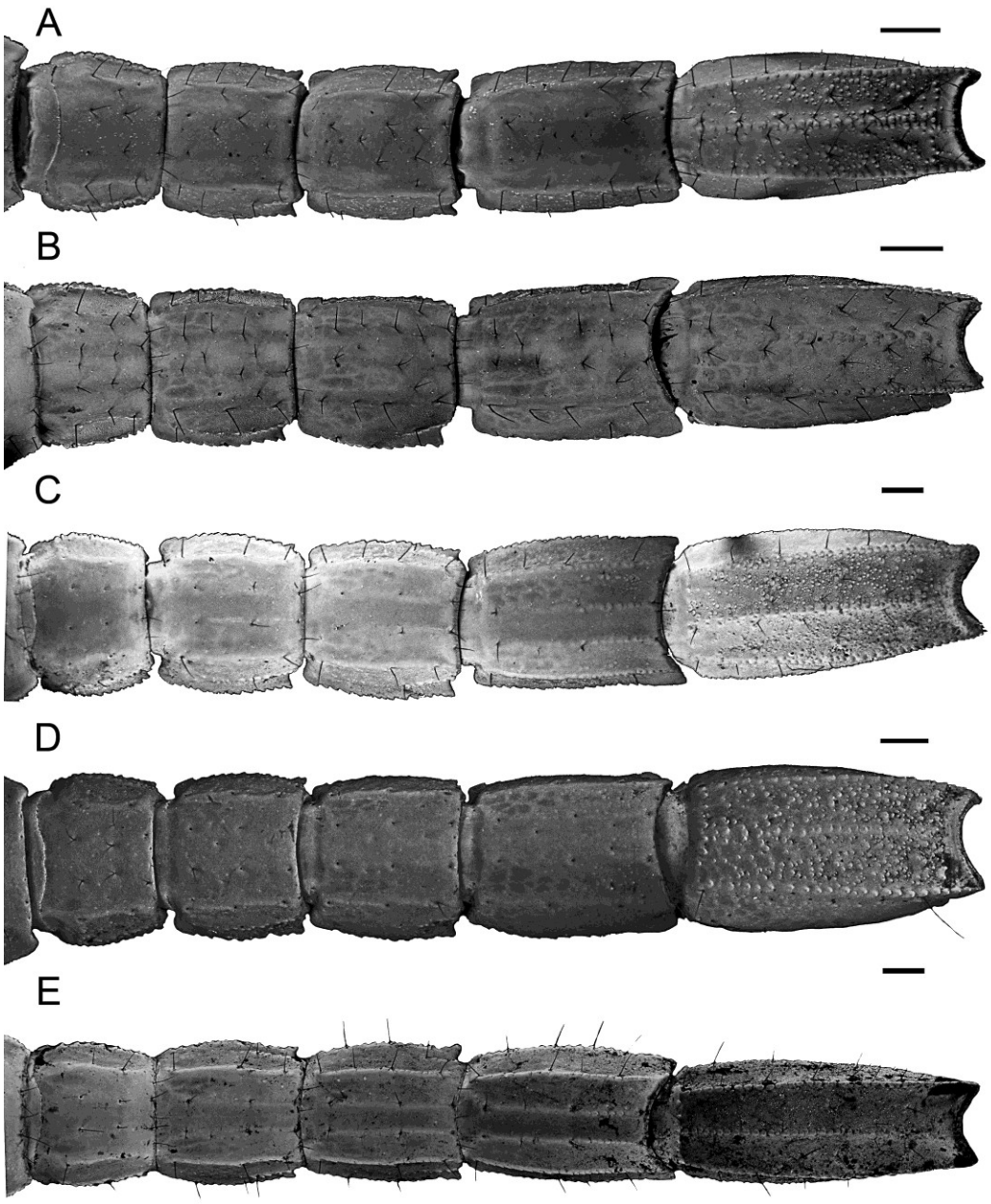


Figure 295. *Mesomexovis* González-Santillán and Prendini, in prep. Metasomal segments I–V, dorsal aspect. **A**. *Mesomexovis tinctus*, **n. sp.**, paratype ♂ (AMNH). **B**. *Mesomexovis tlayoli*, **n. sp.**, paratype ♂ (AMNH). **C**. *Mesomexovis ofeliae*, **n. sp.**, paratype ♂ (AMNH). **D**. *Mesomexovis variegatus* (Pocock, 1898), ♂ (AMNH). **E**. *Mesomexovis zaragozai*, **n. sp.**, paratype ♂ (AMNH). Scale bars = 1 mm.

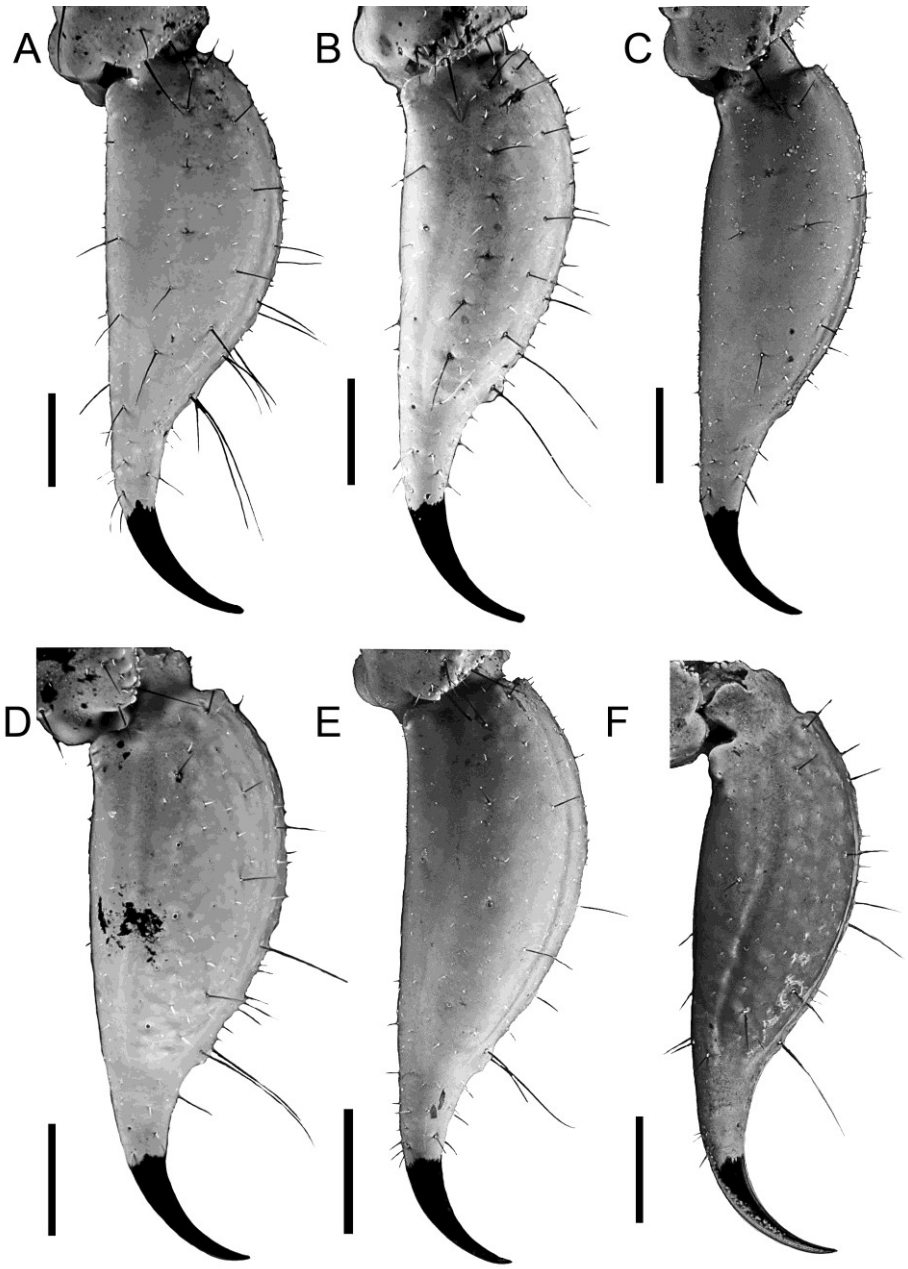


Figure 296. *Mesomexovis* González-Santillán and Prendini, in prep. Telson, lateral aspect. **A**. *Mesomexovis atenango* (Francke and González-Santillán, 2007), ♂ (IBUNAM). **B**. *Mesomexovis caxcan*, **n. sp.**, paratype ♂ (AMNH). **C**. *Mesomexovis fasciatus* Sissom and Hughes, in prep., ♂ (AMNH). **D**. *Mesomexovis hesperus* Sissom and Hughes, in prep., ♂ (AMNH). **E**. *Mesomexovis izazagai*, **n. sp.**, paratype ♂ (AMNH). **F**. *Mesomexovis mintoni* Sissom and Hughes, in prep., ♂ (AMNH). Scale bars = 1 mm.

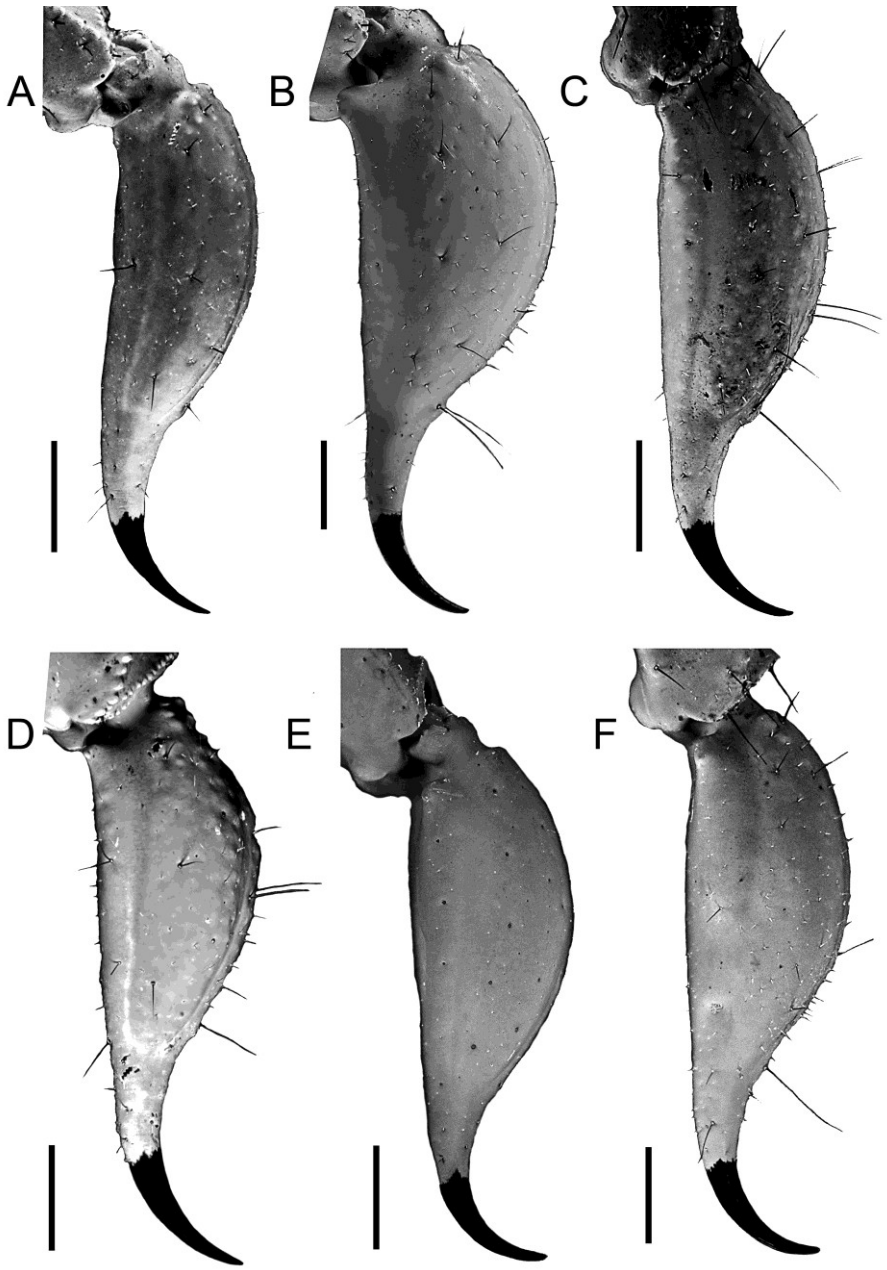


Figure 297. *Mesomexovis* González-Santillán and Prendini, in prep. Telson, lateral aspect. **A**. *Mesomexovis nigropictus* (Pocock, 1898), ♂ (AMNH). **B**. *Mesomexovis oaxaca* (Santibáñez-López and Sissom, 2010), ♂ (AMNH). **C**. *Mesomexovis occidentalis* (Hoffmann, 1931), paratype ♂ (AMNH). **D**. *Mesomexovis ponce* Sissom and Hughes, in prep., ♂ (AMNH). **E**. *Mesomexovis punctatus* (Karsch, 1879), ♂ (AMNH). **F**. *Mesomexovis subcristatus* (Pocock, 1898), ♂ (AMNH). Scale bars = 1 mm.

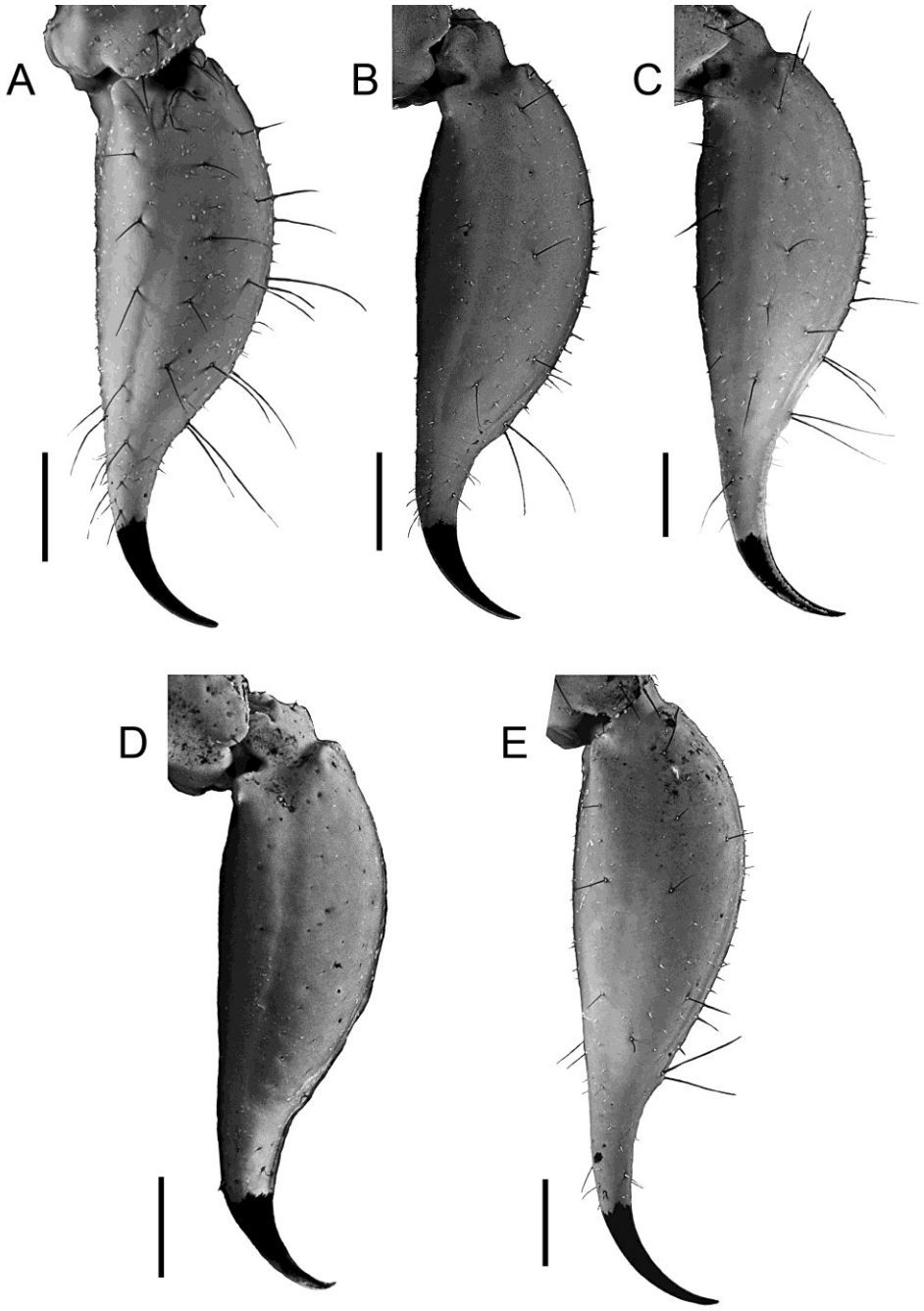


Figure 298. *Mesomexovis* González-Santillán and Prendini, in prep. Telson, lateral aspect. **A**. *Mesomexovis tinctus*, **n. sp.**, paratype ♂ (AMNH). **B**. *Mesomexovis tlayoli*, **n. sp.**, paratype ♂ (AMNH). **C**. *Mesomexovis ofeliae*, **n. sp.**, paratype ♂ (AMNH). **D**. *Mesomexovis variegatus* (Pocock, 1898), ♂ (AMNH). **E**. *Mesomexovis zaragozai*, **n. sp.**, paratype ♂ (AMNH). Scale bars = 1 mm.

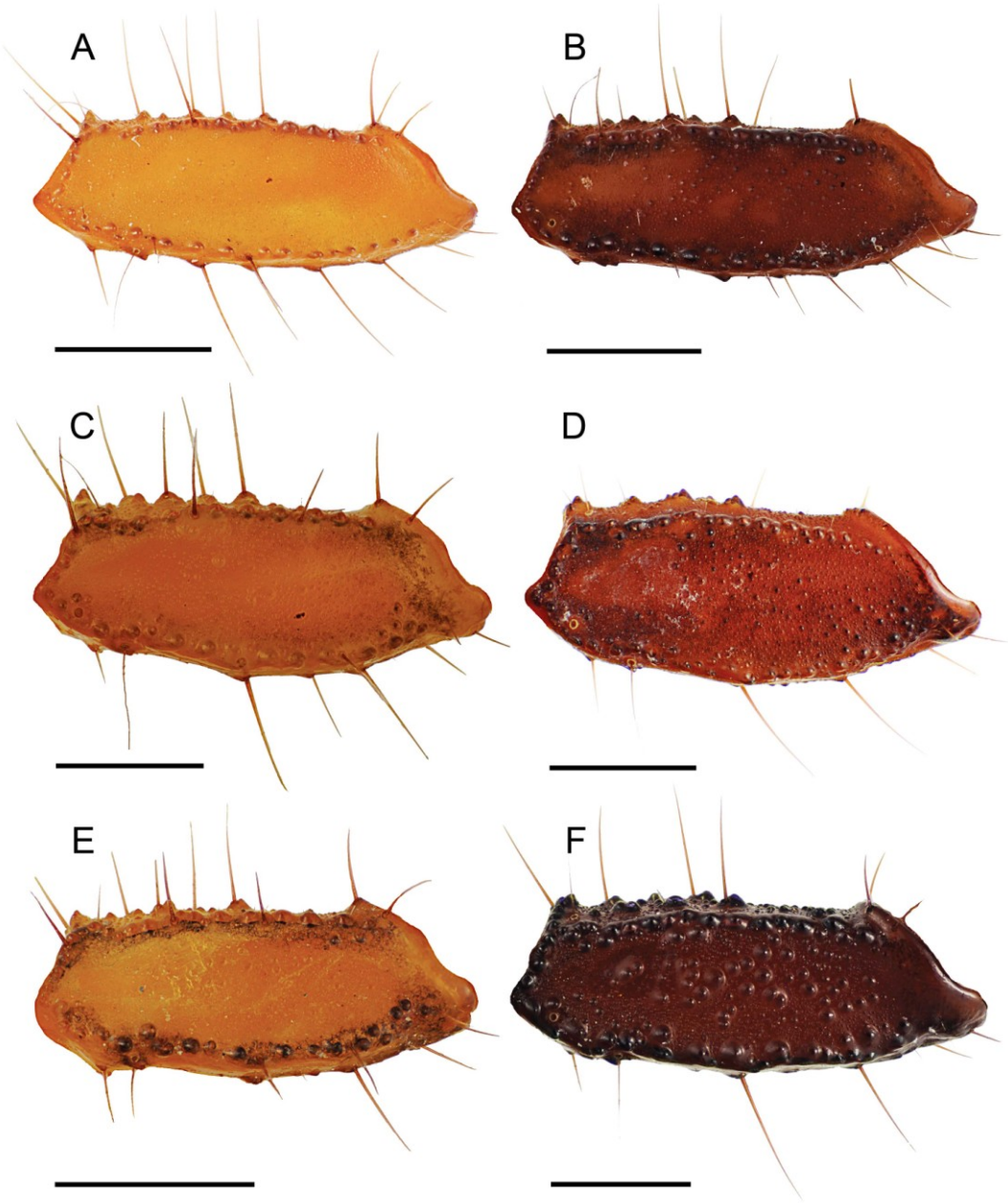


Figure 299. *Mesomexovis* González-Santillán and Prendini, in prep. Dextral dorsal pedipalp femur. **A**. *Mesomexovis atenango* (Francke and González-Santillán, 2007), ♂ (IBUNAM). **B**. *Mesomexovis caxcan*, **n. sp.**, paratype ♂ (AMNH). **C**. *Mesomexovis fasciatus* Sissom and Hughes, in prep., ♂ (AMNH). **D**. *Mesomexovis hesperus* Sissom and Hughes, in prep., ♂ (AMNH). **E**. *Mesomexovis izazagai*, **n. sp.**, paratype ♂ (AMNH). **F**. *Mesomexovis mintoni* Sissom and Hughes, in prep., ♂ (AMNH). Scale bars = 1 mm.

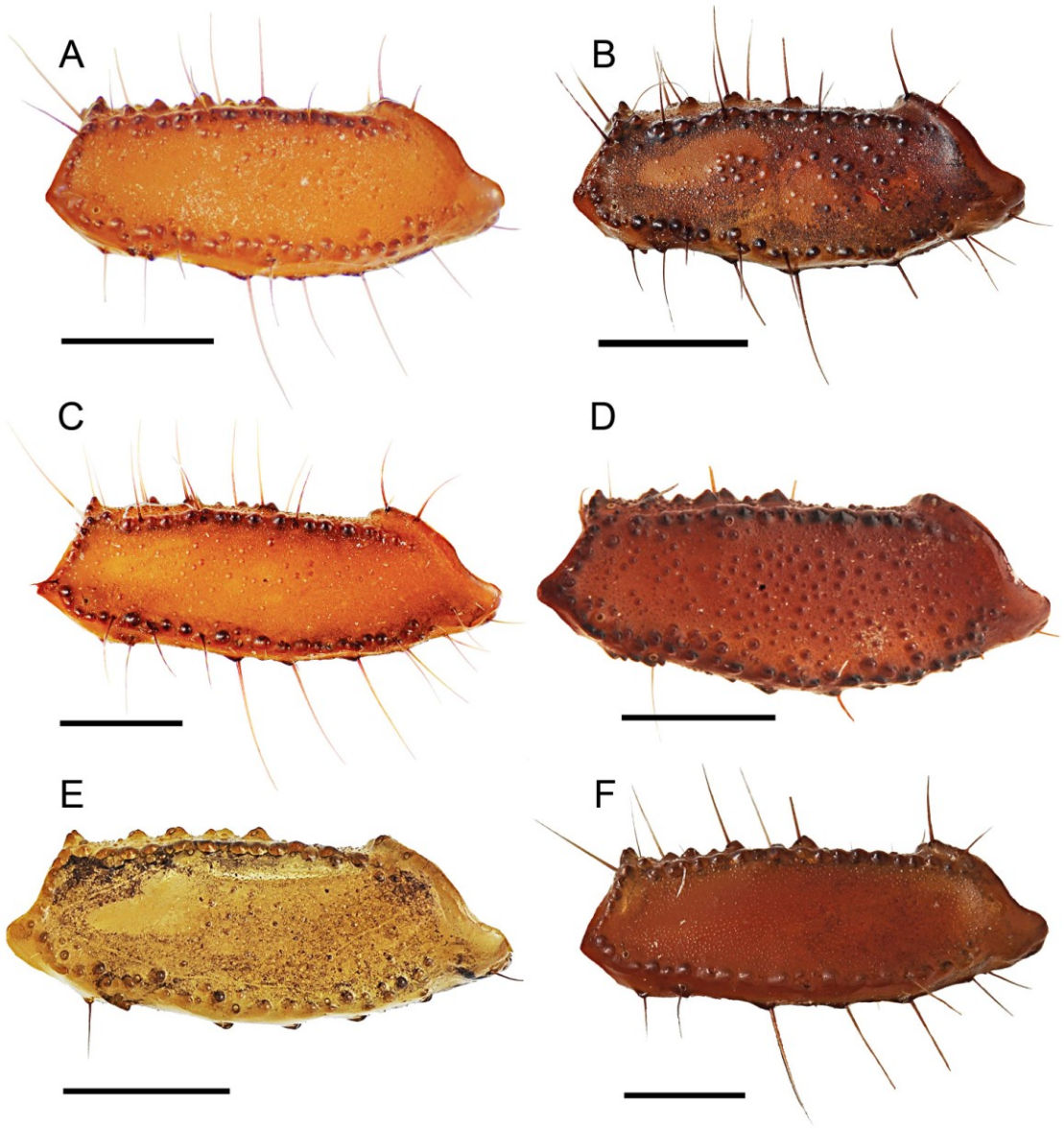


Figure 300. *Mesomexovis* González-Santillán and Prendini, in prep. Dextral dorsal pedipalp femur. **A**. *Mesomexovis nigropictus* (Pocock, 1898), ♂ (AMNH). **B**. *Mesomexovis oaxaca* (Santibáñez-López and Sissom, 2010), ♂ (AMNH). **C**. *Mesomexovis occidentalis* (Hoffmann, 1931), paratype ♂ (AMNH). **D**. *Mesomexovis ponce* Sissom and Hughes, in prep., ♂ (AMNH). **E**. *Mesomexovis punctatus* (Karsch, 1879), ♂ (AMNH). **F**. *Mesomexovis subcristatus* (Pocock, 1898), ♂ (AMNH). Scale bars = 1 mm.

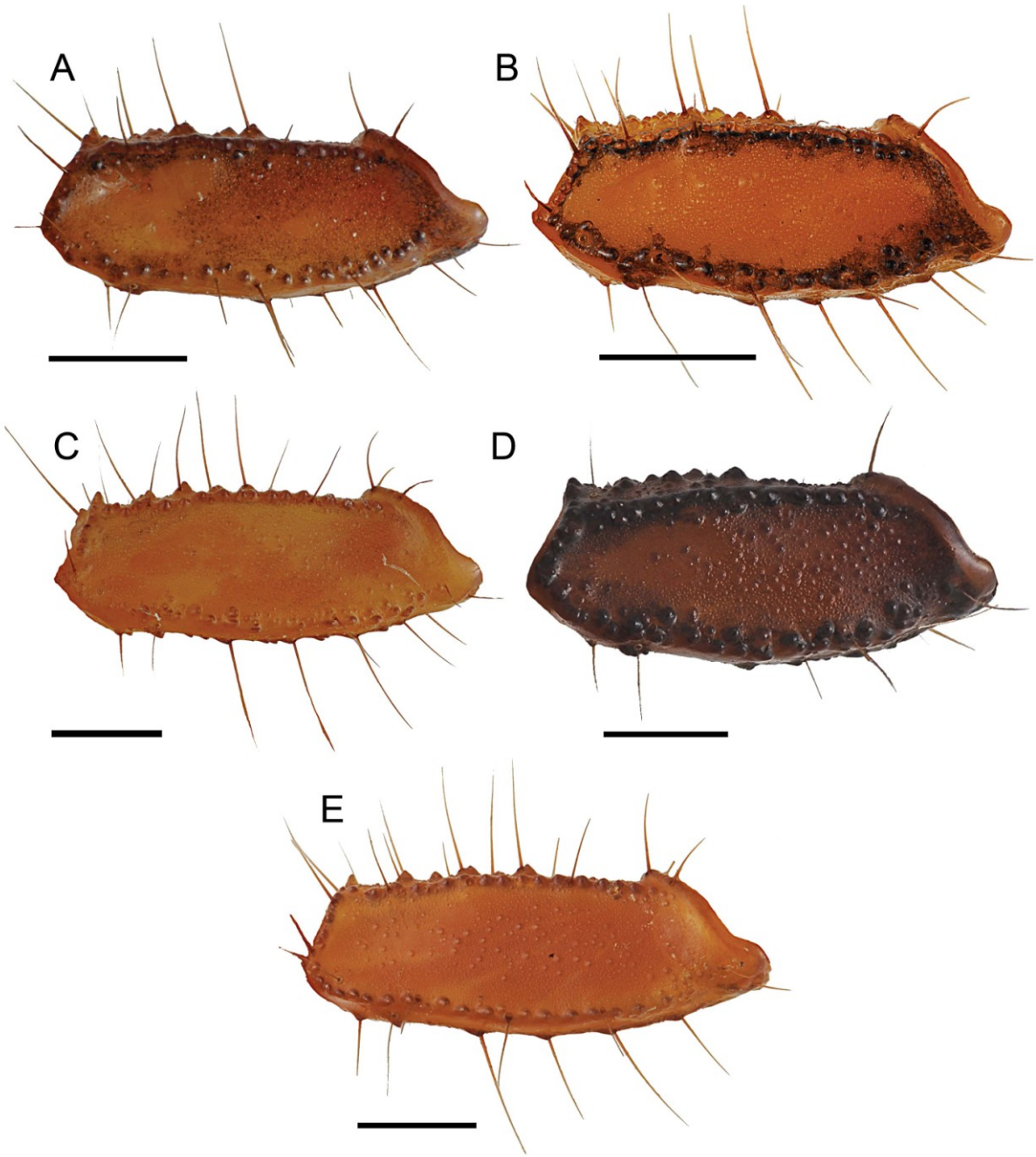


Figure 301. *Mesomexovis* González-Santillán and Prendini, in prep. Dextral dorsal pedipalp femur. **A**. *Mesomexovis tinctus*, **n. sp.**, paratype ♂ (AMNH). **B**. *Mesomexovis tlayoli*, **n. sp.**, paratype ♂ (AMNH). **C**. *Mesomexovis ofeliae*, **n. sp.**, paratype ♂ (AMNH). **D**. *Mesomexovis variegatus* (Pocock, 1898), ♂ (AMNH). **E**. *Mesomexovis zaragozai*, **n. sp.**, paratype ♂ (AMNH). Scale bars = 1 mm.

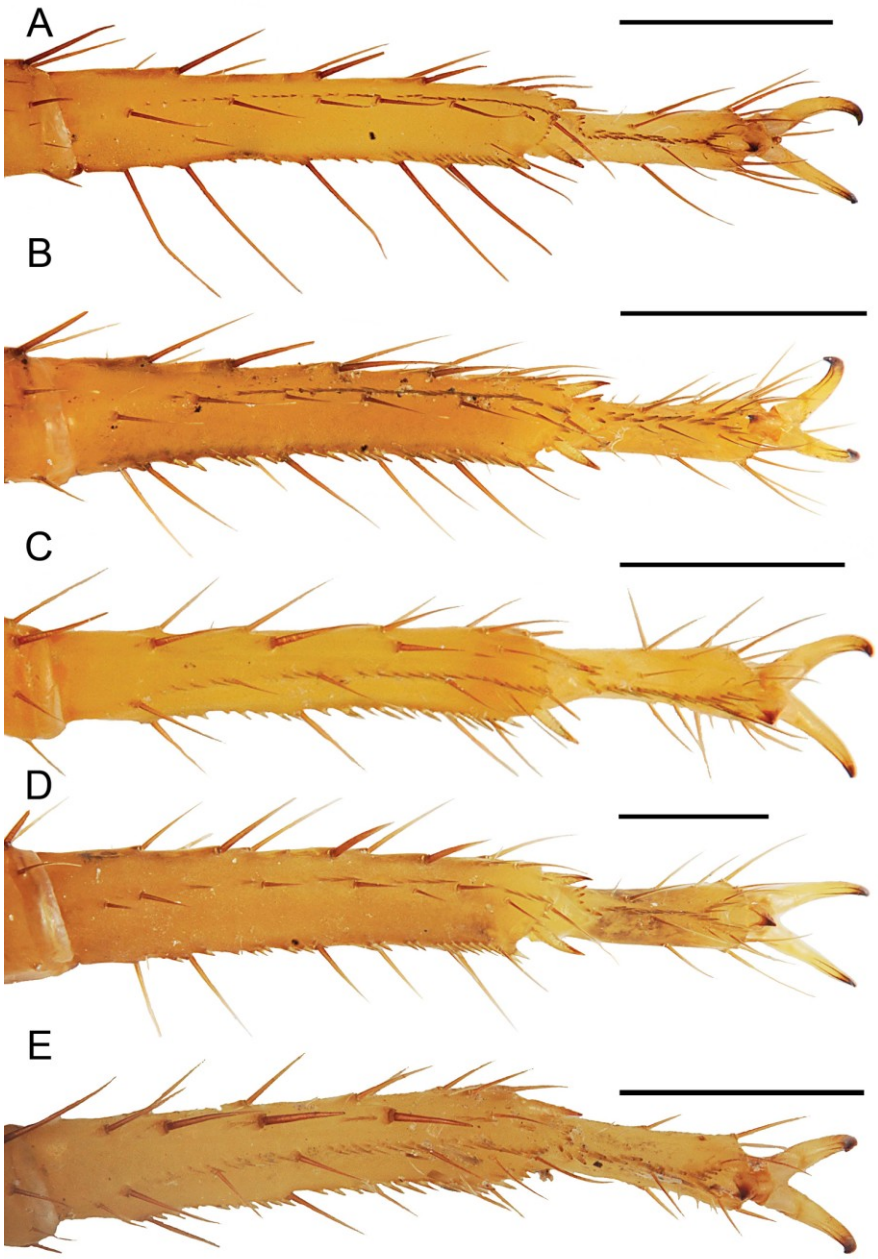


Figure 302. *Mesomexovis* González-Santillán and Prendini, in prep. Dextral basitarsus and telotarsus III. **A**. *Mesomexovis atenango* (Francke and González-Santillán, 2007), ♂ (IBUNAM). **B**. *Mesomexovis caxcan*, **n. sp.**, paratype ♂ (AMNH). **C**. *Mesomexovis fasciatus* Sissom and Hughes, in prep., ♂ (AMNH). **D**. *Mesomexovis hesperus* Sissom and Hughes, in prep., ♂ (AMNH). **E**. *Mesomexovis izazagai*, **n. sp.**, paratype ♂ (AMNH). Scale bars = 1 mm.

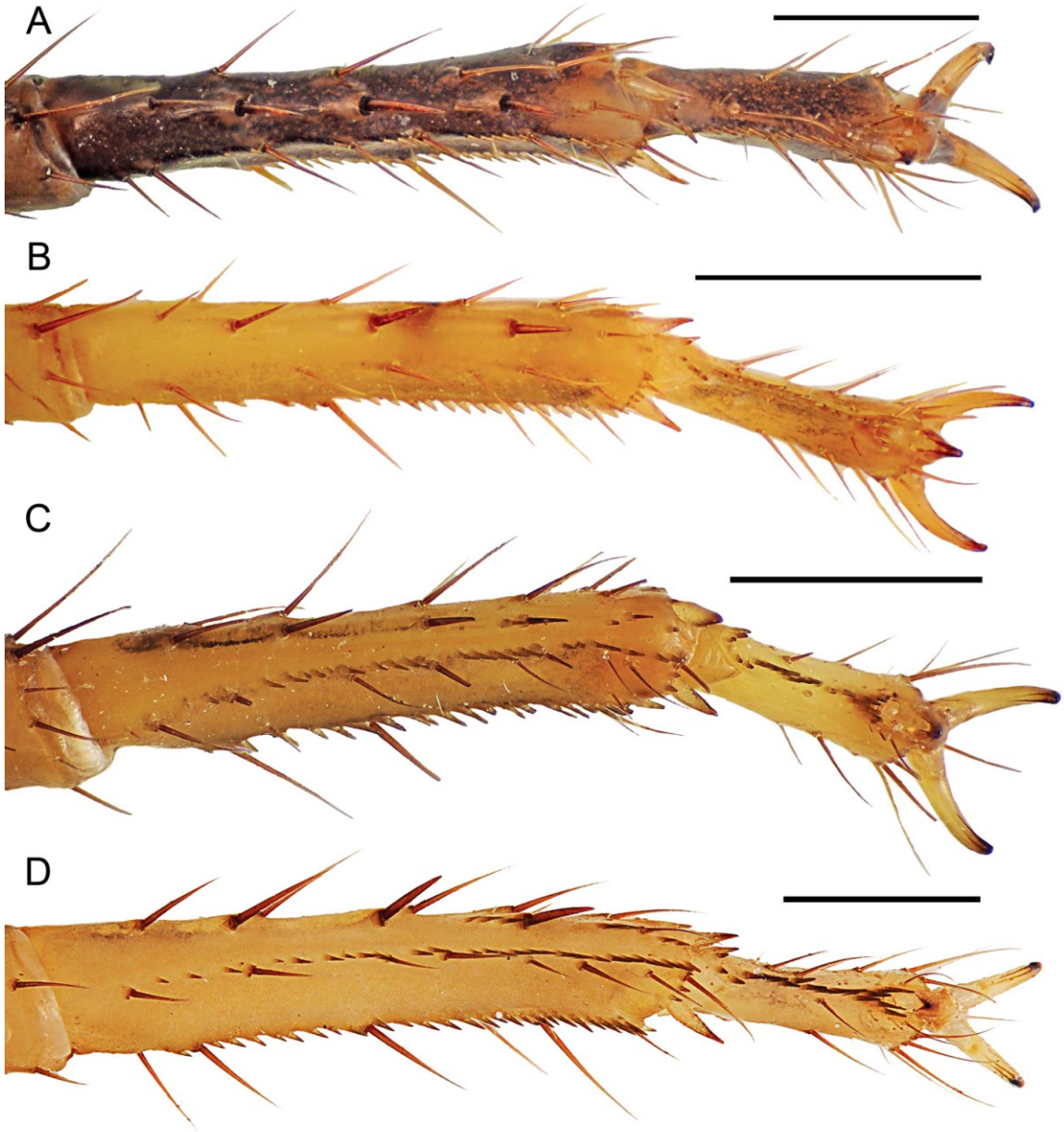


Figure 303. *Mesomexovis* González-Santillán and Prendini, in prep. Dextral basitarsus and telotarsus III. **A**. *Mesomexovis mintoni* Sissom and Hughes, in prep., ♂ (AMNH). **B**. *Mesomexovis nigropictus* (Pocock, 1898), ♂ (AMNH). **C**. *Mesomexovis oaxaca* (Santibáñez-López and Sissom, 2010), ♂ (AMNH). **D**. *Mesomexovis occidentalis* (Hoffmann, 1931), paratype ♂ (AMNH). Scale bars = 1 mm.

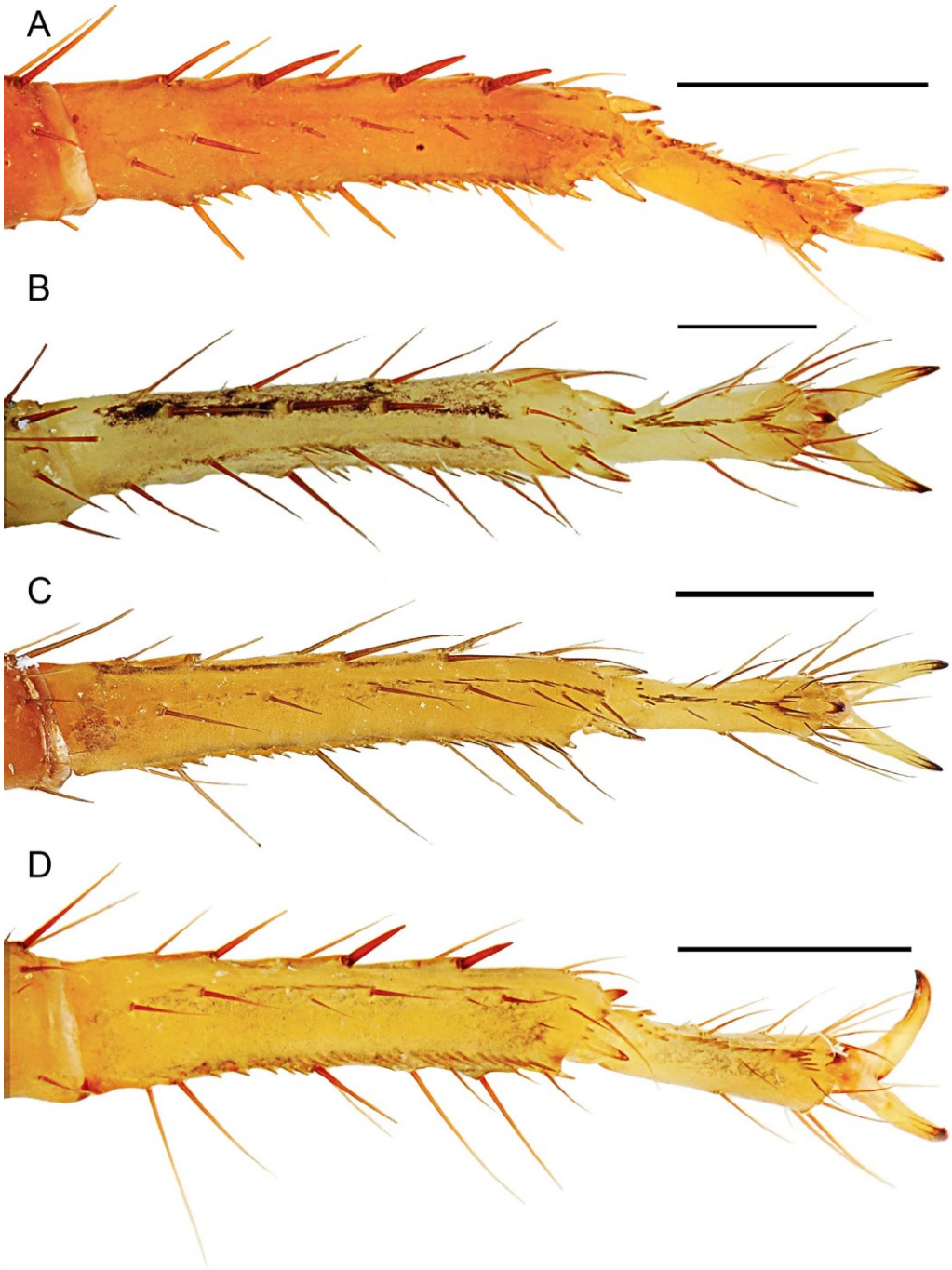


Figure 304. *Mesomexovis* González-Santillán and Prendini, in prep. Dextral basitarsus and telotarsus III. **A**. *Mesomexovis ponce* Sissom and Hughes, in prep., ♂ (AMNH). **B**. *Mesomexovis punctatus* (Karsch, 1879), ♂ (AMNH). **C**. *Mesomexovis subcristatus* (Pocock, 1898), ♂ (AMNH). **D**. *Mesomexovis tinctus*, **n. sp.**, paratype ♂ (AMNH). Scale bars = 1 mm.

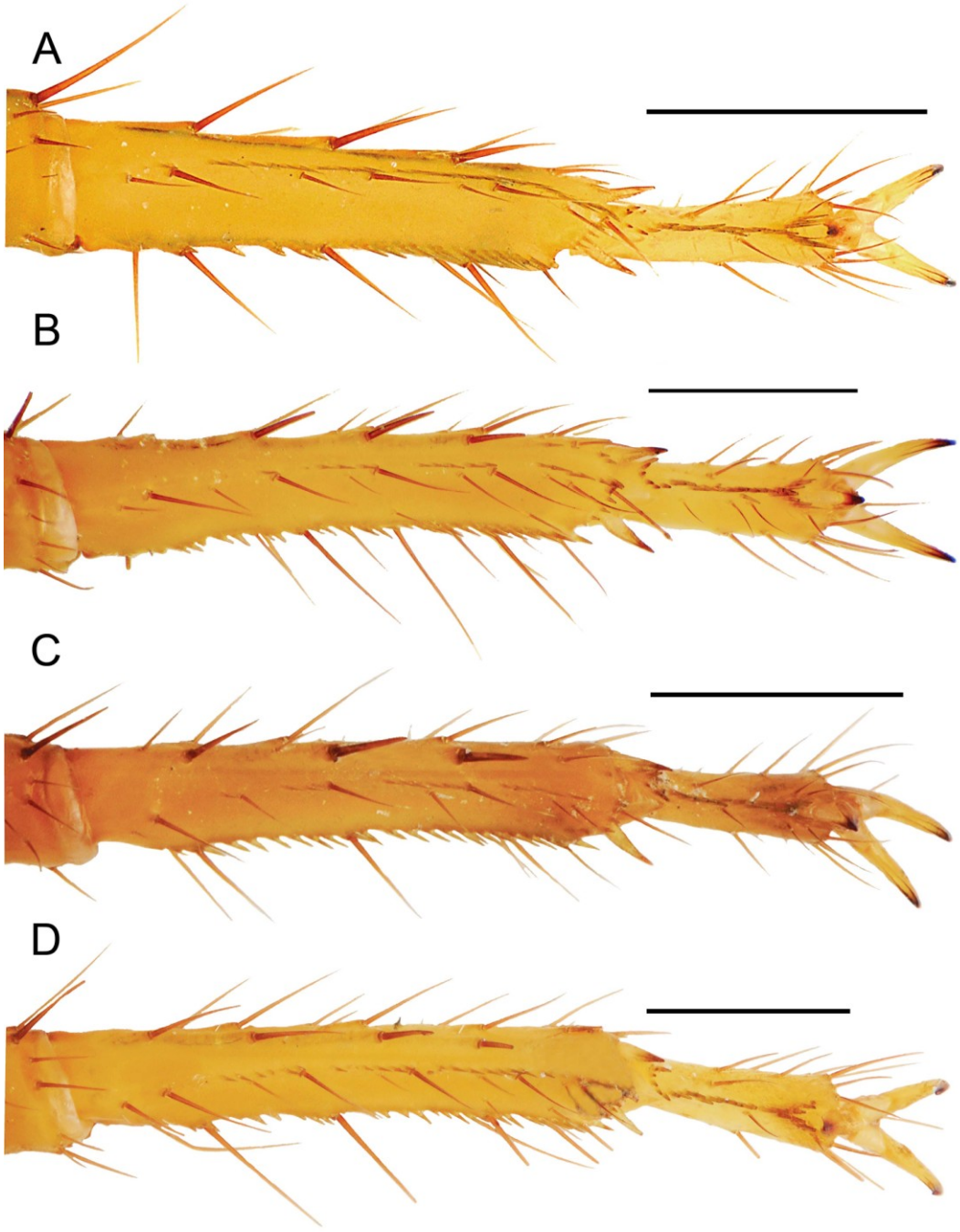


Figure 305. *Mesomexovis* González-Santillán and Prendini, in prep. Dextral basitarsus and telotarsus III. **A**. *Mesomexovis tlayoli*, **n. sp.**, paratype ♂ (AMNH). **B**. *Mesomexovis ofeliae*, **n. sp.**, paratype ♂ (AMNH). **C**. *Mesomexovis variegatus* (Pocock, 1898), ♂ (AMNH). **D**. *Mesomexovis zaragozai*, **n. sp.**, paratype ♂ (AMNH). Scale bars = 1 mm.

CHIHUAHUANUS González-Santillán and Prendini, in litt.

KEY TO IDENTIFICATION OF THE SPECIES OF *Chihuahuanus*

1. Ventral lateral and ventral median carinae of metasomal segments I–IV, including ventral median carinae of V outlined with heavy infuscation, carapace interocular, posterolateral, and posteromedian surfaces, tergites I–VII, and intercarinal surfaces, intensely infuscated with pattern markings……..……..……..……..……..……..……..2

- Ventral lateral and ventral median carinae of metasomal segments I–IV, including ventral median carinae of V diffusely infuscate to immaculate, carapace interocular, posterolateral, and posteromedian surfaces, tergites I–VII, and intercarinal surfaces diffusely infuscate to immaculate…….....…….....……..……..……..……..……..……3

2. Pedipalp chela carinae obsolete and infuscated, metasomal segment V heavily infuscate, ventral submedian carinae of metasomal segment II and III ventral lateral carinae of metasomal segments I–III and obsolete to weakly crenular, ventral prolateral and ventral retrosubmedian carinae of pedipalp patella obsolete.....*C. bilineatus*

- Pedipalp carinae weakly costated and diffusely infuscate, metasomal segment V moderately infuscate, ventral submedian carinae of metasomal segment II and III finely granular, ventral lateral carinae of metasomal segments I–III strongly granular, ventral prolateral and ventral retrosubmedian carinae of pedipalp patella strongly granular to crenular.....*C. coahuilae*

3. Dorsal prolateral, dorsal median, dorsal retrosubmedian accessory, dorsal retrolateral, retrolateral ventral, ventral prolateral, and prolateral median carinae moderately to strongly granular..….....4

- Dorsal prolateral, dorsal median, dorsal retrosubmedian accessory, dorsal retrolateral, retrolateral ventral, ventral prolateral, and prolateral median, moderately to strongly costated smooth……..……..…6

4. Ventral median carinae of metasomal segment I strongly granular, basal notch and medial lobe of pedipalp fixed finger, and basal notch of movable finger moderately developed……..*C. russelli*

- Ventral median carinae of metasomal segment I costated and smooth, basal notch and medial lobe of pedipalp fixed finger, and basal notch of movable finger absent, cutting edge straight……..…….…….…….…….……5

5. Pedipalp chela relatively incrassate, base of chela fingers darker than manus, reddish, telson darker than metasomal segment V, and reddish, telson of ♀ relatively slender, not expanded laterally…….…….…….…….…… *C. crassimanus*

- Pedipalp chela relatively slender, base of chela fingers as pale as manus, yellowish, telson as pale as metasomal segment V, and yellowish, telson of ♀ relatively globose, expanded laterally…....….....….....….....….....….....….....…….....*C. panchovillai*, **n. sp.**

6. Ventral submedian carinae of metasomal segment I, finely crenatoserrate on distal third, on segment II completely finely crenatoserrate, number of macrosetae on ventral lateral and in dorsal lateral carinae of metasomal segment V six, telson of ♀ relatively globose, expanded laterally……..…….…….……...*C. globosus*

- Ventral submedian carinae of metasomal segment I smooth, on segment II smooth to weakly crenatoserrate, number of macrosetae on ventral lateral carinae of metasomal segment V 12–13, and in dorsal lateral carinae seven to eleven, telson of ♀ relatively elongated, not expanded laterally……7

7. Ventral retrolateral carinae of pedipalp chela obsolete to weakly costated, prolateral ventral carinae of pedipalp femur with four macrosetae, dorsal retrolateral carinae of pedipalp chelae with three macrosetae…….…….…….....*C. glabrimanus*

- Ventral retrolateral carinae of pedipalp chela strongly costated and partially crenulated, prolateral ventral carinae of pedipalp femur with nine macrosetae, dorsal retrolateral carinae of pedipalp chelae with seven macrosetae….…….…….…….……*C. kovariki*

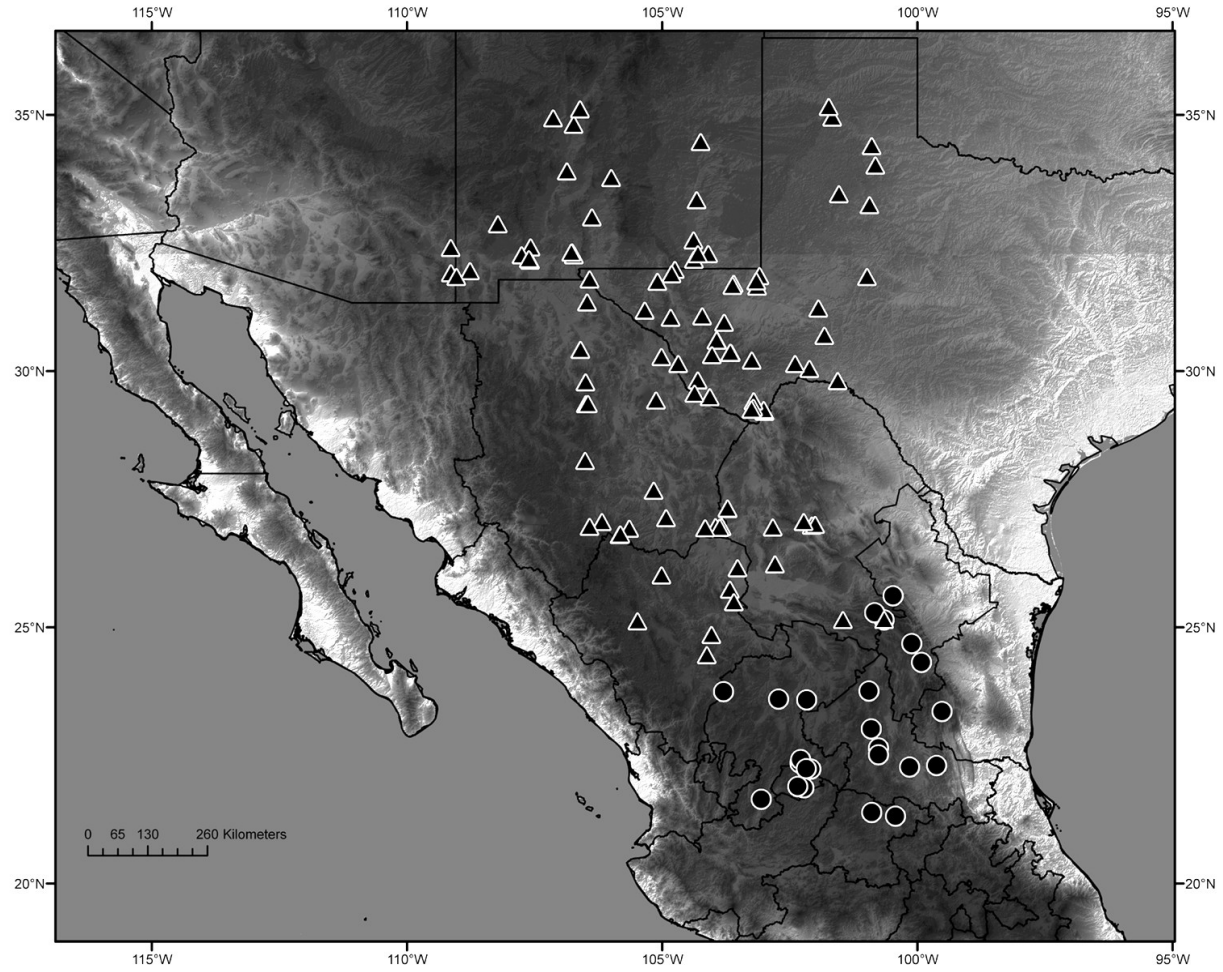


Figure 306. Map of North America, plotting known locality records for two species in the vaejovid scorpion genus *Chihuahuanus* González-Santillán and Prendini, in litt., based on data collected in the present study: *Chihuahuanus coahuilae* (Williams, 1968) (triangles), *Chihuahuanus glabrimanus* (Sissom and Hendrixson, 2005) (circles), darker contour indicates increase of altitudinal gradient.

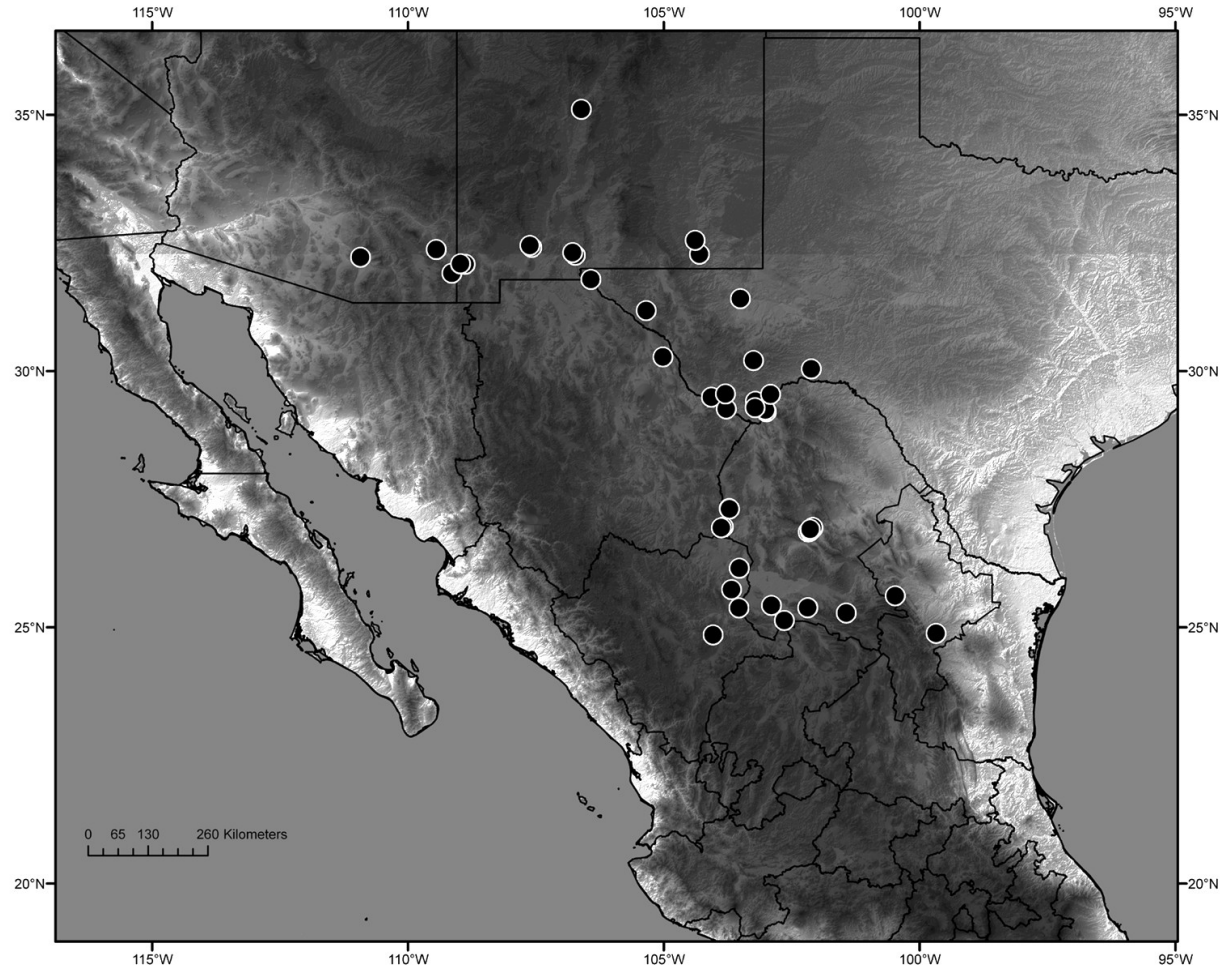


Figure 307. Map of North America, plotting known locality records for two species in the vaejovid scorpion genus *Chihuahuanus* González-Santillán and Prendini, in litt., based on data collected in the present study: *Chihuahuanus crassimanus* (Pocock, 1898) (circles), darker contour indicates increase of altitudinal gradient.

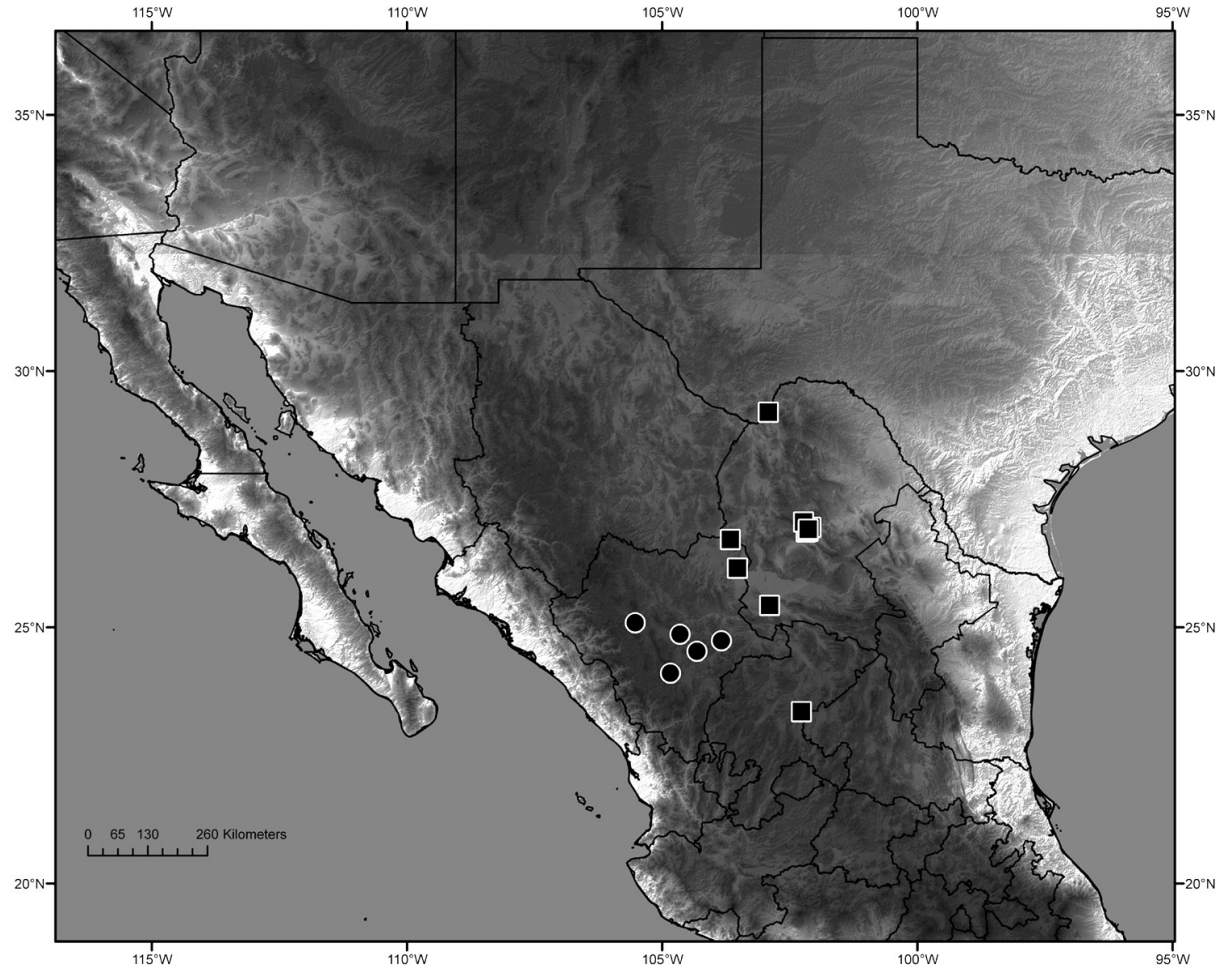


Figure 308. Map of North America, plotting known locality records for two species in the vaejovid scorpion genus *Chihuahuanus* González-Santillán and Prendini, in litt., based on data collected in the present study: *Chihuahuanus globosus* (Borelli, 1915) (squares), *Chihuahuanus kovariki* (Soleglad and Fet, 2008) (circles), darker contour indicates increase of altitudinal gradient.

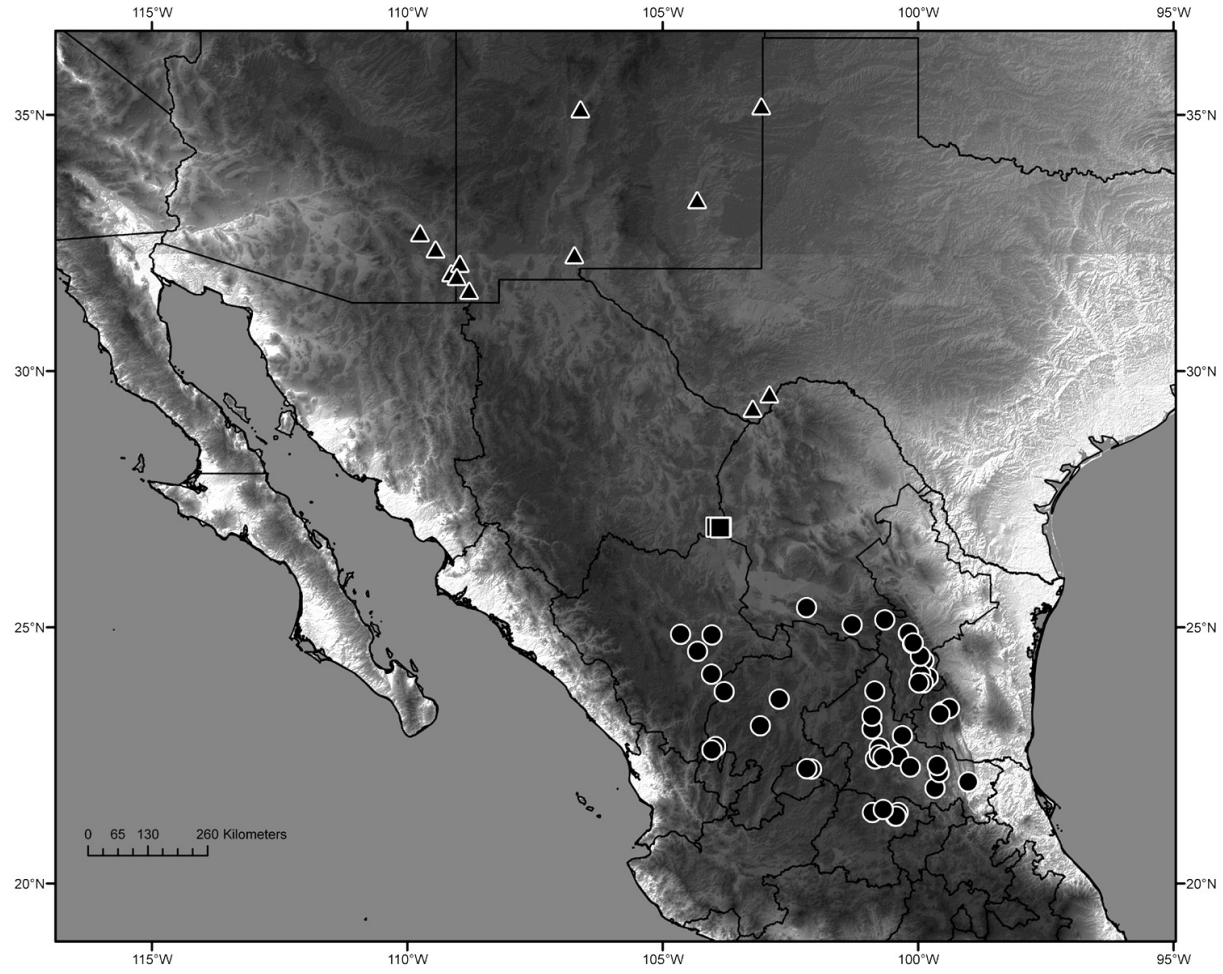


Figure 309. Map of North America, plotting known locality records for three species in the vaejovid scorpion genus *Chihuahuanus* González-Santillán and Prendini, in litt., based on data collected in the present study: *Chihuahuanus bilineatus* (Pocock, 1898) (circles), *Chihuahuanus panchovillai*, **n. sp.** (squares), and *Chihuahuanus russelli* (Williams, 1971) (triangles), darker contour indicates increase of altitudinal gradient.

Chihuahuanus bilineatus (Pocock, 1898)

Figures 309, 310–312, 336A, 338A, 340A, 341A, 344A, 346A, 348A

Vaejovis bilineatus Pocock, 1898: 395; Díaz-Nájera, 1975: 6, 8, 22; Sissom and Francke, 1983: 69–75; Francke and Sissom, 1984: 17, tabs. 6, 7; Sissom, 1991b: 14; Yahia and Sissom, 1996: 81–87; Kovařík, 1998: 146; Sissom and Jackman, 1997: 151; Beutelspacher, 2000: 74, 138, 139, 143, 145, 147, 152, map 48; Sissom, 2000: 530; Hendrixson, 2001: 49; Sissom and Hendrixson, 2005a: 134, 128, tab. 6.2; 2005b: 33, 34, 41 (key); Soleglad and Fet, 2005: 5; McWest, 2009: 19, tab. 1, 41, 55, 63, 116.

Vejovis spinigerus var. *bilineata*: Kraepelin, 1899: 187.

Vejovis bilineatus: Borelli, 1915: 5; Hoffmann, 1931: 362–364, fig. 26; Gertsch, 1958: 7; Williams, 1970d: 238–241, figs. 1, 2; Gertsch and Soleglad, 1972: 605, 606.

Hoffmannius bilineatus: Soleglad and Fet, 2008: 71, 73, 91.

TYPE MATERIAL: **U.S.A.:** Holotype ♀ (BMNH), "San Diego, Texas", spurious locality according to Sissom (2000) [not examined].

DIAGNOSIS: *Chihuahuanus bilineatus* is closely related to *C. coahuilae*, with which forms a monophyletic group, which in turns is sister to the monophyletic group including (*C. globosus* + *C. panchovillai*)(*C. kovariki* + *C. glabrimanus*). *C. bilineatus* and *C. coahuilae* may be separate from these species by having carapace and tergites infuscate with dusky markings and metasomal segments I–IV outlined with intense infuscation, instead of having moderate to diffuse and weak infuscation and metasomal carinae immaculate to partially infuscate on distal third of segments IV and V. *C. bilineatus* may be distinguished from *C. coahuilae* by having pedipalp chelae carinae obsolete, instead of having ventral median, ventral prolateral and

prolateral median moderately to weakly costate. *C. bilineatus* has ventral prolateral and ventral retrosubmedian carinae of pedipalp patella obsolete, weakly angular, instead of having strongly granular to crenular. *C. bilineatus* has ventral surface of metasomal segment V moderately to strongly shagreened, instead of having it matte. *C. bilineatus* has metasomal segment V almost completely and intensely infuscate, rather than moderate and diffusely infuscate.

DESCRIPTION: This redescription supplements Yahia and Sissom's (1996) revision and is based on the material deposited in the collections mentioned below.

Color and infuscation: Body color base medium yellow to dark orange. Carapace, mesosomal tergites, prolateral side of legs and metasoma infuscate with dusky markings. Median and lateral ocular tubercles intensely infuscate. Pedipalp femur and patella with dorsal, prolateral and retrolateral carinae outlined with diffuse infuscation; chelae with all carinae outlined with diffuse infuscation. Proximal half of pedipalp fingers infuscate. Tergites with ventral median carinae immaculate. Metasomal segments becoming more intensely and broadly infuscate distally, being IV and V almost completely infuscate. All carinae of metasomal segments outlined with infuscation. Aculeus dark brownish.

Carapace: Carapace 1.14 times longer than posterior width. Frontal margin sublinear, with vestigial medial notch and three pairs of major macrosetae and two pairs of intersperse minor macrosetae. Carapace shagreened, densely cover by minute granules and scattered coarse moderate granules. Median ocular tubercle completely rose, such that medina eyes position is completely above of carapace surface. Superciliary carinae weak and smooth lower than medina ayes. Position of medina ocular tubercle on anterior half. Three pairs of lateral eyes, two frontal pairs same size and posterior slightly reduced. Median eyes approximately three time the size of

lateral frontal pair. Anteromedian sulci shallow, posteromedian and posterolateral moderate, posterior transverse obsolete.

Sternum and coxal region: Sternum pentagonal subequilateral with three pairs of setae, one distal, one median pair and one pair on the lobes, surface matte, median notch deep. Anterior margin of coxa II with three oblique slit-like structures, adjacent to a moderate and smooth protuberance. Base of coxal endite II with a deep depression each. Coxa IV 1.95 times longer than coxa II.

Chelicerae: Dorsal surface smooth, subdistal margin of manus with one macrosetae. Distal margin with costate carinae. Serrula present on ventral distal half of movable finger, tines numbering 12.

Pedipalps: Trichobothrial pattern Type C, orthobothriotaxic. Chela wider than patella, patella wider than femur. Femur: All intercarinal surfaces matted except prolateral surface shagreened. Dorsal prolateral and dorsal retrolateral and ventral prolateral complete with moderate irregular granules; retrolateral dorsosubmedian obsolete, expressed only by two macrosetae on median aspect; retrolateral ventral vestigial, expressed by two or three proximal minute granules; ventral median vestigial, expressed only on proximal extreme by a short row of granules; prolateral ventrosubmedian partial expressed by a proximal tubercle adjacent to trichobothrium *i*, positioned at proximal mid surface followed by three or four rounded and broad enlarged granules, median enlarged granules with a macroseta at base, slanting gently towards distal end of dorsal prolateral carinae; prolateral ventral vestigial, expressed by one proximal macroseta, one subdistal tubercle with a macroseta on top and three other scattered enlarged granules with a macrosetae on top, these granules slanting gently towards distal end of

ventral prolateral carinae; prolateral ventrosubmedian and prolateral ventral carinae diverging distally.

Patella: Dorsal and prolateral surface matte, ventral and retrolateral surface smooth. Dorsal prolateral complete strongly crenulated; dorsal retrolateral complete weakly crenulated; retrolateral dorsosubmedian and retrolateral median vestigial, expressed by a weak low costa and infuscation; ventral retrolateral obsolete weakly angular; ventral retrosubmedian complete strongly granular; ventral median vestigial, expressed as a short proximal costa; ventral prolateral obsolete, expressed by two macrosetae, one proximal and one distal adjacent to ventral prolateral; prolateral median on a vaulted projection with expressed by a proximal tubercle with a macrosetae on top and a row of scattered and coarse crenulation, protruding strongly medially; distal extreme with crenulated ridge slanting dorsally almost reaching dorsal prolateral carinae on distal fifth of the segment.

Chela: Manus smooth and relatively elongate (manus 1.45 times longer than fixed finger). All carinae obsolete, express by infuscation. Trichobothrium *Db* positioned on dorsal retrolateral carina, subbasal on chelae; *Dt* positioned close to mid manus but on the proximal half.

Fingers: Fix finger, PD = 6, MD rows = 5, RD = 5, proximal RD positioned by mid finger. All RD subpaired with corresponding PD. Movable finger, PD = 7, MD rows = 6, distal row bearing one minute granule, RD = 6, proximal RD positioned by mid finger. All RD subpaired with corresponding PD. Trichobothria *ib* and *it* positioned subbasal on fix finger, in ♂ positioned between PD6 and PD7, PD7 lacking granule, in ♀ *ib* between PD6 and PD7, PD7 lacking granule and *it* at the level of PD6; Fingers with moderate scalloping in ♂, proximal notch

of fixed finger moderate and medina lobe weak, gap created when fingers closed strong fingers fit unevenly, in ♀ fingers lacking scalloping, gap created when fingers closed absent.

Legs: Basitarsi I–II prolateral ventral, retrolateral ventral and retrolateral dorsal carinae with complete rows of spinules, prolateral ventral in III partial expressed on distal half, in IV absent; retrolateral ventral in III complete, in IV absent, retrolateral dorsal in III partial expressed on distal half in IV vestigial, expressed as a distal short row; retrolateral median rows in I–IV vestigial expressed as few terminal spinules. Telotarsi I–IV with two pairs of ventrodistal spinules in I–IV. Setae: Prolateral ventral 2:3:4:4; median two in III and proximal three in IV stout; retrolateral ventral 4:4:5:5; retrolateral dorsal 2:3:3:3; dorsal 3:3:3:3; retrolateral median 1:3:3:6; retrolateral dorsal and dorsal series arranged in two independent rows.

Mesosoma: Pretergites matte, postergites matte medially and shagreened laterally. Tergites I–VI median carinae vestigial, expressed by few minute distal granulations; ventral submedian stronger with few moderate distal granules. Tergite VII with intercarinal surfaces shagreened; dorsal median carina moderately costate expressed on proximal half of the postergite; dorsal submedian vestigial expressed as a low short proximal short protuberance; dorsal lateral and lateral supramedian strong and incomplete expressed on distal three fourths of the segment, distal extreme with an enlarged rounded granule; dorsal lateral carinae projecting and curving laterally approximating to lateral supramedian distal margin, creating a semi ring of strong serrated granulation.

Genital operculum: Male genital operculum: wider than long, with three pairs of macrosetae. Sclerites free on longitudinal edge moving independently but unable to open more than 45°. Genital papillae protrude posteriorly. Female genital operculum: Wider than long, with three macrosetae. Sclerites fuse longitudinal.

Sternites: Sternites I–VI smooth, finely punctuated, and lustrous. Sternite V with distal median glandular spot moderate, not protruding from adjacent surface but whitish, contrasting strongly with darker base color. Sternite VII moderately matte laterally and smooth ventrally; all carinae obsolete, expressed only by pairs of macrosetae. Distomedian glandular spot moderate in ♂, subtriangular wider than long, moderately protruding from adjacent surface, in ♀ lower and poorly developed. Spiracle elongated, slit-like, approximately two times longer than wide.

Pectines: Pectines longer than distal edge of coxa IV in ♂, in ♀ at the level of distal edge of coxa IV. Basal piece with median notch deep. Marginal lamella consist of three sclerites, medial lamella proximally fuse distally progressively forming conspicuous 11 beads. Fulcra with 14–18 in ♂, in ♀ 13–15 beads. Pectinal tooth count 15–19 in ♂, 14–16 in ♀.

Hemispermatophore: Lamina 1.65 longer than trunk. Dorsal through margin long, narrow, curving proximally, and removed from ventral trough. Hemimating plug developed from the inner lobe, distal barb margin with 10 elongated spinules. Primary and secondary hook positioned on the apex of lateral margin extension of the lamina (flange). Both hooks rounded low, separated slightly, forming a shallow notch. Median lobe ental terminus moderated and rounded. Basal plate of inner lobe adjacent to ventral trough. Spine of inner lobe moderate. Neck relatively short (0.37 times longer than basal plate). Measurements, lamina, 2.58; trunk, 1.56; dorsal trough/laminar hooks, 1.14; ventral trough/laminar hook, 0.90; neck, 0.18; basal plate, 0.48.

Metasoma: Dorsal intercarinal surfaces shagreened, with median lateral clusters of moderated granules, becoming weaker in distal segments. Lateral and ventral surfaces moderately matte, medially smooth. Metasoma 1.4 times longer than mesosoma. Metasomal segments I–III wider than long. Carinae: Dorsal lateral and lateral median carinae in I–IV

strongly crenatoserrated terminating in moderated enlarge spinoid granules pointing backwards; except lateral median in IV distal terminus strongly expanded or flared laterally forming a triangular projection; dorsal lateral in V proximally strong and serrated, becoming weaker and crenulated. Lateral inframedian in I complete crenatoserrated; in II incomplete crenatoserrated, becoming weaker proximally, present on distal half; in III incomplete crenatoserrated, becoming weaker proximally, present in distal third; in VI absent, in V proximally strongly crenatoserrated, becoming weaker distally, present in proximal half; ventral lateral in I–V strongly crenatoserrate, becoming granules larger and stronger in distal segments IV and V, in ♂, in ♀ I–IV moderately costate and smooth, in V strongly crenatoserrate; ventral submedian in I obsolete, in II–IV obsolete to moderately crenatoserrated, in ♂, in ♀ obsolete; ventral median in V crenatoserrated bifurcating at distal end in two rows of two or three enlarge serrated granules. Setae: Dorsal lateral carinae, 1:1:2:2:7; lateral median; 2:2:3:6; lateral inframedian, 2:3:1:1:7, ventral lateral, 3:5:5:3:15, setae in IV and V positioned laterally to the carinae, ventral submedian, 3:3:5:5:8, ventral sublateral, 2. Three to six accessory major and minor macrosetae in intercarinal surfaces between ventral submedian carinae in segments I–IV.

Telson: Telson 2.5 times longer than wide. Metasomal segment V 1.3 times wider than telson. Vesicle 2.3 times longer than aculeus. Dorsal and ventral surface smooth. Dorsal surface with a fusiform minute glandular spot at or adjacent to the base of aculeus. Ventral surface with five to six macrosetae in each carina. Ventral median carinae with vestigial subaculear tubercle, Microserration on laterobasal aculeus numbering 3–5.

DISTRIBUTION: *Chihuahuanus bilineatus* is distributed in the southern extreme of the Chihuahuan Desert, including the states of Aguascalientes, Coahuila, Durango, Guanajuato, Jalisco, Nuevo León, San Luis Potosí, Tamaulipas, and Zacatecas, Mexico.

ECOLOGY: *Chihuahuanus bilineatus* is found in a myriad of vegetation types, from arid to temperate forest. It has been found under rocks, in the entrance of burrows, inside rotten logs and inside the leaf litter. This diversity is match by the wide rage of elevations in which it has been recorded, from 624 to 2357 m altitude.

REMARKS: Yahia and Sissom (1996) studied extensively the morphological variation and distribution of this species. They concluded that *C. bilineatus* inhabits a wide distributional range, which is expanded here to Durango, and it is a variable species in terms of color pattern and setal counts. These observations are confirmed here and complemented with the redescription of the species based on abundant material. *C. bilineatus* is not known from Texas (the seemingly spurious type locality), its northern distribution is not known to never cross the border between Mexico and the U.S.A.

MATERIAL EXAMINED: **MEXICO: Aguascalientes:** *Municipio de Asientos*: Asientos, 3.2 km SW, [22°14'N 102°5'W], 2225 m, B. Banta, 2 ♂, 1 ♀, 21 juv. (AMNH). *Municipio de Tepezala*: Tepezala, 3 ♂, 4 ♀, 1 juv. (AMNH); Tepezala, 1 km N, 22°14.348'N 102°10.467'W, 2048 m, 4.vii.2005, O. Francke, J. Ponce, M. Córdova, A. Jaimes, G. Francke, and V. Capovilla, 1 ♂, 1 ♀ (AMNH [LP 5272]). **Coahuila:** *Municipio de Coahuila de Zaragoza*: between India and Tinajuela, 25°2.8686'N 101°17.3286'W, 1979 m, 23.vii.2006, K. Mcwest, B. Hendrixson, S. Grant, and W.D. Sissom, scrubland, under rock, 2 subad. ♀ (AMNH [ARA 1139]). *Municipio de Cuatro Ciénegas*: Sierra San Marcos, 26°52'36.62"N 102°8'15.80"W, 761 m, 18.vii.2006, O. Francke, W.D. Sissom, K. McWest, B. Hendrixson, S. Grant, A. Jaimes, M. Córdova, E. González, and A. Ballesteros, 5 ex. (AMNH); Ojo de Agua, Ejido El Oso, 1039 m, 19.vii.2006, O. Francke, W.D. Sissom, K. McWest, B. Hendrixson, S. Grant, A. Jaimes, M. Córdova, E. González, and A. Ballesteros, 1 ♂, 1 juv. (AMNH [LP 6606]). *Municipio de Ocampo*: Agua

Verde Ranch, 1021 m, 29.i.2005, P. Sprouse and C. Savvas, 1 ♂, 1 ♀ (AMNH [LP 4112]). *Municipio de Parras*: Sierra de Parras, 8 km S of Parras, 25°23.0550'N 102°10.89'W, 1922 m, 21.vii.2008, E. González et al., 5 ex. (AMNH). **Durango:** *Municipio de Durango*: Hwy 137, marker km 4, between Once de Marzo and San Juan del Río, San Francisco de Lajas, 24°51.764'N 104°38.846'W, 1893 m, 10.viii.2005, O. Francke, W.D. Sissom, K. McWest, C. Lee, H. Montaño, J. Ballesteros, L. Jarvis, and C. Durán, rock rolling by day, 4 juv. (AMNH [LP 5300]). *Municipio de Pánuco de Coronado*: La Mina, Hwy 137, between Pánuco de Colorado and San José de Avino, 24°31.809'N 104°18.941'W, 2217 m, 9.viii.2005, O. Francke, W.D. Sissom, K. McWest, C. Lee, H. Montaño, J. Ballesteros, L. Jarvis, and C. Durán, collected at night with UV light, 3 ♂ (AMNH [LP 5491]). *Municipio de Peñón Blanco*: Peñón Blanco, 8 km N, 24°51.1476'N 104°1.98'W, 1667 m, 11.viii.2005, O. Francke, W.D. Sissom, K. McWest, C. Lee, H. Montaño, J. Ballesteros, and L. Jarvis, collected at night with UV light, 1 ♂, 1 ♀ (AMNH [ARA 1469]), 2 ♂ (IBUNAM [ARA 2095]), 1 subad. ♂ (AMNH [LP 5283]). *Municipio de Vicente Guerrero*: Hwy 241, Vicente Guerrero-Guadalupe Victoria, between Cieneguillas and Francisco Zarco, 24°05.129'N 104°02.614'W, 2125 m, 9.viii.2005, O. Francke, W.D. Sissom, K. McWest, C. Lee, H. Montaño, J. Ballesteros, L. Jarvis, and C. Durán, collected at night with UV light, 1 juv. (AMNH [LP 5292]). *Municipio de Villa Unión*: Route DGO 241 Vicente Guerrero-Guadalupe Victoria, between Cieneguillas and Francisco Zarco, 24°5.1288'N 104°2.6136'W, 2125 m, 9.viii.2005, O. Francke, W.D. Sissom, K. McWest, C. Lee, H. Montaño, J. Ballesteros, and L. Jarvis, collected at night with UV light, 3 ♂, 3 ♀, 1 juv. (AMNH [ARA 1475]), 2 ♂, 2 ♀, 1 juv. (AMNH [ARA 1540]), 3 ♂, 3 ♀, 1 juv. (IBUNAM [ARA 2091]). **Guanajuato:** *Municipio de San Diego de la Unión*: San Diego de la Unión, 8 km S, 21°23.1444'N 100°23.4522'W, 2078 m, 28.vii.2006, O. Francke, E. González, A. Jaimes, M. Córdova, and A. Ballesteros, 17 ♂, 2 ♀,

58 juv. (IBUNAM), 1 juv. (AMNH [LP 6533]). *Municipio de San Luis de La Paz*: San Luis de La Paz, 7 km E, 21°18.714'N 100°26.601'W, 2117 m, 24.viii.2006, O. Francke, W.D. Sissom, G. Casper, T. Anton, V. Torti, H. Montaño, C. Santibáñez, and A. Ballesteros, 1 ♂, 1 ♀ (AMNH), 1 ♂, 1 ♀ (IBUNAM), 1 ♀ (AMNH [LP 6594]); towards El Vergel de Guadalupe on dirty road, 21°26.6670'N 100°40.8018'W, 2165 m, 12.viii.2005, O. Francke, H. Montaño, J. Ballesteros, and C. Durán, collected at night with UV light, 3 ♂, 2 ♀ (AMNH [ARA 1474]), 1 ♂, 1 ♀ (CAS [ARA 1539]), 3 ♂, 2 ♀, (IBUNAM [ARA 2090]); dirt road to Vergel, 21°26.667'N 100°40.802'W, 2165 m, 12.viii.2005, O. Francke, A. Ballesteros, H. Montaño, and C. Durán, collected at night with UV light, 2 ♂ (AMNH [LP 5297]). **Jalisco:** *Municipio de Huejuquilla el Alto*: El Vallecito, Huejuquilla, 15 km W, road to San Juan Capistrano, 22°40.2768'N 103°57.6378'W, 1233 m, 16.vii.2005, O. Francke, J. Ponce, M. Córdova, A. Jaimes, G. Francke, and V. Capovilla, 1 juv. (AMNH [LP 5352]), 3 ex. (AMNH [ARA 1181]), 2 ♂, 5 ♀, 3 juv. (AMNH [ARA 1496]), 2 ♀, 4 juv. (CAS [ARA 1522]), 2 ♂, 4 ♀, 3 juv. (IBUNAM [ARA 2061]). **Nuevo León:** *Municipio de Agualeguas*: La Escondida, 2 km S, 24°4.6374'N 99°56.5812'W, 1658 m, 28.vii.2010, O. Francke, M. Córdova, A. Jaimes, E. González, and A. Ballesteros, 1 ♀, 1 juv. (IBUNAM). *Municipio de Aramberri*: La Ascensión, 5 km NE, on the way to La Caballada, 1921 m, 24°21.1332'N 99°52.9728'W, 16.viii.2006, forest, collected at night with UV light, 22 ex. (AMNH [ARA 1111]), 1 ♂, 1 ♀ (AMNH [LP 6514]), 10 ex. (CAS [ARA 1899]), 24°21.1332'N 99°52.9668'W, 1922 m, 17.viii.2006, 12 ♂, 8 ♀ (IBUNAM), O. Francke, W.D. Sissom, G. Casper, T. Anton, V. Torti, H. Montaño, C. Santibáñez, and A. Ballesteros; La Escondida, 2 km S, 24°4.6374'N 99°56.5812'W, 1658 m, 27.vii.2006, O. Francke, M. Córdova, A. Jaimes, E. González, and A. Ballesteros, 1 ♂ (AMNH [LP 6612]); San Juanito de Jesus, 1 km S, 24°26'5.3"N 99°57'9.1"W, 2319 m, 26.vii.2006, O. Francke, W.D.

Sissom, K. McWest, A. Jaimes, S. Grant, M. Córdova, E. González, B. Hendrixson, and A. Ballesteros, 1 ♂ (AMNH), 1 ♂ (AMNH [LP 6488]). *Municipio de Galeana*: Cerro del Potosí, 26.vii.2006, 26°52'57.21"N 100°11'21.8"W, 2172 m, 3 ♀ (AMNH), 1 juv. (AMNH [LP 6425]), 24°53'7.1"N 100°11'1.1"W, 2073 m, 1 ♂ (AMNH [LP 6451]), 1 ♂, 2 ♀ (AMNH), O. Francke, W.D. Sissom, K. McWest, A. Jaimes, S. Grant, M. Córdova, E. González, B. Hendrixson, and A. Ballesteros; km 78, on road to San Roberto Galeana, 24°40'56.7"N 100°06'24.0"W, 1944 m, 23.vii.2006, O. Francke, W.D. Sissom, G. Casper, T. Anton, V. Torti, H. Montaño, C. Santibáñez, and A. Ballesteros, 2 ♀, 4 juv. (AMNH); La Providencia, 3 km NW, 25°8.6496'N 100°39.0498'W, 1980 m, 17.vii.2006, O. Francke, E. González, M. Córdova, J. Ballesteros, and A. Jaimes, collected at night with UV light, 13 ex. (CAS [ARA 1959]); La Providencia, 3 km NE, 25°8.6514'N 100°39.04'W, 1980 m, 17.vii.2006, O. Francke, E. González, M. Córdova, J. Ballesteros, and A. Jaimes, 2 ♂ (AMNH [LP 6505]); road between San Roberto-Galeana, 24°40.950'N 100°6.4002'W, 1984 m, 26.vii.2010, 3 ♂, 7 ♀ (IBUNAM); Road San Roberto-Galeana, marker km 78, 24°40.9596'N 100°6.3996'W, 24°40'57.6"N 100°06'24"W, 1944 m, 25.vii.2006, O. Francke, W.D. Sissom, K. McWest, B. Hendrixson, S. Grant, A. Jaimes, M. Córdova, E. González, and A. Ballesteros, collected at night with UV light, 10 ♂ (IBUNAM [ARA 0098]), 11 ♂ (AMNH [ARA 1086]), 6 ♂ (CAS [ARA 1968]), 1 juv. (AMNH [LP 6482]). *Municipio de General Zaragoza*: General Zaragoza, 5 km N, 1319 m, 17.viii.2006, 24°1.3248'N 99°47.8812'W, 58 ♂ (AMNH [ARA 1128]), 29 ♂ (CAS [ARA 1882]), 24°01'19.5"N 99°47'52.9"W, 2 ♂ (AMNH [LP 6515]), O. Francke, W.D. Sissom, G. Casper, T. Anton, V. Torti, H. Montaño, C. Santibáñez, and A. Ballesteros, collected at night with UV light; Sierra Apanaco approx. 5 km NE of La Zorra, 23°55'1"N 99°53'47.8"W, 2027 m, 17.viii.2006, O. Francke, W.D. Sissom, G. Casper, T. Anton, V. Torti, H. Montaño, C. Santibáñez, and A.

Ballesteros, 4 juv. (AMNH [LP 6607]); Sierra Apanaco, 5 km NE of La Zorra, 23°55.0266'N 99°58.7964'W, 2027 m, 17.viii.2006, O. Francke, W.D. Sissom, T. Anthon, G. Casper, H. Montaño, V. Torti, and C. Santibáñez, collected at night with UV light, 10 ♂ (AMNH [ARA 1125]), 5 ♂ (CAS [ARA 1886]). *Municipio de Iturbide*: W of San Marcos, 77 km W of Linares, 24°41.614'N 100°05.490'W, 1896 m, 23.vii.2006, O. Francke et al., 2 ♂ (AMNH). **San Luis Potosí:** 99 km from Cuidad Valles to Río Verde on Road 70, 12.ix.2004, E. González and O. Francke, 8 ♀ (AMNH [LP 3502]); Hwy 70, km 20, iv.1972, 2 ♂, 1 ♀, 1 juv. (AMNH); road between Ciudad Cárdenas and Ciudad del Maíz, junction to Las Tuzas, 5.viii.2004, O. Francke and E. González, 1 ♂, 24 ♀ (IBUNAM). *Municipio de Alaquines*: San José de las Palmas, 22°10.0788'N 99°35.0046'W, 1172 m, 22.viii.2006, O. Francke, W.D. Sissom, G. Casper, T. Anton, V. Torti, H. Montaño, C. Santibáñez, and A. Ballesteros, desert, under rock, 60 ex. (AMNH [ARA 1140]), 29 ex. (CAS [ARA 1884]), 58 ex. (IBUNAM [ARA 0046]), 2 juv. (AMNH [LP 6504]). *Municipio de Cerritos*: Cerritos, 9.6 km W, 22°29.0130'N 100°22.7946'W, 1269 m, 20.viii.2006, W.D. Sissom, G. Casper, T. Anton, V. Torti, and C. Santibáñez, collected at night with UV light, 2 ♂ (AMNH [ARA 1124]), 1 ♂ (CAS [ARA 1891]), 2 ♂ (IBUNAM [ARA 0042]); Cerritos, 9.7 km W, 22°29.013'N 100°22.795'W, 1269 m, 20.viii.2006, O. Francke, T. Anton, G. Casper, V. Torti, and C. Santibáñez, 1 ♂ (AMNH [LP 6414]), 1 ♂ (AMNH [LP 6572]). *Municipio de Charcas*: La Joya, 2029 m, 19.viii.2006, 22°26'48.84"N 100°50'32.64"W, 1 ♂ (AMNH [LP 6423]), 23°16.0062'N 100°54.1008'W, 14 ♂, 3 ♀, 8 subad. ♂, 9 ex. (IBUNAM), 23°1.0056'N 100°54.1008'W, 18 ex. (AMNH [ARA 1097]), 8 ex. (CAS [ARA 1954]), O. Francke, W.D. Sissom, G. Casper, T. Anton, V. Torti, H. Montaño, and C. Santibáñez, desert, collected at night with UV light. *Municipio de Ciudad del Maíz*: Puerto Santa Catarina, 1214 m, 22–23.viii.2006, 22°18.223'N 99°37.268'W, 1 ♂, 1 ♀ (AMNH [LP 6507]), 1

subad. ♂, 1 subad. ♀, 20 juv. (IBUNAM), 22°18.2232'N 99°37.2678'W, 5 subad. ♂, 5 subad. ♀ (IBUNAM), O. Francke, W.D. Sissom, T. Anthon, G, Casper, H. Montaño, V. Torti, and C. Santibánez; Santa Catarina, 22°18.2226'N 99°37.2678'W, 1214 m, 23.viii.2006, O. Francke, W.D. Sissom, T. Anthon, G. Casper, H. Montaño, V. Torti, and C. Santibánez, desert, collected at night with UV light, 14 ♂, 6 ♀ (IBUNAM), 22 ♂ (AMNH [ARA 1142]), 10 ♂ (CAS [ARA 1885]), 20 ♂ (IBUNAM [ARA 0055]). *Municipio de Real de Catorce*: Real de Catorce, 14 km N, 23°45.3828'N 100°50.7498'W, 2183 m, 18–19.viii.2006, O. Francke, W.D. Sissom, T. Anthon, G. Casper, H. Montaño, V. Torti, and C. Santibáñez, 4 ♂, 12 ♀ (IBUNAM), desert, collected at night with UV light, 18 ex. (AMNH [ARA 1118]), 9 ex. (CAS [ARA 1951]). *Municipio de Río Verde*: La Angostura 3 km W, 1099 m, 21–22.viii.2006, 22°16.393'N 100°08.955'W, 1 ♂ (AMNH [LP 6467]), 22°16.3932'N 100°8.95'W, 1 ♀, 29 juv. (IBUNAM), O. Francke, W.D. Sissom, T. Anthon, G. Casper, H. Montaño, V. Torti, and C. Santibáñez; Río Verde, 25 km W, 21°51.624'N 99°40.007'W, 12.ix.2004, O. Francke, 1 ♀ (AMNH [LP 3501]). *Municipio de San Luis Potosí*: Huizache, 16 km E of turnoff, on Hwy 80, 22°53.00'N 100°18.30'W, 1300 m, 27.vii.2002, E. González, and L. Prendini, female excavated from burrow in open area, 1 ♀, 1 juv. (AMNH [LP 2061]). *Municipio de Valles*: Route 70, 113 km W Valles, [21°59'N 99°1'W], 19.ii.1970, J.C. Cooke, 1 ♂ (AMNH); W of Ciudad Valles, 13.ii.1974, R.W. Mitchell, 2 ♂, 7 ♀, 6 juv. (IBUNAM); Valles on Hwy 70, 113 km W, 19.ii.1970, R.W. Mitchell, 1 ♂, 3 ♀ (AMNH); Valles, 64 km W, iv.1972, 2 ♂, 1 ♀ (AMNH). *Municipio de Villa de Arista*: Villa de Arista, 10 km E, 20.viii.2006, 624 m, 22°38.760'N 100°45.499'W, 3 ex. (AMNH), 22°30.760'N 100°45.499'W, 1624 m, 2 ♂, 1 juv. (AMNH [LP 6553]), 5 ♂ (IBUNAM), O. Francke, W.D. Sissom, G. Casper, T. Anton, V. Torti, H. Montaño, C. Santibáñez, and A. Ballesteros. *Municipio de Villa Hidalgo*: Villa Hidalgo, 1720 m, 20–21.viii.2006, 22°27.754'N

100°41.111'W, 1 ♂ (AMNH [LP 6511]), 22°27.7536'N 100°41.1108'W, 4 ♂ (AMNH [ARA 1029]), 3 ♂ (CAS [ARA 1874]), 4 ♂ (IBUNAM [ARA 0034]), °27.7542'N 100°41.1108'W, 2 ♂, 2 ♀ (IBUNAM), O. Francke, H. Montaño and A. Ballesteros, O. Francke, H. Montaño, and J. Ballesteros. **Tamaulipas:** Hwy 101, marker km 14, 22.ii.1973, W. Graham, 1 ♂ (AMNH), C. McConnell, 1 ♀, 3 juv. (AMNH); T.R. Mollhagen, 2 ♂, 5 ♀, 2 juv. (AMNH); Hwy 101, marker km 53, 23.ii.1973, T.R. Mollhagen, 1 ♀, 1 juv. (AMNH); Hwy 101, marker km 92, 22.ii.1973, T.R. Mollhagen, 1 ♂, 8 ♀ (AMNH); Route 19, marker km 15, 18.iii.1972, J.C. Cooke, 1 ♀ (AMNH). *Municipio de Jaumave*: El Salto, between Palmillas and Jaumave, 1115 m, 23.viii.2006, 23°21.4398'N 99°30.9408'W, 80 ♂ (AMNH [ARA 1129]), 78 ♂ (CAS [ARA 1883]), 78 ♂ (IBUNAM [ARA 0048]), 23°21.440'N 99°30.941'W, 1 ♂, 1 ♀, 1 juv. (AMNH [LP 6575]), O. Francke, W.D. Sissom, G. Casper, T. Anton, V. Torti, H. Montaño, C. Santibáñez, and A. Ballesteros, collected at night with UV light; Jaumave, [23°25'N 99°23'W], 13.vii.2006, P. Berea, 1 ♀ (IBUNAM), 24.x.2006, P. Berea, 5 ♀, 1 subad. ♀ (IBUNAM); Independencia, 24.x.2006, P. Berea, 1 ♀ (IBUNAM); Las Delicias, [25°7'N 98°'W], 19.x.2006, P. Berea, 1 ♀ (IBUNAM). *Municipio de Palmillas*: Palmillas, [23°18.48983'N 99°34.13466'W], 3.xii.1964, T. Raines, 2 ♀ (AMNH). **Zacatecas:** *Municipio de Fresnillo*: Colonia Guanajuato, 23°04.749'N 103°05.139'W, 2250 m, 6.vii.2005, O. Francke, J. Ponce, M. Córdova, A. Jaimes, G. Francke, and V. Capovilla, 1 ♀ (AMNH [LP 5306]). *Municipio de Río Grande*: Felipe Pescador, Cañitas, [23°36'N 102°43'W], 24.xi.1999, E. Barrera and H. Brailovsky, 1 ♂ (IBUNAM). *Municipio de San Juan Capistrano*: junction to Los Tanques, [22°36.29583'N 104°2.0955'W], 1100 m, 20.ix.2005, E. González, 5 ♂, 8 ♀, 4 juv. (IBUNAM). *Municipio de Sombrerete*: Hwy Sombrerete-Durángo, marker km 184.5, 23°44.719'N 103°47.779'W, 2357 m, 9.viii.2005, O.

Francke, W.D. Sissom, K. McWest, C. Lee, H. Montaño, J. Ballesteros, L. Jarvis, and C. Durán, rock rolling by day, 2 juv. (AMNH [LP 5276]).

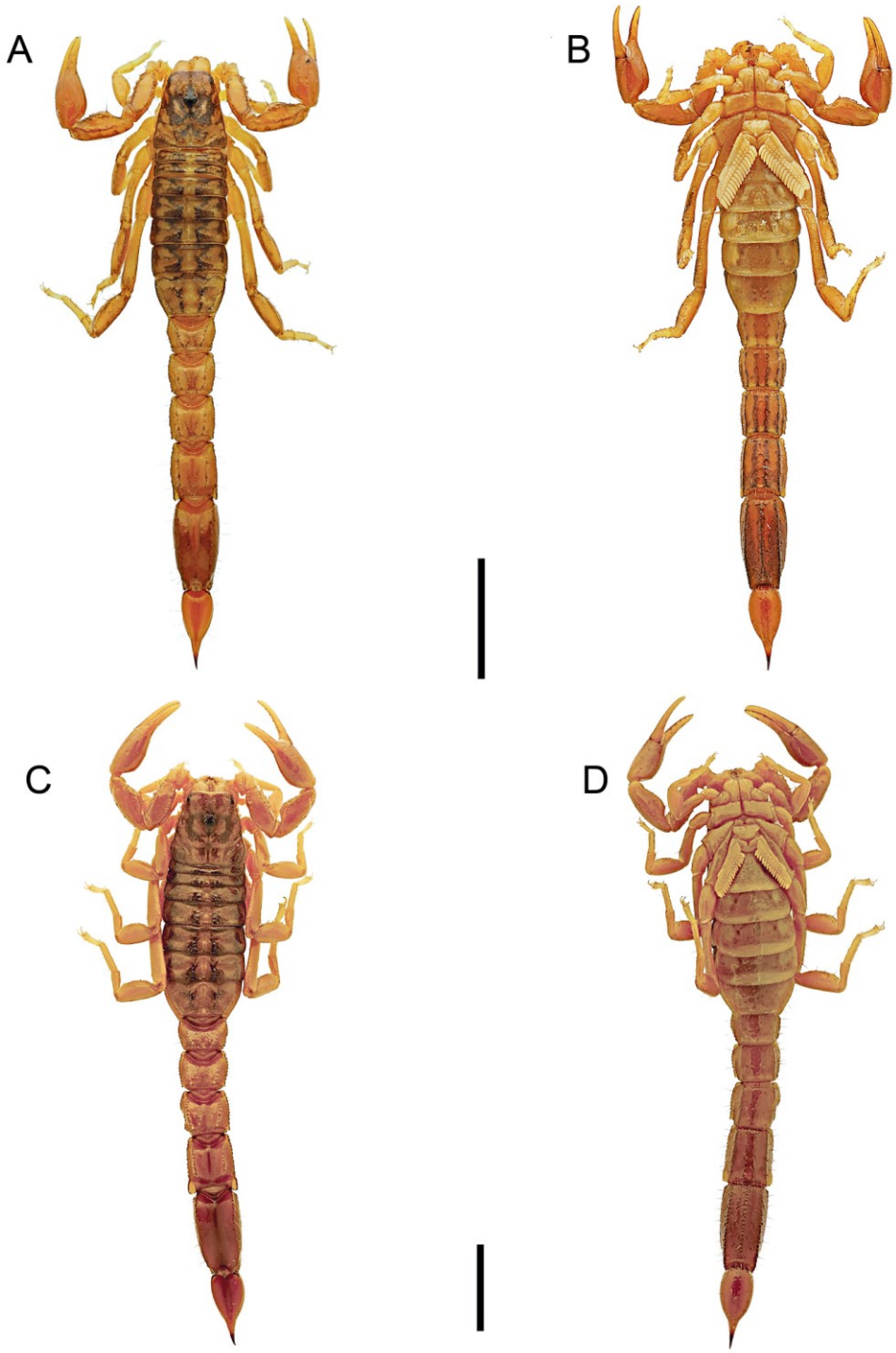


Figure 310. *Chihuahuanus bilineatus* (Pocock, 1898), habitus. **A**, **B**. ♂ (AMNH). **C**, **D**. ♀ (AMNH). **A**, **C**. Dorsal aspect. **B**, **D**. Ventral aspect. Scale bars = 5 mm.

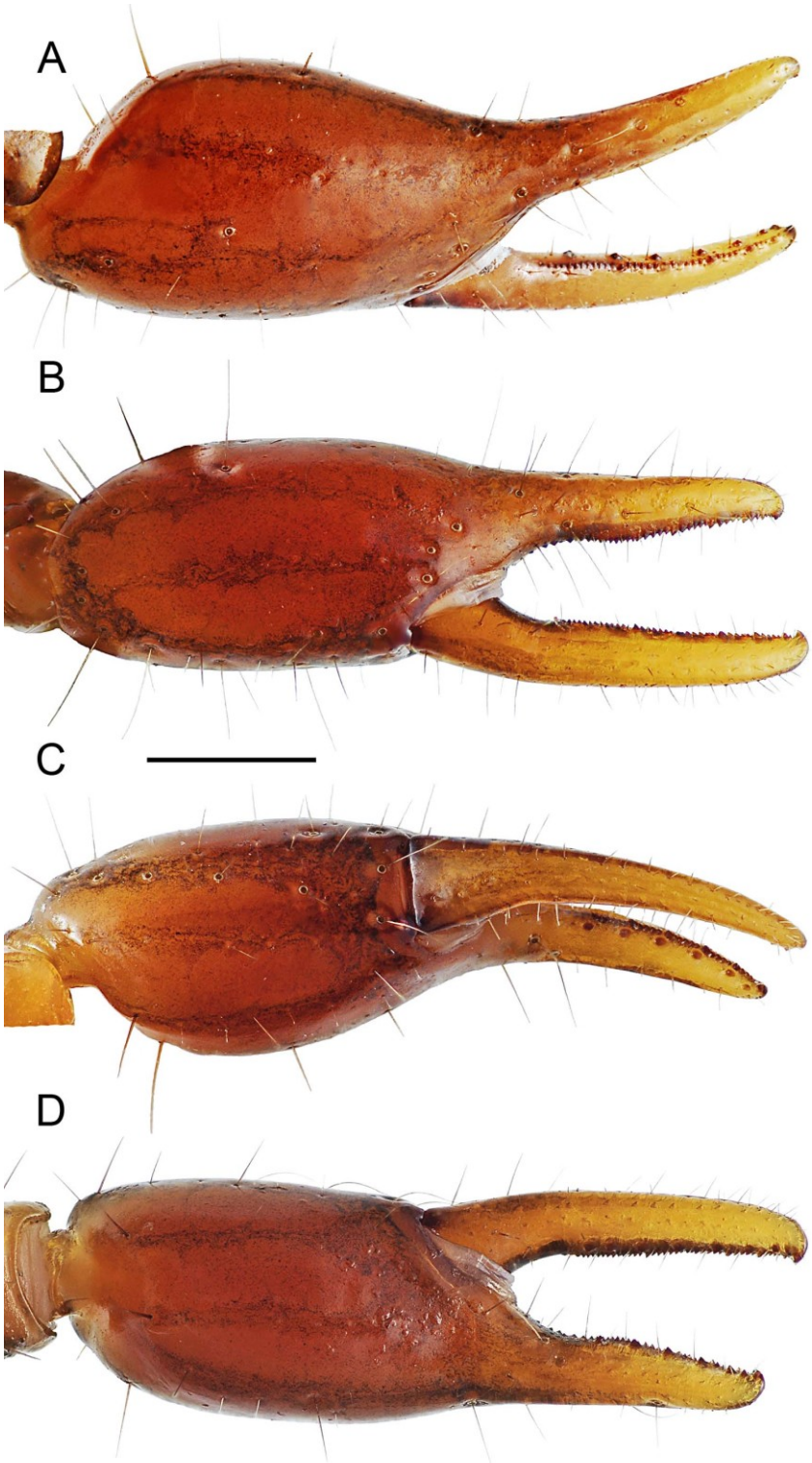


Figure 311. *Chihuahuanus bilineatus* (Pocock, 1898), ♂ (AMNH), dextral pedipalp chela. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

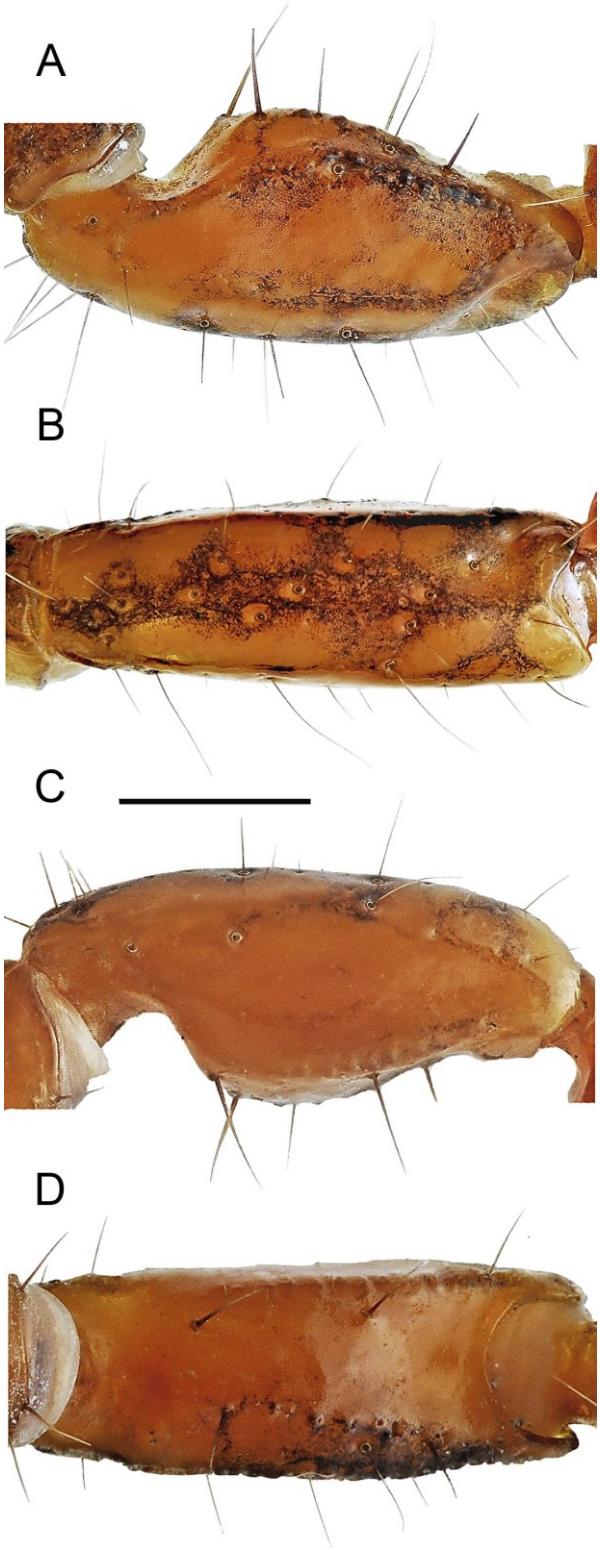


Figure 312. *Chihuahuanus bilineatus* (Pocock, 1898), ♂ (AMNH), dextral pedipalp patella. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

Chihuahuanus coahuilae (Williams, 1968)

Figures 306, 313–315, 336C, 338C, 340B, 341B, 344C, 346C, 348B

Vejovis coahuilae Williams, 1968: 16–21, figs. 9, 10; Stahnke, 1974: 135.

Vejovis spinigerus: Baerg, 1924: 350; 1929: 431(misidentification).

Vaejovis mexicanus: Baerg, 1929: 427 (misidentification).

Vaejovis coahuilae: Williams, 1971a: 60; Díaz-Nájera, 1975: 6, 20; Muma, 1975: 257, 262, 268; Francke, 1977a: 49; Sissom and Francke, 1981: 94; Francke and Sissom, 1984: 3, 4; Bradley and Brody, 1984: 437–440; Bradley, 1988: 534, 540, 545; 1989: 48, 50, 51; Sissom, 1997: 13; Kovařík, 1998: 146; Sissom and Jackman, 1997: 151, 154; Beutelspacher, 2000: 79, 138, 152, map 51; Sissom, 2000: 531; Brown et al., 2002: 411, 412, fig. 1, 414; Sissom and Hendrixson, 2005a: 128, tab. 1, 131–33; 2005b: 33–35, 41 (key); Sissom et al., 2006: 231–233, tab. 1; McWest, 2009: 19, tab. 1, 41, 55, figs. 143–152, 56–58, 63, 117.

Hoffmannius coahuilae: Soleglad and Fet, 2008: 4, 68, 73, 91.

TYPE MATERIAL: **MEXICO: Chihuahua:** *Municipio de Cuatro Ciénegas*: Holotype ♂ (CAS, Type No. 10170), 0.5 km SW Cuatro Ciénegas de Carranza, 740 m, 28.vii.1967, S.C. Williams and W.S. Brown. Paratypes: 19 ♂, 25 ♀ (CAS; including ♀ allotype, Type No. 10170), same locality as holotype. **U.S.A.: Texas**: *Pecos Co.*: 48 ex., Will Banks Ranch.

DIAGNOSIS: *Chihuahuanus coahuilae* is closely related to *C. bilineatus*, with which forms a monophyletic group. *C. coahuilae* may be distinguished by having ventral median, ventral prolateral and prolateral median pedipalp chelae carinae moderately to weakly costate instead of having it obsolete. *C. coahuilae* has pedipalp carinae immaculate, whereas *C. bilineatus* has

these carinae diffusely to moderately infuscate. *C. coahuilae* has ventral prolateral and ventral retrosubmedian carinae of pedipalp patella strongly granular to crenular instead of having them obsolete to weakly angular. *C. coahuilae* has ventral surface of metasomal segment V matte, instead of having it moderately to strongly shagreened. Furthermore, *C. coahuilae* differs by having metasomal segment V moderate to diffusely infuscate rather than almost completely and intensely infuscate. Finally, *C. coahuilae* has ventral submedian carinae of metasomal segment II and III finely granular and ventral lateral carinae of metasomal segments I–III strongly granular, instead of having these carinae obsolete to weakly crenular.

DESCRIPTION: This redescription supplements Williams' (1968) original description and is based on the material deposited in the collections mentioned below.

Color and infuscation: Body color base medium yellow to dark orange. Carapace, mesosomal tergites, prolateral side of legs and metasoma infuscate with dusky markings. Median and lateral ocular tubercles intensely infuscate. Pedipalp femur and patella with dorsal, prolateral and retrolateral carinae outlined with diffuse infuscation; chelae with all carinae outlined with vestigial infuscation. Tergites with intercarinal surface between dorsal submedian carina, including ventral median carinae and lateral surface immaculate. Dorsal and lateral carinae of metasomal segments with vestigial infuscation, ventral carinae more outlined with diffuse infuscation. Ventral surface of telson infuscate with two lateral broad and a median longitudinal bands with dusky markings, dorsal entirely infuscate Aculeus dark brownish.

Carapace: Carapace 1.07 times longer than posterior width. Anterior margin sublinear, with vestigial medial notch and three pairs of major macrosetae and may have one or two pairs of intersperse minor macrosetae. Carapace shagreened, densely cover by minute granules and scattered coarse moderate granules. Median ocular tubercle moderately rose. Superciliary carinae

moderate and smooth slightly higher than median eyes. Position of median ocular tubercle on anterior half. Three pairs of lateral eyes, two frontal pairs same size and posterior slightly reduced. Median eyes approximately three time the size of lateral frontal pair. Anteromedian sulci and posteromedian deep, anterolateral moderate, posterolateral moderate, posterior transverse obsolete.

Sternum and coxal region: Sternum pentagonal subequilateral with four pairs of setae, one distal, two median pairs and one pair on the lobes, surface matte, median notch deep. Anterior margin of coxa II with three oblique slit-like structures, adjacent to a moderate, scattered, and finely granulated protuberance. Proximal margin of coxal endite II with a deep depression each. Coxa IV 2.10 times longer than coxa II.

Chelicerae: Dorsal surface smooth, subdistal margin of manus with one macrosetae. Distal margin with costate carinae. Serrula present on ventral distal half of movable finger, tines numbering 12.

Pedipalps: Trichobothrial pattern Type C, orthobothriotaxic. Chela wider than patella, patella wider than femur. Femur: All intercarinal surfaces matted. Dorsal prolateral and dorsal retrolateral and ventral prolateral complete strongly granular; retrolateral dorsosubmedian obsolete, expressed only by five major macrosetae on distal two; retrolateral ventral vestigial, expressed by a subdistal low tubercle; ventral median vestigial, expressed on proximal extreme by a short row of moderate granules; prolateral ventrosubmedian partial expressed by a proximal granule adjacent to trichobothrium *i*, positioned at proximal mid surface followed by four or five rounded and enlarged granules, median two enlarged granules with a macroseta at base, slanting gently towards subdistal end of dorsal prolateral carinae; prolateral ventral vestigial, expressed by one proximal enlarge granule with a macroseta at base, one subdistal enlarge granule with a

macroseta at base and two other scattered enlarged granules with a macrosetae either on top or at base, these granules slanting gently towards distal end of ventral prolateral carinae; prolateral ventrosubmedian and prolateral ventral carinae diverging distally.

Patella: All intercarinal surface matte. Dorsal prolateral and ventral prolateral complete strongly granular; dorsal retrolateral and ventral retrosubmedian complete weakly crenulated; retrolateral dorsosubmedian and retrolateral median vestigial, expressed by a weak low costa and infuscation; ventral median vestigial, expressed by two or three minute or moderate proximal granules; prolateral median on a vaulted projection expressed by a proximal tubercle with a macrosetae on top and a row of scattered and coarse crenulation with a subproximal crenulation with a macrosetae on top, protruding strongly medially; distal extreme ridge slanting dorsally almost reaching dorsal prolateral carinae on distal fifth of the segment. Prolateral ventral obsolete expressed by three to four major macrosetae adjacent to ventral prolateral row of granules.

Chela: Manus smooth and relatively incrassate in males, relatively elongated in females Dorsal prolateral, dorsal median, dorsal retrolateral, ventral retrolateral, ventral median, ventral prolateral, and prolateral median vestigial weakly costate. All other carinae obsolete. Trichobothrium *Db* positioned on dorsal retrolateral carina, subbasal on chelae; *Dt* positioned close to mid manus but on the proximal half.

Fingers: Fix finger, PD = 6, MD rows = 5, RD = 5, proximal RD positioned by mid finger. All RD subpaired with corresponding PD. Movable finger, PD = 7, MD rows = 6, distal row bearing one minute granule, RD: 6, proximal RD positioned by mid finger. All RD subpaired with corresponding PD. Trichobothria *ib* and *it* positioned subbasal on fix finger, *ib* positioned between PD6 and PD7, PD7 lacking granule, *ib* positioned at the level of PD6;

Fingers with moderate scalloping in ♂, proximal notch of fixed finger moderate and medina lobe weak, gap created when fingers closed moderate, fingers fit unevenly, in ♀ fingers lacking scalloping, gap created when fingers closed absent.

Legs: Basitarsi I–II prolateral ventral, and retrolateral ventral carinae with complete rows of spinules; prolateral ventral in III and IV absent; retrolateral ventral carinae in III complete, in IV absent; retrolateral dorsal carinae in I partial, expressed as a row of spinules on distal half, in II complete, in III partial, expressed as a row of spinules on distal half, in IV absent; retrolateral median rows in I–IV vestigial expressed as few terminal spinules. Telotarsi I–IV with two pairs of ventrodistal spinules in I–IV. Setae: Prolateral ventral, 3:4:4:4, median two in III and IV stout; retrolateral ventral, 4:5:6:6; retrolateral dorsal, 2:3:3:3; dorsal, 3:3:3:3; retrolateral dorsal and dorsal series arranged in two independent rows, in ♀ these rows of setae may have one or two accessory smaller minor macrosetae intersperse between major macrosetae, in all legs making a formula 4:4:4–5:4–5 and 4:4:4–5:4–5.

Mesosoma: Pretergites matte, postergites matte with distal submedian fields of scattered moderate granules. Dorsal median and ventral submedian carinae in tergites I–III obsolete, dorsal median and ventral submedian in IV–VI vestigial, expressed by few distal moderate crenatoserrations. Tergite VII with intercarinal surfaces matte and few scattered moderate granules; dorsal median carina moderately costate with few minute serrated granules, expressed on proximal half of the postergite; dorsal submedian vestigial expressed as a low short pair of proximal protuberance; dorsal lateral and lateral supramedian comparatively stronger and complete, distal extreme with an enlarged rounded granule; dorsal lateral carinae projecting and curving laterally approximating to lateral supramedian distal margin, creating a semi horse show of strong serrated granulation.

Genital operculum: Male genital operculum: wider than long, with three pairs of macrosetae. Sclerites free on longitudinal edge moving independently but unable to open more than 45°. Genital papillae protrude posteriorly. Female genital operculum: Wider than long, with three macrosetae. Sclerites fuse longitudinal.

Sternites: Sternites I–VII smooth, finely punctuated, and lustrous. Sternite V with distal median glandular spot moderate, not protruding from adjacent surface but whitish, contrasting moderately with slightly more obscure base color in ♂, in ♀ obsolete. Sternite VII with all carinae obsolete, expressed only by pairs of macrosetae. Distomedian glandular spot moderate to weak in ♂, rounded, moderately to weakly protruding from adjacent surface, in ♀ obsolete. Spiracle elongated, slit-like, approximately two times longer than wide.

Pectines: Pectines longer than distal edge of coxa IV in ♂, in ♀ at the level of distal edge of coxa IV. Basal piece with median notch deep, in ♂, proximal margin narrow, half of the width of distal margin, in ♀ as wide as the width of distal margin shaped. Marginal lamella consist of three sclerites, medial lamella proximally fuse distally progressively forming conspicuous 10–14 beads. Fulcra with 16–20 in ♂, in ♀ 12–15 beads. Pectinal tooth count 17–21 in ♂, 13–16 in ♀.

Hemispermatophore: Lamina 1.93 longer than trunk. Dorsal through margin long, narrow, curving proximally, and removed from ventral trough. Hemimating plug developed from the inner lobe, distal barb margin with 12 elongated spinules. Primary and secondary hook positioned on the apex of lateral margin extension of the lamina (flange). Both hooks rounded low, separated slightly, forming a shallow notch. Median lobe ental terminus moderated and rounded. Basal plate of inner lobe removed from ventral trough. Spine of inner lobe relatively long and strongly sclerotized. Neck relatively short (0.40 times longer than basal plate).

Measurements, lamina, 3.48; trunk, 1.80; dorsal trough/laminar hooks, 1.02; ventral trough/laminar hook, 0.60; neck, 0.24; basal plate, 0.60.

Metasoma: Intercarinal surfaces smooth lustrous. Carinae: Dorsal lateral and lateral median carinae in I–IV strongly crenatoserrated terminating in moderated enlarge spinoid granules pointing backwards; except lateral median in IV distal terminus strongly expanded or flared laterally forming a triangular projection; dorsal lateral in V strong and serrated proximally, becoming weaker and crenulated distally. Lateral inframedian in I complete crenatoserrated; in II and III incomplete crenatoserrated, becoming weaker proximally, present on distal third; in VI absent, in V proximally strongly crenatoserrated, becoming weaker distally, present in proximal half; ventral lateral in I–IV moderately crenatoserrate, becoming granules larger and stronger in distal segments in ♂, in ♀ I–IV weakly crenulated to smooth, in V strongly crenatoserrate in both sexes; ventral submedian in I–III moderately costate, in IV moderately crenulated, obsolete, in II moderately crenatoserrated, in ♂, in ♀ weaker and smooth; ventral median in V strongly crenatoserrated. Setae: Dorsal lateral carinae, 1:3:3:3:9; lateral median; 2:3:4:5; lateral inframedian, 2:1:1:0:4, ventral lateral, 3:4:4:4:14, setae in IV and V positioned laterally to the carinae, ventral submedian, 3:4:5:5:4, ventral sublateral, 2. Two to three accessory minor macrosetae in intercarinal surfaces between ventral submedian carinae in segments I–IV.

Telson: Dorsal and ventral surface smooth. Dorsal surface with a fusiform whitish minute glandular spot at or adjacent to the base of aculeus. Ventral surface with five to six macrosetae in each carina. Ventral median carinae with vestigial subaculear tubercle, Microserration on laterobasal aculeus numbering 3–5.

DISTRIBUTION: *Chihuahuanus coahuilae* is endemic to the Chihuahuan desert including the states of Chihuahua, Coahuila, Durango, and Nuevo León, Mexico; and Arizona, New Mexico, and Texas, U.S.A.

ECOLOGY: *Chihuahuanus coahuilae* is found in a variety of substrates from sand dunes to compacted gravely soils. Although, it has not strong leg armature, it is an active burrower in sandy substrate. This species constructs burrows in open areas, but in more packed soils may dig under rocks. According to Williams (1968), at the type locality, this species was more abundant on the gypsum sand dunes and less often foun in rocky habitats. This observation was also confirmed by the results of the study of Brown et al. (2002), who surveyed a locality in western Texas, where they observed an assemblage of seven species, with *C. coahuilae* being one of the least common. They described the area as typical Chihuahuan Desert, but did not indicate the presence of sand dunes.

C. coahuilae can be found from deserts with sparse or none vegetation cover to scrublands, to chaparral, and the lower limits of pine forest. The altitude where this species has been recorded in ranges from 530 to 2380 m.

MATERIAL EXAMINED: **MEXICO: Chihuahua:** Ascención, 20.viii.1968, V. Roth, 5 ♂, 3 ♀ (AMNH); Cañón Prieta, near Primavera, 30.vi.1947, W.J. Gertsch, 5 ♂, 2 ♀, 3 juv. (AMNH); Primavera, 1800 m, 29.vi.1947, W.J. Gertsch, 1 ♂, 1 ♀, 2 subad. ♀ (AMNH). *Municipio de Camargo*: Camargo, 40 km SW, [27°40.020'N 105°10.02'W], 14.vii.1947, W.J. Gertsch, 1 ♂ (AMNH). *Municipio de Chihuahua*: Sierra del Nido, on the way to Las Varas, 29°21.475'N 106°27.311'W, 1670 m, 30.vii.2005, H. Montaño, L. Jarvis, and C. Durán, collected at night with UV light, 2 ♂, 1 juv. (AMNH [LP 5284]); East of Hwy MEX 45, on the road to Las Varas, Sierra del Nido, 30.vii.2005, 29°21.4746'N 106°27.3108'W, 1670 m, 4 ♂, 2 ♀, 2 subad. ♀, 1 juv.

(AMNH [ARA 1467]), 1 ♂, 1 ♀, 1 subad. ♀, 1 juv. (CAS [ARA 01542]), 4 ♂, 1 ♀, 3 subad. ♀, 1 juv. (IBUNAM [ARA 2093]), 29°21.4146'N 106°29.6658'W, 1710 m, 9 ♂, 3 ♀, 7 juv. (AMNH [ARA 1466]), 4 ♂, 2 ♀, 3 juv. (CAS [ARA 1541]), 9 ♂, 4 ♀, 7 juv. (IBUNAM [ARA 2092]), O. Francke, W.D. Sissom, K. McWest, C. Lee, H. Montaño, J. Ballesteros, and L. Jarvis, collected at night with UV light; Sierra del Nido, 29°47'N 106°30'W, 15.x.1969, V. Roth, 1 ♀, 1 subad. ♂, 1 subad. ♀, 1 juv. (AMNH). *Municipio de Coyame del Sotol*: Grutas de Coyame, 29°25.714'N 105°07.284'W, 1293 m, 30.vii.2005, W.D. Sissom, K. McWest, C. Lee, and L. Jarvis, large rocks, 1 juv. (AMNH [LP 5301]). *Municipio de Gran Morelos*: Gran Morelos, 19 km NW, [28°14.9333'N 106°30.6'W], 16.viii.1950, R. Smith, 1 ♀ (AMNH). *Municipio de Guadalupe y Calvo*: Route CHIH 23 km 55, between Guachochi and Balleza, 26°57.7566'N 106°25.40'W, 1657 m, 4.viii.2005, O. Francke, W.D. Sissom, K. McWest, C. Lee, H. Montaño, J. Ballesteros, and L. Jarvis, rock turning, 1 ♀, 3 juv. (AMNH [ARA 1464]); Hwy Guachochi-Balleza, marker km 55, 26°57.757'N 106°25.401'W, 1657 m, 4.viii.2005, O. Francke, W.D. Sissom, K. McWest, C. Lee, H. Montaño, J. Ballesteros, L. Jarvis, and C. Durán, rock rolling by day, 4 juv. (AMNH [LP 5285]). *Municipio de Hidalgo del Parral*: Santa Rosa Parral, [30°25'N 106°36'W], 2.ix.1965, F. Sanchez, 1 ♂, 1 ♀, 2 juv. (IBUNAM); Parral, 35 km N, [26°56'N 105°40'W], 17.vii.1956, V. Roth and W.J. Gertsch, 2 subad. ♀, 1 juv. (AMNH); Hidalgo del Parral, hills behind Hotel Los Nogales, 1730 m, 5.viii.2005, 26°55.5666'N 105°38.75'W, K. McWest, rock rolling by day, 1 ♀ (IBUNAM [ARA 2100]), 1 juv. (AMNH [LP 5277]). *Municipio de Huejotitán*: Huejotitán, [27°3.34700'N 106°10.867'W], 20.vii.1974, W.J. Gertsch, 1 ♂, 2 ♀, 5 juv. (AMNH). *Municipio de Jiménez*: Jiménez, 37 km NW, [27°7.800'N 104°55.4'W], 7.ix.1964, W. Ivie, 2 ♂ (AMNH); Arenales, between Carrillo and Guimbalete, 5–6.viii.2005, 26°56.6946'N 103°52.4076'W, 1124 m, rock rolling by day, 3 ♂, 2 ♀, 1 subad. ♂

(AMNH [ARA 1470]), 1 ♂, 2 ♀, 1 subad. ♀ (IBUNAM [ARA 1544]), 3 ♂, 3 ♀ (IBUNAM [ARA 2096]), 1 ♂, 2 ♀, 1 juv. (AMNH [LP 5304]), 26°57.6078'N 103°50.0568'W, 1153 m, 2 ♂, 1 ♀, 3 juv. (AMNH [ARA 1461]), 26°57.2616'N 103°57.2616'W, 1137 m, 1 ♂, 1 ♀, 1 subad. ♀, 1 subad. ♂ (IBUNAM [ARA 2097]), collected at night with UV light; 26°56.027'N 104°09.540'W, 1254 m, rock rolling by day, 1 subad. ♀, 2 juv. (AMNH [LP 5303]), O. Francke, W.D. Sissom, K. McWest, C. Lee, H. Montaño, J. Ballesteros, L. Jarvis, and C. Durán. *Municipio de Juárez*: Samalayuca, [31°20'29.25"N 106°28'15.39"W], 25.vi.1974, W.J. Gertsch, 2 ♂, 1 ♀, 2 subad. ♀, 8 juv. (AMNH). *Municipio de Santa Bárbara*: Santa Bárbara, [26°48.800'N 105°49.21666'W], 1920 m, 9.v.1947, G.M. Bradt, 6 ♂, 2 juv. (AMNH); Santa Bárbara, 8 km NW, Clarines Mine, 2072 m, 8.ii.1947, G.M. Bradt, 6 ♀, 2 subad. ♀ (AMNH). **Coahuila:** *Municipio de Acuña*: Agua Verde Ranch, 23.v.2003, P. Brandant, 1 ♂ (IBUNAM). *Municipio de Arteaga*: Las Delicias, [26°13.71483'N 102°47.39416667'W], 11.viii.1946, C.M. Bogert, 2 ♂ (AMNH). *Municipio de Cuatro Ciénegas*: Cuatro Ciénegas de Carranza, [26°57.00'N 102°49.9998'W], 1.iv.1964, G.N. Knopf, 1 ♀ (AMNH); Cuatro Ciénegas de Carranza, 1.6 km S, 12.viii.1968, M. Cazier, dunes, 1 ♂, 1 ♀ (AMNH); Cuatro Ciénegas Basin, near Tierra Blanca Ranch, [26°59.16667'N 102°3.98333'W], 22.iv.1973, J. Landy, 1 ♀, 1 juv. (AMNH); Ojo de Agua, Ejido El Oso, 1039 m, 19–20.vii.2006, 27°0.0558'N 102°0.2262'W, 9 ex. (CAS [ARA 1961]), 16 ex. (AMNH [ARA 1109]), 36 ex. (AMNH [ARA 1120]), 17 ex. (CAS [ARA 1953]), 34 ex. (IBUNAM [ARA 0070]), 16 ex. (IBUNAM [ARA 0084], 27°3.3594'N 102°13.5816'W, 20 ♂, 14 ♀ (IBUNAM), 1 ♂ (AMNH [LP 6600]), O. Francke, W.D. Sissom, K. McWest, B. Hendrixson, S. Grant, A. Jaimes, M. Córdova, E. González, and A. Ballesteros, desert, collected at night with UV light. *Municipio de General Cepeda*: Sierra de la Concordia, 9 km S of La casita, 2380 m, 23–24.vii.2006, 25°8.6298'N 101°27.4398'W, 5 ♂

(AMNH [ARA 1074]), 2 ♂ (CAS [ARA 1963]), 5 ♂ (IBUNAM [ARA 0088]), 25°8.6292'N 101°27.43'W, 1 ♂, 4 ♀ (IBUNAM), O. Francke, W.D. Sissom, K. McWest, B. Hendrixson, S. Grant, A. Jaimes, and M. Córdova, desert, under rock. *Municipio de Ocampo*: Agua Verde Ranch, 1021 m, 29.i.2005, P. Sprouse and C. Savvas, 1 ♂, 1 ♀ (AMNH [LP 4112]); Ocampo, 16 km W, 1522 m, 20.vii.2006, W.D. Sissom, E. González, and S. Grant, 1 ♀ (AMNH). *Municipio de Sierra Mojada*: Sierra Mojada, 20–21.vii.2006, 27°19.1880'N 103°43.1346'W, 1605 m, 3 ♂ (AMNH [ARA 1113]), 3 ♂ (IBUNAM [ARA 0087]), 1 ♀ (AMNH [LP 6456]), 27°19.1880'N 103°43.1346'W, 1 ♂, 2 ♀ (IBUNAM), 27°18.5988'N 103°42.74'W, 1604 m, 15 ex. (AMNH [ARA 1102]), 7 ex. (CAS [ARA 1958]), 27°18.5988'N 103°42.74'W, 15 ex. (IBUNAM [ARA 0078]), W.D. Sissom, E. González, B. Hendrixson, and S. Grant, desert, collected at night with UV light. **Durango:** Ojo de los Encinos, 4.vi.1947, G.M. Bradt, 1 ♀ (AMNH). *Municipio de Gómez Palacio*: Dinamita, 1328 m, 29.viii.2005, 25°44.0886'N 103°40.3998'W, 1 ♂, 3 ♀ (AMNH [ARA 3017]), 2 subad. ♀ (CAS [ARA 1602]), 1 ♂, 2 ♀ (IBUNAM [ARA 2331]), 25°44.089'N 103°40.400'W, 1 ♂, 2 ♀ (AMNH [LP 5353]), O. Francke, H. Montaño, J. Ballesteros, and C. Durán, desert, collected at night with UV light. *Municipio de Guadalupe Victoria*: Guadalupe Victoria, [24°27'32.05"N 104°7'26.00"W], 10.vii.1971, F.J. Moore, 1 ♀ (OSAL). *Municipio de Lerdo*: Villa de Juárez, [25°29.38333'N 103°35.65'W], 4.i.1967, A. Rodríguez, 1 ♀, 1 juv. (IBUNAM). *Municipio de Peñón Blanco*: Peñón Blanco, 8 km N, 1667 m, 11.viii.2005, 24°51.1476'N 104°1.98'W, 5 ♂, 2 ♀, 1 subad. ♂, 1 subad. ♀ (AMNH [ARA 1468]), 4 ♂, 3 subad. ♂, 3 subad. ♀ (CAS [ARA 1543]), 5 ♂, 2 ♀, 1 subad. ♂, 1 subad. ♀ (IBUNAM [ARA 2094]), 24°51.148'N 104°01.989'W, 1 ♂, 5 juv. (AMNH [LP 5283A]), 1 juv. (AMNH [LP 5290]), O. Francke, W.D. Sissom, K. McWest, C. Lee, H. Montaño, J. Ballesteros, and L. Jarvis, collected at night with UV light. *Municipio de Tlahualilo*: Tlahualilo de Zaragoza,

ca. 15 km NW, junction Montes Claros-Tlahualilo de Zaragoza, 26°9.2418'N 103°31.28'W, 1107 m, 6.viii.2005, O. Francke, W.D. Sissom, K. McWest, C. Lee, H. Montaño, J. Ballesteros, and L. Jarvis, collected at night with UV light, 1 ♂ (CAS [ARA 1546]). *Municipio de Vicente Guerrero*: Loma Alta, [25°7'N 105°29'W], 2008 m, 19.ix.2005, R. Martínez, 2 ♂, 1 subad. ♂, 1 subad. ♀, 2 juv. (IBUNAM). **Nuevo León:** *Municipio de Galeana*: La Providencia, 3 km NW, 25°8.6496'N 100°39.0498'W, 1980 m, 17.vii.2006, O. Francke, E. González, M. Córdova, J. Ballesteros, and A. Jaimes, semidesert, collected at night with UV light, 2 ex. (CAS [ARA 1960]). **U.S.A.: Arizona:** *Cochise Co.*: Peloncillo Mountains, Antelope Pass, [32°24'11.27"N 109°8'42.22"W], 4.viii.1976, M. Cazier and Hubbart, collected at night with UV light, 2 ♂ (AMNH); Portal, [31°54'38.89"N 109°8'32.00"W], Shapiro, 21.vi.1963, 1 ♂ (AMNH), R.M. Hastings, 30.viii.1964, 3 ♂, 1 ♀ (AMNH), V. Roth, 23.viii.1965, 3 ♂ (AMNH), W.J. Gertsch, 1964, 12.vii, 1 ♀ (AMNH), 16.vii, 1 ♂ (AMNH), 3.ix, 2 ♂ (AMNH), 1965, 1–15.vii, 3 ♂ (AMNH), 25.vii, 1 ♂, 1 ♀ (AMNH), 15–30.vii, 1 ♂ (AMNH), 1.viii, 1 ♂ (AMNH), 1966, 14–31.vii, 2 ♂ (AMNH), viii, 1 ♂ (AMNH), ix, 2 ♂, 1 ♀, 1 juv. (AMNH), 27.vii.1967, 1 ♂ (AMNH), 24.viii.1968, 1 ♂ (AMNH), 10.x.1965, 1 ♀ (AMNH). *Maricopa Co.*: Agua Caliente W of Santa Barbara, [26°48'4.08"N 105°50'7.55"W], 23.vii.1974, W.J. Gertsch, 1 ♂ (AMNH). **New Mexico:** *Bernalillo Co.*: Albuquerque, 5 km W, [35°6.64217'N 106°36.5995'W], 2.ix.1981, R.A. Bradley, 1 ♀ (AMNH); Bernalillo, 5 km W Albuquerque Clift, 9.viii.1981, R.A. Bradley, 1 ♀ (AMNH); Ojito, NW of Albuquerque, 16.viii.1975, S. Mulaik, 1 ♀ (AMNH); W of Mesa Lava Beds, Albuquerque, 1.v.1964, W. Shear, 1 ♂, 1 subad. ♀ (AMNH). *Chaves Co.*: Bottomless Lakes, on plateau above lakes, 33°20.233'N 104°19.524'W, 1117 m, 13.vi.2004, J. Huff and R. West, desert, collected at night with UV light, 3 ♂, 2 ♀, 1 subad. ♀, 1 juv. (AMNH [LP 2893]). *Debaca Co.*: [34°28.30'N 104°14.733'W], M. Albert, 1 ♀ (AMNH). *Doña Ana Co.*: Las Cruces-

mesquite, [32°19.1833'N 106°45.9166'W], 28.v.1970, Robert L. Smith, 1 ♂, 2 subad. ♂ (AMNH); Las Cruces, M. Nishiguchi, vii.2002, in house, 1 ♂ (AMNH [LP 2148]), 32°18.7380'N 106°46.69'W, 8.ix.1970, F.J. Moore, 2 ♂, 3 ♀, 2 subad. 3 ♀ (OSAL), 32°15.6480'N 106°43.6548'W, 1237 m, 12.ix.2002, L. Prendini, collected at night with UV light, 4 ♂, 10 ♀, 8 juv. (AMNH [ARA 3138]), 32°15.648'N 106°43.655'W, 1238 m, 15.ix.2002, L. Prendini, M. Nishiguchi, and G. Giribet, collected at night with UV light, 1 ♂ (AMNH [LP 2138A]), 2 ♂ (AMNH [LP 2136]); Las Cruces, 32 km N, ruins of Fort Selden, [32°19.1833'N 106°45.91666'W], Robert L. Smith, around the ruins, 2 ♂, 3 ♀, 1 subad. ♂, 4 subad. ♀, 3 juv. (AMNH); Las Cruces, 16 km S, Robert L. Smith, sandy soil lightly compacted, 1 ♂ (AMNH); W side of Organ Mountains, junction of Baylon Canyon, Road US 82, 1.6 km W Organ, [34°56.1'N 107°8.238'W], 12.vi.1988, W.D. Sissom, Adcock, and Dunn, 1 ♂ (MCZ). *Eddy Co.*: 13 km S junction with US 82, ca. 24 km N Carlsbad, Road 206, 1613 m, 29.vii.1989, W.D. Sissom, 3 ♀ (MCZ); Carlsbad National Park, 6.x.1976, V. Roth, 4 ♂ (AMNH); Carlsbad, 6.iv.1936, 1 subad. ♀, 2 juv. (AMNH); Carlsbad, 16 km S, on Hwy 62,180 shoulder, 14.vi.2003, R.C. West, under old board, 1 ♀ (AMNH [LP 2451]); Carlsbad, 16 km W, 24.1 km N on Dark Canyon Road after second cattle guard, 32°17.082'N 104°18.00'W, 7.vi.2004, J. Huff and R. West, desert, collected at night with UV, 1 ♀, 4 juv. (AMNH [LP 2894]); N of Carlsbad, Brantley Park, Captain Reef Road at Pecos River, 12.vi.2004, J. Huff and R. West, sandy dunes, collected at night with UV light, 2 ♀, 1 juv. (AMNH [LP 2897]); N of Carlsbad, Corner of Hwy 137 and Hwy 285, [32°33.0833'N 104°23.033'W], 8.vi.2004, J. Huff and R. West, under rock, 1 subad. ♀, 1 juv. (AMNH [LP 2896]); Loving, 24 km E, [32°17.133'N 104°5.8'W], 1978, C. Rudolf, 1 ♂, 1 ♀ (AMNH); dunes, 2 ♂, 5 ♀ (AMNH); Whites City, Walnut Canyon, [32°10.542'N 104°22.596'W], 22.vi.2002, K. McWest, H.M. Burrell, and D.S. Roberts, 1 ♂ (AMNH [LP

2151]); Whites City, Washington Ranch Road and Rattlesnake Springs Road, 9.vi.2004, J. Huff and R. West, under rock, 1 ♂ (AMNH [LP 2895]). *Grant Co.*: Pinos Altos, 2.9 km SSW, [32°52.03567'N 108°13.188'W], 30.vii.1960, J. Cole, 1 juv. (AMNH). *Hidalgo Co.*: I-9, ca. 4 km E Animas, 31°57.2300'N 108°45.96'W, 1354 m, 27.vii.2008, K. McWest and H.M. Burrell, collected at night with UV light, 1 ♂ (AMNH [LP 8856]); Rodeo, 1.6 km N, [31°50.21667'N 109°1.9'W], 20.vii.1976, 1 ♂, 1 subad. ♂, 4 subad. ♀, 17 juv. (AMNH), 1310 m, 25.vii.1976, 2 ♂, 2 juv. (AMNH), J. Hubbard, G. Mont, and M. Cazier. *Lincoln Co.*: Carrizozo Malpais, [33°46.200'N 106°0'W], 16.viii.1974, Riechert, 1 ♀ (AMNH), 1 ♂ (IBUNAM). *Luna Co.*: Cookes Canyon Road, 32°25.0607'N 107°34.7237'W, 28.vii.2008, K. McWest and H.M. Burrell, collected at night with UV light, 1 ♂ (AMNH [LP 8854]); Deming, 18 km E, [32°15.66667'N 107°45.35'W], J. Bigelow, gravel slope, 1 ♀ (AMNH); Little Florida Mountains, 1.6 km SE on Bonita Road from turnoff on Gap road, 32°09'29.4"N 107°35'18.9"W, 1761 m, 3.ix.2007, L. Prendini and J. Huff, 2 ♂, 1 ♀ (AMNH), 1 juv. (AMNH [LP 7095]); Rock Hound State Park, Spring Canyon, NE edge of Florida Mountains, 32°11.1401'N 107°36.6831'W, 4.viii.2008, W.D. Sissom, G. Casper, and T. Anton, 1 ♀ (AMNH). *Socorro Co.*: Antonio, 58 km S, 21.iii.1963, B. Bogel, 1 ♀ (AMNH); San Antonio, [33°54'31.29"N 106°52'8.11"W], 23.vii.2008, H.M. Burrell and K. McWest, collected at night with UV light, 1 ♂ (AMNH [LP 8851]). *Valencia Co.*: Los Lunas, 33 km NW, [34°48.56667'N 106°44.11666667'W], 17.vi.1970, M. Cazier et al., 1 ♀ (AMNH); Suwanee, 6.ix.1933, W. Ivie, 1 subad. ♂ (AMNH). **Texas:** *Brewster Co.*: Alpine, 40 km S, [30°21.39667'N 103°39.158'W], 6.xii.1938, 1 ♂, 1 juv. (AMNH); Alpine, 42 km S, 28.vii.1978, O. Francke and J.V. Moody, 1 ♀ (AMNH); Big Bend National Park: 29°15.0120'N 103°15.03'W, 4.ix.1972, J.A. Brubaker and F.J. Moore, 1 ♂, 1 ♀ (OSAL), 29°16.0709'N 103°14.2254'W, 1.viii.2008, W.D. Sissom, T. Anton, and G. Casper, rocky slope, 1 ♂ (AMNH

[LP 9004]); Boquillas Canyon, [29°17'14.42"N 103°12'44.73"W], 27.i.1973, C. McConnell, 1 ♂ (AMNH); Boquillas, 12.viii.1955, T. Cohn, 1 ♀ (AMNH), Castolon and Vicinity, 24.viii.1967, W.J. Gertsch and R. Hastings, 6 ♂, 5 ♀, 4 juv. (AMNH), Grapevine Hills, 22.iii.1977, Roth-Schroepfer, 1 ♂ (AMNH); Grapevine Ranch, N Base Grapevine Mountains, 7.ix.1969, M. Cazier, 34 ♂, 26 ♀ (AMNH), Old One Road, 30.vii.2008, 29°12.4890'N 102°59.5974'W, 1 ♂ (AMNH), 29°14.4859'N 103°0.6401'W, 693 m, 1 ♀ (AMNH), 29°16.0709'N 103°14.2254'W, 1 ♂ (AMNH), 29°24.6241'N 103°12.4611'W, 1 ♂ (AMNH), W.D. Sissom, G. Casper, and T. Anton; Panther Junction, [29°17'14.42"N 103°12'44.73"W], 25.viii.1967, W.J. Gertsch and R. Hastings, 8 ♂, 7 ♀ (AMNH); Rio Grande Village, [29°17'14.42"N 103°12'44.73"W], 21.vi.1970, 3 ♂, 4 ♀, 2 juv. (AMNH), 17.vi.1974, 1 ♀ (AMNH), 564 m, 29.vii.1978, 1 ♂, 1 ♀ (AMNH), L. Draper, M. Cazier and O. Francke, 7.vi.1974, 19 ♂, 11 ♀, 2 subad. ♂, 2 subad. ♀ (AMNH), M. Cazier and O. Francke, 16.vi.1974, 2 ♀ (AMNH), M. Cazier, Welech, and O. Francke, 21.vi.1970, 14 ♂, 13 ♀, 5 subad. ♂, 11 subad. ♀, 1 juv. (AMNH), O. Francke and J.V. Moody, 29.vii.1978, 1 ♀ (AMNH); Marathon, [30°12.4500'N 103°14.6'W], 23.viii.1967, W.J. Gertsch and R. Hastings, 1 ♂ (AMNH); Marathon, 29 km NE, 1265 m, 27.vii.1978, O. Francke and J.V. Moody, 1 ♂ (AMNH); W of Alpine, [30°21.6500'N 103°39.933'W], 5.ix.1939, S. Mulaik, 1 ♀ (AMNH). *Calverson Co.*: Pine Springs, Guadalupe Mountains, 2.5 km S, [31°53.62800'N 104°48.984'W], 3.ix.1972, Calverson, O. Francke, and Davison, 1 ♀ (AMNH). *Crockett Co.*: Rankin, 24 km S, [31°13.46667'N 101°56.45'W], 21.iii.1978, O. Francke, T.B. Hall and J.V. Moody, 2 juv. (AMNH). *Crosby Co.*: White River Lake, [33°14.46667'N 100°56.16666'W], 23.ix.1973, J.M. Rowland, 1 ♀ (AMNH), 12.iv.1985, S.W. Taber, 1 ♀ (AMNH). *Culberson Co.*: Guadalupe Mountains: National Park Mckitlrick Canyon, [31°58.61667'N 104°45.11666'W], 530 m, 14.v.1978, O. Francke and J.V. Moody, 2 juv. (AMNH); Guadalupe Pass, 25.ix.1950, W.J.

Gertsch, 1 ♂, 1 ♀ (AMNH); Indio Research Station, near Van Horn, [31°2.550'N 104°49.9833'W], ix.2002, L. Esposito, collected at night with UV light, 1 ♂, 3 ♀ (AMNH [LP 2145]); Kent, 1.6 km N, [31°4.150'N 104°13.033'W], 23.vi.1970, M. Cazier, Welech, and O. Francke, 3 ♂, 4 ♀, 3 subad. ♀, 1 juv. (AMNH); Nickel Creek, 4 km E, 3.ix.1952, B. Malkin, 2 ♂ (AMNH); Pine Springs Canyon, 18.vi.1974, M. Cazier and O. Francke, 4 ♂, 1 ♀, 1 juv. (AMNH); Pine Springs, 6 km S, (Guadalupe's), [31°53.62800'N 104°48.984'W], 3.ix.1972, O. Francke and Davison, 2 ♂ (AMNH); Van Horn, 126 km NNE, [31°2.5500'N 104°49.9833'W], 6.viii.1979, O. Francke, J.V. Moody, and Merikel, 1 ♀ (AMNH); Van Horn, 31 km NE, 2.vi.1978, O. Francke, T.B. Hall, and J.V. Moody, 1 subad. ♀, 1 juv. (AMNH). *Edinburg Co.*: iii–iv.1933, 1 ♂ (AMNH); 3.xii.1939, S. Mulaik, 1 ♀ (AMNH). *El Paso Co.*: line between Doña Anna Co. New Mexico and El Paso Texas, 19.vi.1970, M. Cazier, Welech, and O. Francke, 1 ♂, 1 ♀ (AMNH); NW of El Paso, along Franklin Mountains W slope, [31°47.41667'N 106°25.4'W], 1400 m, 19.v.1978, O. Francke and J.V. Moody, 1 juv. (AMNH). *Garza Co.*: 11.iv.1983, F. Rose, 1 ♀, 31 ex. (AMNH). *Hall Co.*: Turkey, [34°23.650'N 100°53.6833'W], 18.vi.1970, D. Kiser, 1 juv. (AMNH). *Hudspeth Co.*: Indio Ranch, 30°16'36"N 105°00'58"W, xi.2002, L. Esposito, collected at night with UV light, 2 ♀ (AMNH [LP 2200]); Salt Flat, 9.7 km E, [31°44.61667'N 105°5.5666'W], 3.ix.1972, O. Francke and Davison, 1 ♂ (AMNH); Sierra Blanca, 17.6 km N, [31°10.91667'N 105°20.45'W], 1388 m, 21.v.1978, O. Francke and J.V. Moody, 1 ♀ (AMNH); Sierra Blanca, 4.5 km S, 1350 m, 21.v.1978, O. Francke and J.V. Moody, 2 subad. ♂, 2 subad. ♀ (AMNH), ix.1972, 1 ♀, (AMNH); Hueco, 9.7 km E, 5.vi.1974, L. Draper, M. Cazier, and O. Francke, 2 subad. ♂, 4 subad. ♀, 2 juv. (AMNH). *Jeff Davis Co.*: Davis Mountains State Park, [30°35.750'N 103°55.9666'W], M. Cazier, Welech, and O. Francke, 20.vi.1970, 1 ♀, 2 subad. ♀ (AMNH), J.V. Moody and Meeks, 20.viii.1974, 1 ♂, 1 ♀ (AMNH);

Fort Davis, 18 km NW, [30°35.750'N 103°55.55'W], 7.vi.1978, O. Francke, T.B. Hall, and J.V. Moody, 1 ♀ (AMNH); Fort Davis, 6.4 km W, 6.vi.1978, O. Francke, T.B. Hall, and J.V. Moody, 1 ♂, 1 ♀ (AMNH); Fort Davis, 62 km NW, 7.vi.1978, O. Francke, T.B. Hall, and J.V. Moody, 1 ♀ (AMNH); Limpia Canyon Campground Davis Mountains State Park, [30°35.750'N 103°55.9666'W], 5.vi.1974, L. Draper, M. Cazier, and O. Francke, 1 ♀, 2 subad. ♀ (AMNH); Van Horn, 40 km S, [31°2.550'N 104°49.9833'W], 3.vi.1978, O. Francke, T.B. Hall, and J.V. Moody, 1 ♂, 1 ♀, 1 subad. ♀, 2 juv. (AMNH); Van Horn, 50 km S, [31°2.550'N 104°49.9833'W], 2.vi.1978, O. Francke, T.B. Hall, and J.V. Moody, 1 ♂, 1 ♀ (AMNH). *Loving Co.*: Mentone, 12.9 km N, [31°42.3833'N 103°35.9'W], 1.vi.1978, O. Francke, T.B. Hall, and J.V. Moody, 1 subad. ♀ (AMNH); Red Bluff Lake Road and US Hwy 285, 16.vi.2003, R.C. West, 1 ♂, 1 ♀ (AMNH [LP 2450]); TX 302, E side of Pecos River, 6.4 km E of junction US 285 and TX 302, 31°39'57.44"N 103°37'19.27"W, 5.x.2002, WTAMU Arachnology Class, 1 ♀ (AMNH [LP 2216]). *Lubbock Co.*: Yellowhouse Canyon, [33°27.33'N 101°32.1833'W], 26.iv.1973, T.R. Mollhagen, 1 ♀ (AMNH). *Motley Co.*: Matador, 6.4 km NW, [34°0.833'N 100°49.3'W], 11.vi.1979, O. Francke, J.V. Moody, and Sissom, 1 ♀ (AMNH). *Pecos Co.*: Sheffiield, 6.4 km E, along Pecos River, [30°41.433'N 101°49.35'W], 7.vi.1974, L. Draper, M. Cazier, and O. Francke, 2 ♂, 3 ♀, 3 subad. ♂, 4 subad. ♀ (AMNH). *Presidio Co.*: Big Bend Ranch State Park: 4.8 km E Sauceda, [29°29.5'N 104°4'W], 11.vii.1997, W.D. Sissom and B. Broyles, 1 ♂, (AMNH [LP 1620]); near Sauceda Airstrip, ca. 1.8 km E Sauceda Complex, ca. 56 km E Presidio, [29°29.5'N 104°4'W], 12.x.1996, K. McWest and T.C. Reid, collected at night with UV light, 1 subad. ♀ (AMNH [LP 4386]); Ojito Adentro, 29°29.5'N 104°4'W, 3.x.2005, Platnick Expedition, 1 ♂ (AMNH); Candelaria, [30°8.31667'N 104°41.133'W], 14.vi.1977, R. Wilson, 1 ♂ (CAS); Candelaria, 77 km N, 3.vi.1978, O. Francke, T.B. Hall, and J.V. Moody, 1

♀ (AMNH); Marfa, 53 km S, [30°18.71667'N 104°1.4833'W], 5.vi.1978, O. Francke, T.B. Hall, and J.V. Moody, 1 ♀, 1 subad. ♀ (AMNH); Presidio, 5.3 km N, [29°33.6833'N 104°21.9833'W], 2.ix.1972, O. Francke and Davison, 2 ♂ (AMNH); Presidio, 50 km NE, 5.vi.1978, O. Francke, T.B. Hall, and J.V. Moody, 2 subad. ♀ (AMNH); Presidio, 61 km NE, 5.vi.1978, O. Francke, T.B. Hall, and J.V. Moody, 1 ♀, 3 juv. (AMNH); Shafther, 0.8 km N, [29°49.21667'N 104°18.2'W], 2.viii.1972, Davidson, 1 juv. (AMNH). *Randall Co.*: Palo Duro Canyon, Red River, ca. 11.2 km NE, FM 1541, [34°57'N 101°40'W], 19.v.1998, K. McWest, 1 juv. (AMNH [LP 43570]), 1 subad. ♀ (AMNH [LP 4360]); Palo Duro Creek Canyon, ca. 11 km NE on FM 1549, [35°9.31933'N 101°44.20633'W], 28.v.2004, H.M. Burrell, collected at night with UV light, 1 ♀ 1 juv. (AMNH [LP 2961]). *Reeves Co.*: Balmorhea State Park, [30°56.66667'N 103°47.133'W], 26.viii.1971, K.M. and M. Cazier, 4 ♂, 1 ♀ (AMNH); SE of Pecos just 4.8 km SE of Toyzh Lake, area Pecos CNH 13–3 B-61, 13.vii.1973, J.J. Landye, on limestone area, 1 ♀ (AMNH). *Sterling Co.*: Sterling City, 16 km W, [31°50.300'N 100°59.15'W], 13.ix.1940, S. Mulaik, 1 ♂ (AMNH). *Terrell Co.*: Dryden, 53 km N, [30°2.66633'N 102°6.8501666'W], 21.x.1978, J.V. Moody and Meeks, 1 ♀ (AMNH); Dryden, 6.4 km E, 4.ix.1939, D. and S. Mulaik, 1 ♀ (AMNH); Sanderson, 8 km N, [30°8.46667'N 102°23.75'W], 8.vi.1974, L. Draper, M. Cazier, and O. Francke, 3 ♀ (AMNH); Sheffield, 30.5 km S, [30°41.433'N 101°49.35'W], 8.vi.1974, O. Francke, 1 subad. ♂ (AMNH). *Val Verde Co.*: Langtry, 1.6 km SSE, [29°48.51783'N 101°33.57533'W], 7.vi.1974, L. Draper, M. Cazier, and O. Francke, 7 ♂, 4 ♀, 1 subad. ♂, 1 subad. ♀ (AMNH). *Winkler Co.*: Kermit, 21 km S, [31°51.350'N 103°5.65'W], 7.vi.1979, 1 subad. ♂ (AMNH); TX 115, 14.3 km N of Pyote, 31°39'07.27"N 103°08'18.49"W, 4.x.2002, WTAMU Arachnology Class, 1 ♀ (AMNH [LP 2215]); Wink, 9.7 km N, [31°45.250'N

103°9.333'W], 16.v.2000, 1 ♀ (AMNH [LP 1742]), O. Francke, T.B. Hall, and J.V. Moody, 1.vi.1978, 2 ♀ (AMNH).

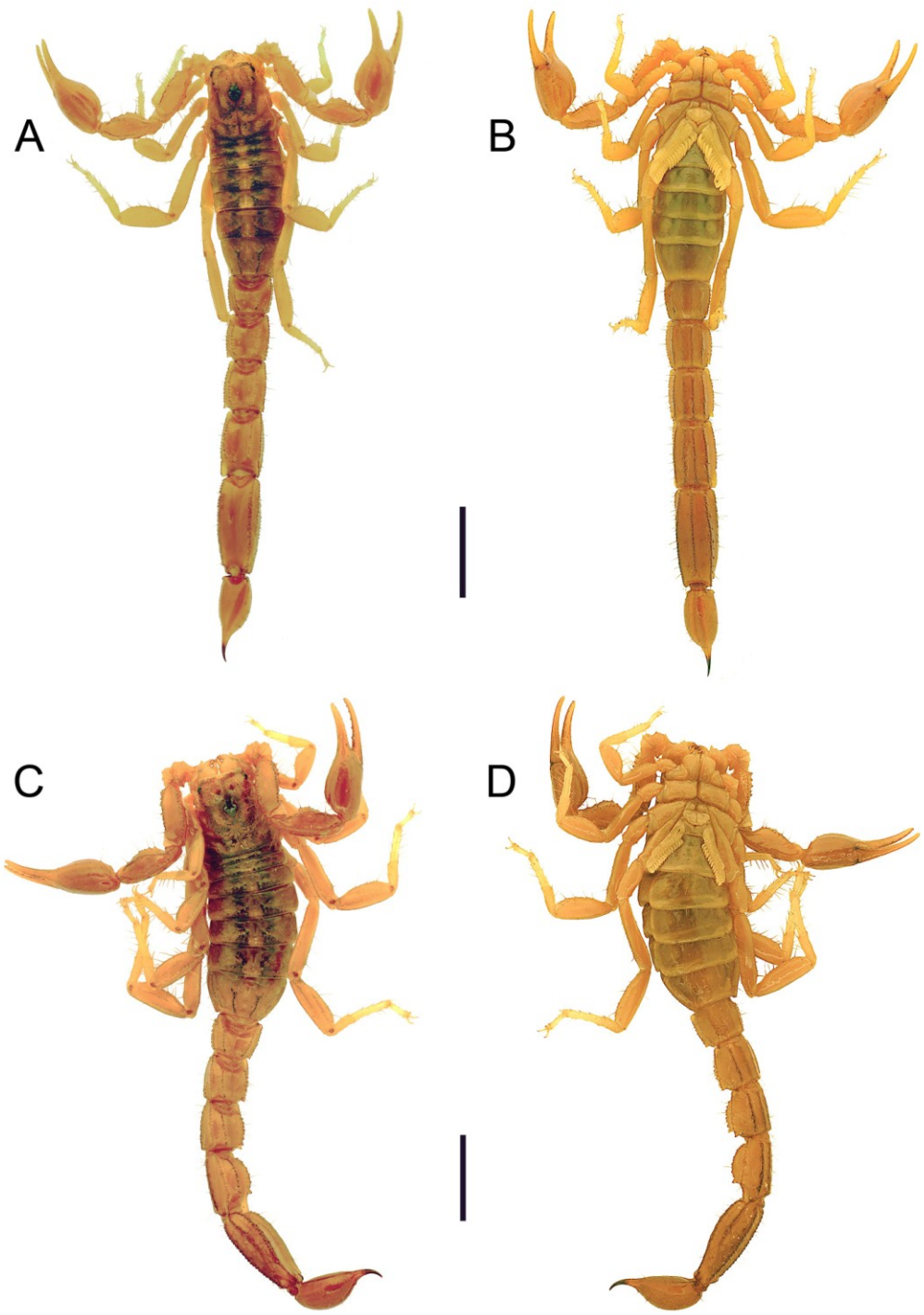


Figure 313. *Chihuahuanus coahuilae* (Williams, 1968), habitus. **A**, **B**. ♂ (AMNH). **C**, **D**. ♀ (AMNH). **A**, **C**. Dorsal aspect. **B**, **D**. Ventral aspect. Scale bars = 5 mm.

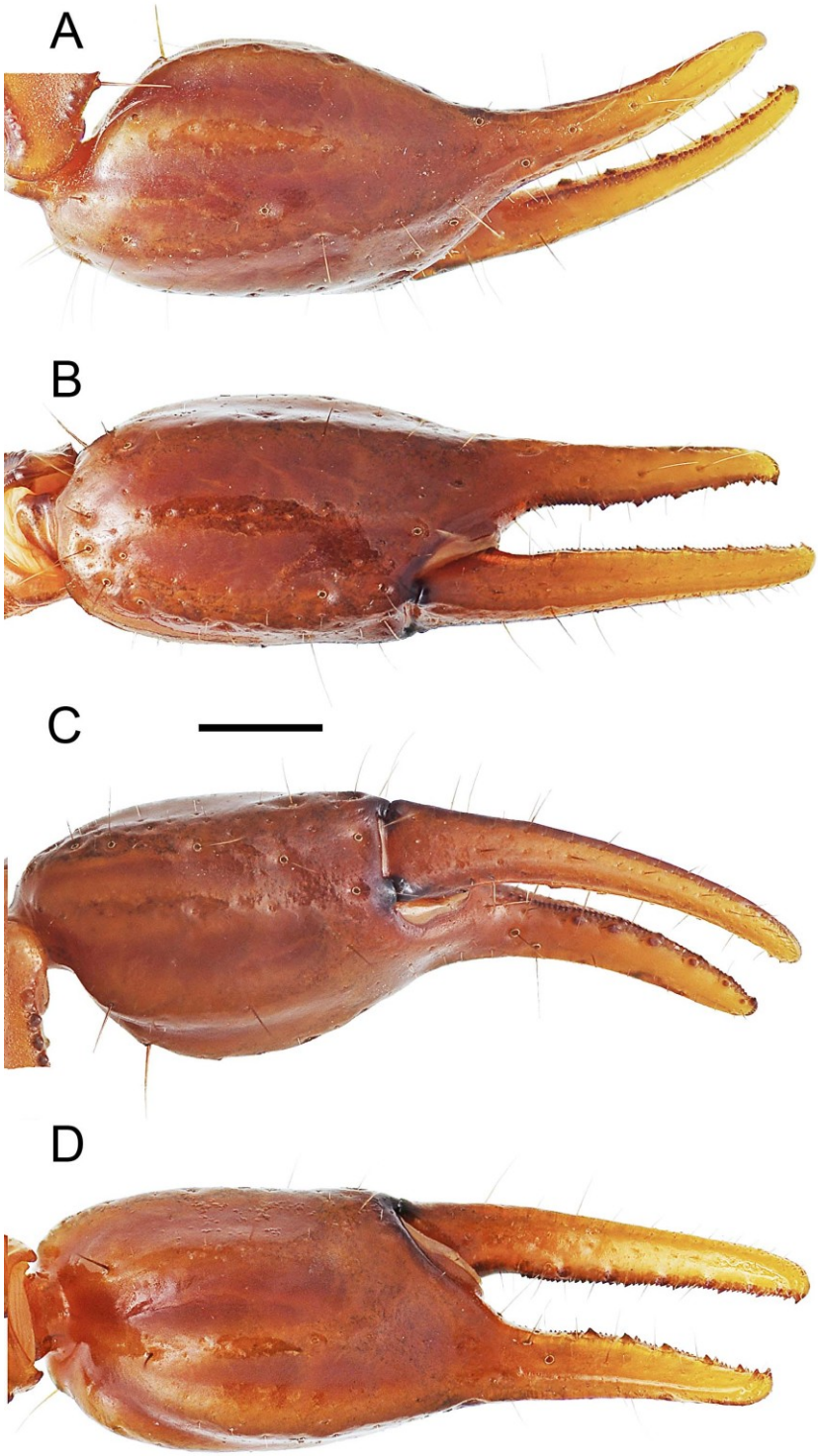


Figure 314. *Chihuahuanus coahuilae* (Williams, 1968), ♂ (AMNH), dextral pedipalp chela. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

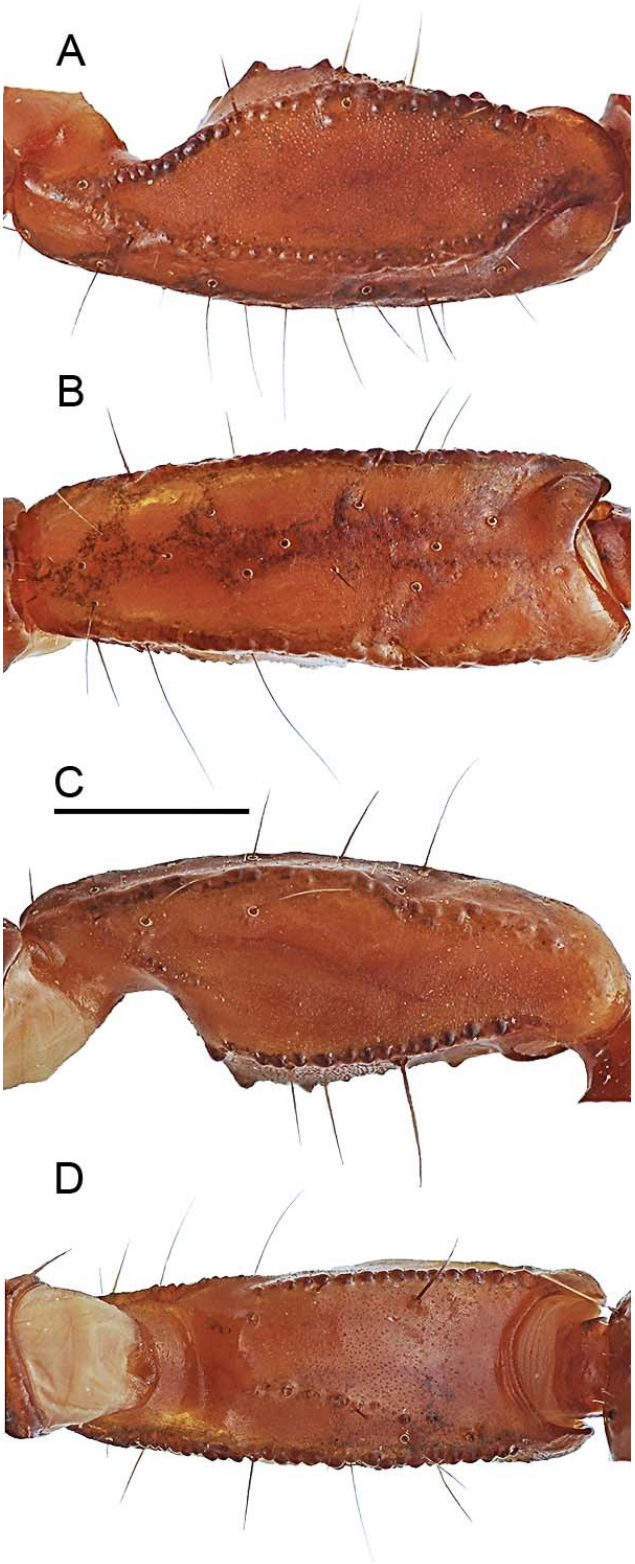


Figure 315. *Chihuahuanus coahuilae* (Williams, 1968), ♂ (AMNH), dextral pedipalp patella. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

Chihuahuanus crassimanus (Pocock, 1898)

Figures 307, 318–320, 336D, 338D, 340C, 341C, 344D, 346D, 348C

Vaejovis crassimanus Pocock, 1898: 397; Borelli, 1915: 3; Díaz-Nájera, 1975: 6, 22; Sissom, 1997: 13; Kovařík, 1998: 146; Sissom and Jackman, 1997: 151; Beutelspacher, 2000: 79, 140, 152, map 51; Sissom, 2000: 549; Brown et al., 2002: 411, 412, fig. 1, 414, 416, fig. 5; Sissom and Hendrixson 2005a: 128, tab. 6.2, 131, 133, 134; 2005b: 33, 42 (key); Graham and Fet, 2006: 8; McWest, 2009: 20, tab. 1.

Vejovis crassimanus: Kraepelin, 1899: 185; Bücherl, 1964: 61; Williams, 1971b: 44–47, figs. 1–2.

Vejovis cazieri Williams, 1968: 12, 15, figs. 7, 8; 1971b: 44; Soleglad, 1973b: 357. NEW SYNONYM

Vaejovis cazieri: Díaz-Nájera, 1975: 6, 20; Kovařík, 1998: 146; Beutelspacher, 2000: 76, 138, 152, map 50; Sissom, 2000: 549; Soleglad and Fet, 2003b: 9; Sissom and Hendrixson, 2005a: 128, tab. 6.2; 2005b: 42 (key); Francke and González-Santillán, 2007: 590.

Kochius cazieri: Soleglad and Fet, 2008: 4, 32, 33, fig. 48, 39, fig. 78, 45, fig. 107, 50, tab. 3, 55, fig. 131, 57, fig. 155, 61, fig. 174, 67, 92, 93, 94.

TYPE MATERIAL: *Vaejovis crassimanus*: **U.S.A.: Texas:** Lectotype ♀ (BMNH) (designated by Williams, 1971b), "San Diego, Texas" [not examined].

Kochius crassimanus: Soleglad and Fet, 2008: 67, 92–94, 105.

Vejovis cazieri: **MEXICO: Coahuila:** *Municipio de Cuatro Ciénegas*: Holotype ♂ (CAS, Type No. 10169), 0.5 km SW of town Cuatro Ciénegas de Carranza, [26°56.1286'N 102°5'W], 740 m, 28.vii.1967, S.C. Williams and W.S. Brown, desert dune. Paratypes: 19 ♂, 3 ♀

(CAS, including ♀ allotype), 1 ♂, 1 ♀ (AMNH) same locality as holotype; 3 ♂, 2 ♀ (CAS), Vicinity of Cuatro Ciénegas.

DIAGNOSIS: *Chihuahuanus crassimanus* is most closely related to *C. russelli*, with which forms a monophyletic group. This group is basal to the other species of the genus. *C. crassimanus* may be distinguished from *C. russelli* by having pedipalp fingers straight, lacking scalloping in both sexes, instead of having moderate scalloping in ♂ and weak in ♀. *C. russelli* has pedipalp chelae moderate to slender, instead of having chelae incrassate. Furthermore, *C. crassimanus* has ventral submedian carinae of metasomal segments I and II finely crenatoserrate, instead of having these carinae smooth to weakly crenular. *C. crassimanus* has dorsal carinae of pedipalp femur immaculate, instead of having outlined by moderately infuscate.

DESCRIPTION: This redescription supplements Pocock's (1898) original description. It is based on the material deposited in the collections mentioned in material examined.

Color and infuscation: Body color base medium yellow to dark orange. Carapace and tergites infuscate with dusky markings restricted to longitudinal median surface and proximal margin of each sclerite. Tergites with ventral median carinae immaculate. Median and lateral ocular tubercles intensely infuscate. Proximal two thirds of pedipalp fingers intensely infuscate. Prolateral surfaces of leg femur and tibia moderately infuscate. Metasomal segment V completely infuscate, except for narrow longitudinal stripes on intercarinal surfaces. Ventral surface of telson infuscate with two lateral and a median broad longitudinal bands, dorsal surface entirely infuscate Aculeus dark brownish.

Carapace: Carapace 1.22 times longer than posterior width. Anterior margin sublinear, with vestigial to moderate median notch and three pairs of major macrosetae. Carapace shagreened, densely cover by minute granules and scattered coarse moderate granules. Median

ocular tubercle moderately rose. Superciliary carinae strong and granular higher than median eyes. Position of median ocular tubercle on anterior half. Three pairs of lateral eyes, two frontal pairs same size and posterior slightly reduced. Median eyes approximately two times the size of lateral frontal pair. Anteromedian sulci moderate and broad, posteromedian deep, posterolateral moderate, posterior transverse obsolete.

Sternum and coxal region: Sternum pentagonal subequilateral with three pairs of setae, one distal, one median pair and one pair on the lobes, surface matte, median notch deep. Anterior margin of coxa II with three oblique slit-like structures, adjacent to a moderate and moderately granular protuberance. Base of coxal endite II with a deep depression each. Coxa IV 2.08 times longer than coxa II.

Chelicerae: Dorsal surface smooth, subdistal margin of manus with one macrosetae. Distal margin with moderate costate carinae. Serrula present on ventral distal half of movable finger, tines numbering 12–14.

Pedipalps: Trichobothrial pattern Type C, orthobothriotaxic. Chela wider than patella, patella wider than femur. Femur: All intercarinal surfaces matte. Dorsal prolateral, retrolateral dorsal, and ventral prolateral carinae complete strongly serrated; retrolateral dorsosubmedian moderate with scattered crenatoserrate granules and two median macrosetae; prolateral ventrosubmedian partial with enlarge unguiform or bicuspid proximal tubercle and a scattered row of four or five conical and enlarge granules and one major median macrosetae on top of a granule; prolateral ventral vestigial with one or two proximal enlarged conical granules and two additional similar granules with a macrosetae at base, these distributed from the basal to the mid aspect of the segment; ventral median and retrolateral ventral vestigial expressed by a row of

proximal scattered serrated granules; ventral retrosubmedian vestigial expressed by few scattered irregular serrated proximal granules reaching first third.

Patella: All intercarinal surfaces matte. Dorsal prolateral, dorsal retrolateral, ventral prolateral, and ventral retrosubmedian strongly granular, ventral median vestigial expressed as a basal short row of low granules, retrolateral dorsosubmedian and retrolateral median vestigial expressed by few sparse minute granules and two low broken costas. Prolateral median on a vaulted projection protruding strongly medially, extending from a basal tubercle with a short row of enlarge granules to mid segments, reaching trichobothrium d_2 and followed by a gap of smooth surface ending in a tubercle with a macroseta on top subdistal to dorsal prolateral. Prolateral ventral obsolete expressed by two major macrosetae, one basal and one distal, both adjacent to ventral prolateral carinae.

Chelae: Pedipalp manus relatively incrassate. Dorsal prolateral, dorsal median, dorsal retrosubmedian accessory, and dorsal retrolateral carinae moderately granular, strongly costate; dorsal prosubmedian and prolateral dorsal vestigial expressed by scattered granules flanking dorsal lateral carina; retrolateral median weakly granular, mostly smooth, strongly costate; ventral retrolateral incomplete moderately granular, ending at the level of trichobothrium *Est*; ventral retrosubmedian vestigial, expressed by few proximal minute granules; ventral prosubmedian moderate with minute granules; ventral prolateral smooth to weakly minutely granular, strongly costate; prolateral median weakly crenatoserrated, strongly costated and parallel to ventral prolateral. Trichobothrium *Db* positioned on dorsal retrolateral carina, surrounded by a ring of minute granules, subbasal on chela; *Dt* close to mid manus, but positioned on proximal half.

Fingers: Fix finger, PD = 6, MD rows = 5, RD = 5, proximal RD positioned by mid finger. All RD subpaired with corresponding PD. Movable finger, PD = 7, MD rows = 6 or 7, distal row bearing one minute granule, RD = 6 or 7, when RD7 absent, proximal RD positioned by mid finger. All RD subpaired with corresponding PD. Trichobothria *ib* and *it* positioned subbasal on fix finger, *ib* positioned between PD6 and PD7, PD7 lacking granule and *it* at the level of PD6. Fingers lacking scalloping, gap created when fingers closed absent.

Legs: Basitarsi I–II prolateral ventral and retrolateral ventral carinae with complete rows of spinules; prolateral ventral in III and IV absent; retrolateral ventral in III complete, in IV absent; retrolateral dorsal in I, vestigial, expressed on distal third, in II complete, in III vestigial, expressed on distal third, in IV absent; retrolateral median rows in I–IV vestigial expressed as few terminal spinules. Telotarsi I–IV with two pairs of ventrodistal spinules in I–IV. Setae: Prolateral ventral 2:4:4:4; median two in III and IV stout; retrolateral ventral 4:5:6:6; retrolateral dorsal 2:2:2:3; dorsal 3:3:3:3; retrolateral dorsal and dorsal series arranged in two independent rows.

Tergites: Pretergites matte, postergites matte medially and shagreened distolaterally. Tergites I–VI median carinae vestigial, expressed by few moderate distal granules; ventral submedian stronger with coarse distal granules. Tergite VII with intercarinal surfaces scattered with moderate conical granules. Dorsal median carina partial expressed on proximal half, moderately costate and few crenatoserrations. Dorsal submedian vestigial expressed as a pair of distal irregular serrations moderately costate. Dorsal lateral and lateral supramedian comparatively stronger than prior carinae, ending in an enlarged spiniform tubercle projecting backwards, Dorsal lateral projecting and curving laterally almost reaching lateral supramedian distal margin, creating a semi ring of strong granulation.

Genital operculum: Male genital operculum: wider than long, with three pairs of macrosetae. Sclerites free on longitudinal edge moving independently but unable to open more than 45°. Genital papillae protrude posteriorly. Female genital operculum: Wider than long, with three macrosetae. Sclerites fuse longitudinal.

Sternites: Sternites I–VII matte. Sternite V with distal median glandular spot moderate, not protruding from adjacent surface but whitish, contrasting moderately with darker base color, Sternite VI also present a distal median glandular spot, weaker but evident. Sternite VII with ventral lateral carinae finely crenatoserrated expressed. Distomedian glandular spot moderate in ♂, rounded, moderately protruding from adjacent surface, in ♀ distomedian glandular spot of sternite V–VII lower and poorly develop but evident. Spiracle elongated, slit-like, approximately two times longer than wide.

Pectines: Pectines longer than distal edge of coxa IV in ♂, in ♀ at the level of distal edge of coxa IV. Basal piece with median notch deep. Marginal lamella consist of three sclerites, medial lamella proximally fuse distally progressively forming conspicuous 11–13 beads. Fulcra with 15–18 in ♂, in ♀ 14–15 beads. Pectinal tooth count 16–19 in ♂, 15–16 in ♀.

Hemispermatophore: Lamina 1.5 longer than trunk. Dorsal through margin long, narrow, curving proximally, and removed from ventral trough. Hemimating plug developed from the inner lobe, distal barb margin with 20 elongated spinules. Primary and secondary hook positioned on the apex of lateral margin extension of the lamina (flange). Both hooks rounded and low, separated slightly, forming a shallow notch. Median lobe ental terminus moderated and rounded. Basal plate of inner lobe removed from ventral trough. Spine of inner lobe moderate. Neck relatively short (0.5 times longer than basal plate). Measurements, lamina, 3.60; trunk,

2.40; dorsal trough/laminar hooks, 1.26; ventral trough/laminar hook, 0.84; neck, 0.30; basal plate, 0.60.

Metasoma: Intercarinal surface matte. Dorsal lateral carinae of metasomal segments I–V and lateral median carinae of segments I–III strongly serrated, proximally terminating in elongated spiniform tubercle pointing backwards. Lateral median in IV proximal terminus moderately expanded or flared. Lateral inframedian in I complete crenatoserrated, in II and III irregularly crenatoserrated expressed in proximal third, in IV absent, in V partial, finely crenatoserrated expressed in distal half. Ventral lateral I–V, ventral submedian I–IV and ventral median in V finely crenatoserrated; ventral sublateral may be from finely crenatoserrated to weakly crenulated. Setae: Dorsal lateral carinae, 0:1:1:1:4; lateral median; 0:1:1:2; lateral inframedian, 1:0:0:0:3; ventral lateral, 2:2:2:4:6; ventral submedian, 3:3:3:3:2; ventral sublateral, 2.

Telson: Telson 2.5 times longer than wide. Metasomal segment V 1.3 times wider than telson. Vesicle 2.3 times longer than aculeus. Dorsal and ventral surface smooth. Dorsal surface with a fusiform minute glandular spot at or adjacent to the base of aculeus. Ventral surface with four to five macrosetae in each carina. Ventral median carinae with subaculear tubercle vestigial. Microserration on laterobasal aculeus numbering 5–8.

DISTRIBUTION: *Chihuahuanus crassimanus* is endemic to the Chihuahuan Desert, including the states of Chihuahua, Coahuila, Durango, and Nuevo León, Mexico; and southwestern Texas, southern New Mexico, and southeastern Arizona, U.S.A.

ECOLOGY: *Chihuahuanus crassimanus* exhibits a marked preference for sandy habitats or rocky habitats. The former group presents faint infuscation and lighter base color; the latter is darker and presents stronger pigmentation. The pale forms are distributed where sand dunes or

sandy substrate are abundant, whereas the brownish forms are associated with rocky habitats. This was observed directly observed in the field. At the type locality, specimens were collected on gypsum sand dunes and a few kilometers from there, at the Sierra of San Marcos, other specimens were colleceted on the northern talus were collected more specimens. Although the specimens were collected in the same region, strong preference for particular substrate was evident. In other sandy habitats of the distribution range, the same microhabitat preferences were noted. The pale forms could be considered psammophylous; besides the lighter color, the tarsi have sublinear rows of macrosetae, similar to that observed in other syntropines such as *Paravaejovis* species. On the other hand, the darker form has a similar configuration of these macrosetae, but its colorations matches the type of substrate were they live. The altitudes where this species has been collected range from 615 to 1922 m altitude.

REMARKS: Sissom (2000) reported the observation of Williams (1971b), who indicated that one of the syntype ♀ at BMNH, from the same locality as lectotype, is not referable to *V. crassimanus*, but to an unknown species closely related to *Vaejovis coahuilae*=[*Chihuahuanus coahuilae*].

The differences in color described above, contrasted to the topology obtained in the phylogenetic analyses, has not correlation. The specimens were study carefully and revealed not significant differences other than, color and variation in setae, which is another character Williams (1971b) used to separate *C. crassimanus* from *C. cazieri*. The position of the specimens from Cuatro Ciénegas, as expected, cluster together, but consistently forming a monophyletic group sister to all other samples. This is may indicate that the specimens at the type locality of *C. cazieri* are a distinctive lineage. However, the lack of diagnosable characters hampers the recognition of a separated species. Further sampling is necessary to test this hypothesis,

primarily to fill those gaps in the distribution between the type locality and the closest samples, to ensure that the topology is not a sampling artifact. Future study of microstructures, such as the hemispermatophore, may aid in separating this putative species.

MATERIAL EXAMINED: **MEXICO: Chihuahua:** *Municipio de Jiménez*: Arenales, between Carrillo and Guimbalate, 1153 m, 5.viii.2005, 26°57.6078'N 103°50.0568'W, 1153 m, 5.viii.2005, 1 ♂, 1 subad. ♂, 1 juv. (AMNH [ARA 1462]), 26°57.608'N 103°50.057'W, 1153 m, 5.viii.2005, 2 juv. (AMNH [LP 5307]), 26°56'39.65"N 103°52'23.73"W, 1124 m, 6.viii.2009, 3 ♂, 1 juv. (IBUNAM), O. Francke, W.D. Sissom, K. McWest, C. Lee, H. Montaño, J. Ballesteros, L. Jarvis, and C. Durán, collected at night with UV light. **Coahuila:** *Municipio de Cuatro Ciénegas*: Cuatro Ciénegas, [26°56.1286'N 102°5'W], 6.vi.1979, 1 ♀ (IBUNAM); Cuatro Ciénegas, 1.6 km S, [26°56.1286'N 102°5'W], 13.viii.1972, M. Cazier, 1 ♂ (IBUNAM); San Orozco Ranch, 5 km SE, Cuatro Ciénegas Ranch, 12.viii.1972, 2 ♀ (IBUNAM); Sierra San Marcos, 761 m, 18–19.vii.2006, 26°54'47.63"N 102°8'15.23"W, 1 ♂ (AMNH [LP 7179]), 26°54.7998'N 102°8.25'W, 3 ♂ (IBUNAM [ARA 0085]), 26°54'47.65"N 102°8'15.21"W, 1 ♂, 2 ♀ (IBUNAM), 26°52.6170'N 102°8.2656'W, 1 ♂ (IBUNAM), E. González, B. Hendrixson, K. McWest, and S. Grant, desert, collected at night with UV light; Dunas de Yeso, 26°51.7650'N 102°10.47'W, 776 m, 18–19.vii.2006, 1 ♂ (IBUNAM), 3 ex. (IBUNAM [ARA 0081]), 1 ♂ (AMNH [LP 7163]), O. Francke, W.D. Sissom, M. Córdova, A. Jaimes, and A. Ballesteros, desert, collected at night with UV light; Ojo de Agua, Ejido El Oso, 1039 m, 19.vii.2006, O. Francke, W.D. Sissom, K. McWest, B. Hendrixson, S. Grant, A. Jaimes, M. Córdova, E. González, and A. Ballesteros, 1 ♂, 1 juv. (AMNH [LP 6606]). *Municipio de Parras*: Parras, 22 km E, 1706 m, 22.vii.2010, O. Francke, W.D. Sissom, A. Jaimes, M. Córdova, and A. Ballesteros, 1 ♂ (IBUNAM); Parras, 8 km S, 1922 m, 22.vii.2010, E. González et al., 1 ♂

(IBUNAM); Sierra Parras, ca. 8 km S of Parras, 21.vii.2006, 25°23.055'N 102°10.893'W, 1900 m, 1 ♂ (AMNH [LP 6555]), 25°22.974'N 102°11.145'W, 1922 m, 1 ♂ (AMNH [LP 6478]), B. Hendrixson, K. McWest, E. González, and S. Grant. *Municipio de Cuatro Ciénegas*: Sierra San Marcos, 26°54.7998'N 102°8.25'W, 761 m, 18.vii.2006, E. González, B. Hendrixson, K. McWest, and S. Grant, desert, collected at night with UV light, 2 ♂ (AMNH [ARA 1110]); Dunas de Yeso, 26°51.7650'N 102°10.47'W, 776 m, 18.vii.2006, O. Francke, W.D. Sissom, M. Córdova, A. Jaimes, and A. Ballesteros, desert, collected at night with UV light, 4 ex. (AMNH [ARA 1105]). *Municipio de General Cepeda*: El Nogal, 2 km S, Sierra de la Concordia, 25°16.7880'N 101°25.7748'W, 1730 m, 22.vii.2006, O. Francke, S. Grant, and J. Ballesteros, collected at night with UV light, 1 ♂ (AMNH [ARA 1072]). *Municipio de Matamoros*: Sierra del Marmol, 10 km S of Nuevo Cuahutemoc, 25°7.9500'N 102°38.4498'W, 1172 m, 21.vi.2006, O. Francke, K. McWest, M. Córdova, A. Jaimes, and A. Ballesteros, 2 juv. (AMNH [LP 6446]). *Municipio de Sierra Mojada*: Sierra Mojada, 20–21.vii.2006, 27°19.1880'N 103°43.1346'W, 1605 m, desert, collected at night with UV light, 3 ♂ (CAS [ARA 1962]), 27°18.599N 103°42.744W, 1604 m, 1 ♂, 1 juv. (AMNH [LP 6486]), 5 ♂ (AMNH [ARA 1119]), 1 ♂, 2 ♀ (IBUNAM), 2 ex. (CAS [ARA 1952]), W.D. Sissom, E. González, B. Hendrixson, and S. Grant. **Durango:** *Municipio de Gómez Palacio*: Dinamita, 25°44.0886'N 103°40.3998'W, 1328 m, 29.vii.2005, O. Francke, H. Montaño, J. Ballesteros, and C. Durán, collected at night with UV light, 1 ♂ (AMNH [ARA 3171]). *Municipio de Lerdo*: Nazareno, 8 km NW, 25°22.7298'N 103°31.6512'W, 1258 m, 3.vi.2011, G. Villegas, 1 ♂ (IBUNAM). *Municipio de Peñón Blanco*: Peñón Blanco, 8 km N, 1667 m, 11.viii.2005, 24°51.1476'N 104°1.98'W, 1 ♀, 2 ♂, 1 juv. (AMNH [ARA 1485]), 1 ♂, 3 juv. (CAS [ARA 1532]), 1 ♀, 2 ♀, 1 juv. (IBUNAM [ARA 2081]), 24°51.148'N 104°01.989'W, 2 juv. (AMNH [LP 5316]), O. Francke, W.D. Sissom, K.

McWest, C. Lee, H. Montaño, J. Ballesteros, L. Jarvis, and C. Durán, desert, collected at night with UV light; Peñón Blanco, 24°51.1482'N 104°1.98'W, 1667 m, 12.viii.2009, O. Francke, W.D. Sissom, K. McWest, C. Lee, H. Montaño, J. Ballesteros, L. Jarvis, and C. Durán, 1 ♂ (IBUNAM). *Municipio de Tlahualilo*: Tlahualilo de Zaragoza, ca. 15 km NW, junction Montes Claros-Tlahualilo de Zaragoza, 26°9.2418'N 103°31.28'W, 1107 m, 6.viii.2005, O. Francke, W.D. Sissom, K. McWest, C. Lee, H. Montaño, J. Ballesteros, and L. Jarvis, collected at night with UV light, 4 ♂, 2 ♀, 1 subad. ♀ (AMNH [ARA 3170]), 1 subad. ♀ (IBUNAM [ARA 2420]), 3 ♀ (IBUNAM [ARA 2420]), 3 ♂ (IBUNAM [ARA 2420]); Hwy 49, at deviation Montes Claros-Tlahualilo de Zaragoza, 26°9.242'N 103°31.284'W, 1107 m, 6.viii.2005, O. Francke, W.D. Sissom, K. McWest, C. Lee, H. Montaño, J. Ballesteros, L. Jarvis, and C. Durán, collected at night with UV light, 2 juv. (AMNH [LP 5273]), 1 juv. (AMNH [LP 5365]), 2 juv. (AMNH [LP 5370]); Hwy 49, junction Montes Claros-Tlahualilo de Zaragoza, 26°9.2418'N 103°31.28'W, 1107 m, 7.viii.2009, 2 ♂, 1 ♀ (IBUNAM). **Nuevo León:** *Municipio de Hualahuises*: Hualahuises, 30 km SW, [24°52'59.36"N 99°40'29.71"W], xi.1974, J.M. Torres, 1 juv. (IBUNAM). *Municipio de Monterrey*: Cañón de la Huasteca, 25°36.8736'N 100°28.5306'W, 728 m, 25.vii.2006, 1 ♂, 1 ♀ (IBUNAM), 25°36.8796'N 100°28.53'W, 780 m, 24.vii.2006, collected at night with UV light, 1 ♂ (AMNH [ARA 1078]), O. Francke, W.D. Sissom, K. McWest, B. Hendrixson, S. Grant, A. Jaimes, and M. Córdova. **San Luis Potosí:** *Municipio de Villa de Arista*: Villa de Arista, 10 km E, 22°38.760'N 100°45.499'W, 1624 m, 20.viii.2006, O. Francke, W.D. Sissom, G. Casper, T. Anton, V. Torti, H. Montaño, C. Santibáñez, and A. Ballesteros, 1 juv. (AMNH [LP 6579]). **U.S.A.: Arizona:** *Cochise Co.*: Portal, 10 km NW, on Portal-San Simon Road, [31°54'38.89"N 109°8'32.00"W], 1371 m, 29.viii.1967, S.C. Williams, collected at night with UV light, 1 ♂ (AMNH); Portal, V. Roth, 9.vi.1965, 1 ♂ (AMNH), W.J. Gertsch,

1.viii.1965, 1 ♂ (AMNH), ix.1966, 1 ♀ (AMNH), 27.vii.1967, 1 ♀ (AMNH). *Graham Co.*: Fan Road, ca. 8.9 km NE of Bowie, 32°22'31.01"N 109°26'51.53"W, 1109 m, 24.vii.2008, H.M. Burrell and K. McWest, collected at night with UV light, 1 ♂ (AMNH [LP 8858]); Fan Road, 8.9 km NE of Bowie, 32°22'30.68"N 109°26'51.49"W, 1109 m, 24.vii.2008, M.H. Burrel and K. McWest, 1 ♀ (AMNH). *Pima Co.*: Tucson, [32°13'18"N 110°55'35"W], viii.1935, 2 ♂ (AMNH). **New Mexico:** *Bernalillo Co.*: Albuquerque, 15 km S, Arroyo Tijeras, [35°6.64217'N 106°36.5995'W], 25.v.1981, R.A. Bradley, 1 ♀ (AMNH); Albuquerque, 15 km S, 20.v.1981, 1 ♂ (AMNH), R.A. Bradley, 24.v.1981, 1 ♂ (AMNH). *Doña Ana Co.*: Las Cruces, 32°18.7380'N 106°46.69'W, 8.ix.1970, F.J. Moore, 1 ♀ (OSAL); 32°15.648'N 106°43.655'W, 1238 m, 15.ix.2002, L. Prendini, M. Nishiguchi, and G. Giribet, collected at night with UV light, 1 ♂ (AMNH [LP 2137A]). *Eddy Co.*: N of Carlsbad, Brantley Park, Captain Reef Road at Pecos River, [32°33.0833'N 104°23.033'W], 12.vi.2004, J. Huff and R. West, sandy dunes, collected at night with UV light, 1 ♀, 1 subad. ♂ (AMNH [LP 2900]); Carlsbad, 16 km W, 24.1 km N on Dark Canyon Road after second cattle guard, 32°17.082'N 104°18.00'W, 7.vi.2004, J. Huff and R. West, desert, collected at night with UV, 1 subad. ♂ (AMNH [LP 2899]). *Hidalgo Co.*: Cotton City, [32°5.26133'N 108°52.81266667'W], 6.viii.1966, S. Roth, 1 subad. ♂ (AMNH); Granite Gap on Hwy 80, N of Rodeo, 32°05'34.2"N 108°58'12.1"W, 1367 m, 22.vii.2007, J. Huff, collected at night with UV light, 1 ♂ (AMNH [LP 7016]); Granite Gap, Peloncillo Mountains, 32°05'43.1"N 108°58'13.7"W, 1367 m, 4.ix.2007, L. Prendini and J. Huff, 1 subad. ♂ (AMNH [LP 7100]). *Luna Co.*: Cookes Canyon Road, 32°25.0607'N 107°34.7237'W, 28.vii.2008, K. McWest and H.M. Burrell, collected at night with UV light, 1 ♂ (AMNH [LP 8857]); Cookes Canyon Road, 6.4 km NW junction NM 26, 32°27.2083'N 107°36.86'W, 28.vii.2008, K. McWest and H.M. Burrell, 1 ♂ (AMNH [LP 8859]); Cookes Canyon,

32°27.2083'N 107°36.86'W, 28.vii.2008, M.H. Burrel and K. McWest, 1 ♀ (AMNH). **Texas:** *Brewster Co.*: Black Gap Wildlife Management Area, 10.5 km past camp 6 on Camp 14 road, [29°32.84200'N 102°54.6285'W], 16.vii.2004, L. Jarvis, W.D. Sissom, and T. Anton, 1 ♂ (AMNH [LP 2972]); Lajitas, 8 km E, [29°15.70'N 103°46.6'W], R.W. Manning, 1 ♂, 1 ♀ (IBUNAM); Marathon, [30°12.4500'N 103°14.6'W], C. and P. Vaurie, 9.vi.1948, 1 ♂ (AMNH), W.J. Gertsch and R. Hastings, 23.viii.19672, 1 ♂ (AMNH); NSU Dalquest Research, Sandy Canyon, 29 km NE Sauceda, 29°33.3'N 103°47.6'W, 1212 m, 4.x.2005, Platnick Expedition, 2 ♂ (AMNH); Big Bend Area, 241 km S of Marathon, [29°17'14.42"N 103°12'44.73"W], 20.ix.1940, B. Brown, 1 ♂ (AMNH); Big Bend National Park: Castolon and Vicinity, 24.viii.1967, W.J. Gertsch and R. Hastings, 3 ♂, 1 ♀, 1 juv. (AMNH); Panther Junction, 25.viii.1967, W.J. Gertsch and R. Hastings, 4 ♂, 2 ♀ (AMNH), Grapevine Hills, N side, 29°24.6241'N 103°12.4611'W, 1.viii.2008, W.D. Sissom, G. Casper and T. Anton, 1 ♀ (AMNH), Old One Road, 30.vii.2008, 29°12.4890'N 102°59.5974'W, 2032 m, 1 juv. (AMNH), 29°14.4859'N 103°0.6401'W, 693 m, 1 ♂ (AMNH), W.D. Sissom, G. Casper, and T. Anton, along Old One Road, 29°12.4890'N 102°59.5974'W, 619 m, 30.vii.2008, W.D. Sissom, T. Anton, and G. Casper, rocky substrate, 1 juv. (AMNH [LP 8930]), Grapevine Hills, 29°24.6241'N 103°12.4611'W, 1.viii.2008, W.D. Sissom, T. Anton, and G. Casper, dry arroyo with sandy bottom, 1 ♂, 1 juv. (AMNH [LP 8927]). *Dallas Co.*: Grapevine Spring, [32°57.068'N 97°0.064'W], 7.iii.1956, 1 ♂ (AMNH). *El Paso Co.*: El Paso, [31°47.41667'N 106°25.4'W], 1 ♀ (AMNH). *Hidalgo Co.*: Edimburg, [26°18.250'N 98°9.833'W], xii.1939, S. Mulaik, 1 ♀ (AMNH). *Hudspeth Co.*: Sierra Blanca, [31°10.91667'N 105°20.45'W], 6.ii.1941, S. Mulaik, 2 juv. (AMNH); Indio Mountain Research Station, Bailey Evans Canyon, 30°16'36"N 105°00'58"W, 16.v.2003, L. Esposito, 1 ♂ (AMNH [LP 2326]). *Presidio Co.*: Ben Ranch State Park, Ojito Adentro, 29°29.5'N 104°4'W, 8.x.2005,

Platnick Expedition, 1 juv. (AMNH). *Reeves Co.*: Pecos, 50 km N, near Red Bluff Lake, [31°24.933'N 103°30'W], 9.vi.2004, J. Huff and R. West, desert scrub, collected at night with UV, 1 ♀ (AMNH [LP 2898]). *Terrell Co.*: Dryden, 6.4 km E, [30°2.66633'N 102°6.8501666'W], 4.ix.1939, D. and S. Mulaik, 1 ♂ (AMNH). *Webb Co.*: Laredo, [27°31.46667'N 99°29.435666'W], x.2002, N. McReynolds, 1 ♂ (AMNH [LP 2217]). Laredo, 51 km E, 9.ii.1935, S. Mulaik, 2 ♂ (AMNH). *Culberson Co.*: Nickel Creek Station, 3.2 km E, 2.ix.1952, B. Malkin, 1 ♂ (AMNH).

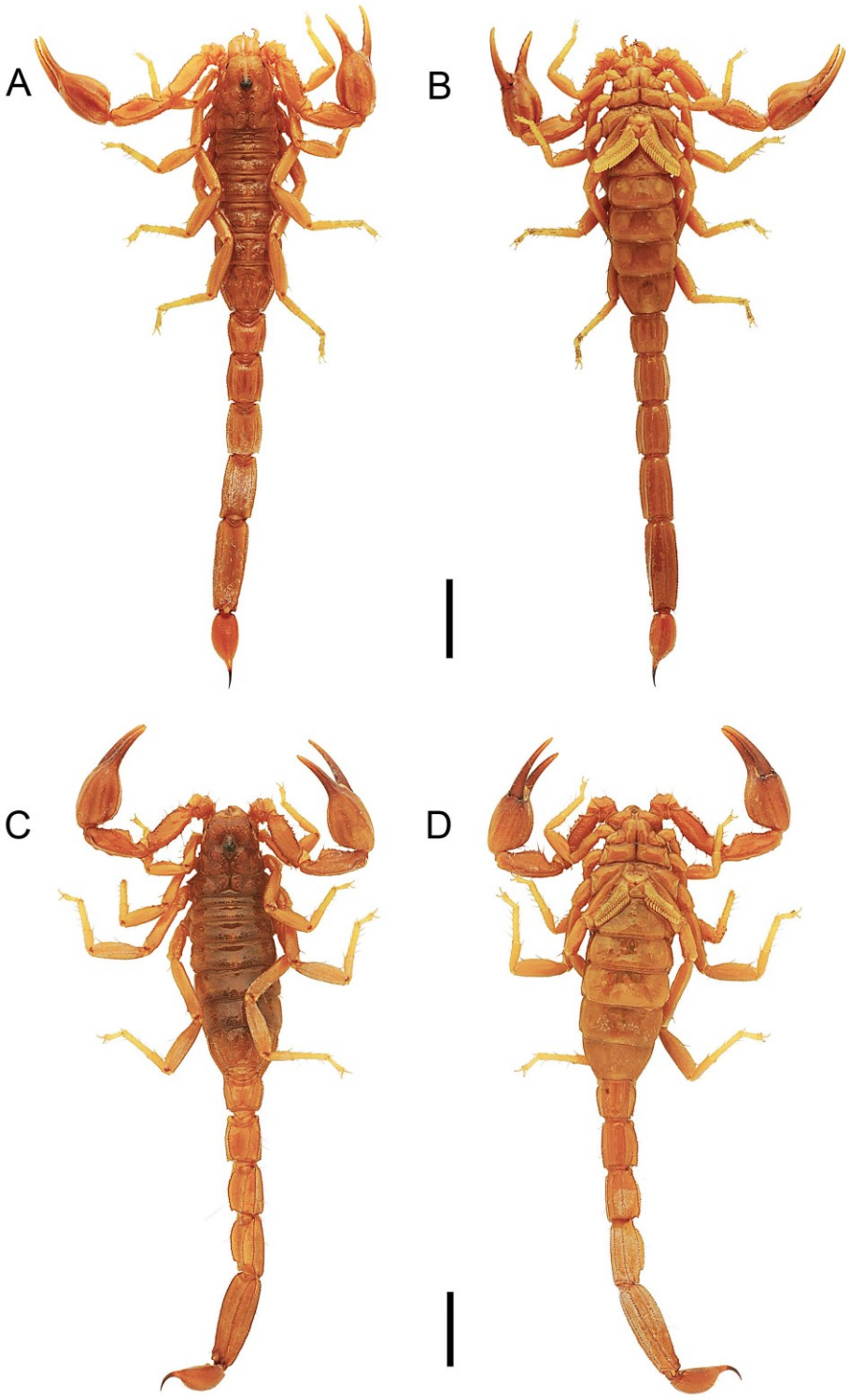


Figure 316. *Chihuahuanus crassimanus* (Pocock, 1898), habitus, dark form. **A**, **B**. ♂ (AMNH). **C**, **D**. ♀ (AMNH). **A**, **C**. Dorsal aspect. **B**, **D**. Ventral aspect. Scale bars = 5 mm.

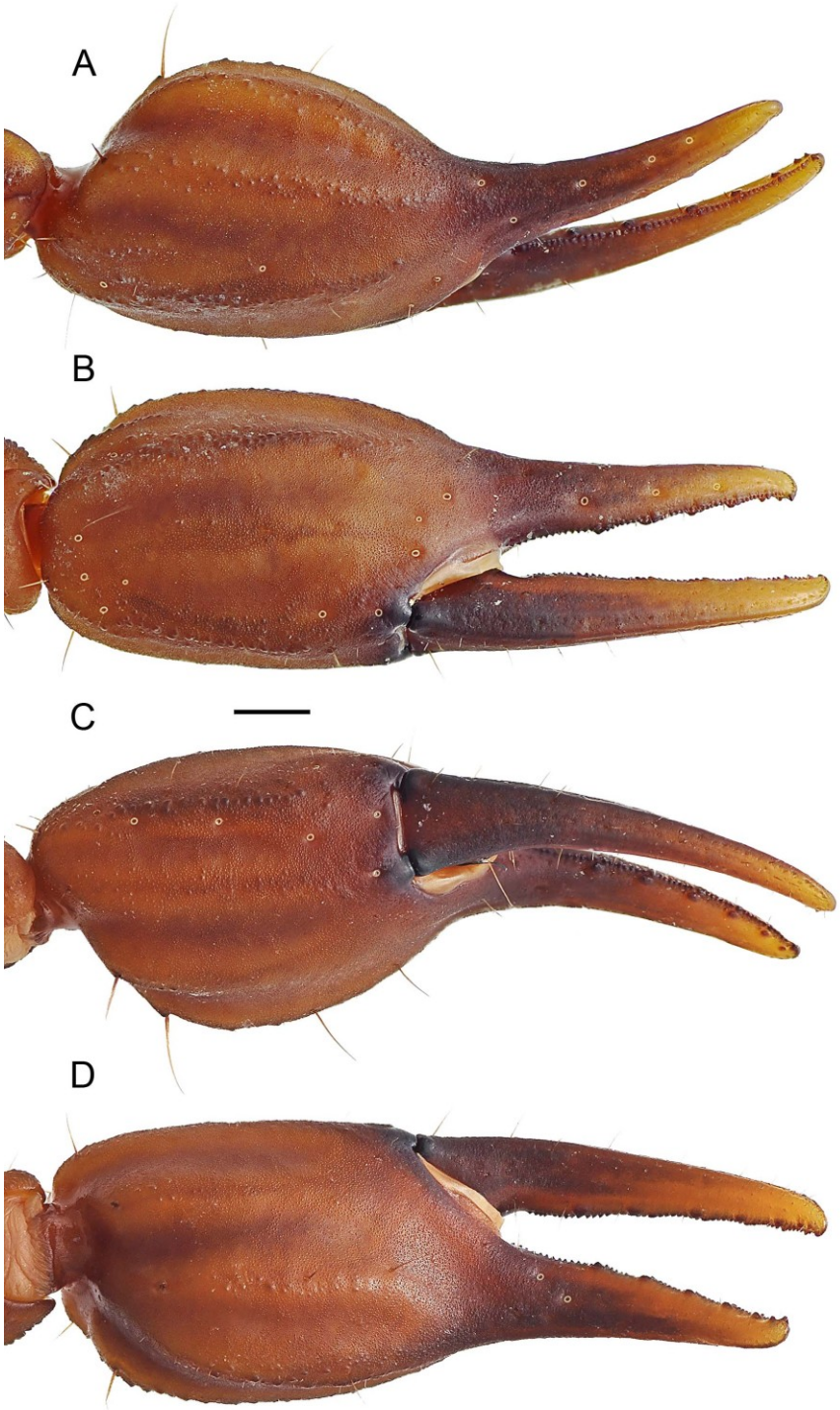


Figure 317. *Chihuahuanus crassimanus* (Pocock, 1898), ♂ (AMNH) dark form, dextral pedipalp chela. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

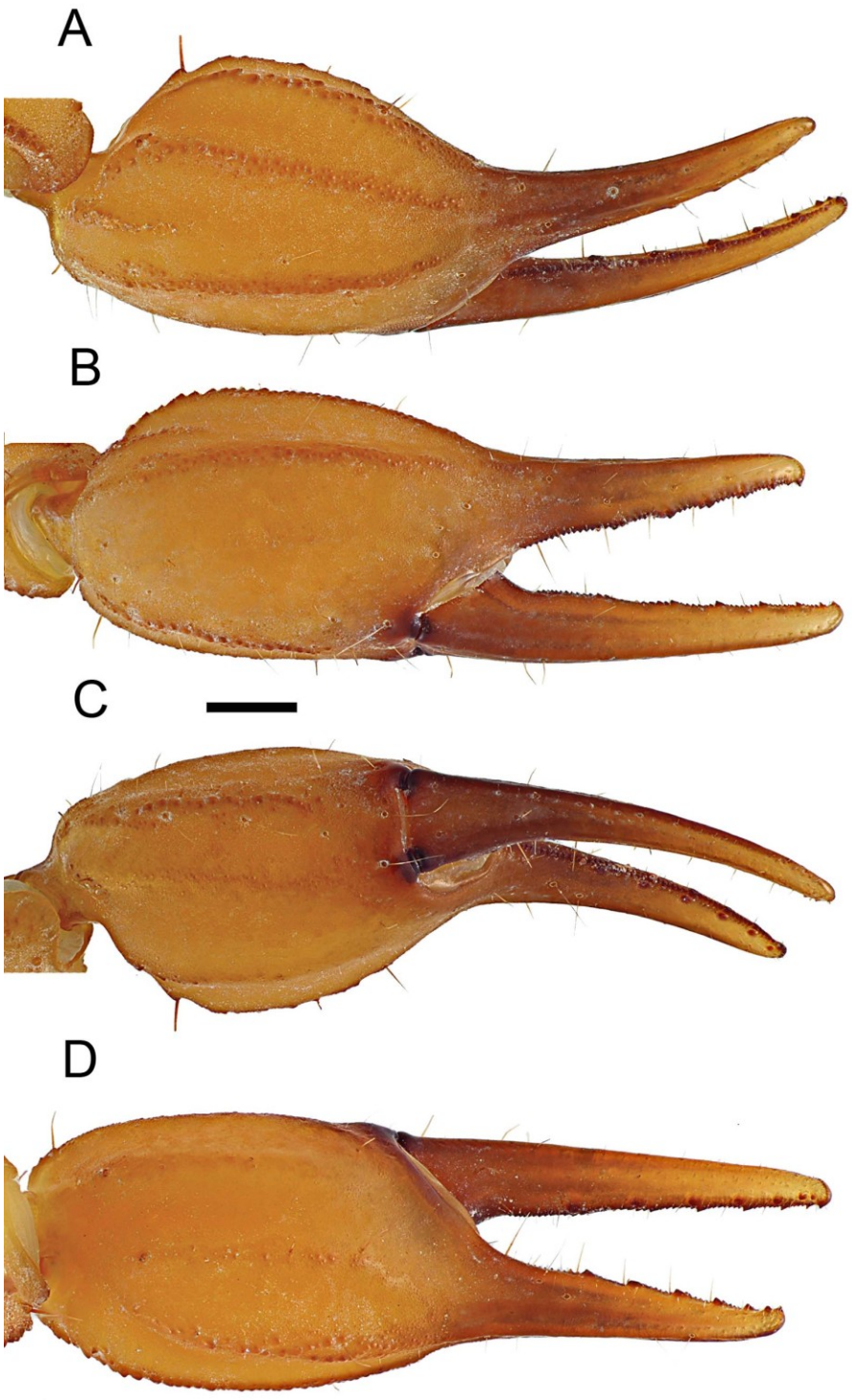


Figure 318. *Chihuahuanus crassimanus* (Pocock, 1898), ♂ (AMNH) pale form, dextral pedipalp chela. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

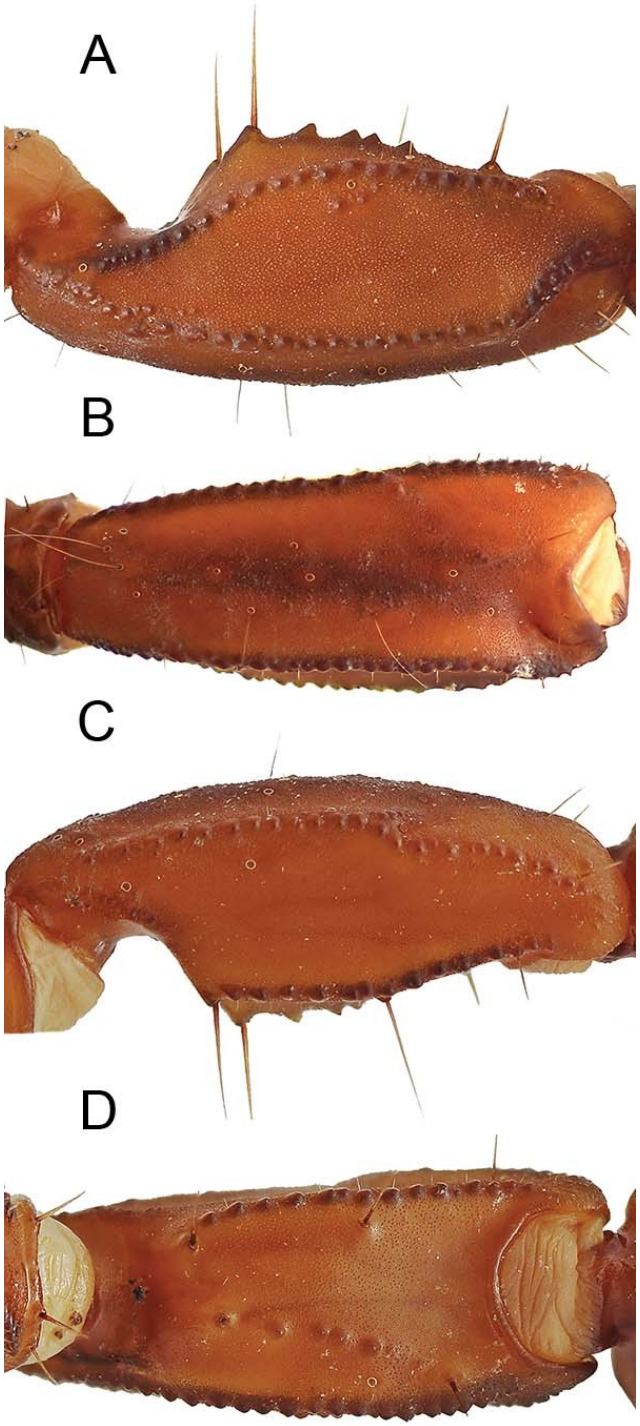


Figure 319. *Chihuahuanus crassimanus* (Pocock, 1898), ♂ (AMNH) dark form, dextral pedipalp patella. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

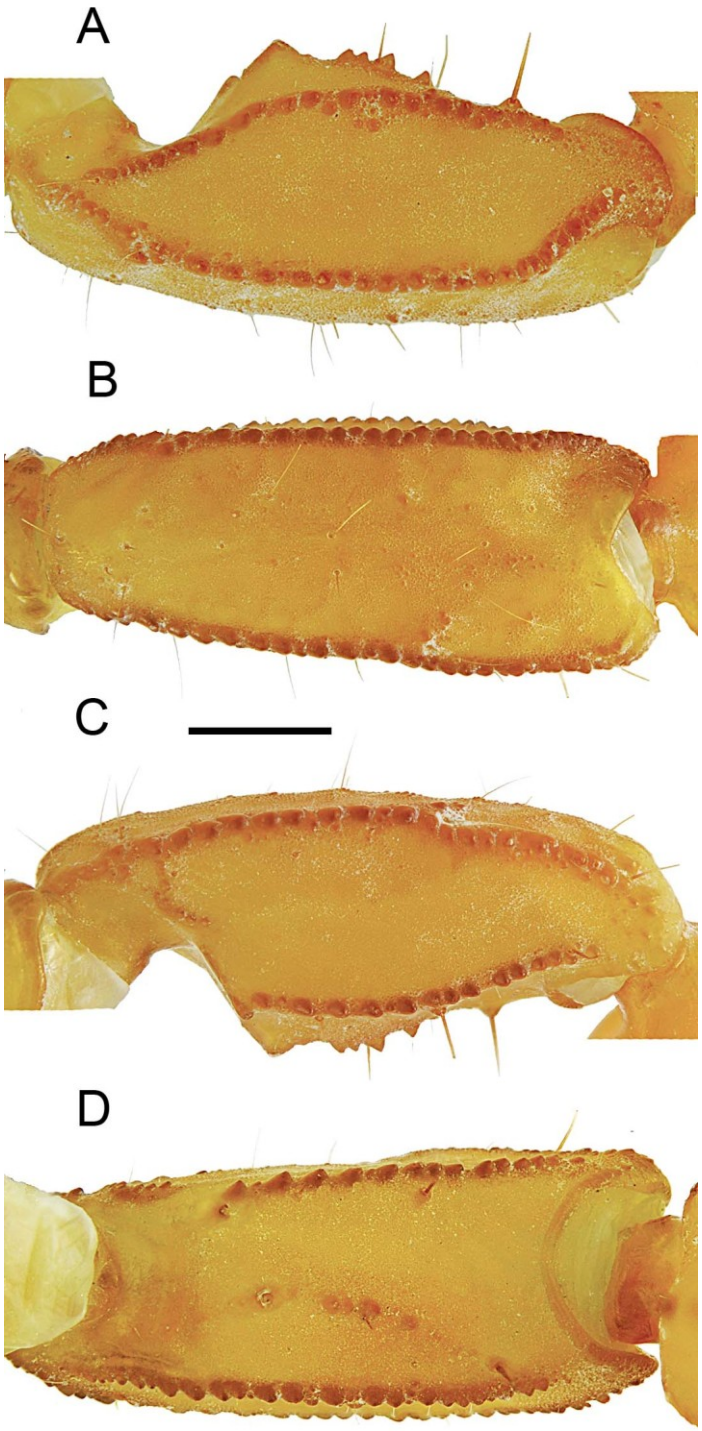


Figure 320. *Chihuahuanus crassimanus* (Pocock, 1898), ♂ (AMNH), pale form, dextral pedipalp patella. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

Chihuahuanus glabrimanus (Sissom and Hendrixson, 2005)

Figures 306, 321–323, 337A, 339A, 340D, 341D, 344E, 346E, 348D

Vaejovis glabrimanus Sissom and Hendrixson, 2005b: 35–39, figs. 1–12.

Hoffmannius glabrimanus: Soleglad and Fet, 2008: 31, 36, 68, 91.

TYPE MATERIAL: **MEXICO: Nuevo Léon:** Holotype ♂ (FSCA), 4.9 mi N La Ascension, Mexico 24°19' N 99°54' W, 18.vii.1972, E.A. Liner, R.M. Johnson and A.H. Chaney. Paratype: **Coahuila:** ♂ (FSCA), 10.8 mi S, 0.1 mi E Arteaga at Los Pinos, 25°17' N 100°50' W, 17.vii.1975, E.A. Liner et al. [not examined].

DIAGNOSIS: *Chihuahuanus glabrimanus* is most closely related to *C. globosus*, *C. kovariki*, and *C. panchovillai*, **n. sp.**, (see *C. globosus* for details). *C. glabrimanus* may be separated from the other species by having dorsal retrolateral and ventral retrosubmedian carinae smooth, instead of having these carinae moderately crenular. *C. glabrimanus* is also the species with the weakest carinae on pedipalp manus, instead of having these carinae moderate and smooth to moderate and finely granular. From *C. kovariki* differs by having dorsal lateral and ventral lateral carinae of metasomal segment V moderately hirsute 7 and 10 macrosetae respectively, instead of having 12 and 14 macrosetae respectively. Additionally *C. glabrimanus* has four macrosetae on prolateral ventral carinae of pedipalp femur, instead of having nine. *C. kovariki* has ventral submedian carinae of metasomal segment I–III smooth to weakly crenular, instead of having this carinae completely, finely and densely crenatoserrate. *C. glabrimanus* has ventral submedian carinae of metasomal segment I–III smooth to weakly crenular, whereas *C. panchovillai*, **n. sp.** has this carinae completely, finely and densely crenatoserrate. Furthermore, differs from *C. panchovillai*, **n. sp.** by having major macrosetae on pedipalp femur, patella, and

chelae, instead of having minor macrosetae. From *C. globosus* differs by having ventral submedian carinae of metasomal segment I smooth and weakly costate, instead of having this carina finely crenatoserrate. Additionally, The female of *C. glabrimanus* has telson relatively elongated, whereas the female of *C. globosus* have the telson globose, expanded laterally.

DESCRIPTION: This redescription supplements Sissom and Hendrixson's (2005b) original description. It is based on the material deposited in the collections mentioned in material examined.

Color and infuscation: Babe color pale yellow. Carapace and tergites, with fine and diffuse dusky markings restricted to median surface, other surface immaculate. Median and lateral ocular tubercles moderately infuscate. Base of fingers slightly reddish. Aculeus dark brownish.

Carapace: Carapace 1.26 times longer than posterior width. Distal margin linear, lacking medial notch and with three or four pairs of major macrosetae. Carapace shagreened, scattered coarse and minute granules. Median ocular tubercle moderately rose. Superciliary carinae moderate, distally strongly crenulated, medially and proximally smooth slightly higher than medina eyes. Position of medina ocular tubercle on distal half. Three pairs of lateral eyes, two frontal pairs same size and posterior slightly reduced. Median eyes approximately two times the size of lateral frontal pair. Anteromedian sulci deep, posteromedian and posterolateral moderate, posterior transverse obsolete.

Sternum and coxal region: Sternum pentagonal subequilateral, wider than long with three pairs of setae, one distal, one median pair and one pair on the lobes, surface matte, median notch deep. Anterior margin of coxa II with three oblique slit-like structures, adjacent to a low and

finely granulate protuberance. Base of coxal endite II with a deep depression each. Coxa IV 2.20 times longer than coxa II.

Chelicerae: Dorsal surface smooth, subdistal margin of manus with one macrosetae. Distal margin with costate carinae. Serrula present on ventral distal half of movable finger, tines numbering 13.

Pedipalps: Trichobothrial pattern Type C, orthobothriotaxic. Chela wider than patella, patella wider than femur. Femur: All intercarinal surfaces weakly matted. Dorsal prolateral and dorsal retrolateral and ventral prolateral complete with moderate to strong irregular granules; retrolateral dorsosubmedian obsolete, expressed only by five macrosetae on distal two thirds, distal two macrosetae minor; retrolateral ventral obsolete, expressed by one moderate granule; ventral median vestigial, expressed as a short row proximal serrated granules; prolateral ventrosubmedian vestigial, expressed by a proximal bicuspid tubercle adjacent to trichobothrium *i*, positioned at proximal mid surface followed by a short row of irregular conical granules and two macrosetae, one median enlarged granule with a macroseta at base, and a distal macroseta slanting gently towards distal end of dorsal prolateral carinae; prolateral ventral vestigial, expressed by one proximal macroseta adjacent to two or three enlarged conical proximal granules, followed by two median moderate granules each with a macrosetae at base, and a distal minor macrosetae these granules slanting gently towards distal end of ventral prolateral carinae; prolateral ventrosubmedian and prolateral ventral carinae diverging distally.

Patella: Dorsal, ventral and prolateral surfaces weakly matte, retrolateral surface smooth. Dorsal prolateral and ventral prolateral complete strongly crenulated; dorsal retrolateral and ventral retrosubmedian costate and smooth; retrolateral carinae obsolete; ventral median vestigial, expressed by few proximal minute granules; prolateral median on a vaulted projection

expressed by a proximal tubercle with a macrosetae on top and two or three proximal coarse granules, distal one with a macroseta at base, protruding strongly medially, followed by a gap of smooth surface and ending on a distal macrosetae following a curve, slanting dorsally almost reaching dorsal prolateral carinae on distal fifth; prolateral ventral obsolete, expressed by three macrosetae, one proximal on the top of a moderate tubercle, one median minor macrosetae and one distal, these adjacent to ventral prolateral carinae.

Chela: Manus smooth and relatively incrassate (manus 1.45 times longer than fixed finger). Dorsal median, dorsal prolateral, ventral retrolateral, ventral median, ventral prolateral and prolateral median weakly to moderately costate and smooth, all other carinae obsolete. Trichobothrium *Db* positioned on dorsal retrolateral carina, subbasal on chelae; *Dt* positioned close to mid manus but on the proximal half.

Fingers: Fix finger, PD = 6, MD rows = 5, RD = 5, proximal RD positioned by mid finger. All retrolateral denticles subpaired with corresponding prolateral denticle. Movable finger, PD = 7, MD rows = 6, distal row bearing one minute granule, RD = 6, proximal RD positioned slightly proximal to mid finger. All RD subpaired with corresponding PD. Trichobothria *ib* and *it* positioned subbasal on fix finger, *ib* positioned between PD6 and PD7, PD7 lacking granule, in and *it* at the close to or adjacent to the level of PD6; Fingers with weak scalloping in ♂, proximal notch and medina lobe of fixed finger moderate; proximal notch and medina lobe of movable finger weak, gap created when fingers closed moderate, fingers fit unevenly; in ♀ fingers lacking scalloping, gap created when fingers closed absent.

Legs: Basitarsi I–II prolateral ventral retrolateral ventral and retrolateral dorsal carinae with complete rows of spinules, prolateral ventral in III and IV absent; retrolateral ventral in III complete, in IV absent, retrolateral dorsal in III partial expressed on distal half in IV absent;

retrolateral median rows in I–IV vestigial expressed as few terminal spinules. Telotarsi I–IV with two pairs of ventrodistal spinules in I–IV. Setae: Prolateral ventral 2:3:4:4; median two in III and IV stout; retrolateral ventral 3:5:7:7; retrolateral dorsal 2:3:3:5; dorsal 4:4:4:4; retrolateral dorsal and dorsal series arranged in two independent rows, all macrosetae in approximately same size, in ♂; in ♀ retrolateral dorsal and dorsal series longer than other series.

Mesosoma: Pretergites smooth, postergites uniformly shagreened, scattered coarse and minute granulation. Tergites I–VI ventral median carinae weak, expressed by a distal low costa and few minute distal granulations; ventral submedian weak expressed by with irregular distal granules. Tergite VII with intercarinal surfaces weakly shagreened with few scattered coarse granules, intercarinal surface between; dorsal median carina moderately costate expressed on proximal half of the postergite with few scattered subserrate crenulations; dorsal submedian vestigial expressed as a low short oblique proximal short protuberance with few low subserrate granules; dorsal lateral and lateral supramedian moderate becoming slightly stronger distally; dorsal lateral carinae projecting and curving laterally approximating to lateral supramedian distal margin, creating a semi ring of serrated granulation.

Genital operculum: Male genital operculum: wider than long, with three pairs of macrosetae. Sclerites free on longitudinal edge moving independently but unable to open more than 45°. Genital papillae protrude posteriorly. Female genital operculum: Wider than long, with three macrosetae. Sclerites fuse longitudinal.

Sternites: Sternites I–VII smooth, finely punctuated, and lustrous. Sternite V with distal median glandular spot weak, not protruding from adjacent surface, expressed as a whitish broad band limited by the spiracles, contrasting weakly with pale base color in ♂, in ♀ obsolete. Sternite VII ventral lateral carinae vestigial, expressed by a short low costa delimited by two

pairs of macrosetae, other carinae obsolete expressed by two or three macrosetae and occasional with one or two median accessory macroseta in ♂, in ♀ with three or more median accessory macrosetae. Distomedian glandular spot rounded, weakly protruding from adjacent surface but distinctly whitish contrasting moderately with base color pale in ♂, in ♀ obsolete. Spiracle elongated, slit-like, approximately two times longer than wide.

Pectines: Pectines longer than distal edge of coxa IV in ♂, in ♀ at the level of distal edge of coxa IV. Basal piece with median notch deep. Marginal lamella consist of three sclerites, medial lamella proximally fuse distally progressively forming conspicuous 10 beads. Fulcra with 16–28 in ♂, in ♀ 12–14 beads. Pectinal tooth count 17–19 in ♂, 13–15 in ♀.

Hemispermatophore: Lamina 1.86 longer than trunk. Dorsal through margin long, narrow, curving proximally, and removed from ventral trough. Hemimating plug developed from the inner lobe, distal barb margin with 15 elongated spinules. Primary and secondary hook positioned on the apex of lateral margin extension of the lamina (flange). Both hooks rounded low, separated slightly, forming a shallow notch. Median lobe ental terminus moderated and rounded. Basal plate of inner lobe removed from ventral trough. Spine of inner lobe relatively long and strongly sclerotized. Neck relatively short (0.42 times longer than basal plate). Measurements, lamina, 3.90; trunk, 2.10; dorsal trough/laminar hooks, 1.68; ventral trough/laminar hook, 1.02; neck, 0.30; basal plate, 0.72.

Metasoma: Intercarinal surfaces smooth. Metasoma 1.4 times longer than mesosoma. Metasomal segments I–III wider than long. Carinae: Dorsal lateral and lateral median carinae in I–IV moderately crenatoserrated terminating in a moderated enlarge spinoid, except lateral median in IV distal terminus moderately expanded or flared laterally forming a triangular projection; dorsal lateral in V proximally moderate and crenatoserrate, becoming weaker and

crenulated distally. Lateral inframedian in I complete moderately crenatoserrated; in II incomplete crenatoserrated, becoming weaker proximally, present on distal third; in III incomplete crenatoserrated, becoming weaker proximally, present in distal fourth; in VI absent, in V proximally strongly crenatoserrated, becoming weaker distally, present in proximal half; ventral lateral in I–V moderately crenatoserrate; ventral submedian in I obsolete, in II weakly costate, in III moderately costate with distal third weakly crenular; in IV moderately crenatoserrated; ventral median in V moderately crenatoserrated. Setae: Dorsal lateral carinae, 1:3:3:4:7; lateral median, 1:3:3:4; lateral inframedian, 2:1:0:0:5; ventral lateral, 3:4:4:4:10; ventral submedian, 3:3:4:5:5, ventral sublateral, 2. One to two accessory major and macrosetae in intercarinal surfaces between ventral submedian carinae in segments I–IV.

Telson: Telson 2.5 times longer than wide. Metasomal segment V 1.3 times wider than telson. Vesicle 2.3 times longer than aculeus. Dorsal and ventral surface smooth. Dorsal surface with a fusiform to irregularly round minute glandular spot at or adjacent to the base of aculeus. Ventral surface with five to six macrosetae in each carina. Ventral median carinae with subaculear tubercle obsolete. Microserration on laterobasal aculeus numbering 4–6.

DISTRIBUTION: *Chihuahuanus glabrimanus* is endemic to the Chihuahuan Desert, including the states of Aguascalientes, Guanajuato, Nuevo León, Coahuila, San Luis Potosí, Tamaulipas, and Zacatecas, Mexico.

ECOLOGY: *Chihuahuanus glabrimanus* is a lapidicolous species that inhabits dry environments, mostly scrublands and chaparral. It has been recorded from 780 to 2357 m altitude.

MATERIAL EXAMINED: **MEXICO: Aguascalientes:** [21°53'40.12"N 102°20'25.69"W], J. Martínez, 1 ♂ (IBUNAM). *Municipio de Aguascalientes*: El Cedazo, [21°51'56.39"N

102°13'14.98"W], 11.vii.2006, 1 ♂ (IBUNAM); 2.x.2006, 1 ♂ (IBUNAM). *Municipio de Asientos*: Francisco Villa, [22°14'N 102°5'W], 16.x.2006, F. Aguinaga, 1 ♀ (IBUNAM). *Municipio de Cosio*: Cosio, [22°21'N 102°18'W], 2.x.2006, F. Aguinaga, 1 ♀ (IBUNAM); Soledad de Abajo, [22°25'N 102°17'W], 4.x.2006, F. Aguinaga, 1 ♀ (IBUNAM). *Municipio de Tepezala*: Tepezala, 1 km N, 22°14.348'N 102°10.467'W, 2048 m, 4–5.vii.2005, O. Francke, J. Ponce, M. Córdova, A. Jaimes, G. Francke, and V. Capovilla, 2 ♂ (AMNH [LP 5294]), 30 ♂, 6 ♀, 3 juv. (IBUNAM). **Guanajuato:** *Municipio de San Diego de la Unión*: San Diego de la Unión, 8 km S, 21°23.1444'N 100°53.4522'W, 2078 m, 28.vii.2006, E. González, M. Córdova, A. Jaimes, A. Ballesteros, and O. Francke, 1 juv. (AMNH [ARA 0119]), 1 ♀ (AMNH), 1 ♀ (AMNH [LP 6611]). *Municipio de San Luis de la Paz*: San Luis de la Paz, 7 km E, 21°18.714'N 100°25.601'W, 2117 m, 24.viii.2006, O. Francke, W.D. Sissom, G. Casper, T. Anton, V. Torti, H. Montaño, C. Santibáñez, and A. Ballesteros, dry forest, in litter, collected at night with UV light, 2 ♂ (AMNH), 1 ♂, 1 ♀, (AMNH [ARA 1088]), 1 ♂ (AMNH [LP 6588]), 3 ♂ (IBUNAM). **Nuevo León:** *Municipio de Galeana*: La Providencia, 3 km NW, 1980 m, 17–8.vii.2006, 25°8.6496'N 100°39.0498'W, 6 ex. (AMNH [ARA 1108]), 25°8.6520'N 100°39.04'W, 5 ♂, 1 ♀, 1 juv. (IBUNAM), O. Francke, E. González, M. Córdova, J. Ballesteros, and A. Jaimes, semidesert, collected at night with UV light; Providencia, 3 km NE, 25°8.6514'N 100°39.04'W, 1980 m, 17.vii.2006, O. Francke, E. González, M. Córdova, J. Ballesteros and A. Jaimes, 2 ♂ (AMNH [LP 6558]); Road San Roberto-Galeana, maker km 78, 24°40'57.6"N 100°06'24"W, 1944 m, 25.vii.2006, O. Francke, W.D. Sissom, K. McWest, B. Hendrixson, S. Grant, A. Jaimes, M. Córdova, E. González, and A. Ballesteros, 1 ♀ (AMNH [LP 6410]); road to San Roberto, 24°40.9500'N 100°6.4002'W, 1984 m, 19.vii.2010, 1 ♀ (IBUNAM). *Municipio de Santa Catarina*: Cañón de la Huasteca, 25°36.8736'N 100°28.5306'W, 780 m, 24.vii.2006, O. Francke,

W.D. Sissom, K. McWest, B. Hendrixson, S. Grant, A. Jaimes, M. Córdova, E. González, and A. Ballesteros, 1 ♂ (AMNH [LP 6415]). **San Luis Potosí:** *Municipio de Charcas*: La Joya, 23°1.0056'N 100°54.1008'W, 2029 m, 19–20.viii.2006, O. Francke, W.D. Sissom, G. Casper, T. Anton, V. Torti, H. Montaño, and C. Santibáñez, desert, in litter, collected at night with UV light, 1 ♂, 1 ♀, 8 juv. (IBUNAM), 9 ex. (AMNH [ARA 1116]), 4 ex. (CAS [ARA 1897]). *Municipio de Ciudad del Maíz*: Puerto Santa Catarina, 1214 m, 22–23.viii.2006, 22°18.2226'N 99°37.2678'W, 1 ♂ (IBUNAM), 22°18.223'N 99°37.268'W, 1 ♂ (AMNH [LP 6610]), O. Francke, W.D. Sissom, G. Casper, T. Anton, V. Torti, H. Montaño, C. Santibáñez, and A. Ballesteros. *Municipio de Real de Catorce*: Real de Catorce, 14 km N, 23°45.3834'N 100°56.7498'W, 2183 m, 19.viii.2006, O. Francke, W.D. Sissom, T. Anthon, G, Casper, H. Montaño, V. Torti, and C. Santibánez, 4 ♂, 1 ♀ (IBUNAM). *Municipio de Río Verde*: La Angostura, 3 km W, 22°16.3932'N 100°8.95'W, 1099 m, 22.viii.2010, O. Francke et al., 1 ♂ (IBUNAM). *Municipio de Villa de Arista*: Villa de Arista, 10 km E, 1624 m, 22°38.760'N 100°45.499'W, 20.viii.2006, O. Francke, W.D. Sissom, T. Anthon, C. Santibáñez, and A. Ballesteros, 7 ex. (AMNH), 5 ♂ (AMNH), 22°30.760'N 100°45.499'W, 8.viii.2006, O. Francke, W.D. Sissom, T. Anthon, V. Torti, G. Casper, H. Montaño, C. Santibáñez, and A. Ballesteros, 5 ♂ (IBUNAM). **Tamaulipas:** *Municipio de Jaumave*: El Salto, between Palmillas and Jaumave, 23°21.4398'N 99°30.9408'W, 1115 m, 23.viii.2006, O. Francke, W.D. Sissom, G. Casper, T. Anton, V. Torti, H. Montaño, and C. Santibáñez, collected at night with UV light, 4 ex. (AMNH [ARA 1135]). **Zacatecas:** *Municipio de Jalpa*: Jalpa, 5 km SW, 1564 m, 21°38.569'N 103°03.425'W, 7.viii.2005, 1 ♂ (AMNH [LP 5267]), 21°38.5596'N 103°3.42'W, 8.vii.2005, 2 ♂ (IBUNAM), O. Francke, J. Ponce, M. Córdova, G. Francke, and V. Capovila. *Municipio de Río Grande*: Felipe Pescador, Cañitas, [23°36'N 102°43'W], 24.xi.1999, E. Barrera and H.

Brailovsky, 1 juv. (IBUNAM). *Municipio de San Alto*: Emiliano Zapata, [23°35'N 102°'W], 10.ix.1975, S. Guijosa, under rocks, 1 ♀ (IBUNAM). *Municipio de Sombrerete*: Route MEX 45, km 184.5 Sombrerete-Durango, 23°44.7186'N 103°47.7786'W, 2357 m, 9.viii.2005, O. Francke, W.D. Sissom, K. McWest, C. Lee, H. Montaño, J. Ballesteros, and L. Jarvis, rock turning, 1 ♀ (AMNH [ARA 3145]).

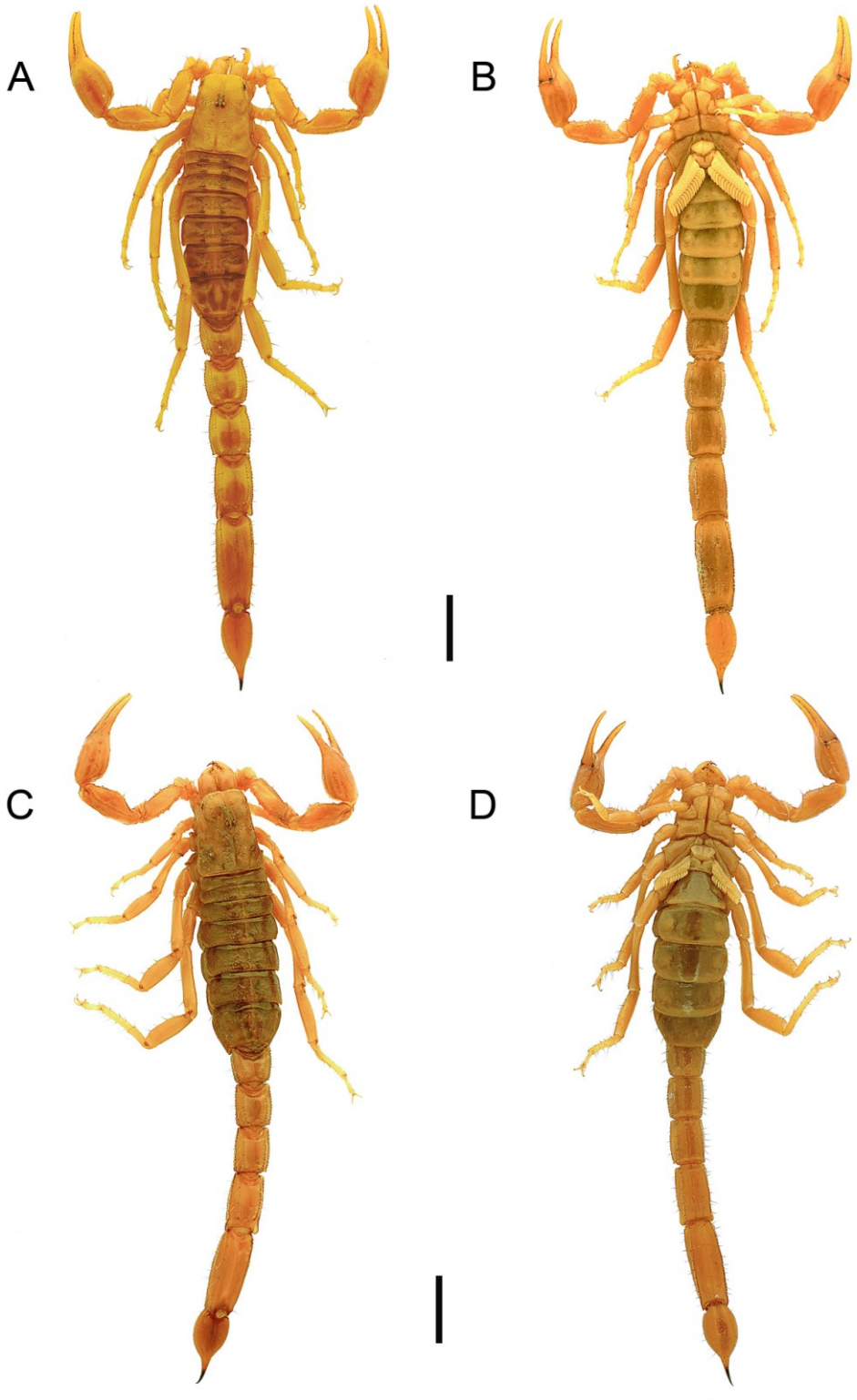


Figure 321. *Chihuahuanus glabrimanus* (Sissom and Hendrixson, 2005), habitus. **A**, **B**. ♂ (AMNH). **C**, **D**. ♀ (AMNH). **A**, **C**. Dorsal aspect. **B**, **D**. Ventral aspect. Scale bars = 5 mm.

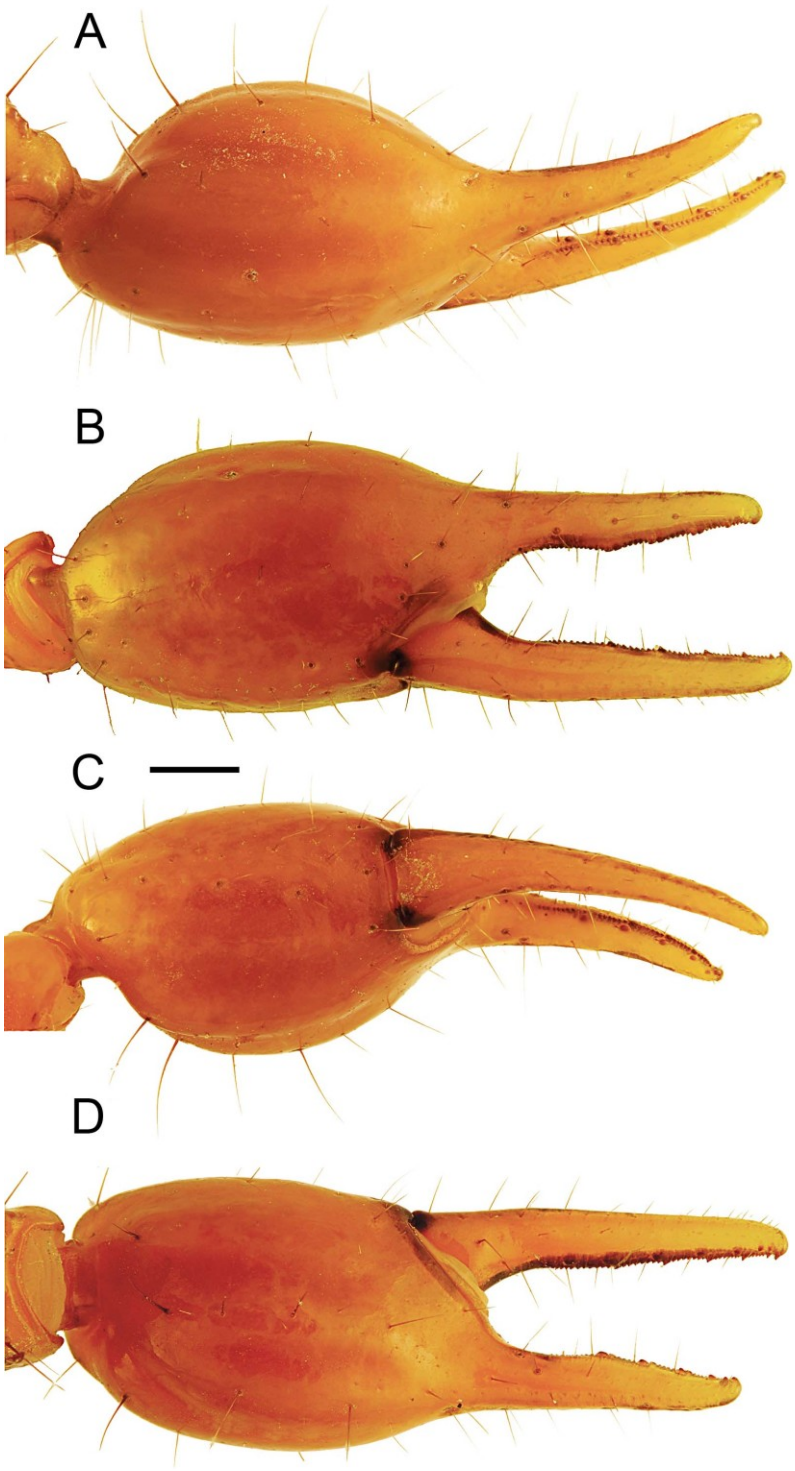


Figure 322. *Chihuahuanus glabrimanus* (Sissom and Hendrixson, 2005), ♂ (AMNH), dextral pedipalp chela. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

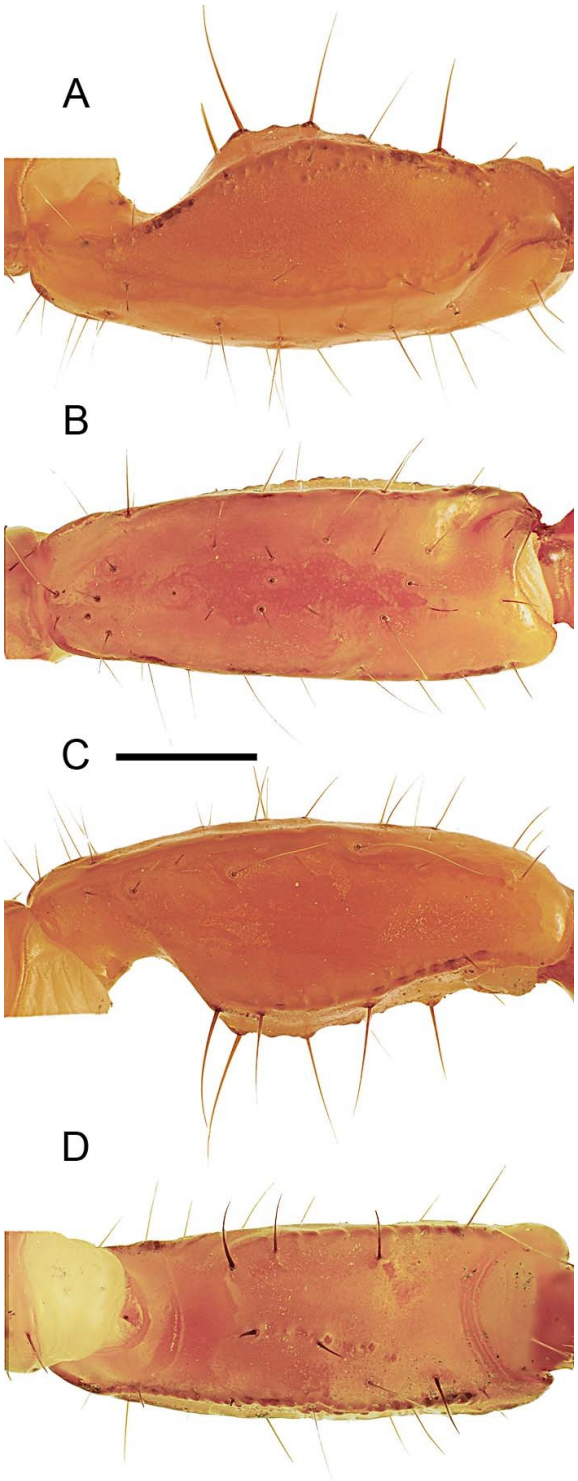


Figure 323. *Chihuahuanus glabrimanus* (Sissom and Hendrixson, 2005), ♂ (AMNH), dextral pedipalp patella. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

Chihuahuanus globosus (Borelli, 1915)

Figures 308, 324–326, 337B, 339B, 342D, 343B, 344F, 346F, 349A

Vaejovis globosus Borelli, 1915: 4, 5; Díaz-Nájera, 1975: 6, 22; Francke, 1977a: 45–49; Kovařík, 1998: 147; Sissom and Jackman, 1997: 151; Beutelspacher, 2000: 85, 138, 140, 148, 153, map 59; Sissom, 2000: 533; Sissom and Hendrixson, 2005a: 128, tab 6.2, 133; 2005b: 33–35, 37, 39, 41, 42 (key); Graham and Fet, 2006: 6; McWest, 2009: 19, tab. 1, 34, 41, 55, figs. 143–152, 56–58, 63, 117.

Vejovis globosus: Hoffmann, 1931: 402; 1938: 318.

Hoffmannius globosus: Soleglad and Fet, 2008: 4, 50, tab. 3, 53, 55, fig. 138, 56, fig. 148, 61, fig. 178, 73, 91.

Vejovis gilvus Williams, 1968: 2–6, fig. 1–2 (synonymized by Francke, 1977a); Soleglad, 1973b: 359, tab. 4; Stahnke, 1974: 135.

TYPE MATERIAL: **MEXICO: Durango:** Holotype ♀ (MIZT), Dinamita [not examined].

□

Vaejovis gilvus: **MEXICO: Coahuila:** *Municipio de Cuatro Ciénegas*: Holotype: ♂ (CAS, Type No. 10172), 13 km SW Cuatro Ciénegas de Carranza, 780 m, 27.vii.1967, S.C. Williams and W.S. Brown. Paratypes: 3 ex. (CAS, including 1 ♀ allotype), same locality as holotype; 5 ♂, 1 ♀, vicinity of Cuatro Ciénegas de Carranza, Coahuila, Mexico.

DIAGNOSIS: *Chihuahuanus globosus* is most closely related to *C. glabrimanus*, *C. kovariki*, and *C. panchovillai*, **n. sp.**, the scheme of relationship resultant of the phylogenetic analyses is: (*C. globosus C. panchovillai*) (*C. glabrimanus C. kovariki*). *C. globosus* may be separated from *C. panchovillai*, **n. sp.** by having dorsal prolateral, dorsal median, dorsal

retrosubmedian accessory, dorsal retrolateral, and ventral retrolateral smooth and weakly costate, instead of having them finely granular. *C. globosus* has ventral submedian carinae of metasomal segment I finely crenatoserrate of distal third and II–IV complete and finely crenatoserrate, instead of having this carinae completely, finely and densely crenatoserrate. *C. globosus* has major macrosetae on pedipalp femur, patella and chela, whereas *C. panchovillai*, **n. sp.** has minor macrosetae. From *C. glabrimanus* and *C. kovariki* differs by having ventral submedian carinae of metasomal segment I finely crenatoserrate, instead of having this carina smooth and weakly costate. The female of *C. globosus* has telson globose, expanded laterally, instead of having telson relatively elongated. From *C. glabrimanus* differs by having pedipalp carinae moderately to weakly costate, instead of having these carinae obsolete. Additionally, *C. globosus* has dorsal retrolateral and ventral retrosubmedian carinae moderately crenular, instead of having these carinae smooth. From *C. kovariki* differs by having dorsal lateral and ventral lateral carinae of metasomal segment V moderately hirsute with 7 and 10 macrosetae respectively, instead of having hirsute these carinae with 12 and 14 macrosetae respectively. Furthermore, *C. globosus* has prolateral ventral carinae of pedipalp femur with four macrosetae, instead of having these carinae with nine macrosetae.

DESCRIPTION: This description supplements Francke's (1977a) redescription and it is based on the material deposited in the collections mentioned below.

Color and infuscation: Base color pale yellow. Carapace and tergites, with fine and diffuse dusky markings restricted to median surface, other surface immaculate. Median and lateral ocular tubercles moderately infuscate. Base of fingers slightly reddish. Aculeus dark brownish. Ventral lateral and ventral submedian carinae of metasomal segments III–V, and ventral median carinae of V outlined with diffuse infuscation.

Carapace: Carapace 1.15 times longer than posterior width. Distal margin sublinear, lacking medial notch and with three or four pairs of major macrosetae. Carapace shagreened with dense coarse and minute granules. Median ocular tubercle completely rose, such that medina eyes position is completely above of carapace surface. Superciliary carinae moderate and entirely granulate. Medina ocular tubercle positioned on distal half. Three pairs of lateral eyes, first anterior pair slightly larger than second posterior and third posterior reduced half size of first anterior pair. Median eyes approximately three times the size of lateral anterior pair. Anteromedian, posteromedian and posterolateral sulci deep, posterior transverse obsolete.

Sternum and coxal region: Sternum pentagonal subequilateral, wider than long with four or five pairs of setae, surface matte, median notch deep, surface matte. Coxae surface entirely matte. Anterior margin of coxa II with three oblique slit-like structures, adjacent to a low and finely granulate protuberance. Base of coxal endite II with a deep depression each. Coxa IV 1.58 times longer than coxa II.

Chelicerae: Dorsal surface smooth, subdistal margin of manus with one macrosetae. Distal margin costate. Serrula present on ventral distal half of movable finger, tines numbering 12.

Pedipalps: Trichobothrial pattern Type C, orthobothriotaxic. Chela wider than patella, patella wider than femur. Femur: All intercarinal surfaces matted, dorsal surface with median a cluster of moderate granules. Dorsal prolateral, dorsal retrolateral and ventral prolateral complete irregular strongly crenatoserrate; retrolateral dorsosubmedian vestigial, expressed by few minute crenatoserrate granules and four macrosetae on distal two thirds, distal two macrosetae minor; retrolateral ventral vestigial, expressed by few proximal moderate subserrate granules; ventral median vestigial, expressed as a short row proximal granules; ventral retrosubmedian vestigial

expressed by few proximal low crenulations; prolateral ventrosubmedian vestigial, expressed by a proximal granule adjacent to trichobothrium *i*, positioned at proximal mid surface followed by a three or four irregular, enlarged, and conical granules, median and distal each with a macroseta at base and few smaller and conical scattered granules between proximal and distal enlarged granules; prolateral ventral vestigial, expressed by one proximal macroseta adjacent to two or three enlarged conical proximal granules, followed by two median moderate granules each with a macrosetae at base; prolateral ventrosubmedian and prolateral ventral carinae diverging distally.

Patella: Dorsal, ventral and prolateral surfaces weakly matte, retrolateral surface smooth. Dorsal prolateral, ventral prolateral, dorsal retrolateral and ventral retrosubmedian complete strongly granular; ventral median vestigial, expressed by few proximal moderate granules; prolateral median on a vaulted projection protruding strongly medially, expressed by a proximal tubercle with a macrosetae on top and three or four proximal coarse granules, median one with a macrosetae on top, followed by a gap of smooth surface and ending on a distal macrosetae following a curve, slanting dorsally almost reaching dorsal prolateral carinae on distal fifth; prolateral ventral obsolete, expressed by three macrosetae, one proximal on the top of a moderate tubercle, one median minor macrosetae and one distal, these adjacent to ventral prolateral carinae.

Chela: Manus smooth and relatively incrassate (manus 1.45 times longer than fixed finger). Dorsal median, dorsal prolateral, ventral retrolateral, ventral median, ventral prolateral and prolateral median weakly to moderately costate and smooth, ventral retrolateral may be weakly crenulated, all other carinae obsolete. Trichobothrium *Db* positioned on dorsal retrolateral carina, subbasal on chelae; *Dt* positioned close to mid manus but on the proximal half.

Fingers: Fix finger, PD = 6, MD rows = 5, RD = 5, proximal RD positioned by mid finger. All retrolateral denticles subpaired with corresponding prolateral denticles. Movable finger, PD = 7, MD rows = 6, distal row bearing one minute granule, RD = 6, proximal RD positioned slightly proximal to mid finger. All retrolateral denticles subpaired with corresponding prolateral denticles. Trichobothria *ib* and *it* positioned subbasal on fix finger, *ib* positioned between PD6 and PD7, PD7 lacking granule, in and *it* at the close to or adjacent to the level of PD6; Fingers with vestigial scalloping in ♂, proximal notch and medina lobe of fixed finger weak; proximal notch and medina lobe of movable finger vestigial, gap created when fingers closed moderate, fingers fit unevenly; in ♀ fingers lacking scalloping, gap created when fingers closed absent.

Legs: Basitarsi I–II prolateral ventral retrolateral ventral and retrolateral dorsal carinae with complete rows of spinules, prolateral ventral in III and IV absent; retrolateral ventral in III complete, in IV absent, retrolateral dorsal in III partial expressed on distal half in IV absent; retrolateral median rows in I–IV vestigial expressed as few terminal spinules. Telotarsi I–IV with two pairs of ventrodistal spinules in I–IV. Setae: Prolateral ventral, 2:3:4:4, median two in III and IV stout; retrolateral ventral, 3:5:6:6; retrolateral dorsal, 2:3:3:4; dorsal, 3:4:4:3; retrolateral dorsal and dorsal series arranged in one sublinear row, forming a setal combs, having dorsal median offset the row, retrolateral dorsal and dorsal series visibly longer than other series, macrosetae in ♂ relatively shorter and stouter than in ♀ that are thinner and longer.

Tergites: Pretergites smooth, postergites uniformly shagreened, scattered coarse and minute granulation. Tergites I–VI ventral median carinae weak, expressed by a distal low costa and few minute distal granulations; ventral submedian weak expressed by with irregular distal granules. Tergite VII with intercarinal surfaces weakly shagreened with few scattered coarse

granules, intercarinal surface between; dorsal median carina moderately costate expressed on proximal half of the postergite with few scattered subserrate crenulations; dorsal submedian vestigial expressed as a low short oblique proximal short protuberance with few low subserrate granules; dorsal lateral and lateral supramedian moderate becoming slightly stronger distally; dorsal lateral carinae projecting and curving laterally approximating to lateral supramedian distal margin, creating a semi ring of serrated granulation.

Genital operculum: Male genital operculum: wider than long, with three pairs of macrosetae. Sclerites free on longitudinal edge moving independently but unable to open more than 45°. Genital papillae protrude posteriorly. Female genital operculum: Wider than long, with three macrosetae. Sclerites fuse longitudinal.

Sternites: Sternites I–VII smooth, finely punctuated, and lustrous. Sternite V with distal median glandular spot weak to moderate, not protruding from adjacent surface, expressed as a whitish moderate band, contrasting weakly to moderate with pale base color in ♂, in ♀ obsolete. Sternite VII ventral lateral carinae complete, moderate, finely crenatoserrate, other carinae obsolete expressed by two or three macrosetae. Distomedian glandular spot rounded, weakly protruding from adjacent surface and weakly whitish contrasting moderately with base color pale in ♂, in ♀ obsolete. Spiracle elongated, slit-like, approximately two times longer than wide.

Pectines: Pectines longer than distal edge of coxa IV in ♂, in ♀ at the level of distal edge of coxa IV. Basal piece with median notch deep. Marginal lamella consist of three sclerites, medial lamella proximally fuse distally progressively forming conspicuous 10 beads. Fulcra with 12–17 in ♂, in ♀ 9–13 beads. Pectinal tooth count 13–18 in ♂, 10–14 in ♀.

Hemispermatophore: Lamina 2.16 longer than trunk. Dorsal through margin long, narrow, curving proximally, and removed from ventral trough. Hemimating plug developed from the inner lobe, distal barb margin with 12 elongated spinules. Primary and secondary hook positioned on the apex of lateral margin extension of the lamina (flange). Both hooks rounded low, separated slightly, forming a shallow notch. Median lobe ental terminus moderated and rounded. Basal plate of inner lobe removed from ventral trough. Spine of inner lobe relatively long and strongly sclerotized. Neck moderate (0.57 times longer than basal plate). Measurements, lamina, 3.24; trunk, 1.50; dorsal trough/laminar hooks, 1.14; ventral trough/laminar hook, 0.72; neck, 0.24; basal plate, 0.42.

Metasoma: Intercarinal surfaces smooth, except intercarinal surface between dorsal lateral carinae of segments I and II. Carinae: Dorsal lateral and lateral median carinae in I–IV moderately crenatoserrated terminating in a moderated enlarge spinoid, except lateral median in IV distal terminus moderately expanded or flared laterally forming a triangular projection; dorsal lateral in V proximally strongly crenatoserrate, becoming irregular and granular distally. Lateral inframedian in I complete moderately crenatoserrated; in II incomplete crenatoserrated, becoming weaker proximally, present on distal third; in III incomplete crenatoserrated, becoming weaker proximally, present in distal fourth; in VI absent, in V proximally strongly crenatoserrated, becoming weaker distally, present in proximal half; ventral lateral in I–V moderately crenatoserrate; ventral submedian in I finely to weakly crenatoserrate and costate, in II weakly to moderately crenatoserrate and strongly costate, in III and IV moderately crenatoserrate and strongly costate; ventral median in V moderately crenatoserrated. Setae: Dorsal lateral carinae, 1:3:3:5:7; lateral median, 1:3:4:4; lateral inframedian, 2:1:0:0:4; ventral lateral, 3:3:4:4:10; ventral submedian, 3:3:3:4:2; ventral sublateral, 2. One to two accessory

major and macrosetae in intercarinal surfaces between ventral submedian carinae in segments I–IV. All macrosetae visibly longer in ♀ than in ♂.

Telson: Dorsal and ventral surface smooth. Dorsal surface with a fusiform to irregularly round minute glandular spot at or adjacent to the base of aculeus. Ventral surface with five to six macrosetae in each carina. Ventral median carinae with subaculear tubercle obsolete. Microserration on laterobasal aculeus numbering 4–6. Vesicle of ♀ visibly more globose than ♀.

DISTRIBUTION: *Chihuahuanus globosus* is endemic to the Chihuahuan Desert, including the states of Coahuila and Durango, Mexico; and southwestern Texas, U.S.A.

ECOLOGY: *Chihuahuanus globosus* is a psammophilous species with morphological adaptations to life in sandy substrate. The most obvious are the setal combs, sublinear rows of macrosetae on the basi- and telotarsi that aid traction and digging in sand. Compared to the other species in the genus, *C. globosus* has been collected almost exclusively on sand dunes or very sandy terrains, where it burrows in open areas. The altitudes at which the species has been collected ranges from 761 to 1107 m altitude.

REMARKS: Williams (1968) described *Vejovis gilbus* from the Cuatro Cienegas basin along with other four new species. Guided by the striking endemism of other animal and plant groups, he failed to realize that this species was previously described. Francke (1977a) studied the types of the *Vaejovis globosus*=[*Chihuahuanus globosus*] and synonymized William's species. Molecular and morphological evidences support the validity of *C. globosus.*

MATERIAL EXAMINED: **MEXICO: Coahuila:** *Municipio de Cuatro Ciénegas*: Dunas de Yeso, 18.iii.2000, M. Balcazar, 1 juv. (IBUNAM), 26°51.7650'N 102°10.47'W, 776 m, 19.vii.2010, O. Francke, W.D. Sissom, M. Córdova, A. Jaimes, and A. Ballesteros, desert, collected at night with UV light, 2 ♂, 10 ♀ (IBUNAM), 13 ex. (AMNH [ARA 1101]), 6 ex.

(CAS [ARA 1957]), 12 ex. (IBUNAM [ARA 0077]), 1 ♀ (AMNH [LP 6472]); Ojo de Agua, Ejido El Oso, 27°3.3594'N 102°13.5816'W, 1039 m, 19.vii.2006, O. Francke, W.D. Sissom, K. McWest, B. Hendrixson, S. Grant, A. Jaimes, M. Córdova, E. González, and A. Ballesteros, 1 ♂ (AMNH [LP 6502]), 1 ♂ (AMNH); Sierra San Marcos, 761 m, 18.vii.2006, 26°54.7998'N 102°8.25'W, desert, collected at night with UV light, 2 ♂ (AMNH [ARA 1112]), 3 ♂ (IBUNAM [ARA 0086]), 26°52'36.62"N 102°8'15.80"W, 1 ♂ (AMNH), 26°54'47.63"N 102°8'15.23"W, 1 ♀ (AMNH [LP 6447]); 26°54'47.65"N 102°8'15.21"W, 1 ♂, 1 ♀ (IBUNAM), E. González, B. Hendrixson, K. McWest, and S. Grant. *Municipio de Viesca*: Dunas de Bilbao, 1098 m, 20.vii.2006, 25°25.5858'N 102°53.6538'W, desert, collected at night with UV light, 11 ex. (AMNH [ARA 1035]), 5 ex. (CAS [ARA 1879]), 11 ex. (IBUNAM [ARA 0044]), 25°25.586'N 102°53.654'W, 2 ♂ (AMNH [LP 6459]), O. Francke, K. McWest, M. Córdova, A. Jaimes, and A. Ballesteros. **Durango:** *Municipio de Tlahualilo*: Hwy 49, at deviation Montes Claros-Tlahualilo de Zaragoza, 26°09.242'N 103°31.284'W, 1107 m, 6.viii.2005, O. Francke, W.D. Sissom, K. McWest, C. Lee, H. Montaño, J. Ballesteros, L. Jarvis, and C. Durán, collected at night with UV light, 13 juv. (AMNH [LP 5281]); Tlahualilo de Zaragoza, ca. 15 km NW, junction Montes Claros-Tlahualilo de Zaragoza, 26°9.2418'N 103°31.28'W, 1107 m, 6.viii.2005, O. Francke, W.D. Sissom, K. McWest, C. Lee, H. Montaño, J. Ballesteros, and L. Jarvis, collected at night with UV light, 5 ♂, 5 ♀, 2 juv. (AMNH [ARA 3066]), 1 ♂, 2 ♀, 1 subad. ♀ (CAS [ARA 1615]), 5 ♂, 5 ♀, 2 juv. (IBUNAM [ARA 2366]). **U.S.A.: Texas:** *Brewster Co.*: Big Bend National Park, Boquillas Canyon, 29°12.0022'N 102°55.0285'W, 30.vii.2008, 1 ♂ (AMNH), 2.viii.2008, sand dunes, 1 ♂, 1 juv. (AMNH [LP 8926]), W.D. Sissom, T. Anton and G. Casper.

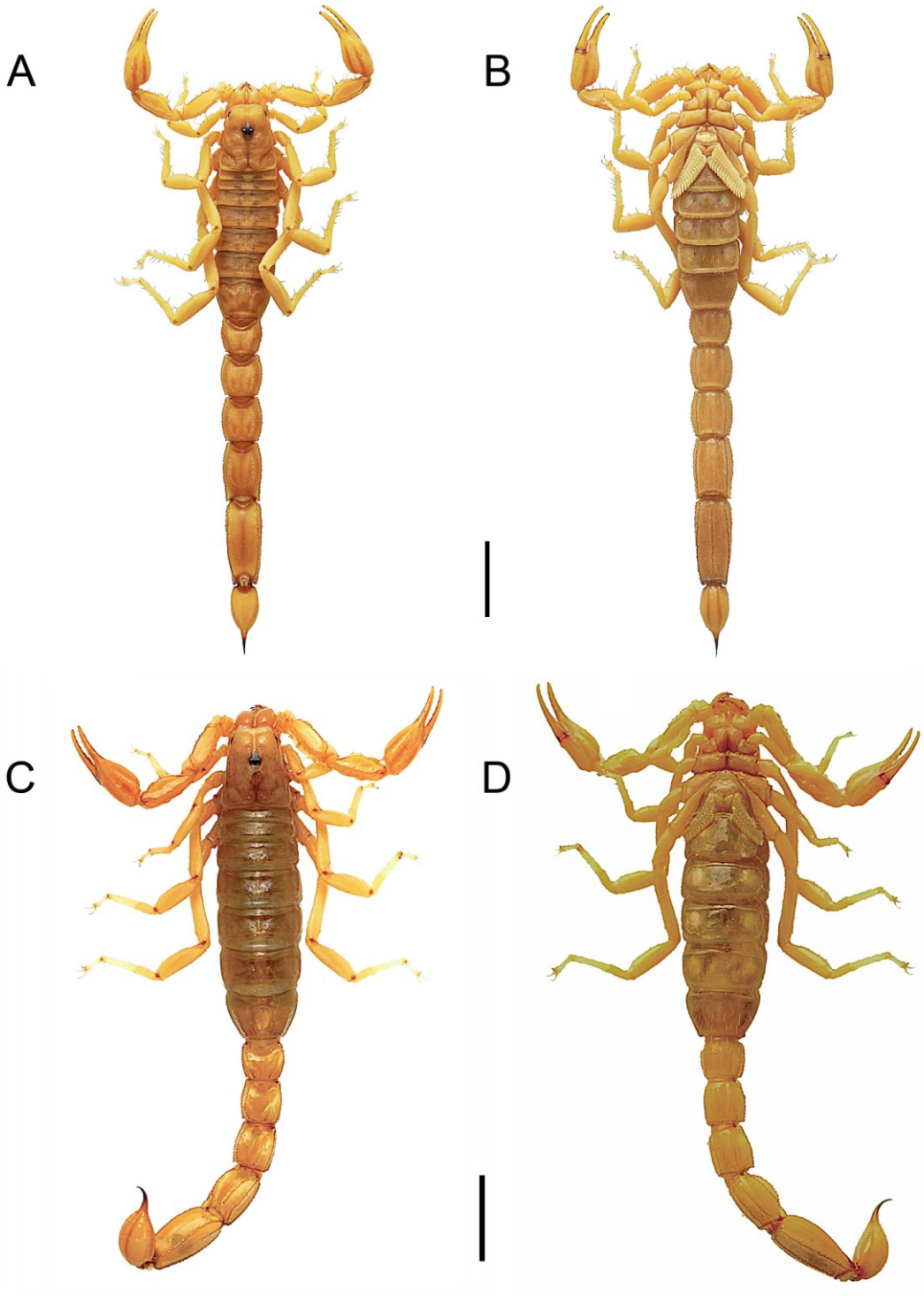


Figure 324. *Chihuahuanus globosus* (Borelli, 1915), habitus. **A**, **B**. ♂ (AMNH). **C**, **D**. ♀ (AMNH). **A**, **C**. Dorsal aspect. **B**, **D**. Ventral aspect. Scale bars = 5 mm.

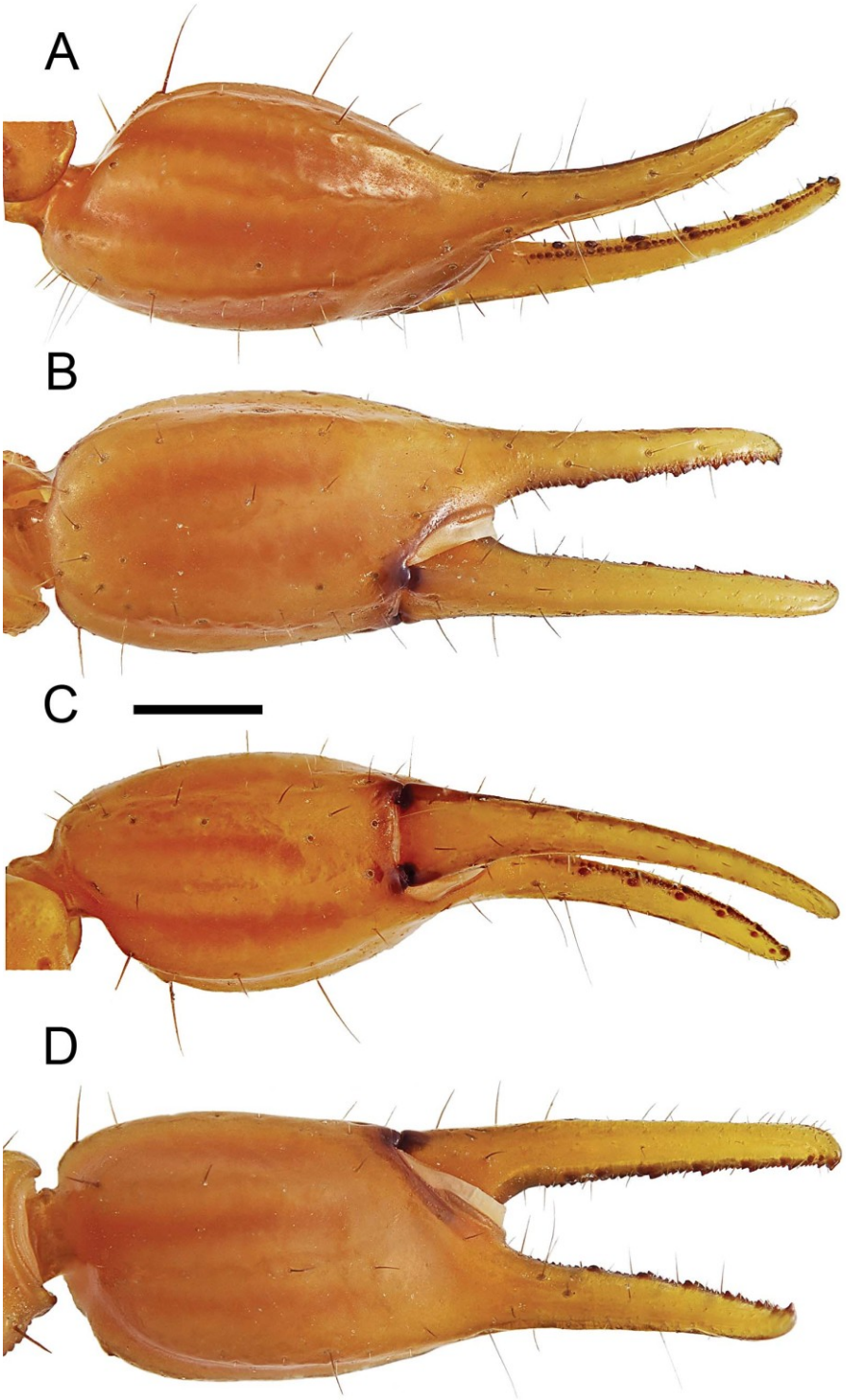


Figure 325. *Chihuahuanus globosus* (Borelli, 1915), ♂ (AMNH), dextral pedipalp chela. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

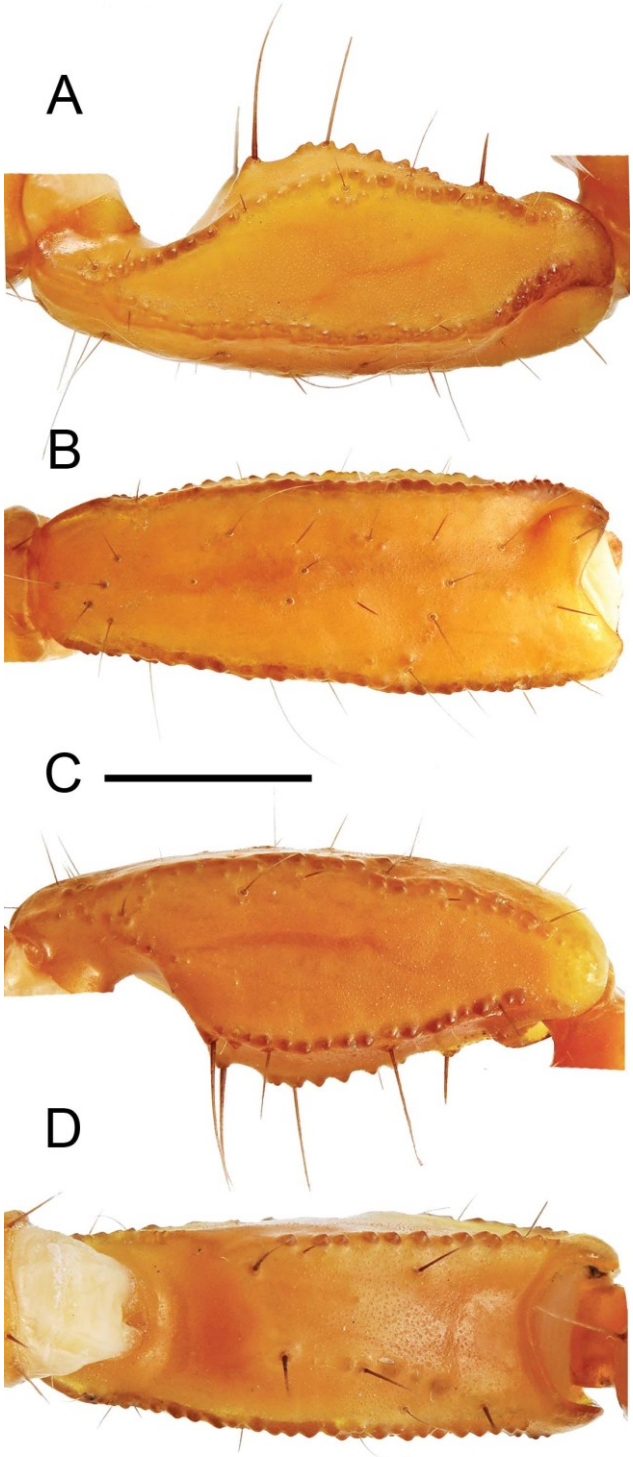


Figure 326. *Chihuahuanus globosus* (Borelli, 1915), ♂ (AMNH), dextral pedipalp patella. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

Chihuahuanus kovariki (Soleglad and Fet, 2008)

Figures 308, 327–329, 337C, 339C, 342D, 343C, 345A, 347A, 349B

Kochius kovariki Soleglad and Fet, 2008: 105–109, figs. 208–218, tab. 11.

TYPE MATERIAL: **MEXICO: Durango:** Holotype ♀ (MES), Durango, xi.1965 [not examined].

DIAGNOSIS: *Chihuahuanus kovariki* is most closely related to *C. glabrimanus*, *C. globosus*, and *C. panchovillai*, **n. sp.**, (see *C. globosus* for details). *C. kovariki* may be separated from the other species by having dorsal lateral and ventral lateral carinae of metasomal segment V hirsute with 12 and 14 macrosetae respectively, instead of having 7 and 10 macrosetae respectively. Additionally is the only species with nine macrosetae prolateral ventral carinae of pedipalp femur, instead of having only four. From *C. panchovillai*, **n. sp.** differs by having dorsal prolateral, dorsal median, dorsal retrosubmedian accessory, dorsal retrolateral, and ventral retrolateral smooth and weakly costate, instead of having them finely granular. *C. kovariki* has ventral submedian carinae of metasomal segment I–III smooth to weakly crenular, instead of having this carinae completely, finely and densely crenatoserrate. *C. kovariki* has major macrosetae on pedipalp femur, patella and chela, whereas *C. panchovillai*, **n. sp.** has minor macrosetae. From *C. globosus* differs by having ventral submedian carinae of metasomal segment I smooth and weakly costate, instead of having this carina finely crenatoserrate. The female of *C. kovariki* has telson relatively elongated, instead of having telson globose, expanded laterally. From *C. glabrimanus* differs by having dorsal retrolateral and ventral retrosubmedian carinae moderately crenular, instead of having these carinae smooth. The only species of the genus that is not closely related to *C. kovariki* but can be confounded by its superficial

resemblance is *C. coahuilae*. These species are readily separated by the absence of infuscation on the ventral lateral and ventral submedian carinae in the former and presence of infuscation in the latter.

DESCRIPTION: This redescription supplements Soleglad and Fet's (2008) original description and is based on ♂ and ♀ fleshly collected or found and deposited in the collections mentioned below.

Color and infuscation: Base color pale yellow. Carapace and tergites, with moderate dusky markings restricted to median surface, other surface immaculate. Median and lateral ocular tubercles moderately infuscate. Base of pedipalp fingers slightly reddish. Aculeus dark brownish. Pectines and genital operculum whitish.

Carapace: Carapace 1.12 times longer than posterior width. Distal margin sublinear, lacking medial notch and with five or six pairs of major and minor macrosetae. Carapace shagreened with dense coarse and minute granules. Median ocular tubercle moderately rose. Superciliary carinae moderate proximally and distally granular, medially with vestigial crenulations or smooth. Medina ocular tubercle positioned on distal half. Three pairs of lateral eyes, first anterior pair slightly larger than second posterior and third posterior reduced half size of first anterior pair. Median eyes approximately two times the size of lateral anterior pair. Anteromedian, posteromedian and posterolateral sulci moderate to deep, posterior transverse obsolete.

Sternum and coxal region: Sternum pentagonal subequilateral, wider than long with five or six pairs of setae, surface weakly matte, median notch deep. Coxae surface weakly matte. Anterior margin of coxa II with three oblique slit-like structures, adjacent to a weak low smooth

protuberance. Base of coxal endite II with a deep and broad depression each. Coxa IV 2.15 times longer than coxa II.

Chelicerae: Dorsal surface smooth, subdistal margin of manus with one macrosetae. Distal margin costated. Serrula present on ventral distal half of movable finger, tines numbering 14.

Pedipalps: Trichobothrial pattern Type C, orthobothriotaxic. Chela wider than patella, patella wider than femur. Femur: All intercarinal surfaces matted. Dorsal prolateral, dorsal retrolateral and ventral prolateral complete irregular moderately crenulate; retrolateral dorsosubmedian vestigial, expressed by few minute crenatoserrate granules and five major and minor macrosetae on distal two thirds; retrolateral ventral vestigial, expressed by few proximal moderate serrate granules; ventral median vestigial, expressed as a short row of proximal serrations; ventral retrosubmedian vestigial expressed by few proximal low crenulations; prolateral ventrosubmedian vestigial, expressed by a proximal enlarged conical granule adjacent to trichobothrium *i*, with a macrosetae on base, positioned at proximal mid surface followed by a four irregular, enlarged, and conical granules, each with a macroseta at base and few smaller and conical scattered granules between proximal and distal enlarged granules; prolateral ventral vestigial, expressed by one enlarged conical granule with a macrosetae on base, followed by six or seven enlarged to median moderate granules each with a macrosetae at base; prolateral ventrosubmedian and prolateral ventral carinae diverging distally.

Patella: Dorsal, ventral and prolateral surfaces weakly matte, retrolateral surface smooth. Dorsal prolateral, ventral prolateral and dorsal retrolateral and ventral retrosubmedian complete strongly granular; ventral median vestigial, expressed by few proximal moderate granules followed by few low crenulations and weakly costate, expressed on proximal half; prolateral

median on a vaulted projection protruding strongly medially, expressed by a proximal tubercle with a macrosetae on top and three or four proximal coarse granules with four scattered macrosetae, three major and two minor, followed by a gap of smooth surface and ending on a distal macrosetae following a curve, slanting dorsally almost reaching dorsal prolateral carinae on distal fifth; prolateral ventral obsolete, expressed by six major and minor macrosetae, one proximal on the top of a moderate tubercle, these adjacent to ventral prolateral carinae.

Chela: Manus smooth and relatively elongated (manus 1.45 times longer than fixed finger). Dorsal median, dorsal prolateral, dorsal retrolateral, and ventral retrolateral moderately costated and weakly crenular; ventral median, ventral prolateral, ventral retrolateral, and prolateral median weakly to moderately costate and smooth; all other carinae obsolete. Trichobothrium *Db* positioned on dorsal retrolateral carina, subbasal on chelae; *Dt* positioned close to mid manus but on the proximal half.

Fingers: Fix finger, PD = 6, MD rows = 5, RD = 5, proximal RD positioned by mid finger. All retrolateral denticles subpaired with corresponding prolateral denticles. Movable finger, PD = 7, MD rows = 6, distal row bearing one minute granule, RD = 6, proximal RD positioned slightly proximal to mid finger. All retrolateral denticles subpaired with corresponding prolateral denticles. Trichobothria *ib* and *it* positioned subbasal on fix finger, *ib* and *it* positioned between PD6 and PD7, PD7 lacking granule, *it* closer to PD6. Fingers with vestigial scalloping in ♂, proximal notch and medina lobe of fixed finger weak; proximal notch and median lobe of movable finger vestigial, gap created when fingers closed moderate, fingers fit unevenly; in ♀ fingers lacking scalloping, gap created when fingers closed absent.

Legs: Basitarsi I–II prolateral ventral retrolateral ventral and retrolateral dorsal carinae with complete rows of spinules, prolateral ventral in III vestigial expressed on distal third and IV

absent; retrolateral ventral in III complete, in IV absent, retrolateral dorsal in III partial expressed on distal half in IV absent; retrolateral median rows in I–IV vestigial expressed as few terminal spinules. Telotarsi I–IV with two pairs of ventrodistal spinules in I–IV. Setae: Prolateral ventral, 2:4:5:5, median two in III and IV stout; retrolateral ventral, 4:9:10:10, minor and major macrosetae; retrolateral dorsal, 3:3:5:5; dorsal, 3:4:4:4; retrolateral dorsal and dorsal series arranged in two independent row, retrolateral dorsal and dorsal series visibly longer than other series, macrosetae in both sexes, first two basitarsi with these series having macrosetae curving ventrally.

Tergites: Pretergites smooth, postergites uniformly shagreened, scattered coarse and minute granulation. Tergites I–VI ventral median carinae weak, expressed by a distal low costa and few minute distal granulations; ventral submedian weak expressed by irregular distal granules. Tergite VII with intercarinal surfaces weakly shagreened with few scattered coarse granules, intercarinal surface between; dorsal median carina moderately costate expressed on proximal half of the postergite with few scattered subserrate crenulations; dorsal submedian vestigial expressed as a low short oblique proximal short protuberance with few low subserrate granules; dorsal lateral and lateral supramedian moderate becoming slightly stronger distally; dorsal lateral carinae projecting and curving laterally approximating to lateral supramedian distal margin, creating a semi ring of serrated granulation.

Genital operculum: Male genital operculum: wider than long, with three pairs of macrosetae. Sclerites free on longitudinal edge moving independently but unable to open more than 45°. Genital papillae protrude posteriorly. Female genital operculum: Wider than long, with three macrosetae. Sclerites fuse longitudinal.

Sternites: Sternites I–VII smooth, finely punctuated, and lustrous. Sternite V with distal median glandular spot weak, not protruding from adjacent surface, expressed as a whitish broad band limited by the spiracles, contrasting weakly with pale base color in ♂, in ♀ obsolete. Sternite VII ventral lateral carinae vestigial, expressed by a short low costa delimited by two pairs of macrosetae, other carinae obsolete expressed by two or three macrosetae and occasional with one or two median accessory macroseta in ♂, in ♀ with three or more median accessory macrosetae. Distomedian glandular spot broad restricted to distal margin, weakly protruding from adjacent surface but distinctly whitish contrasting moderately with base color pale in ♂, in ♀ obsolete. Spiracle elongated, slit-like, approximately two times longer than wide.

Pectines: Pectines longer than distal edge of coxa IV in ♂, in ♀ at the level of distal edge of coxa IV. Basal piece with median notch deep. Marginal lamella consist of three sclerites, medial lamella proximally fuse distally progressively forming conspicuous 12 beads. Fulcra with 14 in ♂, in ♀ 14 beads. Pectinal tooth count 16 in ♂, 15 in ♀.

Hemispermatophore: Lamina 1.98 longer than trunk. Dorsal through margin long, narrow, curving proximally, and removed from ventral trough. Hemimating plug developed from the inner lobe, distal barb margin with 18 elongated spinules. Primary and secondary hook positioned on the apex of lateral margin extension of the lamina (flange). Both hooks rounded low, separated slightly, forming a shallow notch. Median lobe ental terminus protruding slightly towards ental margin and with a distal weak folding. Basal plate of inner lobe removed from ventral trough. Spine of inner lobe relatively long and strongly sclerotized. Neck relatively short (0.38 times longer than basal plate). Measurements, lamina, 4.74; trunk, 2.40; dorsal trough/laminar hooks, 1.80; ventral trough/laminar hook, 1.14; neck, 0.36; basal plate, 0.96.

Metasoma: Intercarinal surfaces weakly matte, except intercarinal surface between dorsal lateral carinae of segments I and II moderately granular. Carinae: Dorsal lateral and lateral median carinae in I–IV moderately crenatoserrated terminating in a moderated enlarge spinoid, except lateral median in IV distal terminus moderately expanded or flared laterally forming a triangular projection; dorsal lateral in V irregularly and strongly crenatoserrate. Lateral inframedian in I complete moderately crenatoserrated; in II incomplete crenatoserrated, becoming weaker proximally, present on distal third; in III incomplete crenatoserrated, becoming weaker proximally, present in distal fourth; in VI absent, in V proximally strongly crenatoserrated, becoming weaker distally, present in proximal half; ventral lateral in I–V moderately crenatoserrate, distal segments with stronger carinae; ventral submedian in I and II weakly costate, in III weakly crenulated and moderately costate, in IV moderately crenatoserrate and strongly costate; ventral median in V strongly crenatoserrated. Setae: Dorsal lateral carinae, 1:3:3:5:12, major and minor macrosetae in V; lateral median; 2:3:4:5, major and minor macrosetae in IV; lateral inframedian, 3:2:1:1:4; ventral lateral, 4:4:6:6:14, macrosetae in both sides of carinae in V; ventral submedian, 3:4:5:4:5; ventral sublateral, 2. One to two accessory major and macrosetae in intercarinal surfaces between ventral submedian carinae in segments I–IV. All macrosetae visibly longer in ♀ than in ♂.

Telson: Dorsal and ventral surface smooth. Dorsal surface with a fusiform to irregularly round minute glandular spot at or adjacent to the base of aculeus. Ventral surface with five to six macrosetae in each carina. Ventral median carinae with subaculear tubercle vestigial. Microserration on laterobasal aculeus numbering 4–7.

DISTRIBUTION: *Chihuahuanus kovariki* has been recorded only from Durango, Mexico.

ECOLOGY: *Chihuahuanus kovariki* seems to be a semi-psammophilous species, as the other examples in the genus as leg morphology resembles that of the other members of the genus. The localities where it was found ranged in elevation from 1893 to 2217 m.

REMARKS: Soleglad and Fet (2008) attributed this species to *Kochius* based on carination and ornamentation of carapace. As demonstrated here, these characters are homoplastic and cannot support the relation of this and other species within this genus. Besides, *C. kovariki* shares with the other species in the genus the presence, in adult males and females, of a small fusiform whitish glandular area on the dorsal surface of the telson, near the base of the aculeus. This unique derived character is not present in any of the species of *Kochius*.

MATERIAL EXAMINED: **MEXICO: Durango:** Encino, 27.vii.1947, W.J. Gertsch, 1 ♂ (AMNH); Hwy 137, marker km 4, between Once de Marzo and San Juan del Río, San Francisco de Lajas, 24°51.764'N 104°38.846'W, 1893 m, 10.viii.2005, O. Francke, W.D. Sissom, K. McWest, C. Lee, H. Montaño, J. Ballesteros, L. Jarvis, and C. Durán, rock rolling by day, 3 ♂ (AMNH [LP 5489]); San Francisco de Lajas 4 km Hwy 137, between Once de Marzo and San Juan del Río, 24°51.764'N 104°38.846'W, 1893 m, 10.viii.2005, O. Francke, W.D. Sissom, K. Mcwest, and C. Lee, 1 ♂ (AMNH). *Municipio de Durango*: Mesa del Divisadero, La Cieneguita, [24°6.3'N 104°50.1'W], 2.x.1977, Don Catarino and S. Hernández, 8 ♂, 8 ♀, 2 subad. ♂ (IBUNAM). *Municipio de Pánuco de Coronado*: La Mina, between Pánuco de Coronado and San José de Avino, Hwy 137, 24°31.8090'N 104°18.9408'W, 2217 m, 9.viii.2005, O. Francke, W.D. Sissom, K. McWest, C. Lee, H. Montaño, J. Ballesteros, and L. Jarvis, collected at night with UV light, 1 ♂, 1 ♀ (AMNH [ARA 1463]); La Mina, Hwy 137, between Pánuco de Colorado and San José de Avino, 24°31.809'N 104°18.941'W, 2217 m, 9.viii.2005, O. Francke, W.D. Sissom, K. McWest, C. Lee, H. Montaño, J. Ballesteros, L. Jarvis, and C. Durán, 4 juv.

(AMNH [LP 5305]). *Municipio de Peñón Blanco*: Yerbaniz, 129 km NW, [24°44.14267'N 103°50.18416667'W], 19.viii.1947, W.J. Gertsch, 1 juv. (AMNH). *Municipio de Santiago Papasquiaro*: Route DGO 36, km 9, between San Andres Atotonilco-Laguna de La Chaparra, 25°5.3058'N 105°31.53'W, 2095 m, 11.viii.2005, O. Francke, W.D. Sissom, K. McWest, C. Lee, H. Montaño, J. Ballesteros, and L. Jarvis, collected at night with UV light, 1 ♂ (AMNH [ARA 3146]); Encino, 27.vii.1947, W.J. Gertsch, 1 ♂ (AMNH); Hwy 36, marker km 9, between crossroad San Andres Atotonilco and La Laguna de La Chaparra, 25°05.306'N 105°31.530'W, 2095 m, 11.viii.2005, O. Francke, W.D. Sissom, K. McWest, C. Lee, H. Montaño, J. Ballesteros, L. Jarvis, and C. Durán, collected at night with UV light, 1 ♂, 1 juv. (AMNH [LP 5299]).

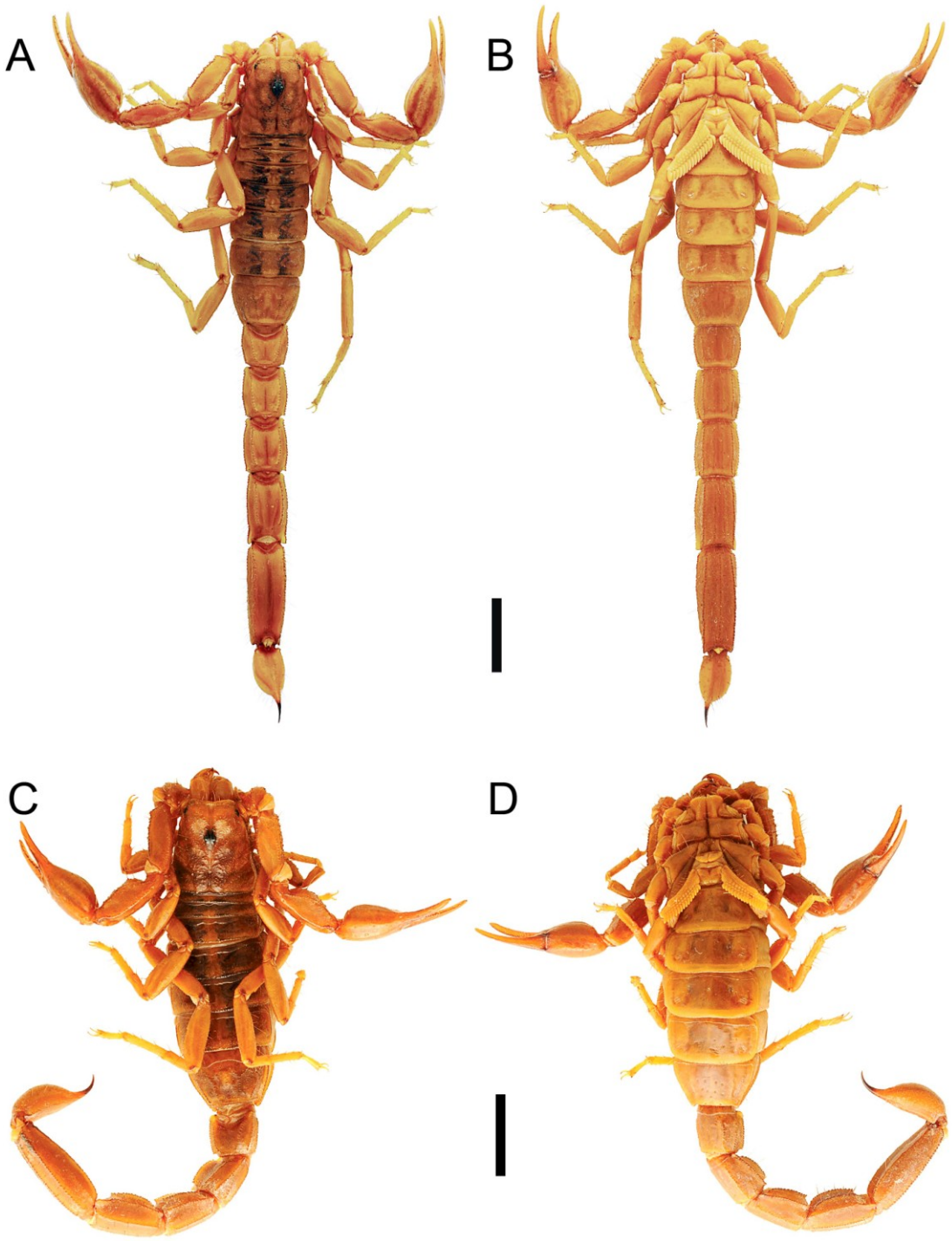


Figure 327. *Chihuahuanus kovariki* (Soleglad and Fet, 2008), habitus. **A**, **B**. ♂ (AMNH). **C**, **D**. ♀ (AMNH). **A**, **C**. Dorsal aspect. **B**, **D**. Ventral aspect. Scale bars = 5 mm.

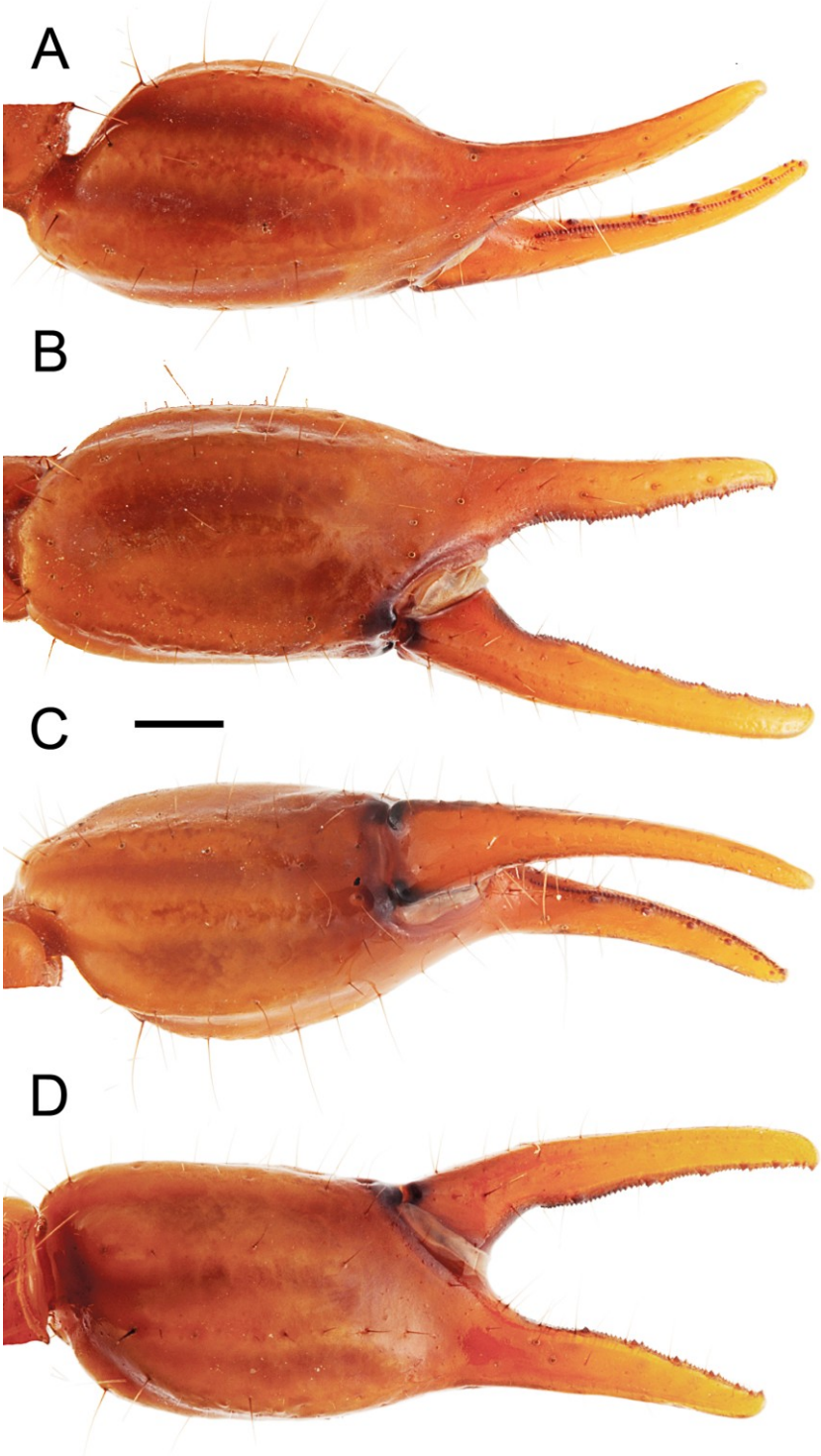


Figure 328. *Chihuahuanus kovariki* (Soleglad and Fet, 2008), ♂ (AMNH), dextral pedipalp chela. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

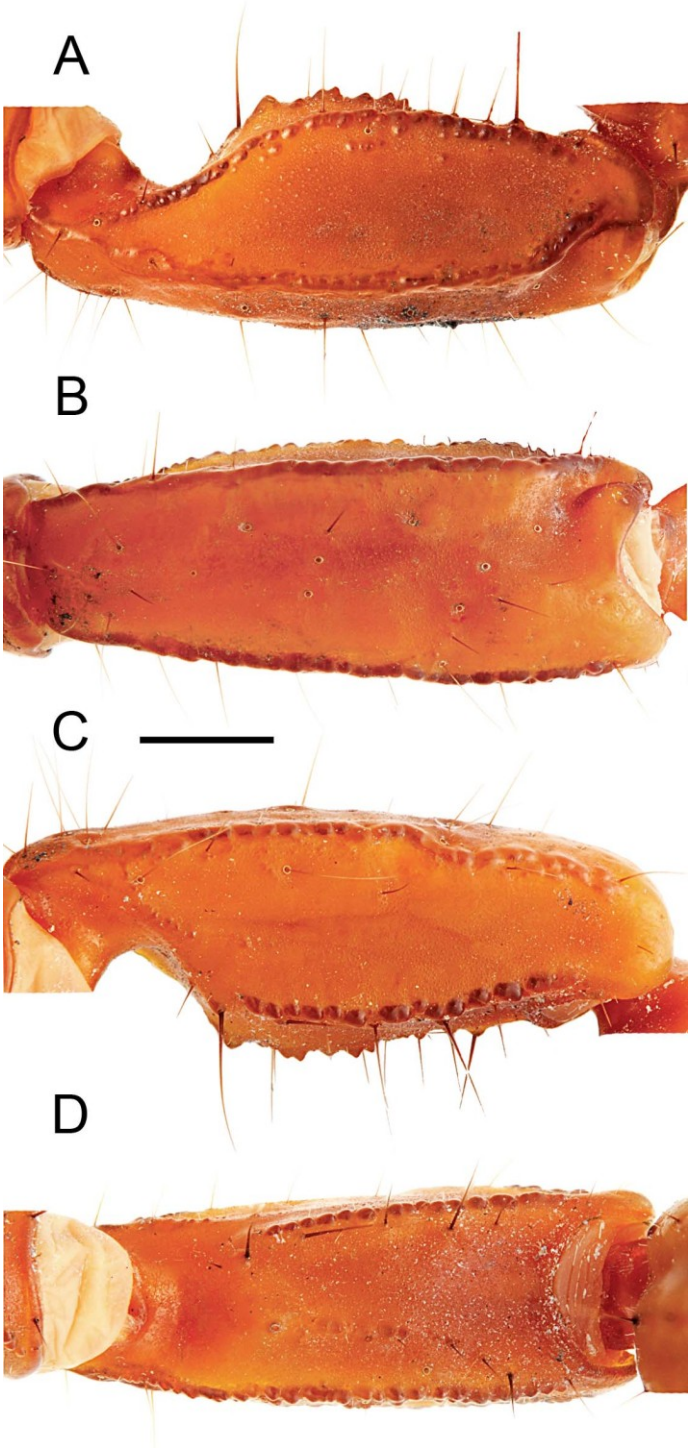


Figure 329. *Chihuahuanus kovariki* (Soleglad and Fet, 2008) ♂ (AMNH), dextral pedipalp patella. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

Chihuahuanus panchovillai, **n. sp.**

Figures 309, 330–332, 337D, 339D, 342A, 343A, 345B, 347B, 349C; Table 15

TYPE MATERIAL: **MEXICO: Chihuahua:** *Municipio de Jiménez*: Holotype ♂ (IBUNAM), Arenales, between Carrillo and Guimbalete, 5–6.viii.2005, desert, 26°56.6946'N 103°52.4076'W, 1124 m, O. Francke, W.D. Sissom, K. McWest, C. Lee, H. Montaño, J. Ballesteros, L. Jarvis, and C. Durán, rock rolling during the day. Paratypes: Same locality as holotype, 16 ♂, 20 ♀, 5 juv. (AMNH [ARA 3020]), 7 ♂, 9 ♀, 3 juv. (CAS [ARA 1601]), 15 ♂, 20 ♀, 5 juv. (IBUNAM [ARA 2334]), 26°56.695'N 103°52.408'W, 1124 m, rock rolling during the day, 1 ♂, 2 ♀, 1 subad. ♀, 26°56'39.65"N 103°52'23.73"W, 1124 m, 8 ♀, 1 subad. ♂, 12 juv. (IBUNAM), 26°57.2616'N 103°57.2616'W, 1137 m, desert, collected at night with UV light, 2 ♂ (AMNH [ARA 1476]), 2 ♂ (IBUNAM [ARA 2082]), 26°57.262'N 103°50.994'W, 1137 m, collected at night with UV light.

ETYMOLOGY: The species name *panchovillai* honors one of the most recognized leaders of the Mexican Revolution, José Doroteo Arango Arámbula, better known by his pseudonym Pancho Villa, (the Centaur of the North). This patronym commemorates the centennial of the Mexican Revolution (1910–2010).

DIAGNOSIS: *Chihuahuanus panchovillai*, **n. sp.** is most closely related to *C. glabrimanus*, *C. globosus*, and *C. kovariki* (see *C. globosus* for details). *C. panchovillai*, **n. sp.** may be separated from the other species by having dorsal prolateral, dorsal median, dorsal retrosubmedian accessory, dorsal retrolateral, and ventral retrolateral finely granular, instead of having them smooth and weakly costate. Furthermore, *C. panchovillai*, **n. sp.** has ventral submedian carinae of metasomal segment I–IV completely, finely and densely crenatoserrate,

instead of having this carinae smooth to weakly crenatoserrate to crenular. This species is also the only one with minor macrosetae on pedipalp femur, patella, and chela. From *C. glabrimanus* and *C. kovariki* differs in females, by having telson globose, expanded laterally, instead of having telson relatively elongated. From *C. glabrimanus* differs by having pedipalp carinae moderately to weakly costate, instead of having these carinae obsolete. Additionally, *C. panchovillai*, **n. sp.** has dorsal retrolateral and ventral retrosubmedian carinae moderately crenular, instead of having these carinae smooth. From *C. kovariki* differs by having dorsal lateral and ventral lateral carinae of metasomal segment V moderately hirsute with 7 and 10 macrosetae respectively, instead of having more hirsute these carinae with 12 and 14 macrosetae respectively. Furthermore, *C. panchovillai*, **n. sp.** has prolateral ventral carinae of pedipalp femur with four macrosetae, instead of having these carinae with nine macrosetae.

DESCRIPTION: The following description is based on the types and the specimens listed in material examined.

Color and infuscation: Babe color pale yellow. Carapace and tergites, with fine and diffuse dusky markings restricted to median surface, other surface immaculate. Median and lateral ocular tubercles intensely infuscate. Base of pedipalp fingers diffusely infuscate. Aculeus dark brownish. Ventral lateral and ventral submedian carinae of metasomal segments III–V and ventral median carinae of V in occasions outlined with diffuse infuscation.

Carapace: Carapace 1.18 times longer than posterior width. Distal margin sublinear, with vestigial medial notch and with three or four pairs of major macrosetae, in ♀, minor in ♂. Carapace shagreened with dense coarse and minute granules. Median ocular tubercle moderately rose. Superciliary carinae moderate and entirely minutely granular. Medina ocular tubercle positioned on distal half. Three pairs of lateral eyes, two anterior pairs slightly larger than

posterior third in half size. Median eyes approximately two times the size of lateral anterior pair. Anteromedian, posteromedian and posterolateral sulci deep, posterior transverse obsolete.

Sternum and coxal region: Sternum pentagonal subequilateral, wider than long with four pairs of setae, surface matte, median notch deep. Coxae surface entirely matte. Anterior margin of coxa II with three oblique slit-like structures, adjacent to a low and finely granulate protuberance. Base of coxal endite II with a deep depression each. Coxa IV 2.04 times longer than coxa II.

Chelicerae: Dorsal surface smooth, subdistal margin of manus with one macrosetae. Distal margin costate. Serrula present on ventral distal half of movable finger, tines numbering 10–12.

Pedipalps: Trichobothrial pattern Type C, orthobothriotaxic. Chela wider than patella, patella wider than femur. Femur: All intercarinal surfaces matted. Dorsal prolateral, dorsal retrolateral and ventral prolateral complete irregular strongly crenatoserrate; retrolateral dorsosubmedian partial, expressed on distal two thirds by moderate crenatoserrate granules and three or four minor macrosetae minor in ♂in and major in ♀; retrolateral ventral vestigial, expressed by few proximal minute serrate granules; ventral median vestigial, expressed as a short row proximal serrate granules; ventral retrosubmedian vestigial expressed by few proximal low crenulations; prolateral ventrosubmedian vestigial, expressed by a proximal granule adjacent to trichobothrium *i*, positioned at proximal mid surface followed by a two irregular, enlarged, and conical granules with a macroseta at base minor in ♂in and major in ♀, and few smaller and conical scattered granules between proximal and distal enlarged granules; prolateral ventral vestigial, expressed by one proximal macroseta adjacent to an enlarged conical proximal granule,

followed by two median moderate granules each with a macrosetae at base minor in ♂in and major in ♀; prolateral ventrosubmedian and prolateral parallel.

Patella: All intercarinal surfaces matte. Dorsal prolateral, ventral prolateral, dorsal retrolateral and ventral retrosubmedian complete strongly and irregularly granular to crenular; ventral median vestigial, expressed by few proximal moderate granules; prolateral median on a vaulted projection protruding strongly medially, expressed by a proximal tubercle with a macrosetae on top and two or three proximal coarse conical granules with three or four macrosetae minor in ♂in and major in ♀, followed by a gap of smooth surface and ending on a distal macrosetae following a curve, slanting dorsally almost reaching dorsal prolateral carinae on distal fifth; prolateral ventral obsolete, expressed by three macrosetae, one proximal on the top of a moderate tubercle, one median minor macrosetae and one distal, these adjacent to ventral prolateral carinae.

Chela: Manus smooth and relatively elongated (manus 1.56 times longer than fixed finger). Dorsal median, dorsal prolateral, dorsal retrolateral, dorsal retrosubmedian accessory and prolateral median complete, weakly crenulated, and strongly costate; ventral retrolateral incomplete, costate and weakly crenulated, expressed on medina two thirds; retrolateral median complete costate and weakly crenulated, all other carinae obsolete. Trichobothrium *Db* positioned on dorsal retrolateral carina, subbasal on chelae; *Dt* positioned close to mid manus but on the proximal half.

Fingers: Fix finger, PD = 6, MD rows: 5, RD = 5, proximal RD positioned by mid finger. All retrolateral denticles subpaired with corresponding prolateral denticles. Movable finger, PD = 7, MD rows = 6, distal row bearing one minute granule, RD = 6, proximal RD positioned slightly proximal to mid finger. All retrolateral denticles subpaired with corresponding prolateral

denticles. Trichobothria *ib* and *it* positioned subbasal on fix finger, *ib* positioned between PD6 and PD7, PD7 lacking granule, in and *it* at the close to or adjacent to the level of PD6; Fingers with vestigial scalloping in ♂, proximal notch and medina lobe of fixed finger weak; proximal notch and medina lobe of movable finger vestigial, gap created when fingers closed moderate, fingers fit unevenly; in ♀ fingers lacking scalloping, gap created when fingers closed absent.

Legs: Basitarsi I–II prolateral ventral retrolateral ventral and retrolateral dorsal carinae with complete rows of spinules, prolateral ventral in III and IV absent; retrolateral ventral in III complete, in IV absent, retrolateral dorsal in III partial expressed on distal half in IV absent; retrolateral median rows in I–IV vestigial expressed as few terminal spinules. Telotarsi I–IV with one or two pairs of ventrodistal spinules in I–IV. Setae: Prolateral ventral, 2:3:4:4, median two in II, basal three in III and IV stout; retrolateral ventral, 3:5:6:6; retrolateral dorsal, 2:3:3:4; dorsal, 3:4:4:3; retrolateral dorsal and dorsal series arranged in one sublinear row in II and III, forming setal combs, having dorsal median offset the row, in I and IV these series separated, the series visibly stouter and shorter in ♂, ♀in distinctly thinner and longer than other series. Ungues relatively elongated.

Tergites: Pretergites and postergites I–VII uniformly matte, with scattered moderate and minute granulation. Tergites I–VI ventral median carinae weak, expressed by a distal low costa and few moderate and minute distal granulations; ventral submedian weak expressed by few irregular distal moderate granules. Tergite VII with intercarinal surfaces matte, intercarinal surface between dorsal lateral and lateral inframedian with scattered enlarge conical granules. Dorsal median carina moderately costate expressed on proximal half of the postergite with few scattered subserrate crenulations; dorsal submedian vestigial expressed as a low short oblique proximal short protuberance with few low subserrate granules; dorsal lateral and lateral

supramedian moderate becoming slightly stronger distally; dorsal lateral carinae projecting and curving laterally approximating to lateral supramedian distal margin, creating a semi ring of serrated granulation.

Genital operculum: Male genital operculum: wider than long, with three pairs of macrosetae. Sclerites free on longitudinal edge moving independently but unable to open more than 45°. Genital papillae protrude posteriorly. Female genital operculum: Wider than long, with three macrosetae. Sclerites fuse longitudinal.

Sternites: Sternites I–VII smooth, finely punctuated, and lustrous. Sternite V with distal median glandular spot weak to moderate, not protruding from adjacent surface, expressed as a whitish moderate band, contrasting weakly to moderate with pale base color in ♂, in ♀ obsolete. Sternite VII ventral lateral carinae complete, moderate, finely crenatoserrate, and other carinae obsolete expressed by two or three macrosetae. Distomedian glandular spot reduced, not protruding from adjacent surface and weakly whitish contrasting moderately with base color pale in ♂, in ♀ obsolete. Spiracle elongated, slit-like, approximately two times longer than wide.

Pectines: Pectines longer than distal edge of coxa IV in ♂, in ♀ at the level of distal edge of coxa IV. Basal piece with median notch deep. Marginal lamella consist of three sclerites, medial lamella proximally fuse distally progressively forming conspicuous 8–9 beads. Fulcra with 13–16 in ♂, in ♀ 11–13 beads. Pectinal tooth count 15–17 in ♂, 12–14 in ♀.

Hemispermatophore: Lamina 2.02 longer than trunk. Dorsal through margin long, narrow, curving proximally, and removed from ventral trough. Hemimating plug developed from the inner lobe, distal barb margin with 12 elongated spinules. Primary and secondary hook positioned on the apex of lateral margin extension of the lamina (flange). Both hooks rounded low, separated slightly, forming a shallow notch. Median lobe ental terminus moderated and

rounded. Basal plate of inner lobe removed from ventral trough. Spine of inner lobe relatively long and strongly sclerotized. Neck relatively short (0.46 times longer than basal plate). Measurements, lamina, 3.23; trunk, 1.60; dorsal trough/laminar hooks, 1.33; ventral trough/laminar hook, 0.85; neck, 0.20; basal plate, 0.44.

Metasoma: Intercarinal surfaces matte. Metasoma 1.88 times longer than mesosoma. Metasomal segments I–III longer than wide. Carinae: Dorsal lateral and lateral median carinae in I–IV moderately crenatoserrated terminating in a moderated enlarge spinoid, except lateral median in IV distal terminus moderately expanded or flared laterally forming a triangular projection; dorsal lateral in V proximally strongly crenatoserrate, becoming irregular and granular distally. Lateral inframedian in I complete moderately crenatoserrated; in II incomplete crenatoserrated, becoming weaker proximally, present on distal third; in III incomplete crenatoserrated, becoming weaker proximally, present in distal fourth; in VI absent, in V proximally strongly crenatoserrated, becoming weaker distally, present in proximal half; ventral lateral and ventral submedian in I–V, and ventral median in V moderately crenatoserrate. Setae: Dorsal lateral, 1:3:3:4:7; lateral median, 1:3:4:4; lateral inframedian, 1:0:0:0:4; ventral lateral, 3:4:4:5:10; ventral submedian, 3:3:3:4:2, ventral sublateral, 2. One to two accessory major and macrosetae in intercarinal surfaces between ventral submedian carinae in segments I–IV. All macrosetae minor in ♂ and major in ♀, visibly longer.

Telson: Telson 2.5 times longer than wide. Metasomal segment V 1.3 times wider than telson. Vesicle 2.3 times longer than aculeus. Dorsal and ventral surface smooth. Dorsal surface with a fusiform to irregularly round minute glandular spot at or adjacent to the base of aculeus. Ventral surface with five to six macrosetae in each carina. Ventral median carinae with

subaculear tubercle vestigial. Microserration on laterobasal aculeus numbering 4–6. Vesicle of ♀ visibly more globose than ♀.

DISTRIBUTION: *Chihuahuanus panchovillai*, **n. sp.** has been recorded only in vicinities of the Silence zone near the border of the states of Chihuahua, Durango and Coahuila, in a locality within Chihuahua, Mexico.

ECOLOGY: *Chihuahuanus panchovillai*, **n. sp.** is another psammophilous species, it was exclusively collected in sandy substrate possessesing setal combs, (however, these macrosetae in this case are minor, rather than major as in its sister species *C. globosus*).

MATERIAL EXAMINED: **MEXICO: Chihuahua:** *Municipio de Jiménez*: Arenales, between Carrillo and Guimbalete, 5–6.viii.2005, desert, 26°56.6946'N 103°52.4076'W, 1124 m, rock rolling by day, 26°56.695'N 103°52.408'W, 1124 m, rock rolling by day, 1 subad. ♀, 3 juv. (AMNH [LP 5265]), 26°57.262'N 103°50.994'W, 1137 m, collected at night with UV light, 1 ♂ (AMNH [LP 5279]), O. Francke, W.D. Sissom, K. McWest, C. Lee, H. Montaño, J. Ballesteros, L. Jarvis, and C. Durán.

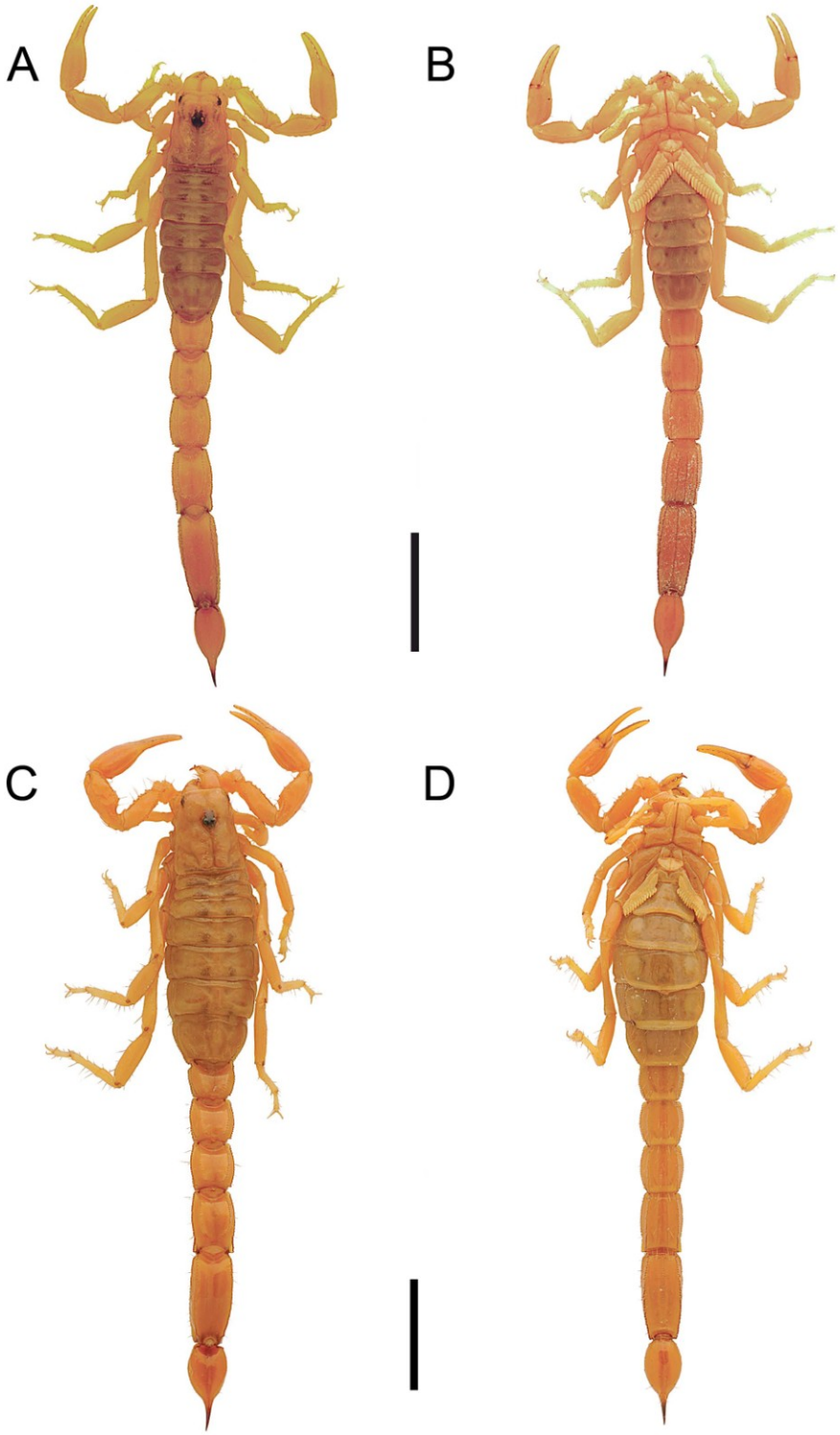


Figure 330. *Chihuahuanus panchovillai*, **n. sp.**, habitus. **A**, **B**. Paratype ♂ (AMNH). **C**, **D**. Paratype ♀ (AMNH). **A**, **C**. Dorsal aspect. **B**, **D**. Ventral aspect. Scale bars = 5 mm.

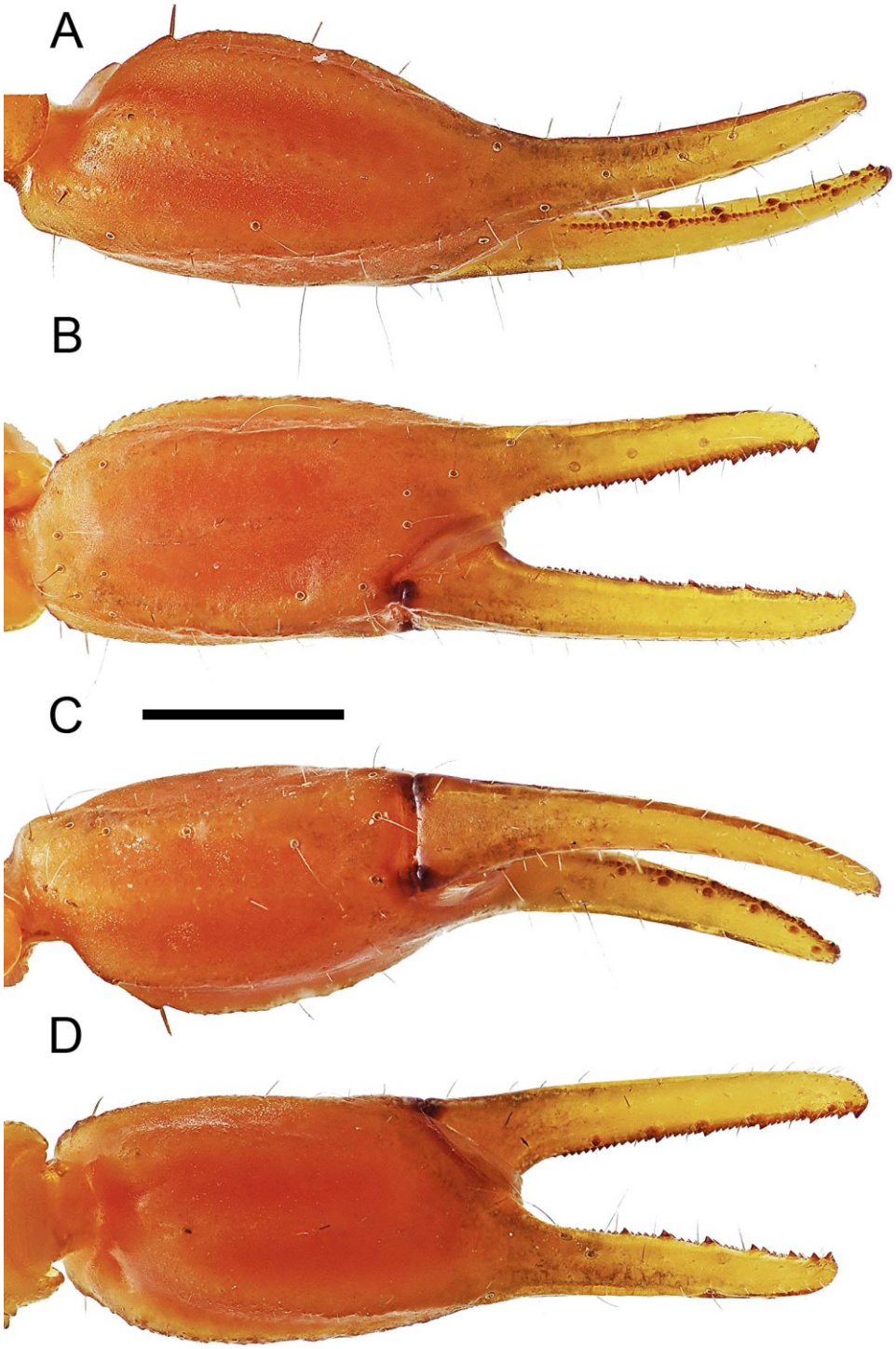


Figure 331. *Chihuahuanus panchovillai*, **n. sp.**, paratype ♂ (AMNH), dextral pedipalp chela. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

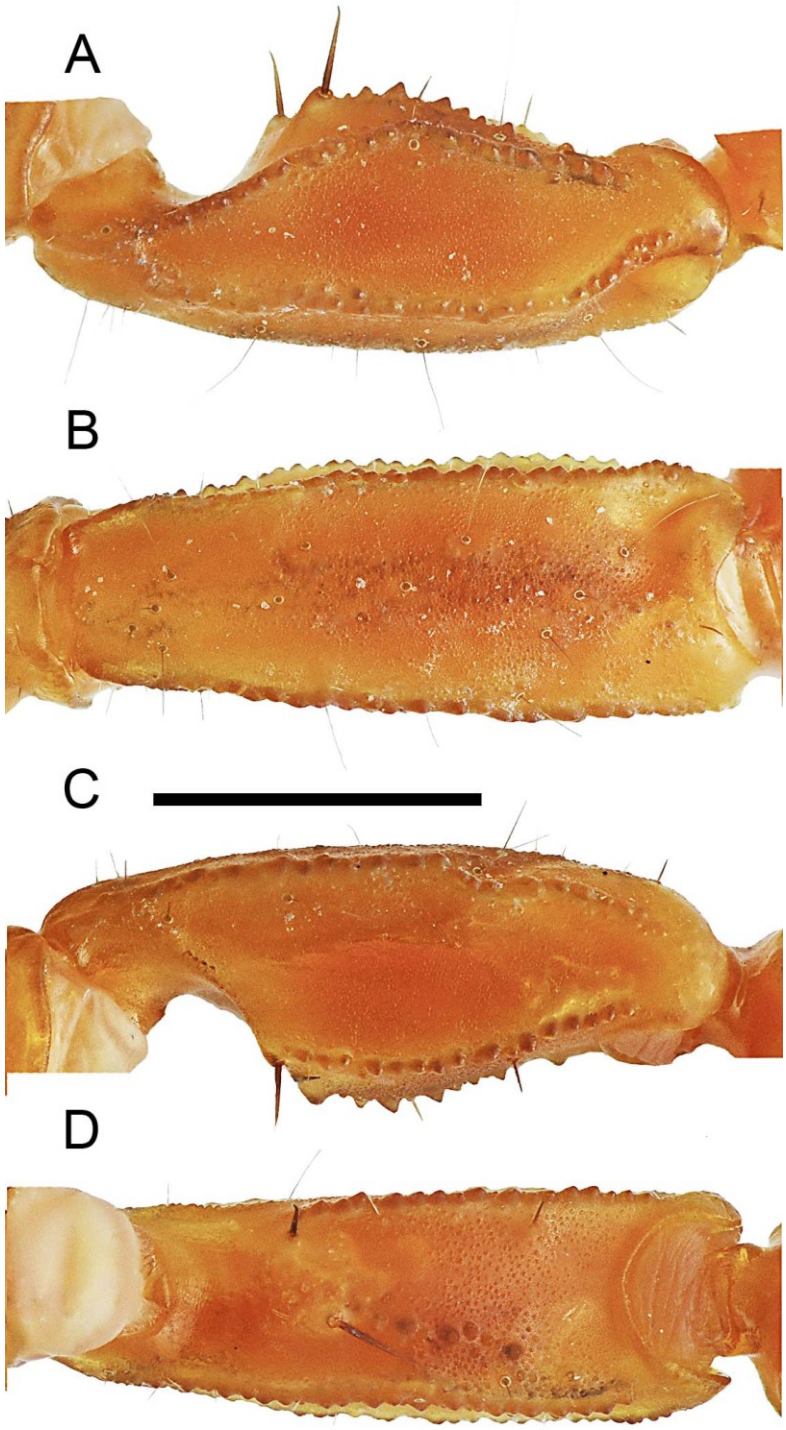


Figure 332. *Chihuahuanus panchovillai*, **n. sp.**, paratype ♂ (AMNH), dextral pedipalp patella. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

Table 15. Measurements (mm) of adult *Chihuahuanus panchovillai*, **n. sp.** Abbreviation: H, holotype.

	C. panchovillai ♂, H, IBUNAM
Length	
Carapace	3.50
Pedipalp: femur	2.50
Pedipalp: patella	2.70
Pedipalp: chela	4.00
Fixed finger	1.60
Movable finger	2.20
Mesosoma	6.80
Metasoma	12.80
Metasomal segment I	1.60
Metasomal segment II	1.90
Metasomal segment III	2.20
Metasomal segment IV	2.90
Metasomal segment V	4.20
Telson	3.70
Telson: vesicle	2.40
Telson: aculeus	1.30
Total	26.80
Width	
Pedipalp: femur	0.90
Pedipalp: patella	1.00
Pedipalp: chela	1.20
Metasomal segment I	1.40
Metasomal segment II	1.40
Metasomal segment III	1.40
Metasomal segment IV	1.30
Metasomal segment V	1.30
Telson: vesicle	1.30
Height	
Pedipalp: chela	1.20
Metasomal segment I	1.40
Metasomal segment II	1.40
Metasomal segment III	1.50
Metasomal segment IV	1.60
Metasomal segment V	1.50
Telson: vesicle	1.10

Chihuahuanus russelli (Williams, 1971)

Figures 309, 333–335, 336B, 338B, 342D, 343D, 344B, 346B, 349D

Vaejovis punctipalpi: Banks, 1901: 594 (misidentification).

Vaejovis russelli Williams, 1971a: 59–62, fig. 4; Bradley and Brody, 1984: 437–440; Sissom, 1991b: 221, 222; 1997: 13; Kovařík, 1998: 148; Sissom and Jackman, 1997: 151; Sissom, 2000: 551; Brown et al., 2002: 411, 412, fig. 1, 414, fig. 5, 416, fig. 5; Sissom and Hendrixson, 2005a: 131, 133; 2005b: 33, 37, 42 (key); McWest, 2009: 21, tab. 1, 92, fig. 328, 93, 125.

Vejovis russelli: Soleglad, 1973b: 357.

Kochius russelli: Soleglad and Fet, 2008: 4, 55–57, 61, 66, 69, 93, 94, figs. 132, 143, 156, 175.

TYPE MATERIAL: **U.S.A.: Arizona:** *Cochise Co.*: Holotype ♂ (CAS, Type No. 11471), Portal, 4770 ft, 26.viii.1965, S.C. Williams and G. Fernald. Paratypes: 7 ex. (CAS; including ♀ allotype), same locality as holotype.

DIAGNOSIS: *Chihuahuanus russelli* is most closely related to *C. crassimanus*, with which forms a monophyletic group. *C. russelli* may be distinguished from *C. crassimanus* by having pedipalp fingers scalloping moderate in ♂ and weak in ♀, instead of having fingers straight, lacking scalloping in both sexes. *C. russelli* has moderate to slender chelae, instead of having incrassate chelae. *C. russelli* differs also by having ventral submedian carinae of metasomal segments I and II smooth to weakly crenular, instead of having them finely crenatoserrate. *C. russelli* has dorsal carinae of pedipalp femur outlined by moderate infuscate.

DESCRIPTION: This description supplements William's (1968) original description and it is based on the material deposited in the collections mentioned below.

Color and infuscation: Babe color pale yellow. Carapace and tergites, with fine and diffuse dusky markings restricted to median surface, other surface immaculate. Median and lateral ocular tubercles moderately infuscate. Pectines and genital operculum whitish. Aculeus dark brownish. Pedipalp fingers reddish.

Carapace: Carapace 1.13 times longer than posterior width. Anterior margin sublinear, with vestigial medial notch and with three pairs of major macrosetae, occasionally with one accessory minor macrosetae. Carapace shagreened with dense coarse and minute granules. Median ocular tubercle moderately rose. Superciliary carinae weakly crenular and higher than median eyes. Medina ocular tubercle positioned on distal half. Three pairs of lateral eyes, two anterior pairs slightly larger than posterior third in half size. Median eyes approximately two times the size of lateral anterior pair. Anteromedian, posteromedian and posterolateral sulci deep, posterior transverse obsolete.

Sternum and coxal region: Sternum pentagonal subequilateral, as long as wide with three pairs of macrosetae, surface matte, median notch deep. Coxae surface entirely matte. Anterior margin of coxa II with three oblique slit-like structures, adjacent to a low and finely granulate protuberance. Base of coxal endite II with a deep depression each. Coxa IV 2.22 times longer than coxa II.

Chelicerae: Dorsal surface smooth, subdistal margin of manus with one macrosetae. Distal margin costate. Serrula present on ventral distal half of movable finger, tines numbering 12.

Pedipalps: Trichobothrial pattern Type C, orthobothriotaxic. Chela wider than patella, patella wider than femur. Femur: All intercarinal surfaces matted. Dorsal prolateral, dorsal retrolateral and ventral prolateral complete irregular moderately crenatoserrate; retrolateral

dorsosubmedian vestigial, expressed on distal two thirds by few scattered minute crenatoserrate granules and three macrosetae, being the last one minor; retrolateral ventral vestigial, expressed by few proximal minute serrate granules; ventral median vestigial, expressed as a short row proximal serrate granules; ventral retrosubmedian vestigial expressed by three or four proximal enlarge crenulations and minute granules; prolateral ventrosubmedian vestigial, expressed by a proximal bicuspid or double granule adjacent to trichobothrium *i*, positioned at proximal mid surface followed by a row of five or six enlarged or moderate conical granules, having median and distal a macroseta at base; prolateral ventral vestigial, expressed by one proximal macroseta adjacent to a double enlarged conical proximal granule, followed by one median moderate granules and one distal similar granule, each with a macrosetae at base; prolateral ventrosubmedian and prolateral parallel.

Patella: All intercarinal surfaces matte. Dorsal prolateral, ventral prolateral, dorsal retrolateral and ventral retrosubmedian complete strongly and irregularly granular to crenular; ventral median vestigial, expressed by few proximal moderate granules; prolateral median on a vaulted projection protruding strongly medially, expressed by a proximal tubercle with a macrosetae on top and a row of serrate granules with a median macrosetae, weakening distally at the level of trichobothrium *i*, followed by a gap of smooth and ending on a distal macrosetae following a curve, slanting dorsally almost reaching dorsal prolateral carinae on distal fifth; prolateral ventral obsolete, expressed by two macrosetae, one proximal on the top of a moderate tubercle and one distal, these adjacent to ventral prolateral carinae.

Chela: Manus smooth and relatively elongated (manus 1.45 times longer than fixed finger). Dorsal median, dorsal prolateral, dorsal retrolateral, and prolateral median complete, weakly crenulated, and strongly costate; ventral retrolateral incomplete, costate and weakly

crenulated, expressed on proximal two thirds; retrolateral median and ventral prolateral complete costate and smooth. Trichobothrium *Db* positioned on dorsal retrolateral carina, subbasal on chelae; *Dt* positioned close to mid manus but on the proximal half.

Fingers: Fix finger, PD = 6, MD rows = 5, RD = 5, proximal RD positioned by mid finger. All retrolateral denticles subpaired with corresponding prolateral denticles. Movable finger, PD = 7, MD rows = 6 or 7, distal row bearing one minute granule, RD = 6 or 7, proximal RD positioned slightly proximal to mid finger. All retrolateral denticles subpaired with corresponding prolateral denticles. Trichobothria *ib* and *it* positioned subbasal on fix finger, *ib* positioned between PD6 and PD7, PD7 lacking granule, and *it* at the level of PD6; Fingers with moderate to strong scalloping in ♂, proximal notch strong and median lobe of fixed finger moderate; proximal notch and medina lobe of movable finger moderate, gap created when fingers closed strong, fingers fit unevenly; in ♀ fingers lacking scalloping, gap created when fingers closed absent.

Legs: Basitarsi I–II prolateral ventral retrolateral ventral and retrolateral dorsal carinae with complete rows of spinules, prolateral ventral in III and IV absent; retrolateral ventral in III complete, in IV absent, retrolateral dorsal in III partial expressed on distal half in IV absent; retrolateral median rows in I–IV vestigial expressed as few terminal spinules. Telotarsi I–IV with one or two pairs of ventrodistal spinules in I–IV. Setae: Prolateral ventral, 2:3:4:4, median two in II, basal three in III and IV stout; retrolateral ventral, 3:6:6:6; retrolateral dorsal, 2:3:2:2; dorsal 4:4:3:3; retrolateral dorsal and dorsal series arranged in one sublinear row, forming setal combs, having dorsal median macrosetae offset the row. Ungues relatively elongated.

Tergites: Pretergites matte and postergites I–VII shagreened with moderate and minute granules restricted to a proximal band. Tergites I–VI ventral median carinae moderate, expressed

by a distal moderate costa and few distal granulates; ventral submedian weaker but with slightly more larger. Tergite VII with intercarinal surfaces matte, intercarinal surface between dorsal lateral and lateral inframedian with scattered enlarge conical granules. Dorsal median carina weakly costate expressed on proximal half of the postergite matte; dorsal submedian vestigial expressed as a low short oblique proximal short protuberance with few low subserrate granules; dorsal lateral and lateral supramedian moderate becoming strong distally ending in an enlarge spinoid process; dorsal lateral carinae projecting and curving laterally approximating to lateral supramedian distal margin, creating a semi ring of serrated granulation.

Genital operculum: Male genital operculum: wider than long, with three pairs of macrosetae. Sclerites free on longitudinal edge moving independently but unable to open more than 45°. Genital papillae protrude posteriorly. Female genital operculum: Wider than long, with three macrosetae. Sclerites fuse longitudinal.

Sternites: Sternites I–VII smooth, finely punctuated medially and moderately matte laterally. Sternite V with distal median glandular spot weak to moderate, not protruding from adjacent surface, expressed as a whitish moderate band, contrasting weakly to moderate with pale base color in ♂, in ♀ obsolete. Sternite VII ventral lateral carinae complete, moderate, finely crenatoserrate, other carinae obsolete expressed by two or three macrosetae. Distomedian glandular spot vestigial, not protruding from adjacent surface and weakly contrasting with base color pale in ♂, in ♀ obsolete. Spiracle elongated, slit-like, approximately two times longer than wide.

Pectines: Pectines longer than distal edge of coxa IV in ♂, in ♀ at the level of distal edge of coxa IV. Basal piece with median notch deep. Marginal lamella consist of three sclerites,

medial lamella proximally fuse distally progressively forming conspicuous 10–12 beads. Fulcra with 14–17 in ♂, in ♀ 12–14 beads. Pectinal tooth count 15–18 in ♂, 13–15 in ♀.

Hemispermatophore: Lamina 2.12 longer than trunk. Dorsal through margin long, narrow, curving proximally, and removed from ventral trough. Hemimating plug developed from the inner lobe, distal barb margin with 16 elongated spinules. Primary and secondary hook positioned on the apex of lateral margin extension of the lamina (flange). Both hooks rounded low, separated slightly, forming a shallow notch. Primary hook slightly rotated to dorsal surface. Median lobe ental terminus moderated and rounded. Basal plate of inner lobe removed from ventral trough. Spine of inner lobe relatively long and strongly sclerotized. Neck short (0.2 times longer than basal plate). Measurements, lamina, 4.20; trunk, 1.98; dorsal trough/laminar hooks, 1.62; ventral trough/laminar hook, 1.20; neck, 0.18; basal plate, 0.90.

Metasoma: Intercarinal surfaces weakly matte to smooth. Metasoma 1.4 times longer than mesosoma. Metasomal segments I–III wider than long. Carinae: Dorsal lateral and lateral median carinae in I–IV moderately crenatoserrated terminating in a moderated enlarge spinoid, except lateral median in IV distal terminus moderately expanded or flared laterally forming a triangular projection; dorsal lateral in V proximally strongly crenatoserrate, becoming irregular and granular distally; lateral inframedian in I complete moderately crenatoserrated; in II incomplete crenatoserrated, becoming weaker proximally, present on distal third; in III incomplete crenatoserrated, becoming weaker proximally, present in distal fourth; in VI absent, in V proximally strongly crenatoserrated, becoming weaker distally, present in proximal half; ventral lateral moderately crenatoserrate in I–V; ventral submedian in I smooth to weakly crenulated, moderately costate; in II–IV and ventral median in V moderately crenatoserrate. Setae: Dorsal lateral, 1:2:2:3:6; lateral median, 1:1:2:4; lateral inframedian, 1:0:0:0:4; ventral

lateral, 2:2:3:3:6; ventral submedian, 2:3:3:4:2; ventral sublateral, 2. One to two accessory major and macrosetae in intercarinal surfaces between ventral submedian carinae in segments I–III. All macrosetae major.

Telson: Telson 2.5 times longer than wide. Metasomal segment V 1.3 times wider than telson. Vesicle 2.3 times longer than aculeus. Dorsal and ventral surface smooth. Dorsal surface with a fusiform to irregularly round minute glandular spot at or adjacent to the base of aculeus. Ventral surface with three to four macrosetae in each carina. Ventral median carinae with subaculear tubercle vestigial. Microserration on laterobasal aculeus numbering 4–6.

DISTRIBUTION: *Chihuahuanus russelli* is endemic to the central-southern states of U.S.A., including Arizona, New Mexico, and Texas.

ECOLOGY: *Chihuahuanus russelli* is another psammophilous species, found both in sandy and more compacted loamy to gravely soils. It has been recorded at altitudes from 1117 to 1367 m. *C. russelli* and *C. crassimanus* are the only two species that have been recorded across the Cochise Filter Barrier, a biogeographic connection between the fauna of the Chihuahuan and the Sonoran Deserts (Pyron and Burbrink, 2010).

REMARKS: *Chihuahuanus russelli* was originally described in the *punctipalpi* group of *Vaejovis* (Williams, 1971a) and subsequently transferred to *Kochius* (Soleglad and Fet, 2008). The results of the analyses conducted here revealed that *C. russelli* is part of *Chihuahuanus*, instead of *Kochius*, because of the fusiform glandular area on the dorsal surface of the telson, a diagnostic characters for this genus.

MATERIAL EXAMINED: **U.S.A.: Arizona:** *Cochise Co.*: Foothills of Pinaleno Mountains, 7.4 km from junction of Hwy 191 on Hwy 366, 32°41'33.9"N 109°45'13.3"W, 1132 m, 25.vii.2007, J. Huff, collected at night with UV light, on sand in scrub, 1 ♂ (AMNH [LP 7017]);

Portal, [31°54'38.89"N 109°8'32.00"W], Shapiro, 21.vi.1963, 1 ♀ (AMNH); W.J. Gertsch, 4.ix.1964, 1 ♂ (AMNH), 3.ix.1964, 1 ♀ (AMNH), 1.viii.1965, 2 ♂, 1 juv. (AMNH), 6.viii.1965, 1 ♂, 1 ♀ (AMNH), 1–15.vii.1965, 1 ♂, 2 ♀, 2 juv. (AMNH), 5 ex. (AMNH), 6.ix.1966, 1 ♂, 1 ♀ (AMNH); F. Russell, 20.viii.1965, 1 ♂ (AMNH); R.M. Hastings, 31.viii.1964, 6 ♂ (AMNH); V. Roth, 17.ix.1965, 3 ♂, (AMNH), 27.vii.1973, 1 ♀, 1 juv. (AMNH). *Graham Co.*: Fan Road, ca. 8.9 km NE Bowie, 32°22'31.01"N 109°26'51.53"W, 1109 m, 24.vii.2008, H.M. Burrell and K. McWest, collected at night with UV light, 1 ♂ (AMNH [LP 8855]). **New Mexico:** *Bernalillo Co.*: Albuquerque, 6 km W, [35°6.64217'N 106°36.5995'W], 24.ix.1981, R.A. Bradley, below lava cliff, 5 ♀ (AMNH); Albuquerque, Cemetery on Edit SE, [35°6.64217'N 106°36.5995'W], 13.vii.1964, J. Young, 1 ♀ (AMNH). *Chaves Co.*: Bottomless Lakes, on plateau above lakes, 33°20.233'N 104°19.524'W, 1117 m, 13.vi.2004, J. Huff and R. West, scrub desert, collected at night with UV light, 1 ♀, 2 juv. (AMNH [LP 2892]). *Doña Ana Co.*: Las Cruces, 32°15.648'N 106°43.655'W, 1238 m, 12.ix.2002, L. Prendini, collected at night with UV light, 1 ♀ (AMNH [LP 2146]). *Hidalgo Co.*: Animas, Hwy 9, 11 km W, [31°34.1700'N 108°47.322'W], 2.iv.1998, B. Tomberlin and T. Snell, 1 ♀ (IBUNAM); Granite Gap, Peloncillo Mountains, 32°05'43.1"N 108°58'13.7"W, 1367 m, 4.ix.2007, L. Prendini and J. Huff, 1 ♀ (AMNH [LP 7274]); Peloncillo Mountains, 32°05'43.1"N 108°58'13.7"W, 1367 m, 4.iv.2007, L. Prendini and J. Huff, 1 ♀ (AMNH); Rodeo, 16 km N, [31°50.21667'N 109°1.9'W], 22.ix.1963, V. Roth, 1 ♀ (AMNH). *Quay Co.*: Glenrio, ca. 2.4 km W on Old US 66, 35°10'08.0"N 103°04'05.3"W, 1169 m, 3.ix.2007, K. McWest, H.M. Burrell and K.S.M. Torres, 1 juv. (AMNH [LP 7266]). **Texas:** Colorado, vi–x.1910, T. Merril, 1 ♀ (AMNH). *Brewster Co.*: Big Bend National Park, Pine Canyon Trail, Chisos Mountains, 29°16.0709'N 103°14.2254'W, 1.viii.2008, W.D. Sissom, T. Anton, and G. Casper, rocky slope, 1 juv. (AMNH [LP 8920]), 2 ♂ (AMNH); Black Gap

Wildlife Management Area, 6.4 km past camp on Camp 14 Road, [29°32.84200'N 102°54.6285'W], 16.vii.2004, L. Jarvis, W.D. Sissom, and T. Anton, 1 ♂ (AMNH [LP 2971]).

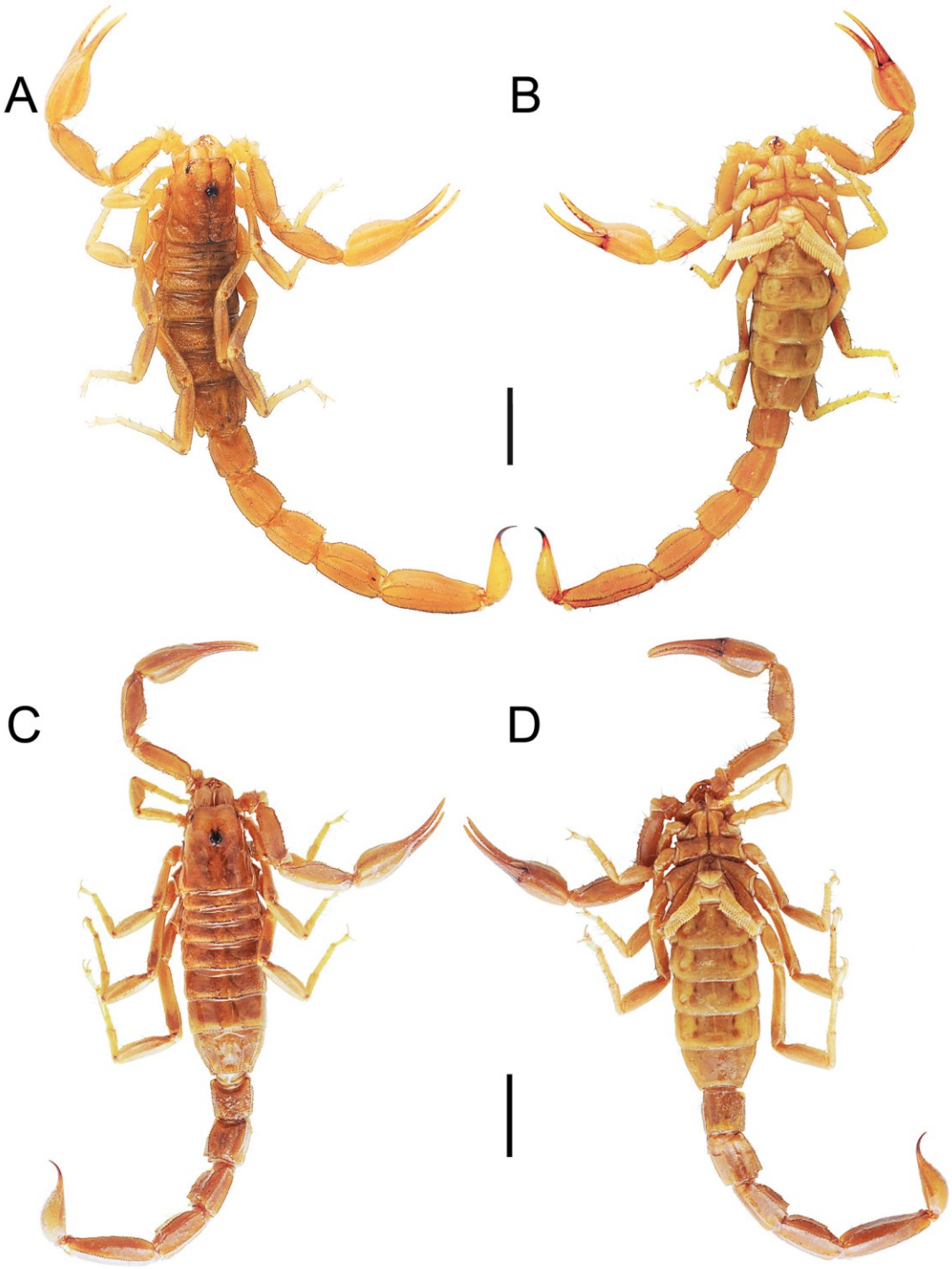


Figure 333. *Chihuahuanus russelli* (Williams, 1971), habitus. **A**, **B**. ♂ (AMNH). **C**, **D**. ♀ (AMNH). **A**, **C**. Dorsal aspect. **B**, **D**. Ventral aspect. Scale bars = 5 mm.

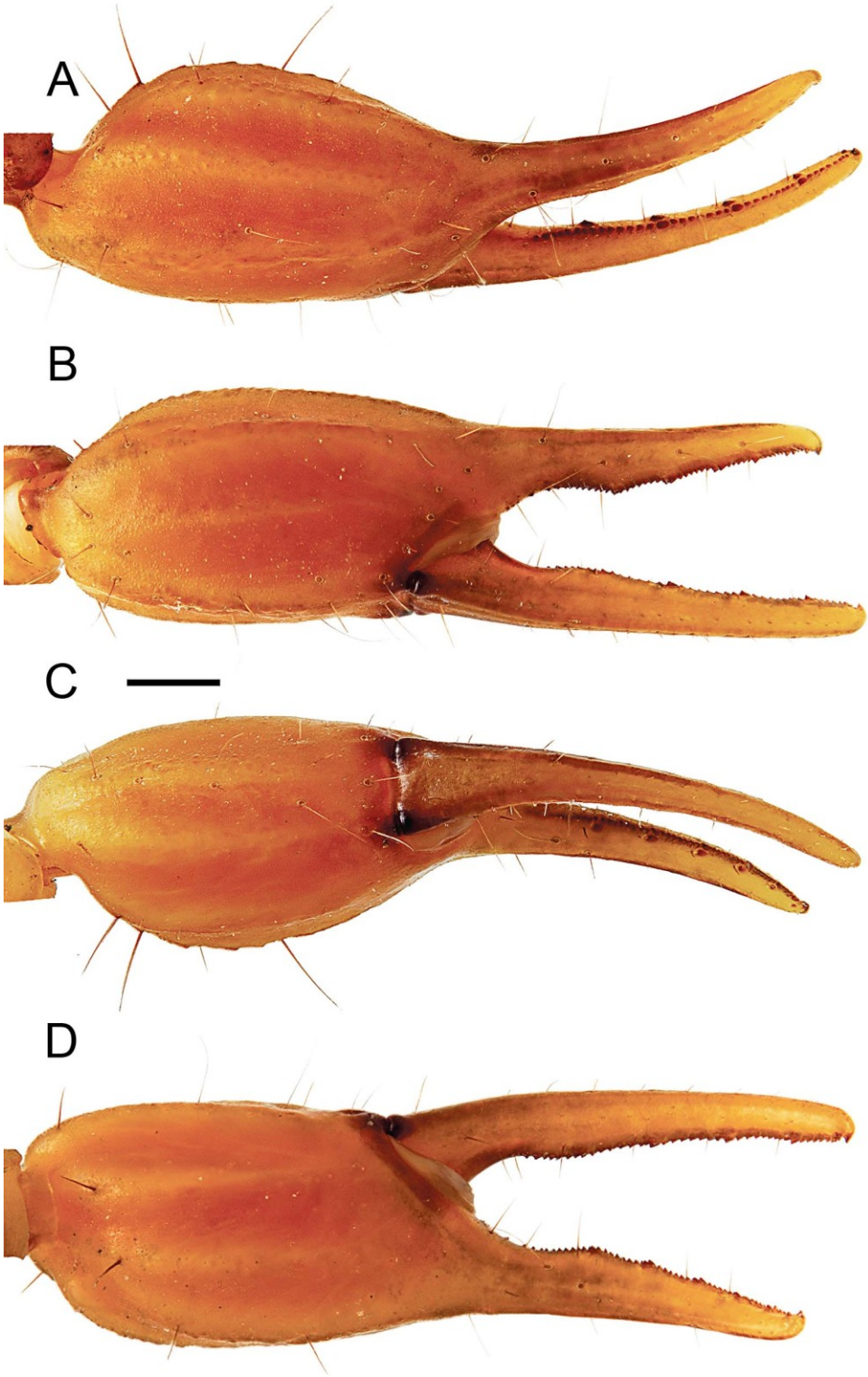


Figure 334. *Chihuahuanus russelli* (Williams, 1971), ♂ (AMNH), dextral pedipalp chela. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

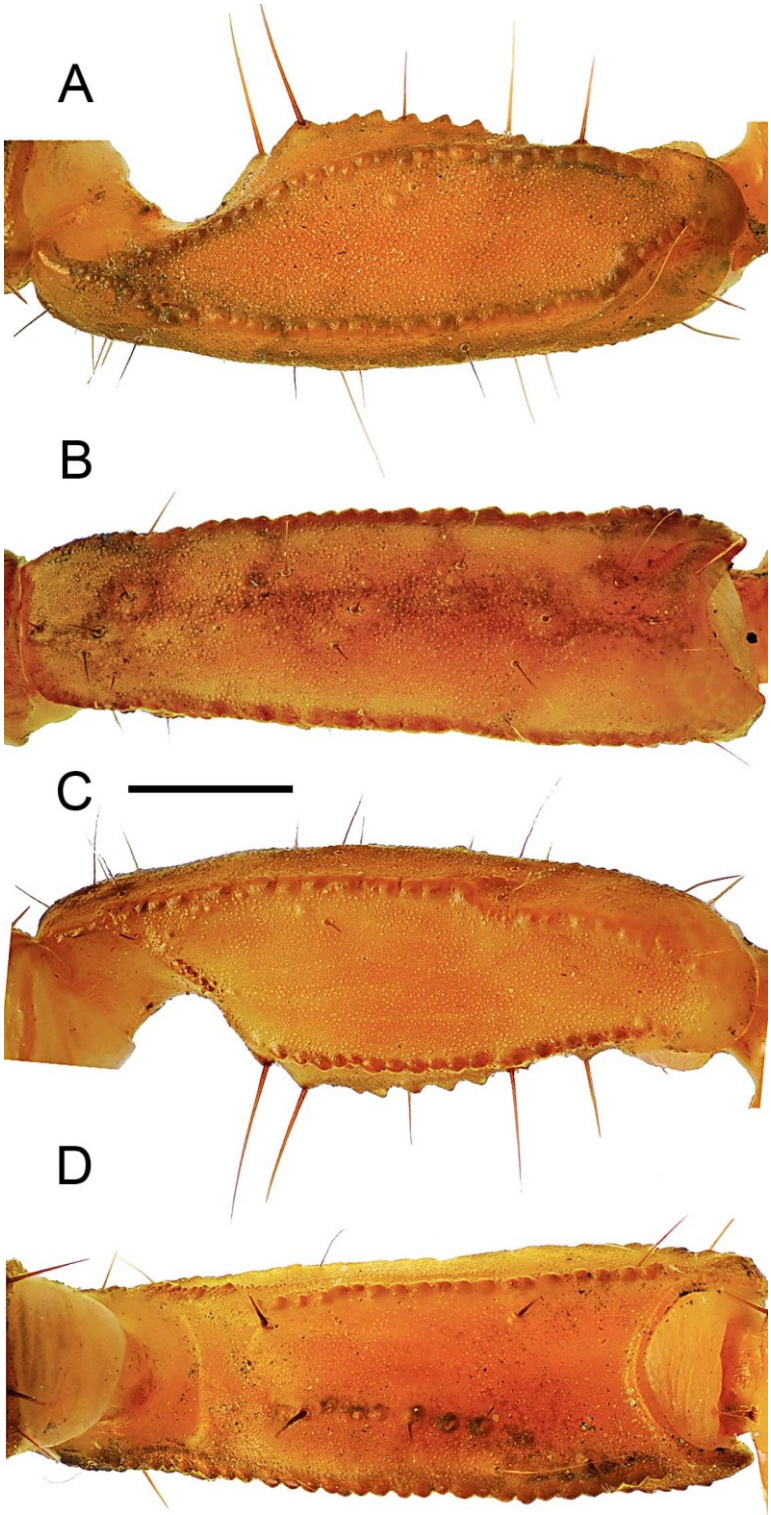


Figure 335. *Chihuahuanus russelli* (Williams, 1971), ♂ (AMNH), dextral pedipalp patella. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

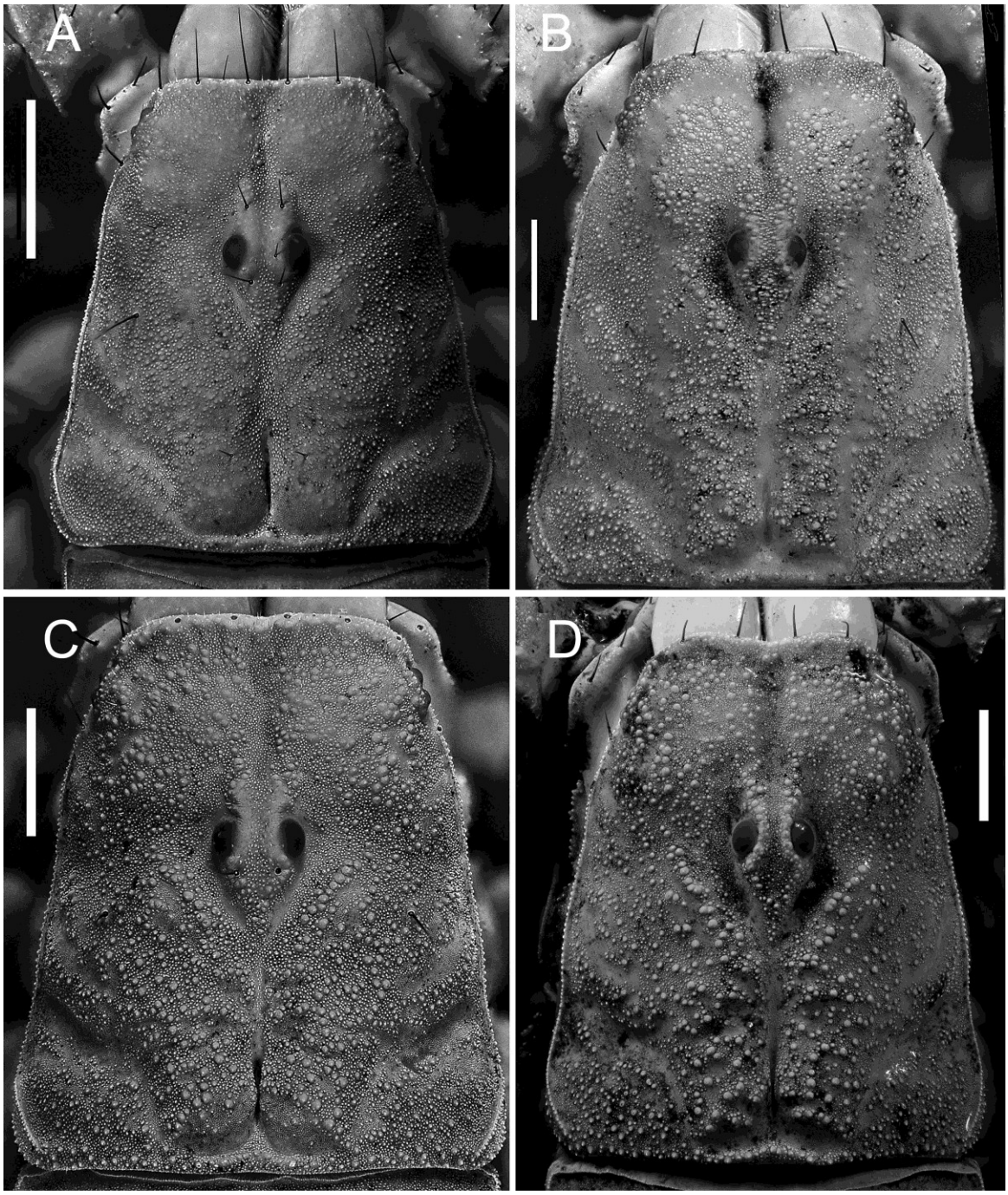


Figure 336. *Chihuahuanus* González-Santillán and Prendini, in litt. Carapace. **A**. *Chihuahuanus bilineatus* (Pocock, 1898), ♂ (AMNH). **B**. *Chihuahuanus russelli* (Williams, 1968), paratype ♂ (AMNH). **C**. *Chihuahuanus coahuilae* (Williams, 1968), ♂ (AMNH). **D**. *Chihuahuanus crassimanus* (Pocock, 1898), ♂ (AMNH). Scale bars = 1 mm.

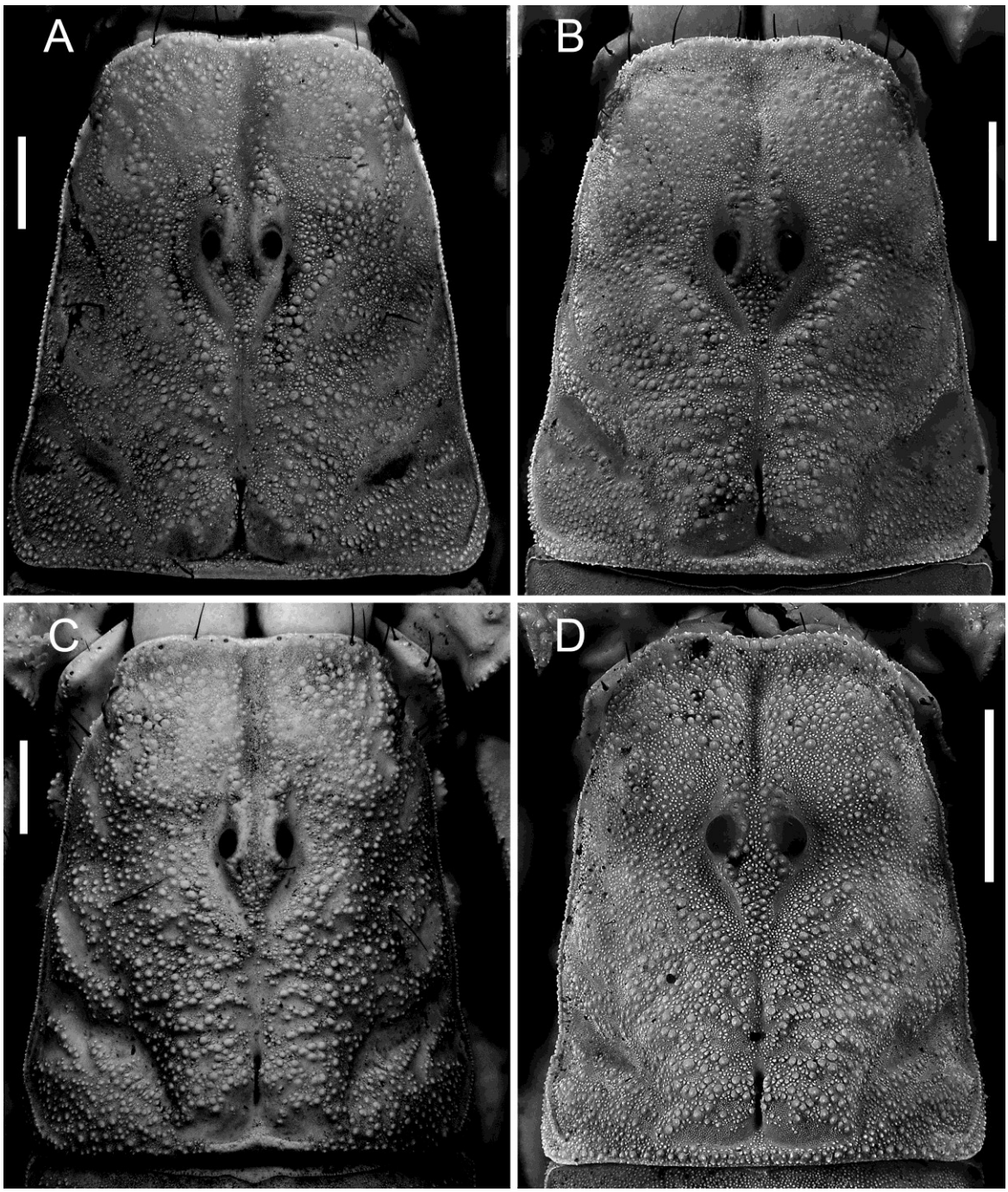


Figure 337. *Chihuahuanus* González-Santillán and Prendini, in litt. Carapace. **A**. *Chihuahuanus glabrimanus* (Sissom and Hendrixson, 2005), ♂ (AMNH). **B**. *Chihuahuanus globosus* (Borelli, 1915), ♂ (AMNH). **C**. *Chihuahuanus kovariki* (Soleglad and Fet, 2008), ♂ (AMNH). **D**. *Chihuahuanus panchovillai*, **n. sp.**, paratype ♂ (AMNH). Scale bars = 1 mm.

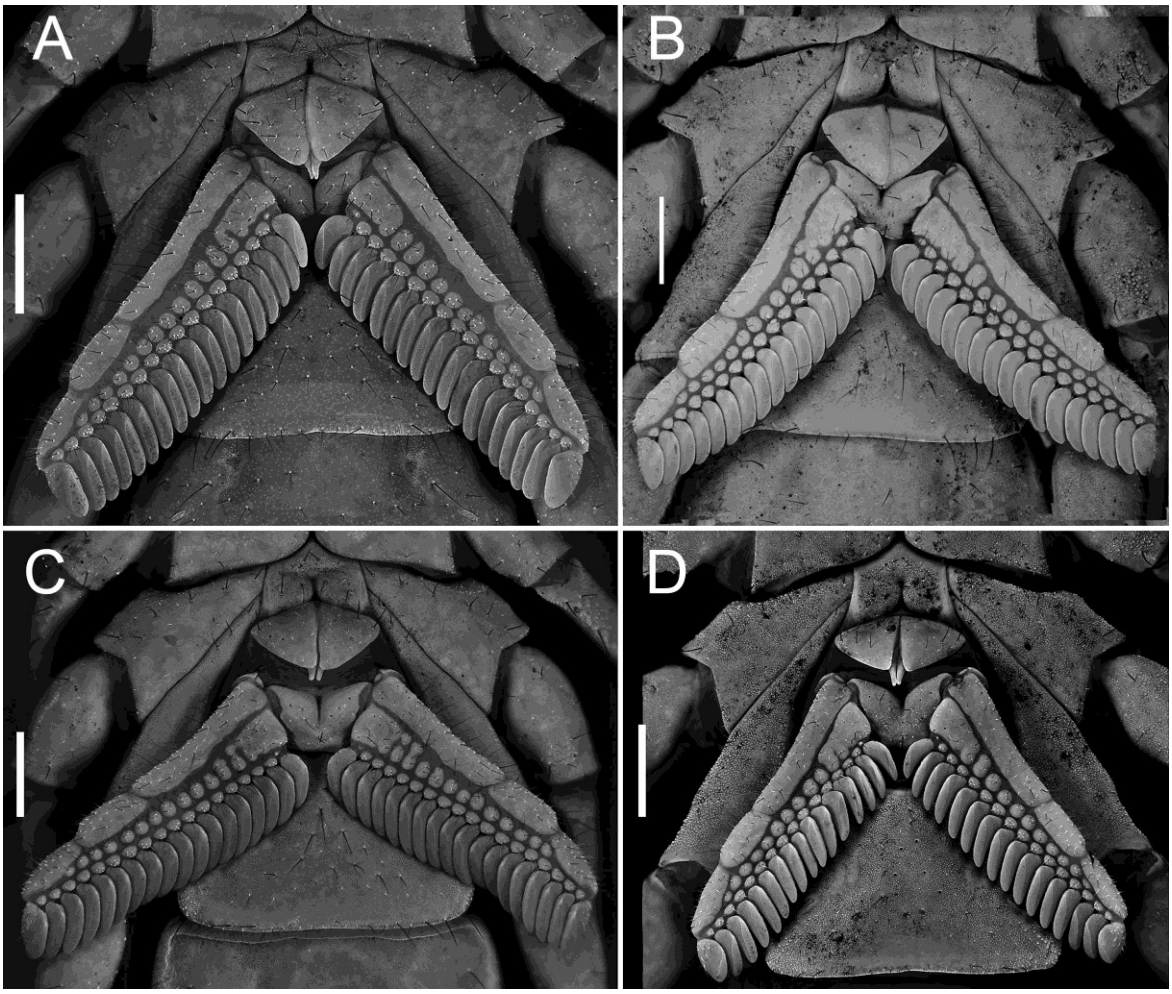


Figure 338. *Chihuahuanus* González-Santillán and Prendini, in litt. Sternum, genital operculum, and pectines. **A**. *Chihuahuanus bilineatus* (Pocock, 1898), ♂ (AMNH). **B**. *Chihuahuanus russelli* (Williams, 1968), paratype ♂ (AMNH). **C**. *Chihuahuanus coahuilae* (Williams, 1968), ♂ (AMNH). **D**. *Chihuahuanus crassimanus* (Pocock, 1898), ♂ (AMNH). Scale bars = 1mm.

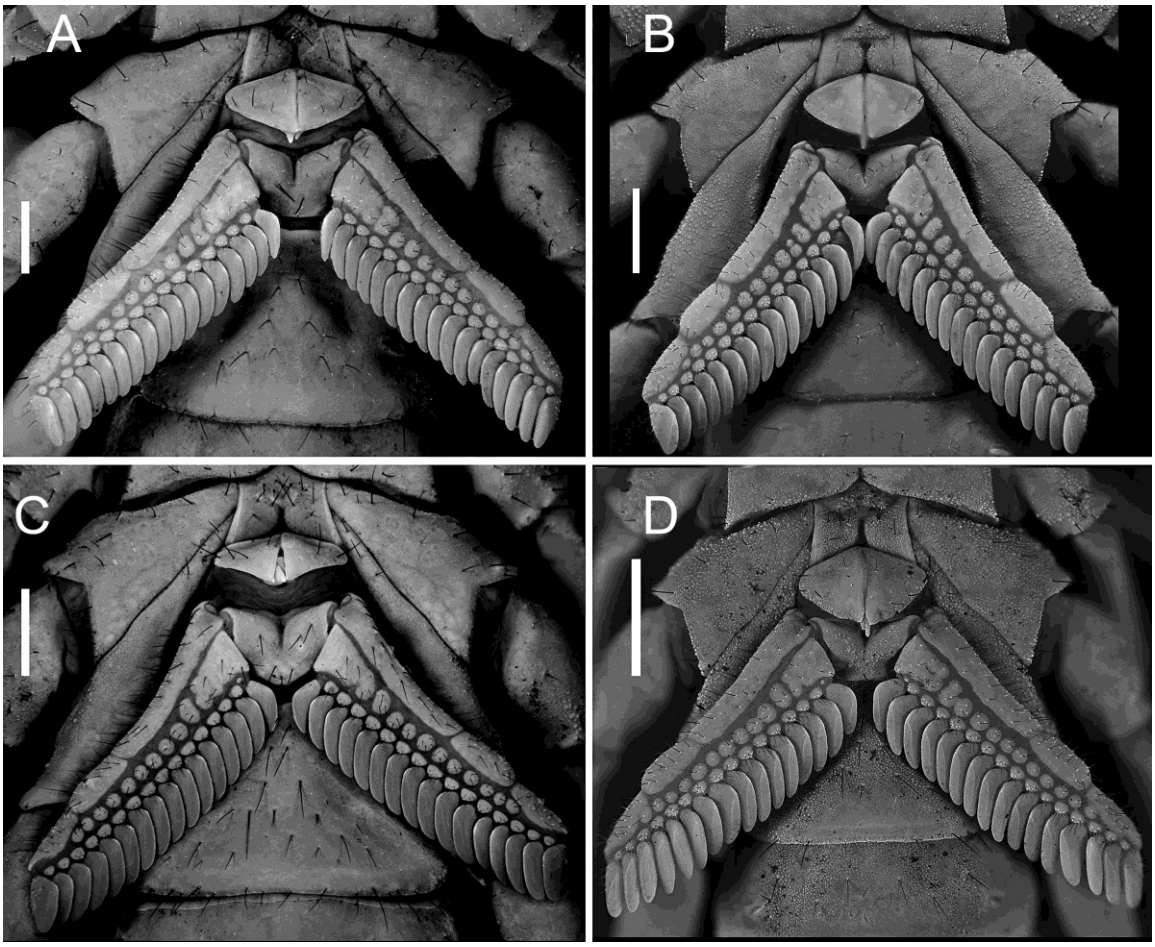


Figure 339. *Chihuahuanus* González-Santillán and Prendini, in litt. Sternum, genital operculum, and pectines. **A**. *Chihuahuanus glabrimanus* (Sissom and Hendrixson, 2005), ♂ (AMNH). **B**. *Chihuahuanus globosus* (Borelli, 1915), ♂ (AMNH). **C**. *Chihuahuanus kovariki* (Soleglad and Fet, 2008), ♂ (AMNH). **D**. *Chihuahuanus panchovillai*, **n. sp.**, paratype ♂ (AMNH). Scale bars = 1 mm.

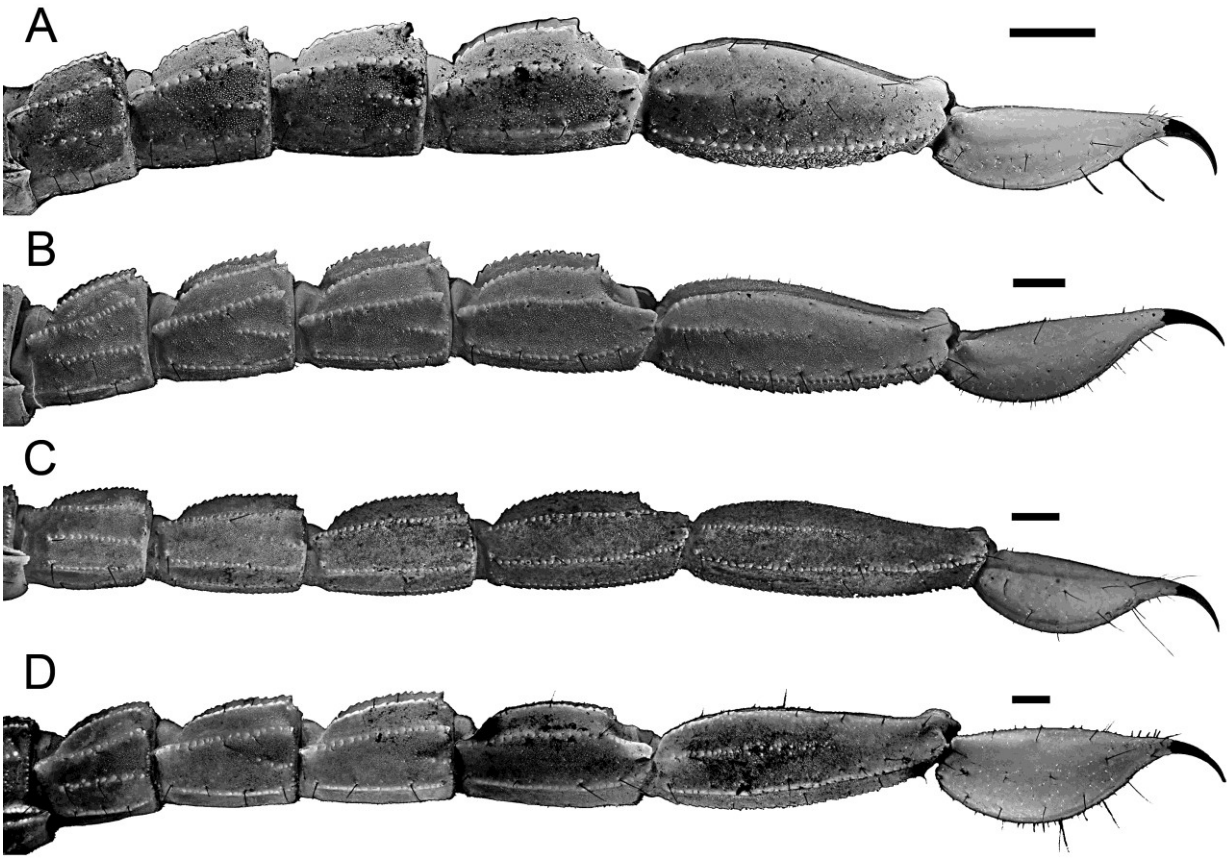


Figure 340. *Chihuahuanus* González-Santillán and Prendini, in litt. Metasomal segments I–V, lateral aspect. **A**. *Chihuahuanus bilineatus* (Pocock, 1898), ♂ (AMNH). **B**. *Chihuahuanus coahuilae* (Williams, 1968), ♂ (AMNH). **C**. *Chihuahuanus crassimanus* (Pocock, 1898), ♂ (AMNH). **D**. *Chihuahuanus glabrimanus* (Sissom and Hendrixson, 2005), ♂ (AMNH). Scale bars = 1 mm.

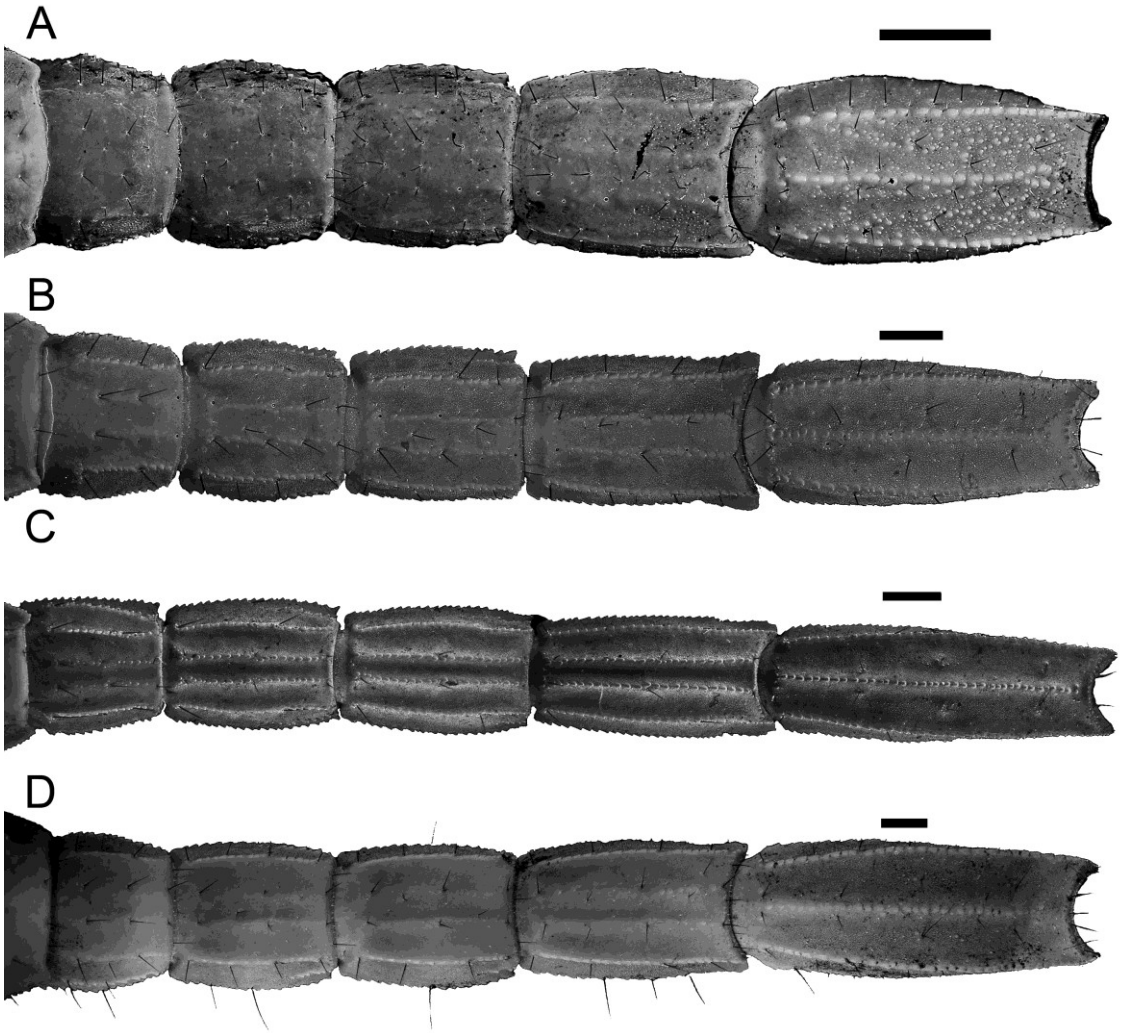


Figure 341. *Chihuahuanus* González-Santillán and Prendini, in litt. Metasomal segments I–V, ventral aspect. **A**. *Chihuahuanus bilineatus* (Pocock, 1898), ♂ (AMNH). **B**. *Chihuahuanus coahuilae* (Williams, 1968), ♂ (AMNH). **C**. *Chihuahuanus crassimanus* (Pocock, 1898), ♂ (AMNH). **D**. *Chihuahuanus glabrimanus* (Sissom and Hendrixson, 2005), ♂ (AMNH). Scale bars = 1 mm.

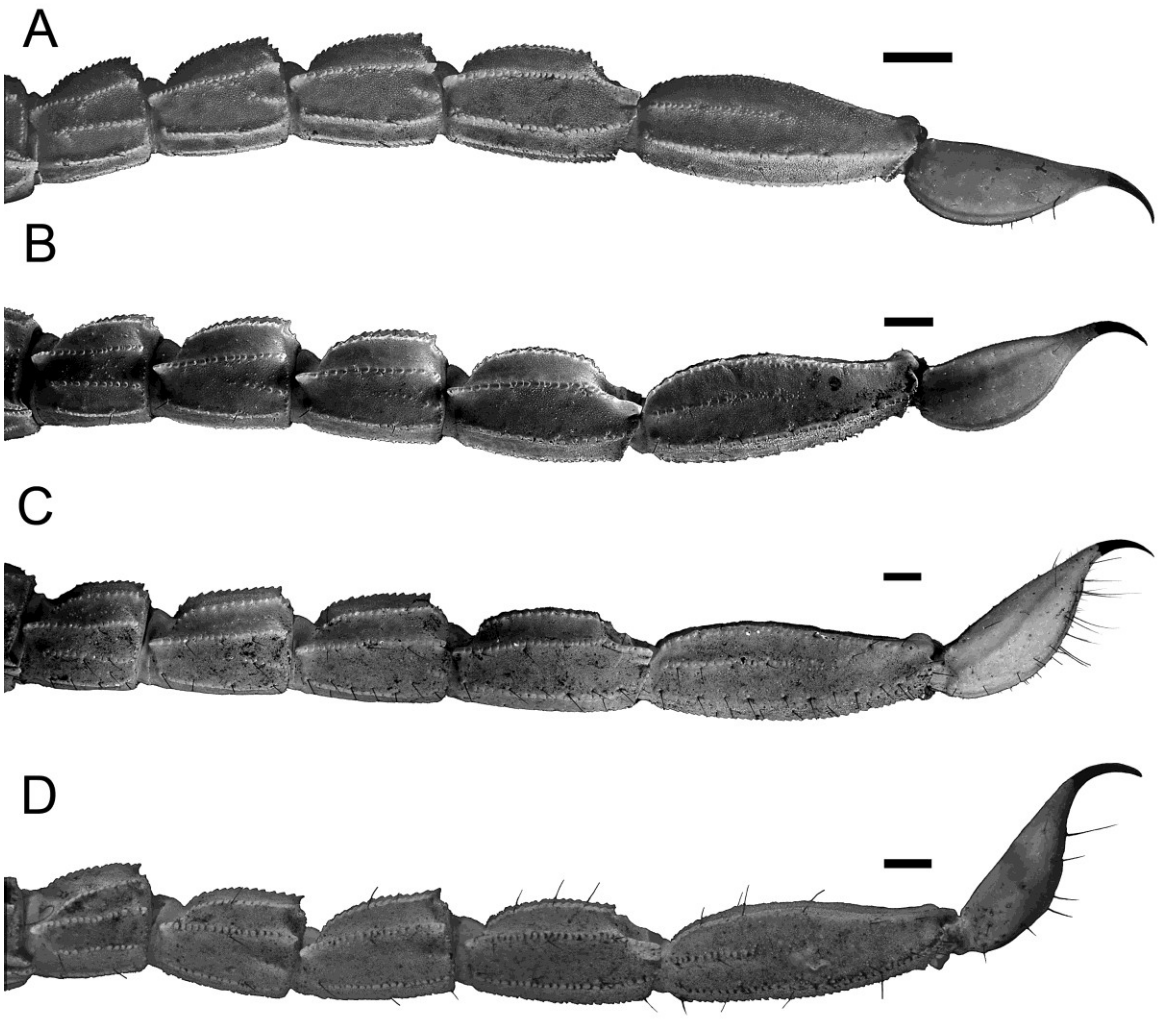


Figure 342. *Chihuahuanus* González-Santillán and Prendini, in litt. Metasomal segments I–V, lateral aspect. **A**. *Chihuahuanus panchovillai*, **n. sp.**, paratype ♂ (AMNH). **B**. *Chihuahuanus globosus* (Borelli, 1915), ♂ (AMNH). **C**. *Chihuahuanus kovariki* (Soleglad and Fet, 2008), ♂ (AMNH). **D.** *Chihuahuanus russelli* (Williams, 1968), paratype ♂ (AMNH). Scale bars = 1 mm.

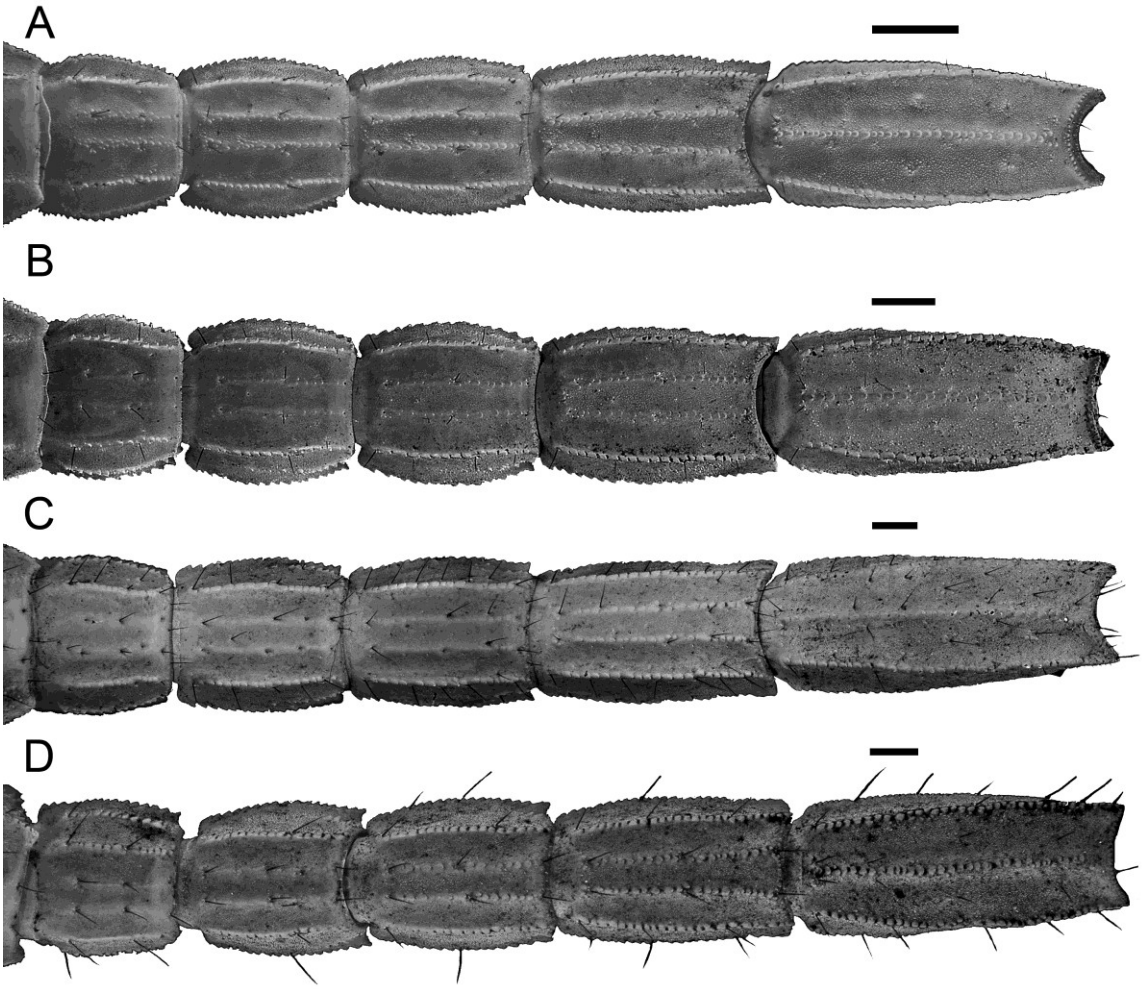


Figure 343. *Chihuahuanus* González-Santillán and Prendini, in litt. Metasomal segments I–V, ventral aspect. **A**. *Chihuahuanus panchovillai*, **n. sp.**, paratype ♂ (AMNH). **B**. *Chihuahuanus globosus* (Borelli, 1915), ♂ (AMNH). **C**. *Chihuahuanus kovariki* (Soleglad and Fet, 2008), ♂ (AMNH). **D**. *Chihuahuanus russelli* (Williams, 1968), paratype ♂ (AMNH). Scale bars = 1 mm.

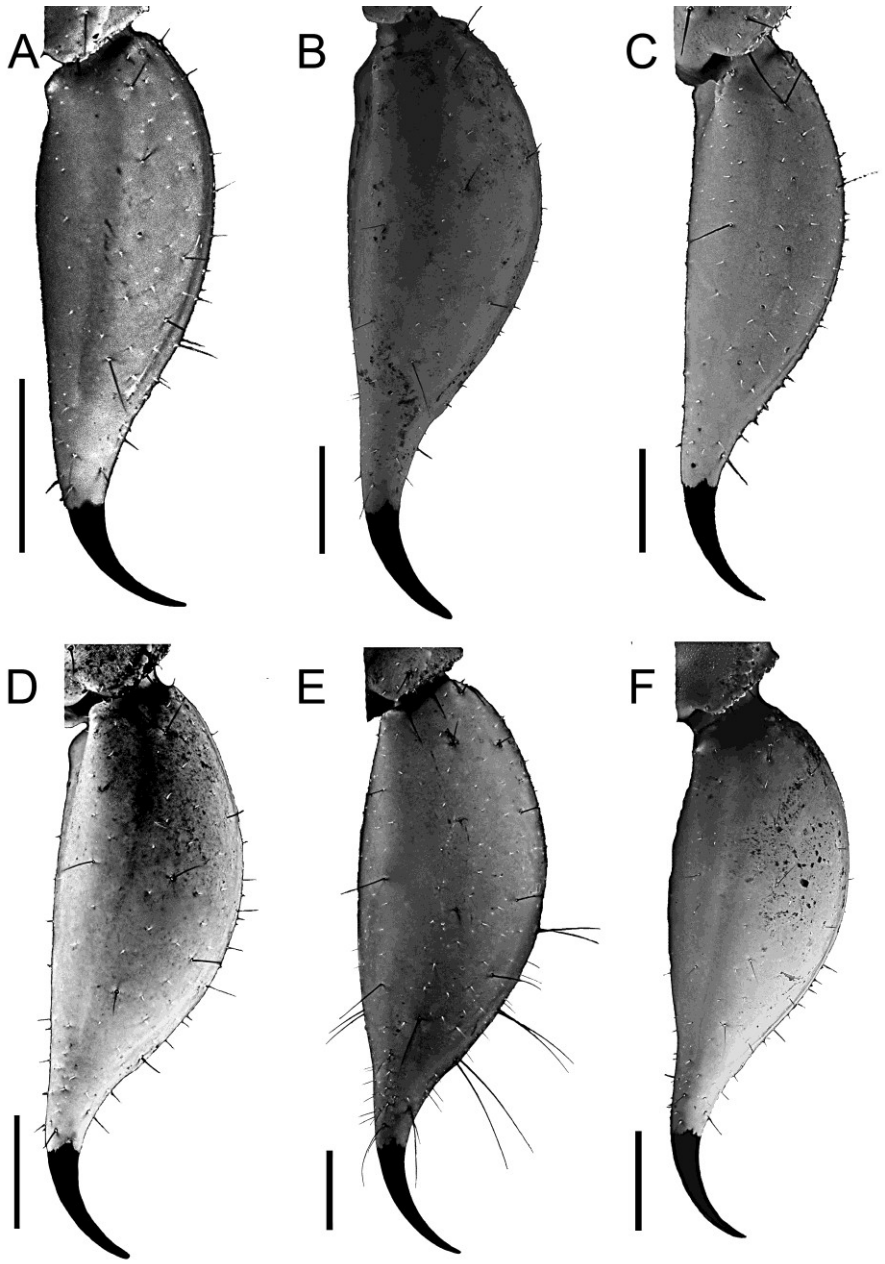


Figure 344. *Chihuahuanus* González-Santillán and Prendini, in litt. Telson, lateral aspect. **A**. *Chihuahuanus bilineatus* (Pocock, 1898), ♂ (AMNH). **B**. *Chihuahuanus russelli* (Williams, 1968), paratype ♂ (AMNH). **C**. *Chihuahuanus coahuilae* (Williams, 1968), ♂ (AMNH). **D**. *Chihuahuanus crassimanus* (Pocock, 1898), ♂ (AMNH). **E**. *Chihuahuanus glabrimanus* (Sissom and Hendrixson, 2005), ♂ (AMNH). **F**. *Chihuahuanus globosus* (Borelli, 1915), ♂ (AMNH). Scale bars = 1 mm.

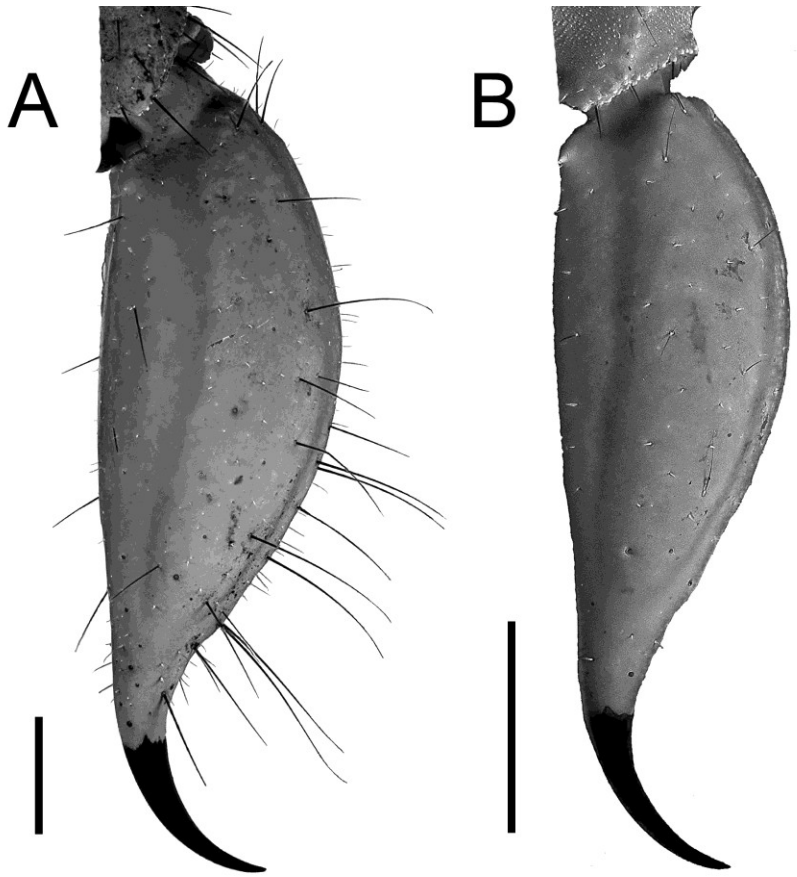


Figure 345. *Chihuahuanus* González-Santillán and Prendini, in litt. Telson, lateral aspect. **A**. *Chihuahuanus kovariki* (Soleglad and Fet, 2008), ♂ (AMNH). **B**. *Chihuahuanus panchovillai*, **n. sp.**, paratype ♂ (AMNH). Scale bars = 1 mm.

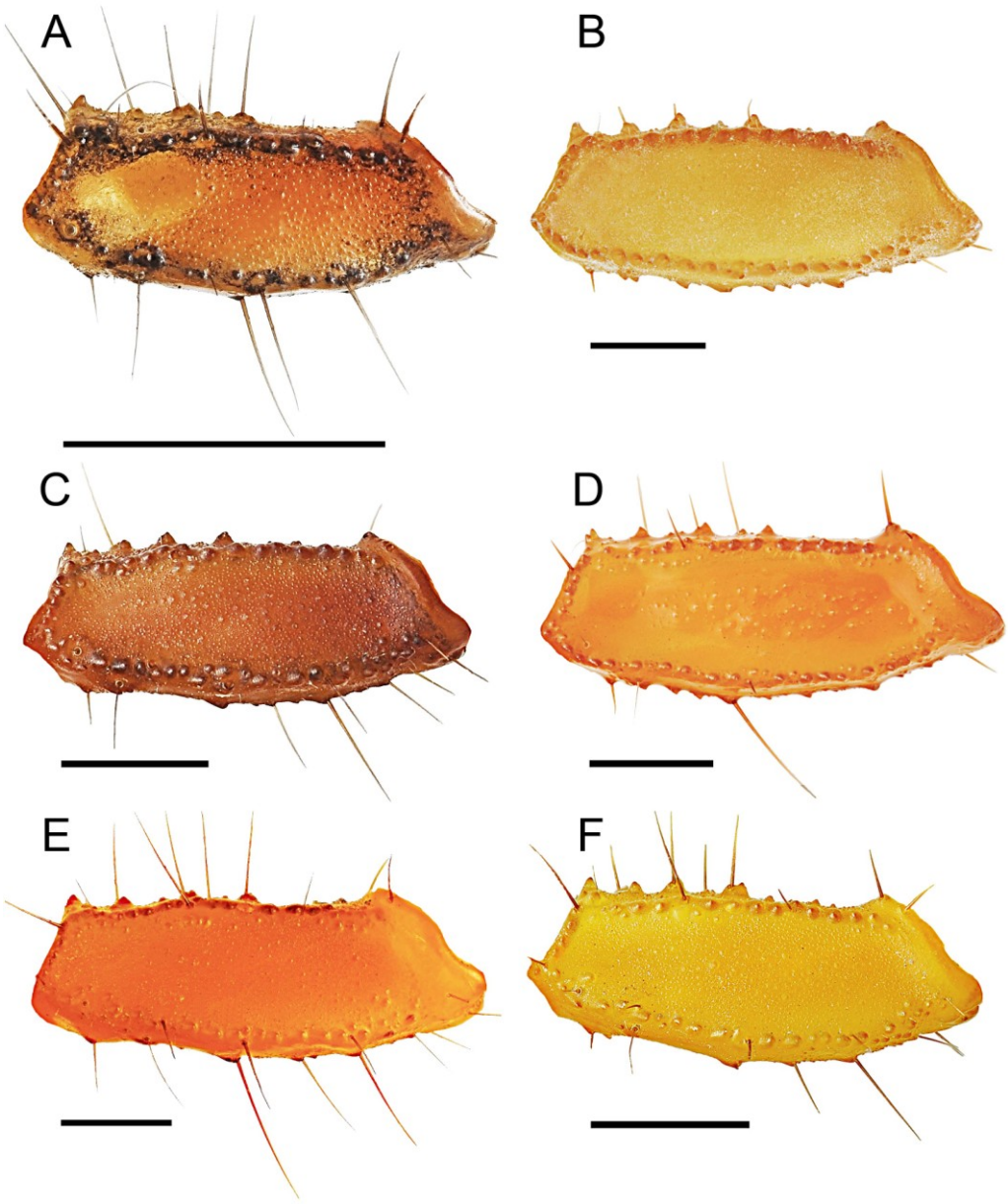


Figure 346. *Chihuahuanus* González-Santillán and Prendini, in litt. Dextral dorsal pedipalp femur. **A**. *Chihuahuanus bilineatus* (Pocock, 1898), ♂ (AMNH). **B**. *Chihuahuanus russelli* (Williams, 1968), paratype ♂ (AMNH). **C**. *Chihuahuanus coahuilae* (Williams, 1968), ♂ (AMNH). **D**. *Chihuahuanus crassimanus* (Pocock, 1898), ♂ (AMNH). **E**. *Chihuahuanus glabrimanus* (Sissom and Hendrixson, 2005), ♂ (AMNH). **F**. *Chihuahuanus globosus* (Borelli, 1915), ♂ (AMNH). Scale bars = 1 mm.

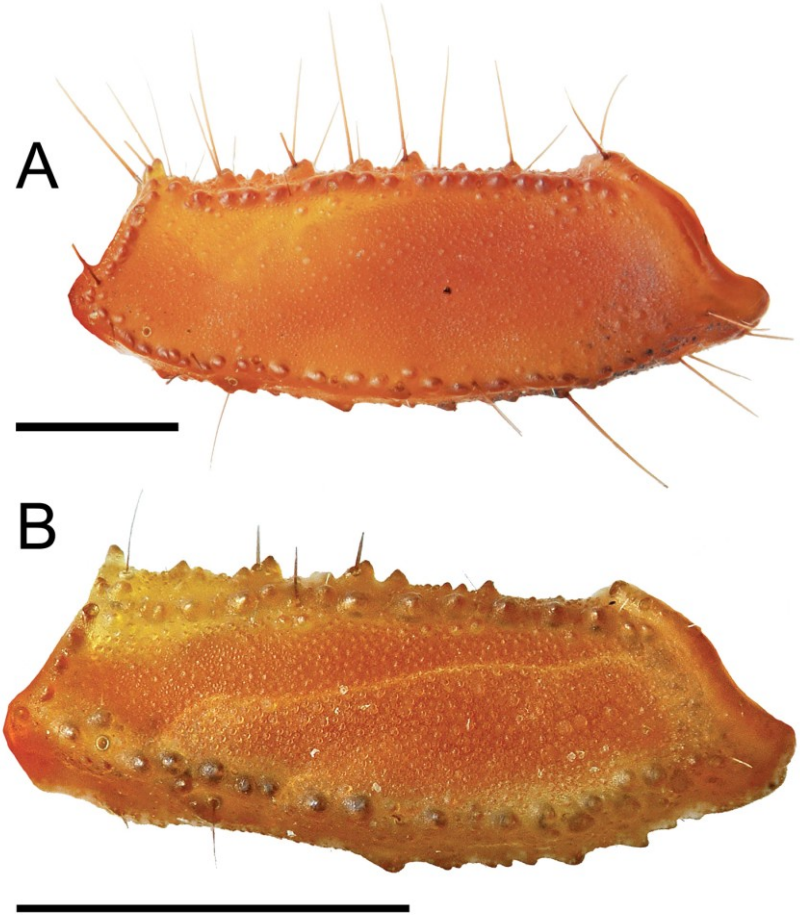


Figure 347. *Chihuahuanus* González-Santillán and Prendini, in litt. Dextral dorsal pedipalp femur. **A**. *Chihuahuanus kovariki* (Soleglad and Fet, 2008), ♂ (AMNH). **B**. *Chihuahuanus panchovillai*, **n. sp.**, paratype ♂ (AMNH). Scale bars = 1 mm.

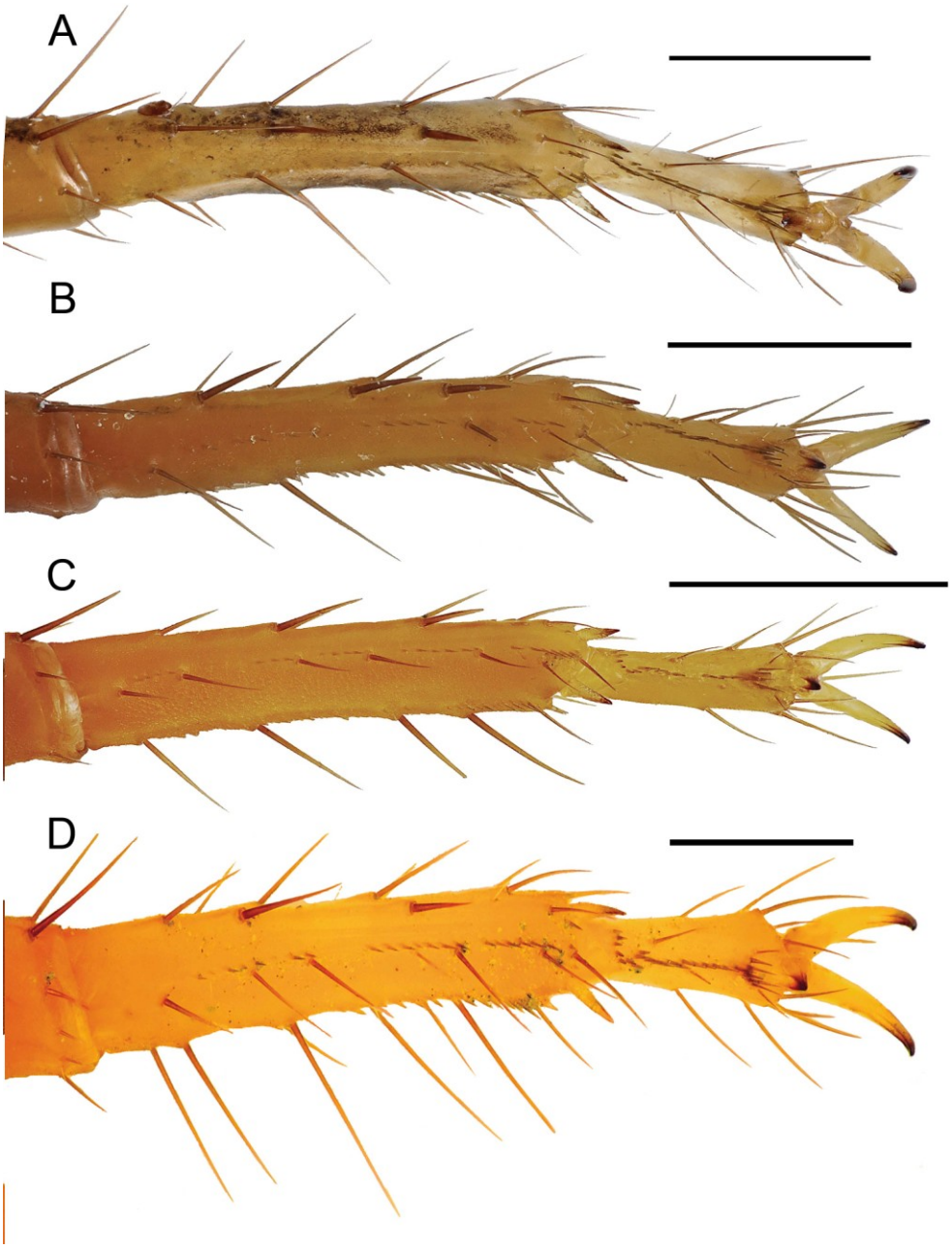


Figure 348. *Chihuahuanus* González-Santillán and Prendini, in litt. Dextral basitarsus and telotarsus III. **A**. *Chihuahuanus bilineatus* (Pocock, 1898), ♂ (AMNH). **B**. *Chihuahuanus coahuilae* (Williams, 1968), ♂ (AMNH). **C**. *Chihuahuanus crassimanus* (Pocock, 1898), ♂ (AMNH). **D**. *Chihuahuanus glabrimanus* (Sissom and Hendrixson, 2005), ♂ (AMNH). Scale bars = 1 mm.

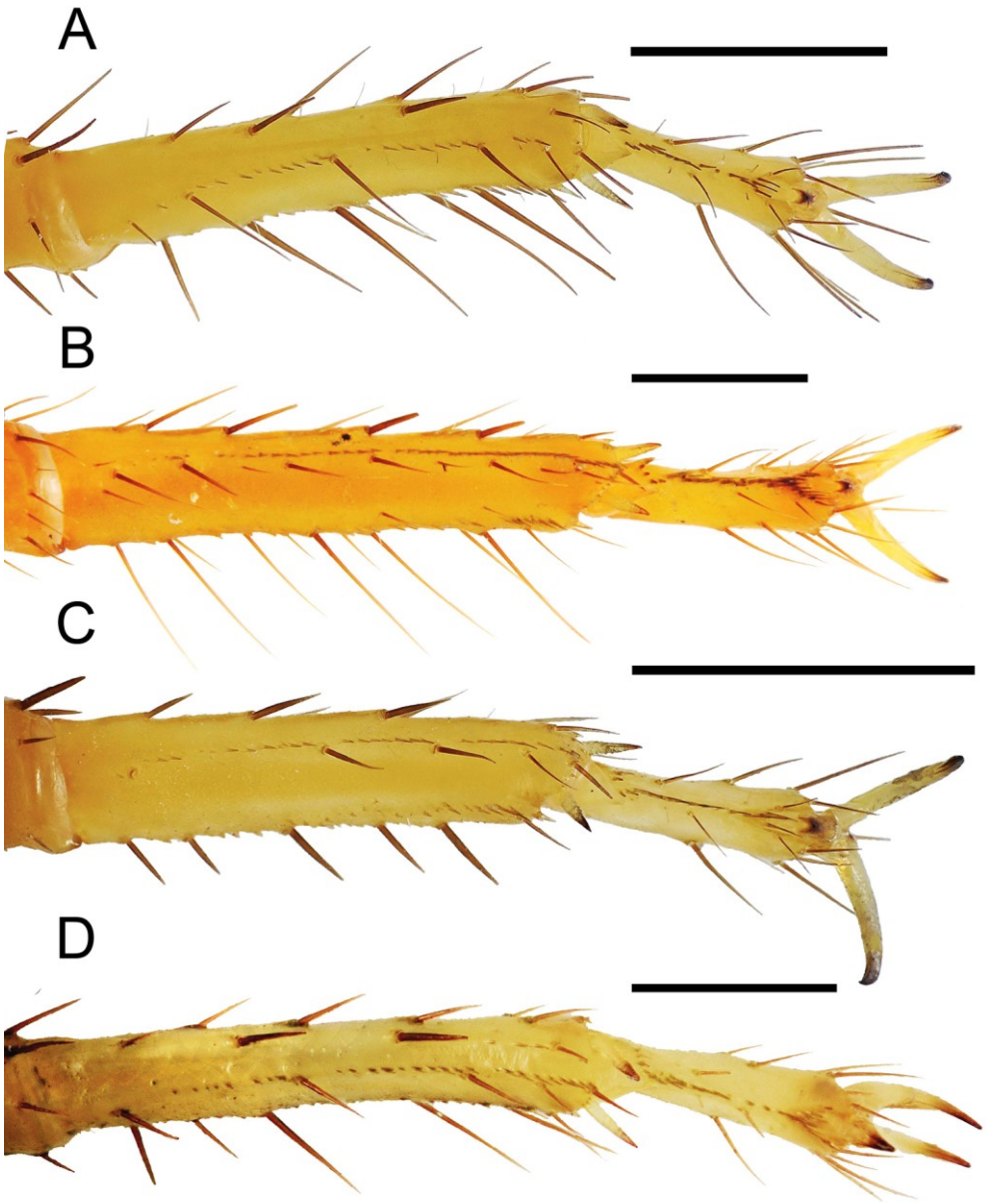


Figure 349. *Chihuahuanus* González-Santillán and Prendini, in litt. Dextral basitarsus and telotarsus III. **A**. *Chihuahuanus globosus* (Borelli, 1915), ♂ (AMNH). **B**. *Chihuahuanus kovariki* (Soleglad and Fet, 2008), ♂ (AMNH). **C**. *Chihuahuanus panchovillai*, **n. sp.**, paratype ♂ (AMNH). **D.** *Chihuahuanus russelli* (Williams, 1968), paratype ♂ (AMNH). Scale bars = 1 mm.

PARAVAEJOVIS Williams, 1980

KEY TO IDENTIFICATION OF THE SPECIES OF *Paravaejovis*

1. Rows of trichobothria $V_{1–4}$ and $Eb_{1–3}$ separate and distinguishable, trichobothria *ib* and *it* at base of fixed finger, proximal to associated macroseta RD7, distal margin of carapace convex……..…...……..…...……..….....2

- Row of trichobothria $V+Eb_{13–17}$ merged and indistinguishable, trichobothria *ib* and *it* at proximal third to median third of fixed finger, at or close to RD6 or between RD6 and RD5, distal margin of carapace sublinear……..….....….……...……3

2. Pedipalp chela globose, dorsal retrolateral carinae of pedipalp patella partially granular, proximal two-thirds smooth, telson vesicle globose with broad granules on proximal ventral surface, ventral surface of metasomal segments I–III smooth, ventral submedian carinae obsolete, femur greatly widened, expanded laterally, and shagreened, densely covered with broad conical granules…….……..…*P. voluptatis*, **n. sp.**

- Pedipalp chela relatively elongated, dorsal retrolateral carinae of pedipalp patella completely granular, telson relatively elongated with ventral surface completely smooth, ventral surface of metasomal segments I–III matte, covered with minute granulation, ventral submedian carinae finely granular, femur slightly widened, expanded laterally, and matte, densely covered with minute granules.…….……*P. pumilis*

3. Trichobothria *ib* and *it* on median third of fixed finger, *it* between RD6 and RD5, metasomal segments I–IV finely crenulated to finely granular……..……...4

- Trichobothria *ib* and *it* on proximal third of fixed finger, *it* at or close to RD6, metasomal segments I–IV smooth weakly costate to obsolete……8

4. Pedipalp patella wider than chela and femur or as wide as patella but wider than femur in ♂, dorsal median, dorsal prolateral, dorsal retrolateral, and prolateral median strongly costate and angular, predominantly finely granular, ventral surface of metasomal segment V shagreened, metasomal segment I–V relatively constant in width, pedipalp and metasomal segments with a mix of major and minor setae…..……5

- Pedipalp chela wider than patella and femur in ♂, dorsal median, dorsal prolateral, dorsal retrolateral and prolateral median weakly costate and angular, predominantly smooth with scattered fine granules, ventral surface of metasomal segment V weakly shagreened, scattered fine granulation, metasomal segment I–V increasing in width from proximal to distal segments progressively, pedipalp and metasomal segments with major setae.....*P. confusus*

5. Ventral surface of metasomal segment V almost smooth, with few distal granules, ventral surface of telson with few proximal granules, metasomal segment V relatively slender (length/width = 2.10 ± 0.04), telson vesicle relatively slender (length/height = 1.93 ± 0.18 in ♂ and 1.85 ± 0.13 in ♀), pedipalp chela as wide as patella and wider than femur in ♂ and in ♀, metasomal segments II and III wider than I, IV and V…….....*P. kino*, **n. sp.**

- Ventral surface of metasomal segment V moderately to densely granular, ventral surface of telson densely granular, metasomal segment V relatively robust (length/width = 1.76 ± 0.10–1.93 ± 0.09), telson vesicle relatively robust (length/height = 2.09 ± 0.11–3.09 ± 0.12 in ♂ and 2.21 ± 0.04–2.88 ± 0.11 in ♀), pedipalp patella wider than chela and wider than femur in ♂, but pedipalp chela wider than patella and wider than femur, metasomal segments II and III as wide as I, IV and V……...6

6. Hemispermatophore extension of laminar trough and axial carina hook partially fused, bilobed, telson vesicle relatively elongated (length/width = 1.24 ± 0.04), pedipalp femur of ♀ relatively slender (length/width = 3.25 ± 0.10)……*P. elucidatus*, **n. sp.**

- Hemispermatophore extension of laminar trough and axial carina hook completely fused forming unique unguiform curved hook, telson vesicle relatively robust (length/width = 1.40 ± 0.06–1.62 ± 0.08), pedipalp femur of ♀ relatively slender (length/width = 2.49 ± 0.10–3.16 ± 0.08)……..……..……..……..……..……..……...7

7. Pedipalp and metasomal segments with major setae, pedipalp chela in males relatively robust (length/width = 4.96 ± 0.16), metasomal segment V in females relatively robust (length/width = 1.53 ± 0.04), (length/height = 2.15 ± 0.24 in ♂ and 2.21 ± 0.04 in ♀).....*P. waeringi*

- Pedipalp and metasomal segments with minor setae, pedipalp chela in males relatively slender (length/width = 5.31 ± 0.09), metasomal segment V in females relatively slender (length/width = 1.82 ± 0.27), telson vesicle relatively slender (length/height = 3.09 ±0.12 in ♂ and 2.88 ± 0.11 in ♀)……...……....*P. exploratus*, **n. sp.**

8. Ventral submedian carinae of metasomal segments I–III obsolete……..…9

- Ventral submedian carinae of metasomal segments I–III costate smooth to crenulated……...11

9. Ventral submedian carinae of metasomal segments I–III costate, smooth, base color dark brownish, ventral surface of metasomal segment V and ventral surface of telson shagreened, densely granular……..……...….*P. puritanus*

- Ventral submedian carinae of metasomal segments I–III crenulated, base color pale yellow, ventral surface of metasomal segment V and ventral surface of telson weakly shagreened, sparsely granular……..……..10

10. Pedipalp manus relatively incrassate, telson vesicle relatively globose, leg unguis relatively elongated, trichobothrium V_3 positioned on distal third of hand, pedipalp manus with all carinae obsolete…….……..…….……*P. nigroguerreroensis*, **n. sp.**

- Pedipalp manus relatively elongated, telson vesicle relatively elongated, leg unguis relatively shorten, trichobothrium V_3 positioned on median third of hand, pedipalp manus with ventral retrolateral and ventral prosubmedian costate……..……..*P. schwenkmeyeri*

11. Ventral lateral and ventral submedian carinae of metasomal segment I–IV and ventral median carinae of metasomal segment V outlined with diffuse to strong infuscation……..…….……12

- Ventral lateral and ventral submedian carinae of metasomal segment I–IV and ventral median carinae of metasomal segment V immaculate…….……..……14

12. Pedipalp manus incrassate in ♂, retrolateral dorsosubmedian carinae of pedipalp femur partial and weakly granular with three enlarged tubercles, each with a macroseta on the tip…...13

- Pedipalp manus slender in ♂, retrolateral dorsosubmedian carinae of pedipalp femur complete and serrated with two enlarged tubercles, each with a macroseta on the tip…....*P. cochimi*, **n. sp.**

13. Ventral median carinae of tergites I–VII infuscated, interocular surface of carapace moderately granular, dorsal lateral carinae of metasomal segment V with nine macrosetae, ventral retrosubmedian carinae of pedipalp carinae with seven macrosetae…….*P. gravicaudus*

- Ventral median carinae of tergites I–VII immaculate, interocular surface of carapace densely granular, dorsal lateral carinae of metasomal segment V with five macrosetae, ventral retrosubmedian carinae of pedipalp carinae with four macrosetae….....*P. spinigerus*

14. Ventral surface of telson vesicle moderately to densely hirsute, ventral lateral carinae of metasomal segment with more than nine macrosetae…..……...15

- Ventral surface of telson vesicle sparsely hirsute, metasomal segment with fewer than seven macrosetae ……..……..…...16

15. Proximal notch and median lobe of fixed finger and proximal notch of movable finger strongly developed, hands relatively incrassate, ventral retrosubmedian and ventral retrolateral carinae with less than 5 macrosetae, prolateral ventrosubmedian carinae of pedipalp femur with less than five macrosetae……..…….……..*P. diazi*

- Proximal notch and median lobe of fixed finger and proximal notch of movable finger absent, fingers basal internal margin straight, hands relatively slender, ventral retrosubmedian and ventral retrolateral carinae with more than 10 macrosetae, prolateral ventrosubmedian carinae of pedipalp femur with more than six macrosetae……..…….*P. eusthenura*

16. Proximal notch and median lobe of fixed finger moderate, carinae of pedipalp manus angular and moderately costate, prolateral dorsal and retrolateral dorsal macrosetae on basitarsi I–III spiniform, moderate, not visible elongated……...…….……*P. galbus*

- Proximal notch and median lobe of fixed finger weak, carinae of pedipalp manus obsolete and weakly costate, prolateral dorsal and retrolateral dorsal macrosetae on basitarsi I–III visibly elongated and thin……..……..….*P. hoffmanni*

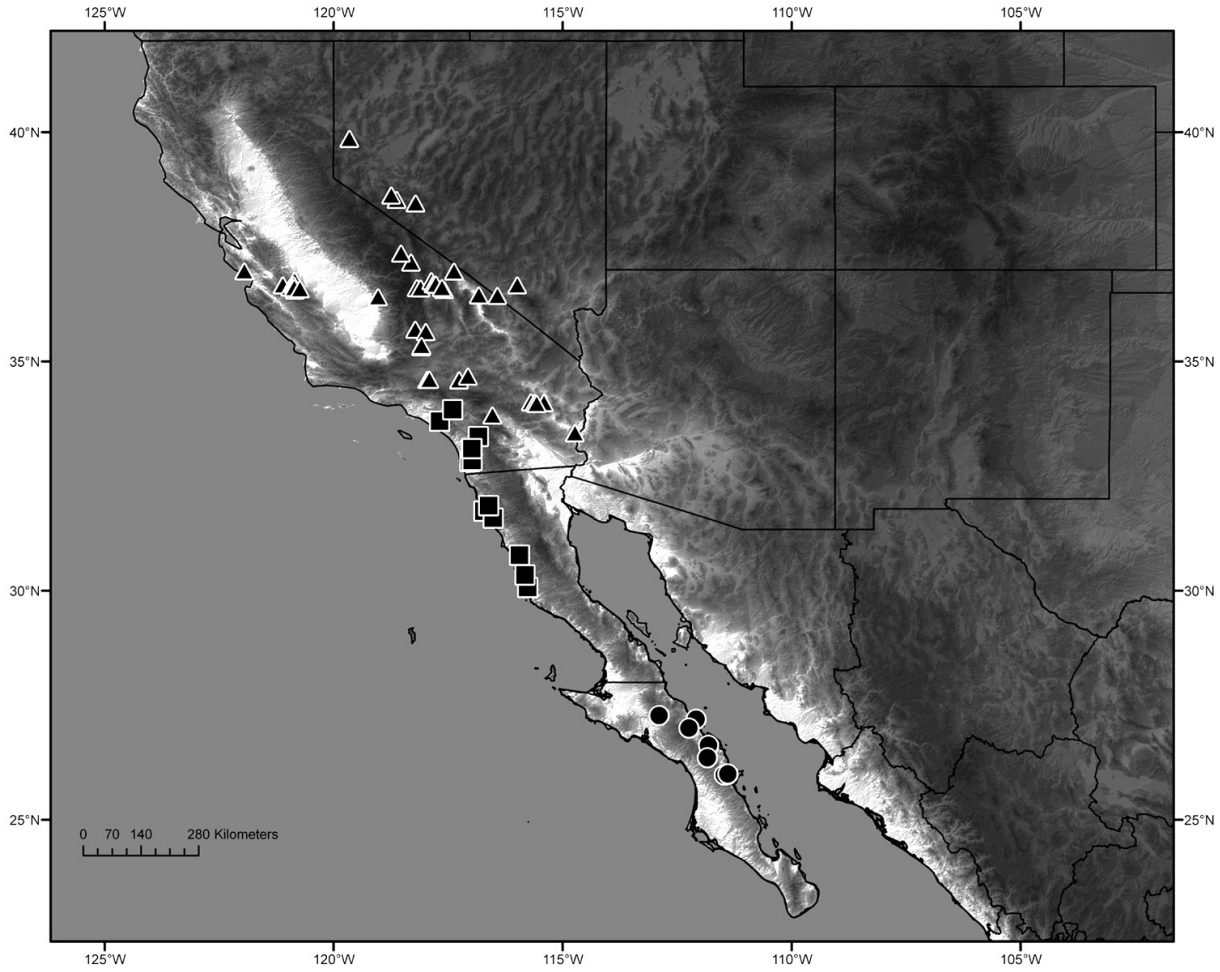


Figure 350. Map of southwestern North America, plotting known locality records for three species in the vaejovid scorpion genus *Paravaejovis* Williams, 1980, based on data collected in the present study: *Paravaejovis cochimi*, **n. sp.** (circles), *Paravaejovis elucidatus*, **n. sp.** (triangles), *Paravaejovis puritanus* (Gertsch, 1958) (squares), darker contour indicates increment of altitudinal gradient.

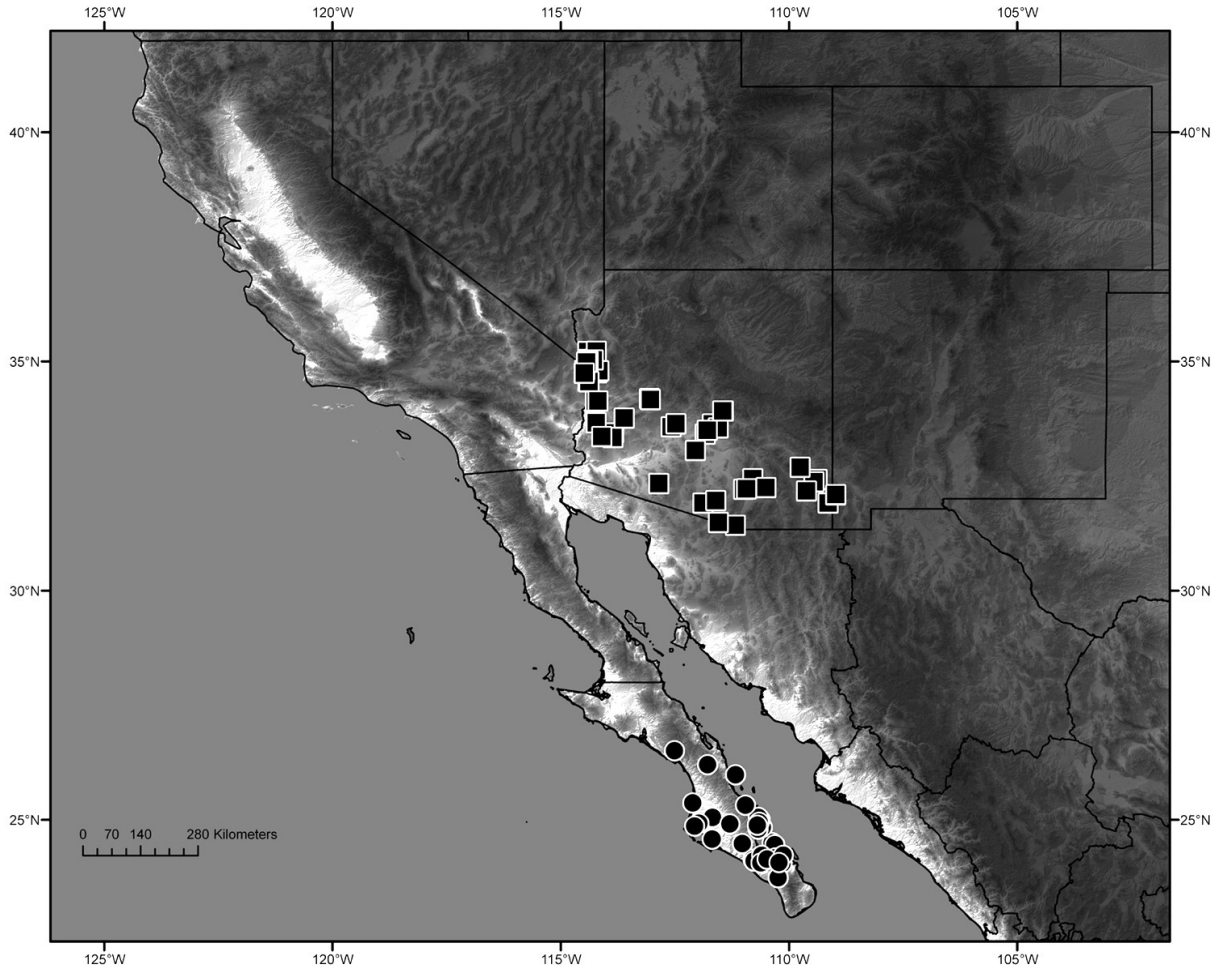


Figure 351. Map of southwestern North America, plotting known locality records for three species in the vaejovid scorpion genus *Paravaejovis* Williams, 1980, based on data collected in the present study: *Paravaejovis diazi* (Williams, 1970) (circles), *Paravaejovis confusus* (Stahnke, 1940) (squares), darker contour indicates increment of altitudinal gradient.

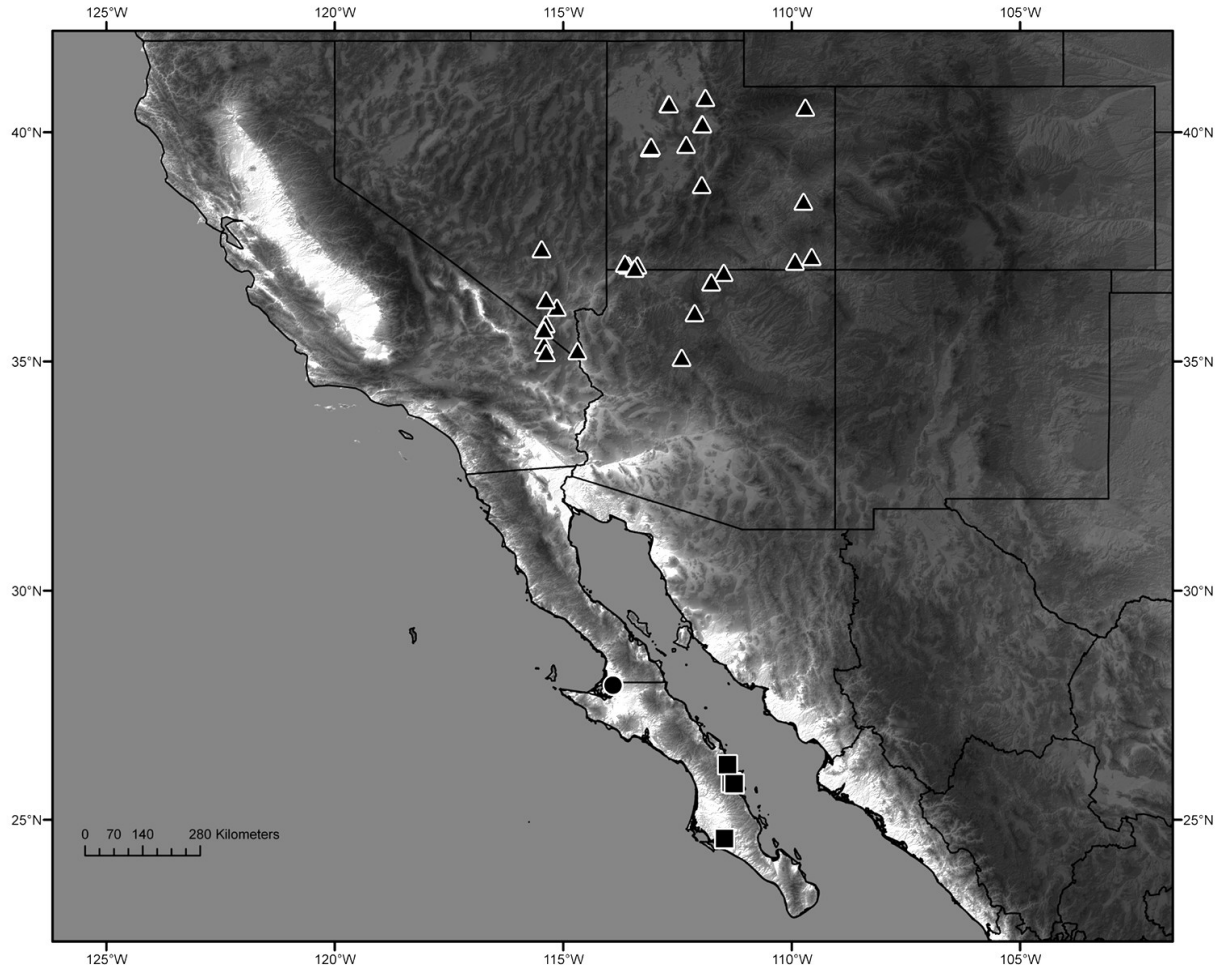


Figure 352. Map of southwestern North America, plotting known locality records for three species in the vaejovid scorpion genus *Paravaejovis* Williams, 1980, based on data collected in the present study: *Paravaejovis exploratus*, **n. sp.** (triangles), *Paravaejovis nigroguerreroensis*, **n. sp.** (circle), *Paravaejovis galbus* (Williams, 1970) (squares), darker contour indicates increment of altitudinal gradient.

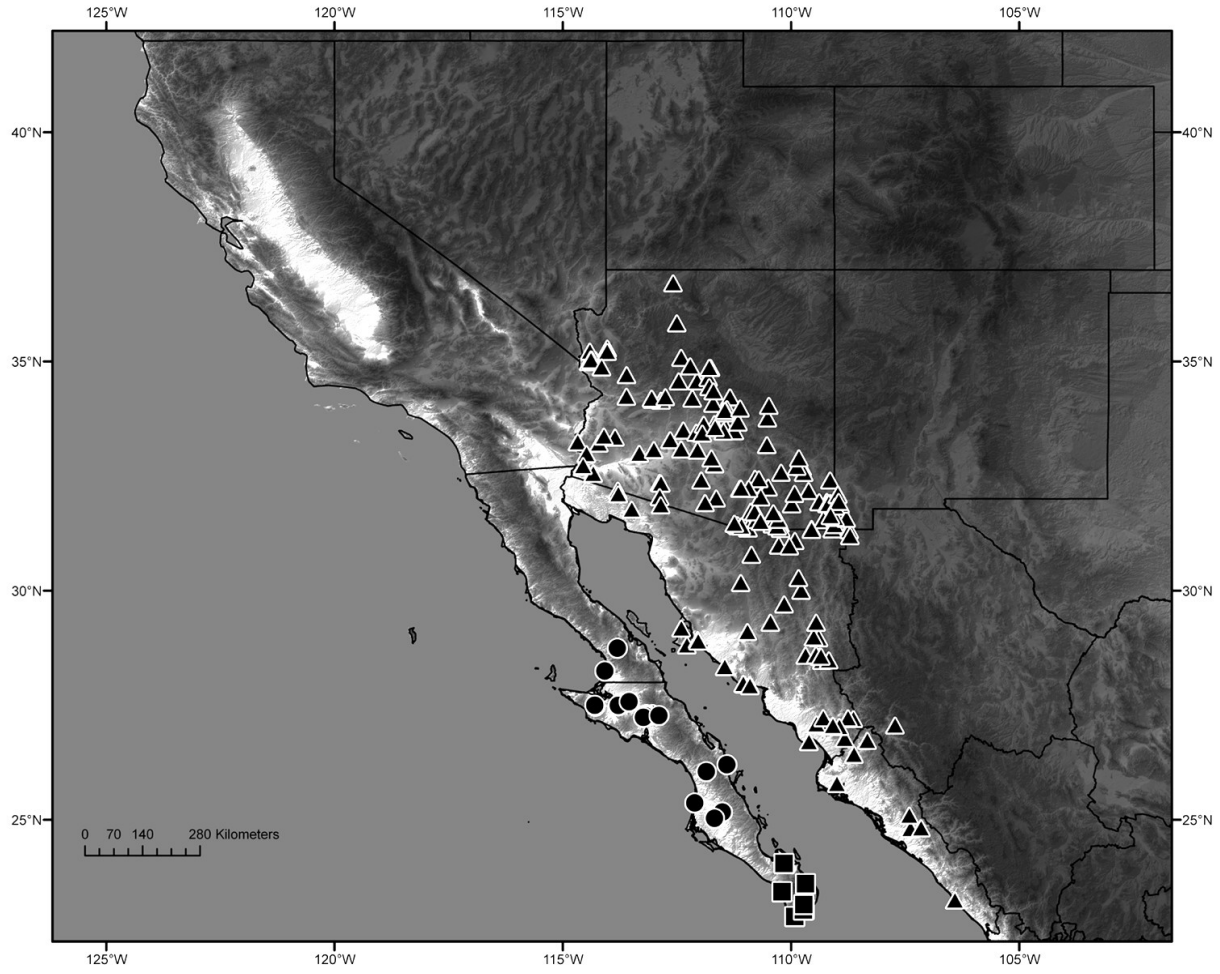


Figure 353. Map of southwestern North America, plotting known locality records for three species in the vaejovid scorpion genus *Paravaejovis* Williams, 1980, based on data collected in the present study: *Paravaejovis spinigerus* (Wood, 1863) (triangles), *Paravaejovis hoffmanni* (Williams, 1970) (circles), *Paravaejovis eusthenura* (Wood, 1863) (squares), darker contour indicates increment of altitudinal gradient.

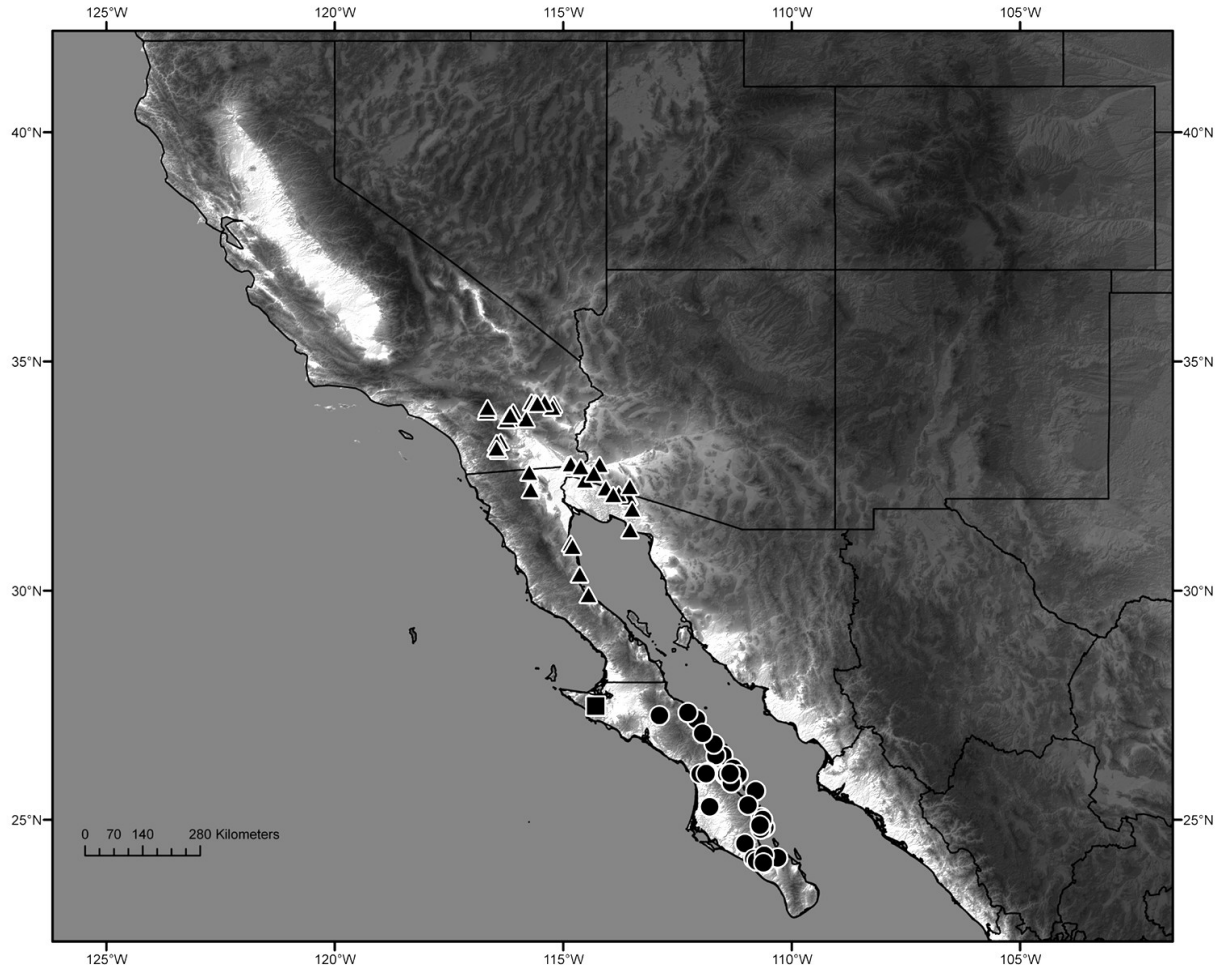


Figure 354. Map of southwestern North America, plotting known locality records for three species in the vaejovid scorpion genus *Paravaejovis* Williams, 1980, based on data collected in the present study: *Paravaejovis waeringi* (Williams, 1980) (triangles), *Paravaejovis gravicaudus* (Williams, 1970) (circles), *Paravaejovis voluptatis*, **n. sp.** (square), darker contour indicates increment of altitudinal gradient.

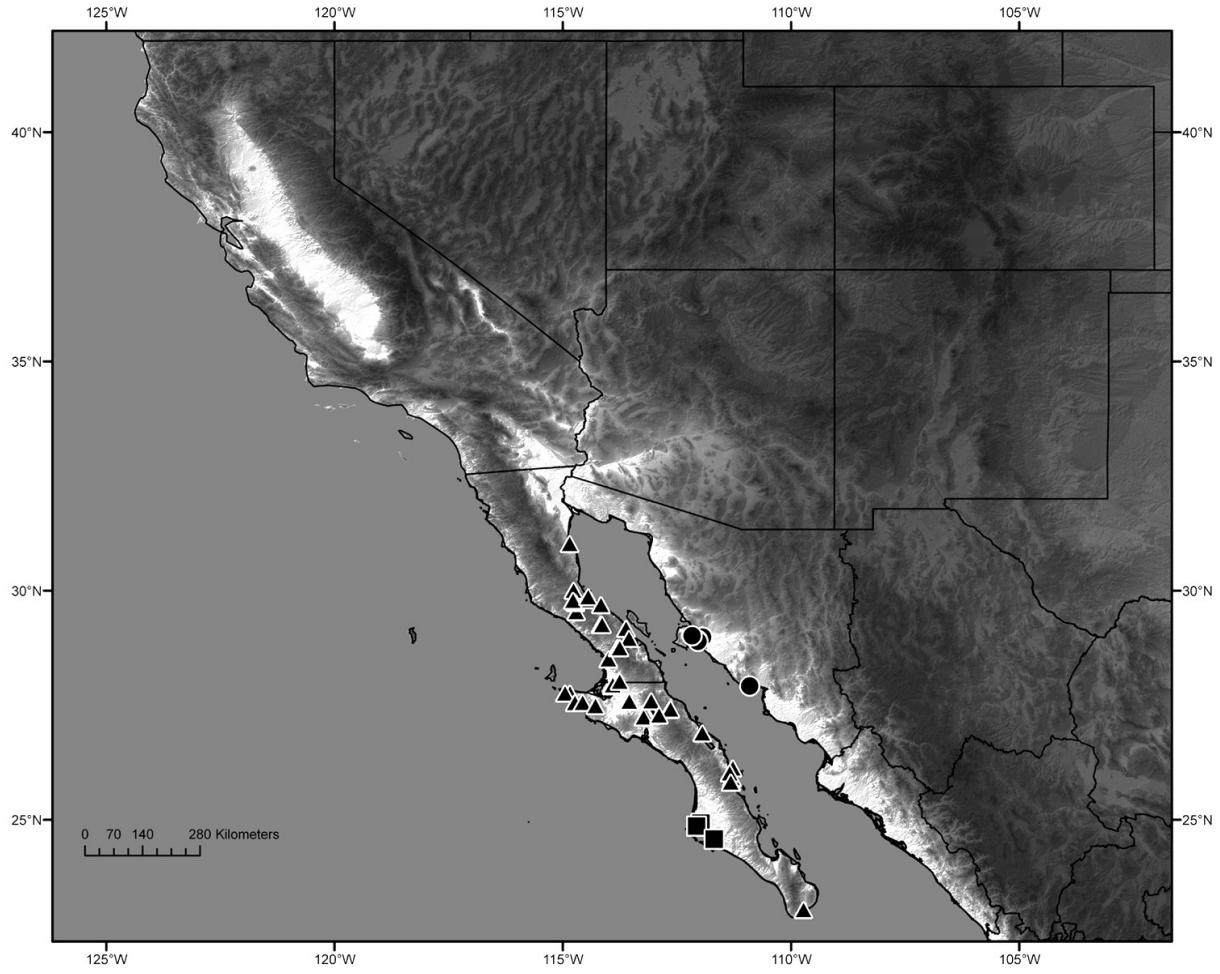


Figure 355. Map of southwestern North America, plotting known locality records for three species in the vaejovid scorpion genus *Paravaejovis* Williams, 1980, based on data collected in the present study: *Paravaejovis kino*, **n. sp.** (circles), *Paravaejovis pumilis* (Williams, 1980) (square), *Paravaejovis schwenkmeyeri* (Williams, 1970) (triangles), darker contour indicates increment of altitudinal gradient.

Paravaejovis cochimi, **n. sp.**

Figures 350, 356–358, 408A, 413A, 418A, 419A, 424A, 427A, 430A; Table 17

TYPE MATERIAL: **MEXICO: Baja California Sur:** *Municipio de Loreto*: Holotype ♂ (IBUNAM) Loreto, 12 km W, 25°58.6998'N 111°27.1662'W, 190 m, 13.vii.2004, A. Valdez, E. González, O. Francke, and W.E. Savary, desert, on ground, collected at night with UV light. Paratypes: same locality as holotype, 2 ♂, 1 ♀, 3 subad. ♂, 3 subad. ♀, 3 juv. (AMNH [ARA1500]), 1 ♀, 5 juv. (IBUNAM [ARA2065]); 8 ♂, 9 ♀, 15 juv. (AMNH [ARA2857]), 8 ♂, 9 ♀, 16 juv. (IBUNAM [ARA2236]), Loreto, 13 km W to San Javier, provisional dirt road, 25°59.733'N 111°25.116'W, 176 m, 26.vi.2008, H. Montaño and E. González, desert, collected at night with UV light; 2 ♀ (AMNH [ARA1491]), 1 ♀ (IBUNAM [ARA2066]), Loreto, 15 km W, 213 m, 13.vii.2004, 25°58.6332'N 111°27.8832'W, A. Valdez, E. González, O. Francke, and W.E. Savary; 1 subad. ♀, 3 juv. (AMNH [ARA1492]), 4 juv. (AMNH [ARA1524]), 1 subad. ♂ (AMNH [ARA2067]), 1 ♀, 3 juv. (IBUNAM [ARA2067]), Loreto, ca. 3 km S along gravel road to San Javier, from junction with Route 1, 25°59'48.14"N 111°23'3.88"W, 8.vii.2005, 38 m, desert, on ground, collected at night with UV light, 1 subad. ♂, 3 subad. ♀ (AMNH [ARA1493]), 1 ♀, 2 subad. ♂, 1 juv. (CAS [ARA1611]), 1 subad. ♂, 3 subad. ♀ (IBUNAM [ARA2068]), 120 m, 2 ♂, 2 ♀ (AMNH [ARA1492]), 2 ♀ (CAS [ARA1524]), 1 ♂, 3 ♀ (IBUNAM [ARA2067]), 38 m, 1 ♂, 2 ♀ (AMNH [ARA1493]), 1 ♂, 2 ♀ (IBUNAM [ARA2068]), 120 m.

ETYMOLOGY: The species name *cochimi* refers to the Cochimí people, aboriginal inhabitants of the mid peninsular region. The name is a noun in apposition.

DIAGNOSIS: *Paravaejovis cochimi*, **n. sp.** is closely related to *P. gravicaudus* and *P. spinigerus*, with which it forms a monophyletic group (see *P. puritanus* for details). *P. cochimi*, **n. sp.** may be distinguished from these two species by having pedipalp manus and fingers gracile, instead of having incrassate manus and short and stouter fingers. From *P. spinigerus* differs by having weak dusky marking on the carapace and ventral median and ventral submedian carinae of metasomal segments I–IV diffusely outlined with infuscation, instead of having carapace and metasomal carinae outline intensely and broadly infuscated. *P. cochimi*, **n. sp.** has six retrolateral granules and six rows of median granules on pedipalp movable finger, instead of having seven retrolateral granules and seven rows of median denticles. Furthermore, *P. cochimi*, **n. sp.** has distal end of ventral median carinae of metasomal segment V weakly bifurcated, with two or three paired granules, instead of having this carinae bifurcated at least on distal half by two rows of large conical granules.

DESCRIPTION: The following description is based on the types and the specimens listed in material examined.

Color and infuscation: Base color yellow straw. Carapace and tergites weakly and diffusely infuscate with dusky markings. Median and lateral ocular tubercles intensely infuscate. Pedipalp femur and patella, and legs slightly paler than carapace and tergites. Genital operculum and pectines pale yellowish to whitish. Ventral median and ventral submedian carinae finely infuscate. Ventral lateral and ventral submedian carinae of metasomal segments I-IV and ventral lateral and ventral median carinae in V weakly and finely infuscate. Aculeus base reddish, median and distal dark brownish.

Carapace: Carapace 1.06 times longer than posterior width. Anterior margin sublinear, with vestigial medial notch and five pairs of major macrosetae. Carapace shagreened, densely

cover by minute granules and scattered moderate and enlarge granules. Median ocular tubercle moderately raised. Superciliary carinae moderate and smooth higher than median eyes. Position of median ocular tubercle on anterior half of carapace. Three pairs of lateral eyes, first anterior pair slightly larger than second pair and third pairs slightly half the size of first pair. Median eyes approximately two times the size of first lateral frontal pair. Anteromedian sulci deep with a anterior depression; posteromedian moderate on proximal half and deep distally, anterolateral deep, posterolateral deep, posterior transverse vestigial to weak.

Sternum and coxal region: Sternum pentagonal subequilateral with three pairs of setae, one distal, two median pairs and one pair on the lobes, surface matte, median notch deep. Coxal region with scatter matte spots in ♂, in ♀ smooth. Anterior margin of coxa II entirely cover with scatter moderate and minute granules, subbasally three oblique slit-like structures, adjacent to a moderate, scattered, completely granulated protuberance; Proximal margin of coxal endite II with a deep depression each, median edge finely granular. Coxa IV 2.22 times longer than coxa II.

Chelicerae: Dorsal surface smooth, subdistal margin of manus with one macrosetae; distal margin with costate. Serrula present on ventral distal half of movable finger, tines numbering 12–14.

Pedipalps: Trichobothrial pattern Type C, orthobothriotaxic. Chela wider than patella, patella wider than femur. Femur: All intercarinal surfaces matted. Dorsal prolateral and dorsal retrolateral complete strongly granular with conical enlarged granules and hirsute, with eight to nine erect macrosetae; ventral prolateral strongly granular with conical enlarged granules; retrolateral dorsosubmedian obsolete expressed by eight or nine macrosetae and one or two moderate granules; retrolateral ventral vestigial expressed by row of enlarge granules; ventral

prolateral and ventral retrosubmedian, vestigial expressed by a row of scatter crenatoserrate granules; prolateral ventrosubmedian vestigial, expressed by a two proximal enlarged spiniform tubercles followed by three enlarged conical tubercles with a macroseta on top and few moderate intersperse granules; prolateral ventral vestigial expressed by two pairs of proximal enlarged tubercles with a macroseta on top followed by two enlarged conical tubercles with a macroseta on base. Prolateral surface, on ventral lateral and ventral prolateral intercarinal surface with a row of six or seven macrosetae.

Patella: All intercarinal surface matte. Dorsal prolateral complete strong with enlarge subserrate granules, hirsute with seven or eight erect macrosetae; ventral prolateral complete strong with enlarge subserrate granules; dorsal retrolateral complete strong, moderately crenulated and hirsute with seven or eight erect macrosetae; ventral retrosubmedian complete strong, moderately crenulated and hirsute with eight or seven erect macrosetae; retrolateral dorsosubmedian and retrolateral median vestigial, expressed by a vestigial low costa; ventral median vestigial, expressed by a moderate proximal row of irregular fine granules; prolateral median on a vaulted projection protruding strongly medially, expressed by a proximal tubercle and a row of three or four scattered and coarse crenatoserrate granules, proximal, median and distal granules with a macroseta on top and one minor intersperse macrosetae, the row of macrosetae slanting gently towards subdistal end of dorsal prolateral carinae; prolateral ventral obsolete expressed by five to six major macrosetae adjacent to ventral prolateral carinae. Dorsal prolateral and prolateral median intercarinal surface with one or two macrosetae.

Chela: Manus smooth and elongate in ♂, in ♀ incrassate (manus 1.45 times longer than fixed finger). Dorsal prolateral, dorsal median, dorsal retrolateral, ventral retrolateral, dorsal retrosubmedian accessory, and prolateral median obsolete, weakly costate in ♂, in ♀ obsolete.

All other carinae obsolete; Dorsal prolateral, dorsal median, dorsal retrolateral, ventral retrolateral, prolateral median, ventral median, and ventral retrolateral hirsute with four major macrosetae and tree or four intersperse minor macrosetae. Trichobothrium *Db* positioned on dorsal retrolateral carina, subbasal on chelae; *Dt* positioned at mid manus.

Fingers: Fixed finger, PD = 6, MD rows = 6, RD = 6, proximal RD positioned by proximal third. All RD subpaired with corresponding PD. Movable finger, PD = 7, MD rows = 6, distal row bearing one minute granule, RD: 6, proximal RD positioned by mid finger. All RD subpaired with corresponding PD. Trichobothria *ib* and *it* positioned subbasal on fixed finger, *ib* positioned between PD6 and PD7, PD7 lacking granule adjacent to PD6, *it* between PD5 and PD6, adjacent to PD6 in ♂, in ♀ *ib* at the level of PD6 and *it* between PD5 and PD6, adjacent to PD6; Distal retrolateral denticles in both fingers enlarged claw-like. Fingers with vestigial scallop in ♂, proximal notch of fixed finger vestigial and medina lobe obsolete, proximal notch and median lobe of movable finger obsolete, gap created when fingers closed weak, fingers fit unevenly, in ♀ fingers lacking scalloping, gap created when fingers closed absent.

Legs: Basitarsi I–II prolateral ventral, retrolateral ventral and retrolateral dorsal carinae with complete rows of spinules; prolateral ventral in III and IV absent; retrolateral dorsal carinae in III partial, expressed as a row of spinules on distal two thirds, in IV vestigial, expressed on distal third by scatter spinules; retrolateral median rows in I–IV vestigial expressed as few terminal spinules. Telotarsi I–IV with two or three pairs of ventrodistal spinules in I–IV. Setae: Prolateral ventral, 3:4:5:5, subdistal two in III slightly stout and in IV stout; retrolateral ventral, 3:7:8:9, intersperse minor and major macrosetae; retrolateral dorsal, 2:3:3:3; dorsal, 4:4:4:4; retrolateral dorsal and dorsal series arranged in two independent rows, in ♀ macrosetae visibly more elongate and with one or two intersperse accessory minor macrosetae.

Tergites: Pretergites matte, postergites with ventral submedian carinae intercarinal surface matte, other surface with scattered coarse granules. Dorsal median and ventral submedian carinae in tergites I–VI moderate expressed by few distal moderate granules on distal half. Tergite VII dorsal lateral intercarinal surface matte, other intercarinal surface shagreened with few scattered moderate granules and dense minute granules; dorsal median carina moderately costate with few moderate granules, expressed on proximal half of the postergite; dorsal submedian vestigial expressed as a low short pair of proximal short oblique costa; dorsal lateral and lateral supramedian comparatively stronger and complete, distal extreme with an enlarged subserrate granules; dorsal lateral carinae projecting and curving with scattered granules laterally approximating to lateral supramedian proximal margin, creating a semi horse show of strong and subserrated granules.

Genital operculum: Male genital operculum: wider than long, with four pairs of macrosetae. Sclerites free on longitudinal edge moving independently but unable to open more than 45°. Genital papillae protruding posteriorly. Female genital operculum: Wider than long, with three macrosetae. Sclerites fuse longitudinal.

Sternites: Sternites I–VII acarinated matte smooth in ♂, in ♀ finely punctuated, and lustrous. Sternite V with distal median glandular spot obsolete in both sexes. Sternite VII with ventral lateral carinae weak, expressed only by a weak costa with two or three lower crenulations and two pairs of macrosetae; other carinae obsolete expressed by macrosetae. Distomedian glandular spot vestigial ♂, weakly protruding from adjacent surface, in ♀ obsolete. Spiracle elongated, slit-like, approximately four times longer than wide.

Pectines: Basal piece with median notch deep, with three pairs of macrosetae. Marginal lamella consist of three sclerites, medial lamella proximally fuse distally progressively forming

two conspicuous rows of beads, a proximal with 4 or 5 smaller beads and a median with 17–20 beads. Fulcra with 24–26in ♂, in ♀ 20–22 beads. Pectinal tooth numbering 25–27 in ♂, in ♀21–23. Pectines relatively long, second sclerite of marginal lamella at the level of distal edge of coxa IV in ♂, in ♀ mid distal sclerite at the level of distal edge of coxa IV.

Hemispermatophore: Lamina 1.90 longer than trunk. Dorsal through margin long, narrow, curving proximally, and removed from ventral trough. Hemimating plug developed from the inner lobe, distal barb margin with 10 elongated spinules. Primary and secondary hook positioned on the apex of lateral margin extension of the lamina (flange). Both hooks rounded low, separated slightly, forming a shallow notch. Median lobe ental terminus moderate and rounded. Basal plate of inner lobe removed from ventral trough. Spine of inner lobe relatively long and strongly sclerotized, secondary spine on ventromedian aspect of neck absent. Neck relatively short (0.40 times longer than basal distal plate). Measurements, lamina, 4.80; trunk, 2.52; dorsal trough/laminar hooks, 1.74; ventral trough/laminar hook, 0.90; neck, 0.36; basal plate, 0.90.

Metasoma: Intercarinal surfaces smooth lustrous, ventral intercarinal surface of segments V moderately matte, distal half with scatter moderate granules. Metasoma 1.87 times longer than mesosoma. Metasomal segments I wider than long, II and III longer than wide. Carinae: Dorsal lateral and lateral median carinae in I–IV strongly crenatoserrated terminating in moderate enlarge spinoid granules pointing backwards; except lateral median in IV distal terminus strongly expanded laterally forming a triangular projection; dorsal lateral in V strong and serrated proximally, becoming weaker and crenulated, medially with a field of fine crenulation, ending on at low tubercle. Lateral inframedian in I complete strongly crenatoserrated; in II and III incomplete moderately crenatoserrated, becoming weaker proximally, present on distal third; in

IV absent, in V vestigial with a proximal tubercle followed by moderate crenatoserrate granules, becoming weaker distally, present in proximal half; ventral lateral in I–IV moderately costate and smooth, ventral submedian in I–IV obsolete; ventral lateral and ventral median moderately. Setae: In ♀, dorsal lateral carinae, 0:2:2:3:9; lateral median; 0:2:2:4; lateral inframedian, 2:1:1:0:5, ventral lateral, 3:4:4:5:16, setae in IV and V positioned in both sides of carinae, ventral submedian, 3:3:3:4:4, ventral sublateral, 2. Two to three accessory major macrosetae in ventral submedian intercarinal surfaces in segments I–IV. In ♂ all macrosetae reduced to microsetae or absent.

Telson: Telson 2.11 times longer than wide. Metasomal segment V 1.20 times wider than telson. Vesicle 2.16 times longer than aculeus. Dorsal and ventral surface smooth. Ventral surface hirsute with 8–12 macrosetae in each carina and accessory minor and three or macrosetae in intercarinal surfaces in ♀, in ♂ relatively bald, all macrosetae reduced to microsetae or absent. Ventral median carinae with vestigial subaculear tubercle, Microserration on laterobasal aculeus numbering 5–8.

DISTRIBUTION: *Paravaejovis cochimi*, **n. sp.** is endemic to the Sierra de la Giganta and San Marcos Island in the Cortez Sea, Baja California Sur, Mexico. It has been recorded from the Loreto area to San Ignacio.

ECOLOGY: *Paravaejovis cochimi*, **n. sp.** occupies low altitudes from sea level to 258 m. In most collection localities this species was sympatric with its sister species *P. gravicaudus* Williams, 1970. *P. cochimi*, **n. sp.** is a cryptic species delimitated here by means of molecular and morphological evidence. The results of the phylogenetic analyses conducted in chapter 1 and 4 consistently retrieved this species sister to *P. gravicaudus*. The sympatric distribution with its sister species and lack of evident vicariant event, suggest that speciation in these species could

have occurred *in situ*. Most models of sympatric speciation are based on disruptive selection, in which homozygous alleles at the extremes of variation are selected, and the heterozygote is eventually eliminated from the population (Maynard Smith, 1966; Felsenstein, 1981, Kondrashov, 1986; Diehl and Bush, 1989). Morphologically, males of *P. cochimi* exhibit a slender pedipalp manus and males of *P. gravicaudus* a robust manus, but females are indistinguishable. The sympatric model of speciation would predict that the development of the pedipalp manus, may represent a trait with two alleles at the extreme of variation, whereas the heterozygote would have an intermediate size, which by selection could be eliminated, resulting in these two sympatric species. Testing the suitability of this model or other models (i.e. sympatric speciation via polyploidy) is beyond the scope of this study. However, this evidence shows the paucity of biological information and the potential insight provided by scorpions as a model for investigating sympatric speciation.

REMARKS: *Paravaejovis cochimi*, **n. sp.** is a species that was confounded for a long time with *P. gravicaudus*, which has long been recognized as part of the *eusthenura* group (Williams, 1980), and subsequently transferred to *Hoffmannius* (Soleglad and Fet, 2008). This last genus is not monophyletic, according to the phylogenetic analyses conducted in chapter 1.

MATERIAL EXAMINED: **MEXICO: Baja California Sur:** *Municipio de Comondú*: San José de Comondú, 30 km N, between Rosarito and San Isidro, 26°21.252'N 111°50.109'W, 258 m, 27.vi.2008, H. Montaño and E. González, desert, collected at night with UV light, 1 ♀, 1 juv. (AMNH [LP 8782]), 8 ♂, 7 ♀, 14 juv. (AMNH [ARA2856]), 8 ♂, 7 ♀, 14 juv. (IBUNAM [ARA2238]). *Municipio de Loreto*: Loreto, 15 km W, 213 m, 13.vii.2004, 25°58'38.5"N 111°27'53.1"W, O. Francke, W.E. Savary, E. González, and A. Valdez, desert, on ground, collected at night with UV light, 2 ♂, 2 ♀ (AMNH [LP 3162]); Loreto, ca. 3 km S along gravel

road to San Javier, from junction with Route 1, 25°59'48.14"N 111°23'3.88"W, 8.vii.2005, 38 m, desert, on ground, collected at night with UV light, 4 juv. (AMNH [LP 4434]); Loreto, ca. 8 km S along gravel road to San Javier, from junction with Route 1, 25°59'48.97"N 111°23'21.43"W, 120 m, 8.vii.2005, L. Prendini, E. González, R. Mercurio, and W.E. Savary, collected at night with UV light, 2 juv. (AMNH [LP 4435]). *Municipio de Mulegé*: Isla San Marcos, 27°11'37.07"N 112°4'53.21"W, W. López-Forment, 1.vi.2010, 1 ♂, 2 ♀ (IBUNAM), 2.iv.2009, 2 ♂, 3 ♀, 2 juv. (IBUNAM); Microwave station San Lucas, 27°0'N 112°14.1498'W, 185 m, 5.vii.2005, W.E. Savary and R. Mercurio, desert, on ground, collected at night with UV light, 1 ♀ (CAS [ARA1525]); Playa Armenta, ca. 30 km S of Mulegé, 26°37.499'N 111°48.563'W, 3 m, 25.v.2004, R. Mercurio, M. Nishiguchi et al., collected at night with UV light, 1 ♂ (AMNH [LP 3483]); San Ignacio, 3 km S on road to La Laguna, 27°16.533'N 112°53.366'W, 167 m, 12.vii.2005, E. González, W.E. Savary, L. Prendini, and R. Mercurio, collected at night with UV light, 1 ♂ (AMNH [LP 4418]), 1 ♂ (CAS [ARA1526]).

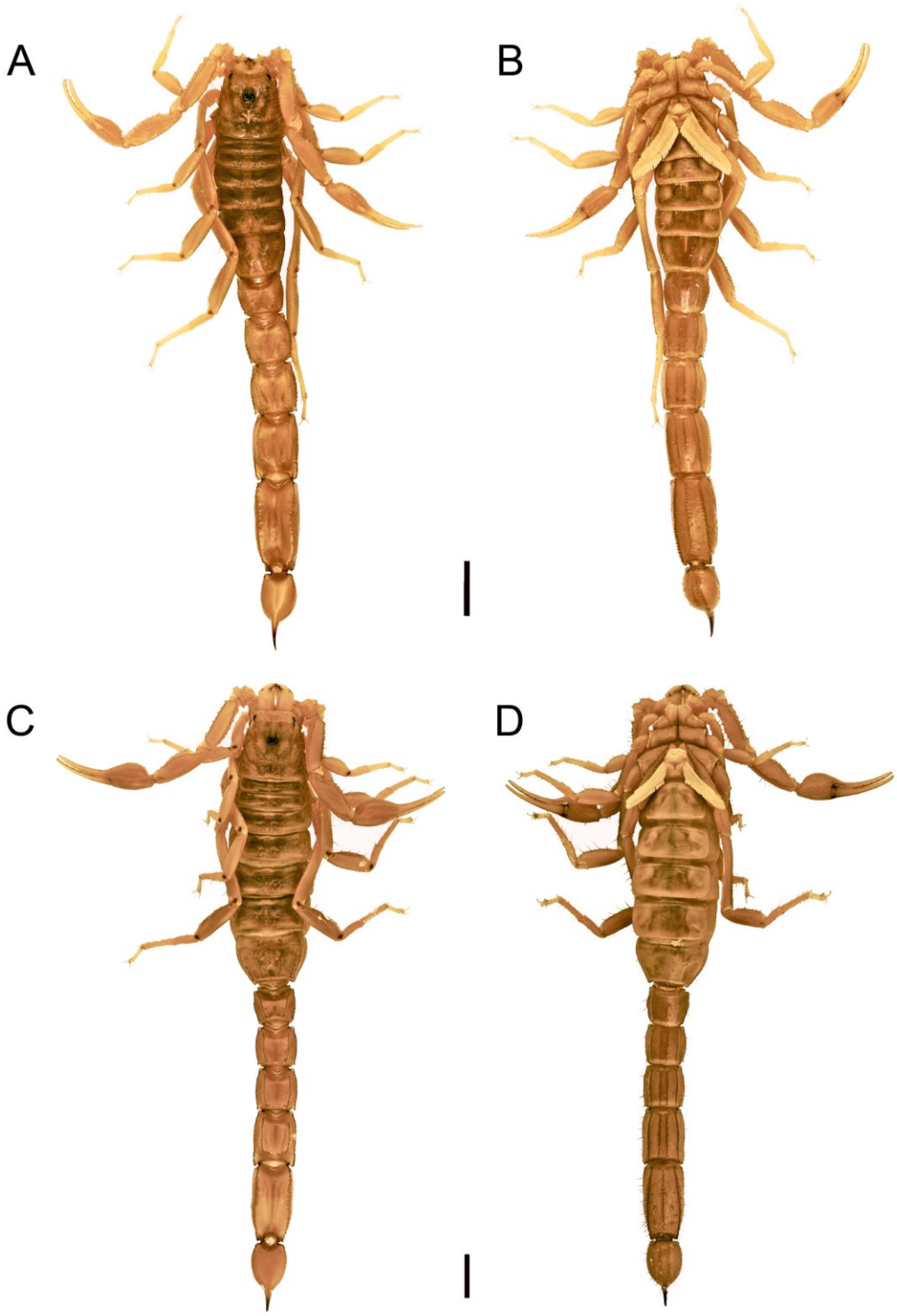


Figure 356. *Paravaejovis cochimi*, **n. sp.**, habitus. **A**, **B**. Paratype ♂ (AMNH). **C**, **D**. ♀ (AMNH). **A**, **C**. Dorsal aspect. **B**, **D**. Ventral aspect. Scale bars = 5 mm.

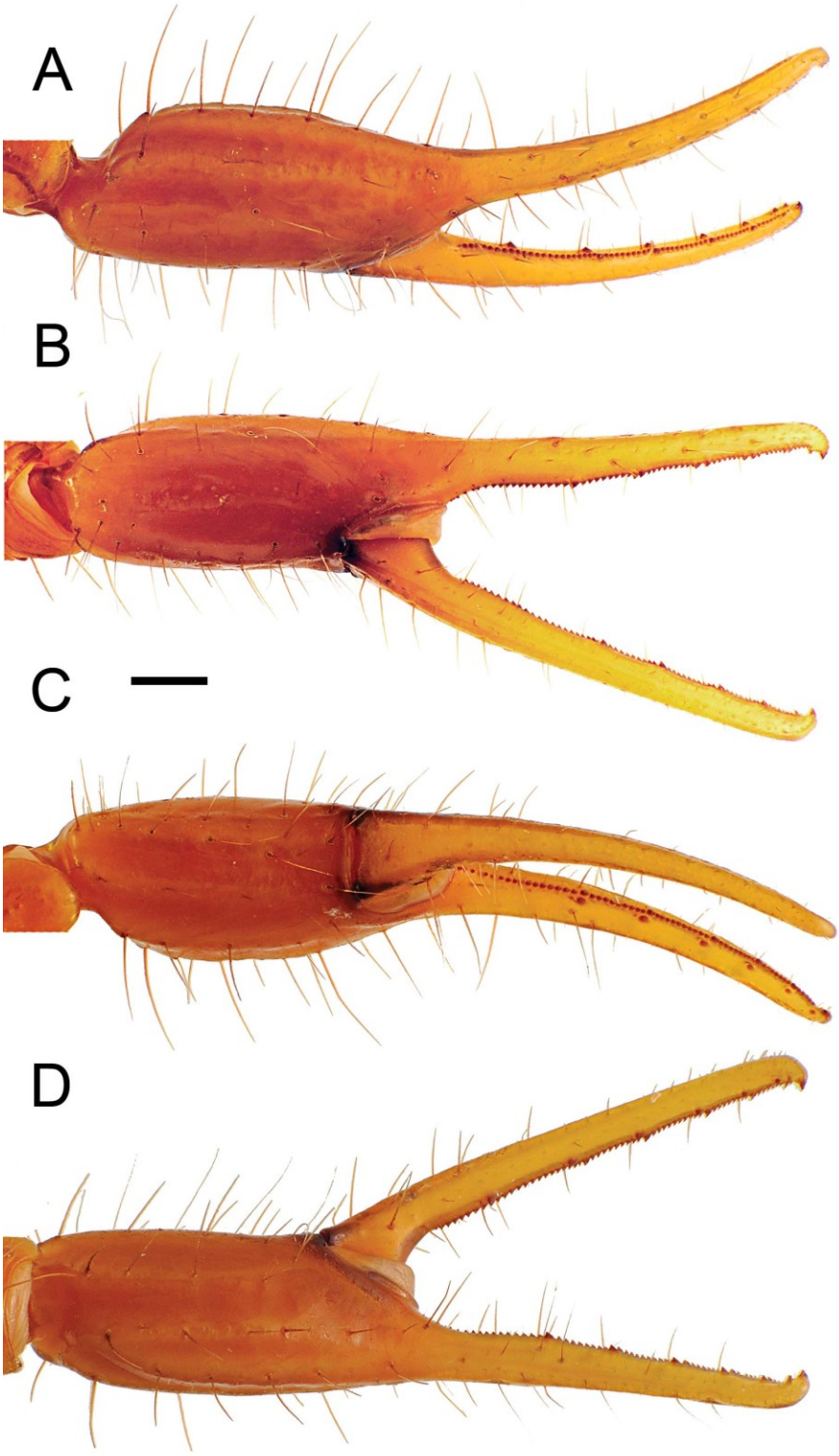


Figure 357. *Paravaejovis cochimi*, **n. sp.**, paratype ♂ (AMNH), dextral pedipalp chela. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

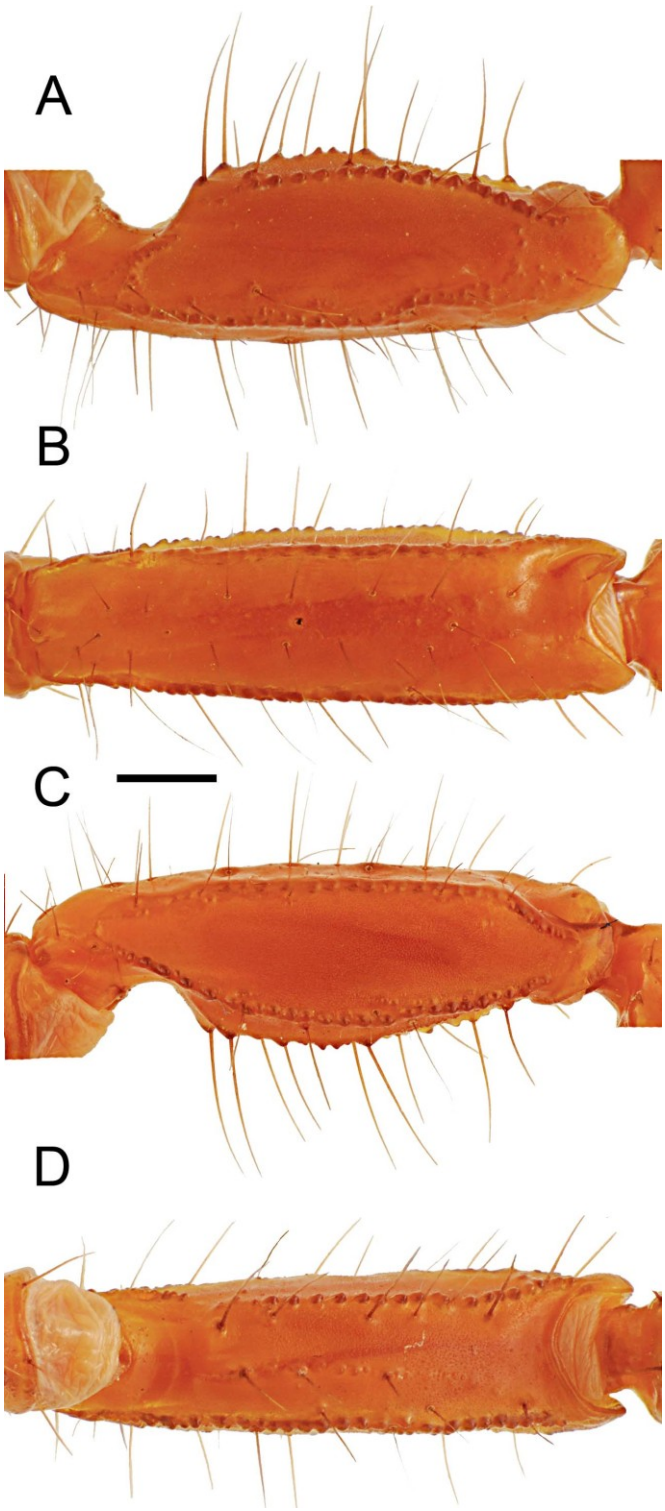


Figure 358. *Paravaejovis cochimi*, **n. sp.**, paratype ♂ (AMNH), dextral pedipalp patella. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

Paravaejovis confusus (Stahnke, 1940)

Figures 351, 359–362, 408C, 413B, 418B, 419B, 424B, 427B, 430B; Table 16

Vejovis flavus (probable misidentification): Ewing, 1928: 13 (in part); Gertsch, 1958: 11 (in part).

Vejovis confusus Stahnke, 1940: 101; Gertsch and Allred, 1965: 4; Williams, 1976: 106, 112–114; Williams and Hadley, 1967: 112, 113; Williams, 1968: 2; 1969: 3, 13; 1970a: 401; 1970b: 303; 1970d: 256, 261–266, tab. 1, 2, 3, 4; Soleglad, 1973b: 165; 1973b: 357, tab. 3; Hadley, 1974: 12; Stahnke, 1974: 135.

Vaejovis confusus Johnson and Allred, 1972: 166–168; Díaz-Nájera, 1975: 6, 31; Anderson, 1975: 13–16, figs. 2, 4, 7, 11, 12, tab. 1; Williams, 1976: 3, tab. 1; Allred and Gertsch, 1976: 93–96, tabs. 7–10; Francke, 1977a: 49; 1979: 19, 20, 27, 29, tab. 1, figs. 10–14; Williams, 1980: 55, 56, 57, figs. 53P, 54J, 58, 59; Berkenkamp and Landers, 1983: 27, 29, 30, tab. 1; Sissom and Francke, 1983: 69; Polis and McCormick, 1986: 61–69, tabs. 2–11, figs. 4–6, 71; Williams, 1987: 283, 248, 286, 287, 288; Sissom, 1991b: 219, 221, figs. 5–10; Kovařík, 1998: 146; McIntrye, 1999: 47; Beutelspacher, 2000: 79, 146, 152, map 51; Sissom, 2000: 531; Schofield, 2005: 45, fig. 2; Sissom and Hendrixson, 2005a: 128, tab. 6.2; Soleglad and Fet, 2006: 6; Kloock, 2008: 133. 134, tab. 1, 2, fig. 2; McWest, 2009: 19, 41, 55, 63; Ross, 2009: 531, 532, tab. 1; Ibrahim and Abdel-Rahman, 2011; 82

Vaejovis puritanus: Polis, 1979: 343 (misidentification).

Hoffmannius confusus: Soleglad and Fet, 2008: 4, 39, fig. 81, 50, tab. 3; 53, 73, 91, 96.

TYPE MATERIAL: **U.S.A.: Arizona:** Syntypes 3 ♂, 3 ♀ (CAS, Type No. 15170), Coolidge, Mesa, Superior, Tucson, Wickenburg, and Casa Grande National Monument.

DIAGNOSIS: *Paravaejovis confusus* is closely related to *P. exploratus*, **n. sp.**, *P. elucidatus*, **n. sp.**, *P. kino*, **n. sp.**, and *P. waeringi*, with which it forms a monophyletic group. These species may be distinguished from the other species in the genus by having elongated fingers such that trichobothria *ib–it* are in the medial third of the fixed finger, being *ib* at or close to PD6 and *it* between PD5 and PD6; carinae ventral submedian I–IV carinae ventral submedian I–IV costate crenulated to finely granulated, setal combs on basitarsus I–III. *Paravaejovis confusus* is distinguished from the aforementioned species by having pedipalp chela with carinae weakly to moderately angular in ♂ and ♀, the protrusion of the carinae on dorsal and prolateral surfaces are less pronounced than the other species, that is dorsal media, dorsal prolateral, and prolateral median costate, moderately to weakly angular, finely crenular, and with scattered fine granules, predominantly smooth, not strongly angular and predominantly crenular as in the *P. exploratus*, **n. sp.** and *P. elucidatus*, **n. sp.** All intercarinal surfaces on metasomal segments are weakly granular, especially in the ventral surface of segment V, in which the other species tend to be more densely shagreened, except *P. kino*, **n. sp.** All body with major macrosetae, never a mix of, or predominantly minor setae. Compared to the above species *P. confusus* has the widest segments IV and V of the metasoma but the slenderest vesicle of telson and pedipalp chela in ♂. Females of this species also have the slenderest vesicle of telson (table 16). *Paravaejovis confusus* is the only species in which the ♂ have pedipalp chela wider than patella and femur, although *P. kino*, **n. sp.** has pedipalp chela slightly wider than patella and femur, less so than *P. confusus* (table 16). Finally, whereas the other species tend to maintain the same width in

metasomal segments I–V, ♂ of *P. confusus* is the only species with a strong tendency to increase in.

DESCRIPTION: This description supplements Sissom's (1991b) diagnosis, recount, and relationship with related species. It is based on the material deposited in the collections mentioned below.

Color and infuscation: Base color pale yellow straw. Median and lateral eyes intensely infuscate. Genital operculum and pectines pale yellowish to whitish. Aculeus base reddish, median and distal dark brownish.

Carapace: Carapace 1.15 times longer than posterior width. Anterior margin sublinear, with obsolete notch and with three pairs of major macrosetae. Carapace shagreened, densely cover by minute granules and scatter moderate granules. Median ocular tubercle moderately raised. Superciliary carinae moderate and finely granular higher than median eyes. Position of median ocular tubercle on anterior half of carapace. Three pairs of lateral eyes, first two pairs same size and third pair smaller than first two pairs. Median eyes approximately three times the size of first lateral frontal pair. Anteromedian sulci deep with an anterior shallow depression; posteromedian shallow on proximal half, medially broad, and deep distally; anterolateral moderate, posterolateral deep, posterior transverse vestigial.

Sternum and coxal region: Sternum pentagonal equilateral with three pairs of setae, one distal, one median pairs and one pair on the lobes, surface matte, median notch deep. Coxal region matte in ♂, in ♀ smooth. Anterior margin of coxa II with few scatter minute granules, subbasally three oblique slit-like structures, adjacent to a weak, scattered granular protuberance. Proximal margin of coxal endite II with a moderate elongate depression each, median edge finely crenular. Coxa IV 2.20 times longer than coxa II.

Chelicerae: Dorsal surface smooth, subdistal margin of manus with one macrosetae; distal margin with costate and base of movable finger with vestigial crenulation. Serrula present on ventral distal half of movable finger, tines numbering 8

Pedipalps: Trichobothrial pattern Type C, orthobothriotaxic. Chela wider than patella, patella wider than femur. Femur: All intercarinal surfaces matted. Dorsal prolateral, dorsal retrolateral, and ventral prolateral complete moderately granular with conical rounded granules; retrolateral dorsosubmedian complete, expressed by four macrosetae and a row of scatter weak crenatoserrate granules; retrolateral ventral vestigial expressed by few scatter serrate granules; ventral prolateral vestigial expressed by a row of finely regular crenatoserrate granules; ventral retrosubmedian vestigial expressed by few scatter proximal crenatoserrate granules; prolateral ventrosubmedian partial, expressed by two proximal enlarged spiniform tubercles followed by an irregular row of scatter conical moderate and enlarged tubercles, subbasal and distal enlarged granules with a macroseta on top; prolateral ventral vestigial expressed by two proximal enlarged tubercles with a macroseta on top followed by three moderate and enlarged conical tubercles, subbasal and distal enlarged granules with a macroseta on top.

Patella: All intercarinal surface matte. Dorsal prolateral, ventral prolateral, dorsal retrolateral, and ventral retrosubmedian finely crenatoserrate; retrolateral dorsosubmedian and retrolateral median vestigial, expressed by a vestigial irregular broad costa; ventral median vestigial, expressed by a proximal row of enlarge granules; prolateral median on a vaulted projection, protruding moderately medially, complete expressed by row of moderate scatter conical granules gently slanting towards subdistal end of dorsal prolateral carinae, proximal, median, and distal moderate granules with a minor macroseta on top; prolateral ventral obsolete expressed by three major macrosetae on top, adjacent to ventral prolateral carinae.

Chela: Manus smooth and elongate in both sexes (chela 1.87–1.90 times longer than fixed finger). Intercarinal surface smooth. Dorsal prolateral, dorsal median, dorsal retrolateral and prolateral median, weakly to moderately finely crenular; ventral prolateral, ventral median, ventral retrolateral, and dorsal submedian accessory weakly costate smooth in ♂, in ♀ all these carinae weaker to obsolete. All other carinae obsolete. Trichobothrium *Db* positioned on dorsal retrolateral carina, subbasal on chelae; *Dt* positioned at mid manus.

Fingers: Fixed finger, PD = 6, MD rows = 6, RD = 6, proximal RD positioned by proximal half. All RD subpaired with corresponding PD. Movable finger, PD = 7, MD rows = 6/7, distal row bearing one minute granule, RD = 6/7, proximal RD positioned by mid finger/proximal third. All RD subpaired with corresponding PD. Trichobothria *ib* and *it* positioned medially on fixed finger, *ib* positioned adjacent to PD6 and *it* between PD5 and PD6. Trichobothria series *db–dt* and *eb–et* distributed along the entire length of fixed finger. Trichobothria *db* and *eb* subbasal on fixed finger. Distal retrolateral denticles in both fingers moderately enlarged claw-like. Fingers lacking scalloping, gap created when fingers closed moderate, fingers fit unevenly in both sexes.

Legs: Basitarsi I–II prolateral ventral, retrolateral ventral carinae with complete rows of spinules; prolateral ventral in III and IV absent; retrolateral ventral in III complete, expressed by a scatter row of spinules, in IV absent; retrolateral dorsal in I–III partial expressed on distal third by a row of spinules, in IV absent; retrolateral median rows in I–IV vestigial expressed as few terminal spinules. Telotarsi I–IV with two to three pairs of ventrodistal spinules in I–IV. Setae: Prolateral ventral, 3:4:5:5; retrolateral ventral, 4:5:7:8; retrolateral dorsal, 2:3:4:3; dorsal, 4:4:4:4; retrolateral dorsal and dorsal series in IV expressed as minor macrosetae in ♂, these

series arranged in two independent rows in I and IV and in II and III arranged in one sublinear row being dorsal median offset. All macrosetae in ♂ relatively shorter than in ♀.

Tergites: Pretergites and postergites dorsal submedian intercarinal surface matte, other surfaces shagreened with scatter sharp conical moderate granules; dorsal submedian and dorsal median carinae in tergites I–VI moderate, expressed on distal half by few moderate granules. Tergite VII ventral lateral intercarinal surface matte, other surfaces shagreened with dense minute granule and moderate scatter granules; dorsal median carina strongly costate with few enlarge rounded granules, expressed on proximal half of the postergite; dorsal submedian vestigial expressed as a pair of proximal short row of conical granules; dorsal lateral and lateral supramedian comparatively stronger and complete with elongate subserrate granules; dorsal lateral carinae projecting weakly and curving with scattered granules laterally approximating to lateral supramedian proximal margin, creating a semi horseshoe of moderate and subserrated granules.

Genital operculum: Male genital operculum: wider than long, with three pairs of macrosetae. Sclerites free on longitudinal edge moving independently but unable to open more than 45°. Genital papillae protruding posteriorly. Female genital operculum: Wider than long, with three macrosetae. Sclerites fuse longitudinal.

Sternites: Sternites I–VII acarinated matte in ♂, in ♀ finely punctuated, and lustrous. Distomedian glandular spot in V and VII vestigial not protruding from adjacent surfaces and weakly contrasting with slightly darker base color, in ♂, in ♀ obsolete. Sternite VII with ventral lateral carinae strong, finely crenatoserrate with two macrosetae; other carinae obsolete expressed by macrosetae, all macrosetae. Spiracle elongated, slit-like, approximately two times longer than wide.

Pectines: Basal piece with median notch deep, with one pairs of macrosetae. Marginal lamella consist of three sclerites, medial lamella proximally fuse distally progressively forming a conspicuous rows with 6–10 beads. Fulcra with 16–18 in ♂, in ♀ 12–14 beads. Pectinal tooth count 17–19 in ♂, in ♀ 13–15. Pectines relatively short, with second sclerite of marginal lamella at the level of distal margin of coxa IV in ♂, in ♀ total length of marginal lamella slightly shorter than distal margin of coxa IV.

Hemispermatophore: Lamina 1.3 longer than trunk. Median lobe ental terminus moderate and rounded. Basal plate of inner lobe adjacent to ventral trough, spine of inner lobe short. Hemi-mating plug developed from the inner lobe, distal barb margin with 8 spinules. Dorsal through margin long, tapering distally but almost as broad as capsule proximally, curving proximally. Primary and secondary hook positioned on the apex of lateral margin extension of the lamina (flange), completely fused and undistinguished. The sole hook sharp and strongly curved towards the dorsal trough. Neck short compared to the basal plate (0.46 times shorter than basal plate). Measurements, lamina, 2.93; trunk, 2.16; dorsal trough/laminar hooks, 0.66; ventral trough/laminar hook, 0.40; inner lobe (mating plug) neck, 0.23; basal plate, 0.50.

Metasoma: Metasoma 1.4 times longer than mesosoma. Metasomal segments I–III wider than long. Intercarinal surfaces matte, ventral and lateral intercarinal surface shagreened with dense minute granules and moderate scatter granules. Carinae: Dorsal lateral and lateral median carinae in I–IV strongly crenatoserrated terminating in moderate enlarge spinoid granules pointing backwards; except lateral median in IV distal terminus moderately expanded laterally forming a triangular projection; dorsal lateral in V strong and serrated proximally, becoming granular medially with a field of granules becoming moniliform distally, ending on at moderate tubercle. Lateral inframedian in I complete moderately crenatoserrated; in II and III partial

moderately crenatoserrated, becoming weaker proximally, present on distal third; in IV absent, in V partial with a moderate row of crenatoserrate granules, becoming weaker distally, present in proximal half; ventral lateral in I–IV finely crenatoserrate, ventral submedian in I–III costate smooth to minutely crenatoserrate, in IV weakly crenatoserrate; ventral lateral and ventral median in V strongly crenatoserrate. Setae: Dorsal lateral carinae, 0:1:1:1:6; lateral median; 0:1:1:2; lateral inframedian, 0:0:0:0:3, ventral lateral, 2:2:2:3:9, ventral submedian, 3:3:3:3:2; ventral sublateral, 2; in ♀ all macrosetae major in ♂ all macrosetae minor or reduced to microsetae,

Telson: Telson 1.56–1.67 times longer than wide. Metasomal segment V 1.2–1.3 times wider than telson. Vesicle 2.97–3.10 times longer than aculeus. Dorsal surface smooth, ventral and lateral carinae moderate and irregular, crenulations weakening distally disappearing at the base of the aculeus. Ventral surface with 5–6 macrosetae in each carina. Ventral median carinae with moderate to weak subaculear tubercle. Microserration on laterobasal aculeus numbering 6–8.

DISTRIBUTION: This species is restricted to the northern part of the Sonoran Desert including the states of Arizona, Nevada, and New Mexico in the U.S.A., although no record from Sonora was available, it is likely that the species occurs there. At the western limit, the Colorado River seems to provide an efficient biogeographic barrier, no sample was found across the river. At the southern limit, the sand dunes of Sonora in the Great Desert of Altar form another efficient biogeographic barrier.

ECOLOGY: *Paravaejovis confusus* is psammophilous, preferring loose sand in desert habitats. Morphological adaptations to this ecomorphotype are: presence of tarsal setal combs, pale color, and lack of pigmentation. The setal combs are more evident in ♀ than in males, as

occurs in other *Paravaejovis*, such as *P. eusthenura* and *P. diazi*. Although *P. confusus* is associated with sandy habitats, this species is adapted to compacted gravely and rocky soils. *P. confusus* inhabits desert landscapes from 144–993 m altitude with vegetation typical of Sonoran Desert.

REMARKS: The *confusus* group of *Paravaejovis* comprises *P. confusus*, *P. elucidatus*, **n. sp.**, *P. exploratus*, **n. sp.**, *P. kino*, **n. sp.**, and *P. waeringi* (Williams, 1970). The morphology of this group is quite homogeneous. They are readily distinguished from other species of *Paravaejovis* by having trichobothrium *ib* and *it* by mid fixed finger, ventral submedian carinae of metasomal segments I–IV costate and finely crenular to granular, and by having primary and secondary hook positioned on the apex of lateral margin extension of the lamina (flange) completely fused in a sole sharp hook that curves strongly towards the dorsal trough, except *P. confusus*, in which the hooks are weakly visible and almost completely fuse. Although morphologically similar, the populations at the extremes of the distribution present several diagnosable characters, i.e. the degree of granulation on pedipalp chelae, metasomal segments I–V, and telson, and several morphometric ratios. These species overlap around the borders of Arizona, California, and Nevada, in which they present intermediate morphotypes. For instance, the populations found along the Colorado River present mixed characters of *P. confusus* and *P. waeringi*. However, in other areas, two species are readily identified, for example at Twentynine Palms in California, *P. elucidatus*, **n. sp.** and *P. waeringi* are sympatric. Field observations at this locality suggest that this species use different habitats. Whereas *P. elucidatus*, **n. sp.** was collected on sandy substrate, *P. waeringi* was found in a rocky habitat.

The ecology of this complex of species was studied intensely by Polis et al. (Polis and Farley, 1979; Polis and McCormick, 1986, 1987; Polis, 1990). According to the distribution of these specimens, it is likely that Polis and colleges studied *P. elucidatus*, **n. sp.** and *P. waeringi* in most cases.

Sissom (1991b) identified several anomalies in characters commonly used by previous scorpionologists to delimit species, for instance the variability in the number of prolateral denticles and median denticle rows in the internal cutting edge of the pedipalp fingers. McWest also identified this problem and independently arrived in part at the conclusion presented here. According to his observations, the populations from San Bernardino are conspecific with *P. waeringi* instead of *P. confusus* as suggested by Williams (1980), although in this area *P. elucidatus*, **n. sp.** and *P. waeringi* are sympatric. Moreover, the populations from the central valley of California are indeed referable to *P. elucidatus*, **n. sp.**, which McWest, cautiously treated as *V. confusus/waeringi* (McWest, 2009, table 1, 2).

MATERIAL EXAMINED: **U.S.A.: Arizona:** *Cochise Co.*: Dos Cabezas, [32°10.5'N 109°36.78'W], 21.x.1970, V. Roth, 1 juv. (AMNH); Portal, [31°54'38.89"N 109°8'32.00"W], 15.vi.1964, W.J. Gertsch and J. Woods, 1 juv. (AMNH); Portal,1.6 km W, Silver Creek Wash, [31°54'38.89"N 109°8'32.00"W], 446 m, 15.vi.1964, J. Hubbard, G. Mont and M. Cazier, 45 ex. (AMNH); Route 66, Black Mountains, 35°02'03.42"N 114°16'59.56"W, 8.x.2007, R.C. West, 2 ♀♀ (AMNH). *Graham Co.*: Fan Road, ca. 17.7 km NE Bowie, 32°25'37.71"N 109°22'46.01"W, 324 m, 24.vii.2008, H.M. Burrell and K. McWest, 2 juv. (AMNH [LP 8853]); Fan Road, ca. 8.9 km NE Bowie, 32°22'31.01"N 109°26'51.53"W, 338 m, 24.vii.2008, H.M. Burrell and K. McWest, collected at night with UV light, 1 ♂ (AMNH [LP 8852]). *Maricopa Co.*: Fort McDowell, 16 km NE, Río Verde Ranger, [33°38.20'N 111°40.4666'W], 21.v.1930, Chamberlin,

1 ♀ juvenile (AMNH); Mesa, 9.7 km NW, Sun Shine Acres, [33°24.90'N 111°49.8833'W], M. Soleglad, 2 ♀♀ (AMNH); Mount Ord, 56 km NE, Phoenix, [33°55'12.1"N 111°26'00.3"W], 649 m, 4.iv.2006, R.C. West, under rocks, 1 ♀ (AMNH [LP 6216]); North Brush Hwy, 0.15 km S, 33°33'11.68"N 111°32'44.17"W, 425 m, 9.v.2008, Z.J. Valois and B. Hendrixson, 1 ♀ (AMNH [LP 8514]); Off-road area NE White Tank Mountains, [33°34.51667'N 112°34.733'W], 15.vi.2007, Z.J. Valois, K.J. McWest and ATS group, 1 ♀ (AMNH [LP 7809]); Salt River Indian Reservation, Gilbert road, 33°29'57.26"N 111°47'16.11"W, 382 m, 19.iv.2008, Z.J. Valois, sandy desert grassland, receding into dry sand banks of the Salt River, 1 ♀ (AMNH [LP 8497]); Sentinel, [32°12.63600'N 110°59.502'W], 9.x.1959, V. Roth, 1 ♀ (AMNH); Tonto National Forest, Mount Ord, Mazatzal Mountains, 6.ix.2007, 33°55'12.1"N 111°26'00.3"W, 470 m, 1 juv. (AMNH), 33°55'09.11"N 111°26'50.8"W, 438 m, 1 juv. (AMNH), L. Prendini and J. Huff; W of Phoenix, Surprise, soft soil Flats N White Tanks Mountains, 33°38'19.4"N 112°28'22.3"W, 418 m, 2007, Z.J. Valois, K.J. McWest, H.M. Burrell et al., very disturbed off-road area, collected at night with UV light, 1 ♂, (AMNH [LP 7272]). *Mohave Co.*: Black Mountains, 2.4 km S Oatman, Route 66, 34°59.255'N 114°25.723'W, 670 m, 2.iv.2004, R.C. West, steep western talus slopes, under rocks, cacti, creosote, 1 juv. (AMNH [LP 2967]); Black Mountains, 5.6 km E Oatman, Route 66, 34°59.255'N 114°25.723'W, 731 m, 2.iv.2004, R.C. West, low eastern rocky slope, under rocks, cacti, creosote, 1 ♀ (AMNH [LP 2968]); Oatman, 3.2 km S on Route 67, 34°59.255'N 114°25.723'W, 3.iv.2003, R.C. West, 1 juv. (AMNH [LP 2445]). Black Mountains, loop road on W side of Union Pass, W of Kingman, 35°12.970'N 114°24.456'W, 993 m, 11.viii.2007, W.D. Sissom, T. Anton, and G. Casper, 1 juv. (AMNH [LP 7811]), 1 juv. (AMNH [LP 7814]), 2 ♂, 1 ♀ (AMNH); Black Mountains, W side of Sitgreaves Pass, 2.9 km W Gold Road on Oatman Hwy, 35°02.678'N 114°23.200'W, 832 m, 12.viii.2007, W.D. Sissom, T.

Anton, and G. Casper, 1 juv. (AMNH [LP 7812]); Buckeye Station, on Frontage Road, 4.3 km SW intersection of Santa Fe Ranch Road and I-40 (exit 20), 34°46.1166'N 114°11.7666'W, 424 m, 9.ix.2007, L. Prendini and J. Huff, collected at night with UV light, 2 ♂ (AMNH [ARA3118]), 2 ♂ (IBUNAM [ARA2373]); Buckeye Station, on Frontage Road, 6 km SW intersection of Santa Fe Ranch Road and I-40 (exit 20), 34°45.4164'N 114°12.15'W, 407 m, 9.ix.2007, L. Prendini and J. Huff, collected at night with UV light, 3 ♂, 1 ♀ (AMNH [ARA3102]), 4 ♂ (IBUNAM [ARA2365]); Buckeye Station, on Frontage Road, 9.7 km SW of intersection of Santa Fe Ranch Road and I-40 (exit 20), 34°45'25.1"N 114°12'09.6"W, 9.ix.2007, L. Prendini and J. Huff, Mohave desert, low sand dunes on gravel plain, scattered saguaro cacti and creosote bushes, 1 subad. ♀ (AMNH [LP 7205]); East of Black Mountains Range on Oatman Hwy, 35°02.969'N 114°14.934'W, 693 m, 12.viii.2007, W.D. Sissom, T. Anton, and G. Casper, creosote flats, packed sand and gravel, 1 juv. (AMNH [LP 7813]), 1 juv. (AMNH); Crystal Beach, Spring Lane, ca. 9.7 km S Lake Havasu City, 34°34'31.4"N 114°23'55.2"W, 180 m, 10.ix.2007, L. Prendini and J. Huff, sand dune on hillcrest, 1 ♂ (AMNH [LP 7148]); Crystal Beach, Vista Drive, ca. 9.5 km S Lake Havasu City, 34°34.1496'N 114°23.4666'W, 149 m, 10.ix.2007, L. Prendini and J. Huff, collected at night with UV light, 2 ♂, 3 ♀ (AMNH [ARA3107]), 2 ♂, 2 ♀ (IBUNAM [ARA2279]); Crystal Beach, Vista Drive, ca. 9.7 km S Lake Havasu City, 34°34'09.3"N 114°23'28.2"W, 149 m, 10.ix.2007, L. Prendini and J. Huff, large white sand dune along dry wash, against hill, 1 subad. ♀ (AMNH [LP 7133]); E of SR-10, H-05 junction, S of resident housing, 220 m, 20.iv.2008, 34°46.7328'N 114°27.9162'W, desert, 1 subad. ♂, (AMNH [ARA3007]), 34°46'44.19"N 114°27'55.11"W, Z.J. Valois and K. Neeley, soft sandy grassland and washes, 1 subad. ♀ (AMNH [LP 8493]), Z.J. Valois and K. Neeley; Golden Shores, S side Powell Lake Road, 34°46'44.2"N 114°28'15.5"W, 213 m, 9.iv.2007, J.

Huff and L. Prendini, 3 ♂♂, 4 ♀♀ (AMNH), L. Prendini and J. Huff, Mohave desert, low sand dunes on gravel plain, slightly degraded, 1 ♂ (AMNH [LP 7138]); Golden Valley, [35°13.3833'N 114°12.9'W], 2008, B. Savary, 1 juv. (AMNH [LP 8994]); Havasu National Wildlife Refuge, Catfish Paradise Road, 3 km N Topock, on E bank Colorado River, 34°44.5662'N 114°29.13'W, 144 m, 9.ix.2007, L. Prendini and J. Huff, collected at night with UV light, 10 ♂, 5 ♀, 2 subad. ♂ (AMNH [ARA3129]); Havasu National Wildlife Refuge, Catfish Paradise Road, 3.2 km N Topock, on E bank Colorado River, 144 m, 9.ix.2007, 34°44.5662'N 114°29.13'W, collected at night with UV light, 10 ♂, 5 ♀, 1 subad. ♂ (IBUNAM [ARA2381]), 34°44'34.3"N 114°29'08.1"W, 1 juv. (AMNH [LP 7213]), L. Prendini and J. Huff; Intersection of Santa Fe Ranch Road and I-40 at exit 20, 476 m, 9.ix.2007, 34°47.7828'N 114°9.75'W, collected at night with UV light, 1 ♂, 1 ♀, 1 juv. (AMNH [ARA3106]), 34°47'47.8"N 114°09'45.8"W, rocky ravine and low rocky slopes and outcrops and loose volcanic rocks, 1 juv. (AMNH [LP 7173]), L. Prendini and J. Huff; Lake Havasu City, 20.iv.2008, 34°33.5832'N 114°22.8'W, 166 m, desert, 1 ♂, 1 subad. ♀ (AMNH [ARA3009]), 34°33.5166'N 114°23.2164'W, 172 m, 20.iv.2008, 1 ♂ (AMNH [ARA3010]), Z.J. Valois and K. Neele; Lake Havasu, NW of gated community, 20.iv.2008, 34°33'31.01"N 114°23'13.08"W, 172 m, found on open dune face, 1 juv., (AMNH [LP 8487]), 34°33'35.83"N 114°22'48.97"W, 166 m, on and around large dune face, in both rocky hard pack sand and loose sand, 1 subad. ♂ (AMNH [LP 8498]), Z.J. Valois and K. Neeley; Oatman, 3.2 km S on Route 66, [35°1.5833'N 114°23.01666'W], 3.iv.2003, R.C. West, 1 juv. (AMNH [LP 2446]); Oatman, 500 m SE on Route 66, [35°1.5833'N 114°23.01666'W], 3.iv.2003, R.C. West, under roots of Mesquite bush, 1 juv. (AMNH [LP 2442]); Parker, Shea Road, Osborne Well Road, 10.5 km E intersection with Hwy 95, 34°07'46.5"N 114°14'12.2"W, 169 m, 10.ix.2007, L. Prendini and J. Huff, Mohave

desert, sand dunes on S side of road, sparse shrubs and grass, 1 subad. ♂ (AMNH [LP 7203]); Parker, Shea Road, Osborne Well Road, 10.5 km E intersection with Hwy 95, at base of "P" Mountain (Black Peak), 34°08'08.7"N 114°10'59.2"W, 196 m, 10.ix.2007, L. Prendini and J. Huff, E slope of black volcanic mountain and gravel wash, 1 juv. (AMNH [LP 7165]); Parker, Shea Road, Osborne Well Road, 11 km E intersection with Hwy 95, 34°7.7664'N 114°14.1996'W, 169 m, 10.ix.2007, L. Prendini and J. Huff, collected at night with UV light, 1 ♂, 1 ♀ (AMNH [ARA3112]), 2 ♂ (IBUNAM [ARA2364]); Parker, Shea Road, Osborne Well Road, 11 km E intersection with Hwy 95, at base of "P" Mountain (Black Peak), 34°8.1330'N 114°10.98'W, 196 m, 10.ix.2007, L. Prendini and J. Huff, collected at night with UV light, 2 ♀ (AMNH [ARA3111]), 1 ♀, 1 juv. (IBUNAM [ARA2130]); W of SR-10, 208 m, 20.iv.2008, 34°48.7164'N 114°28.2498'W, desert, 1 ♂ (AMNH [ARA3001]), 34°48'43.26"N 114°28'15.34"W, sandy slopes and washes, and hard packed ground, 1 ♀ (AMNH [LP 8495]), Z.J. Valois and K. Neeley; Warm Springs Wash, 4.7 km N Topock, 34°44.8662'N 114°28.8996'W, 147 m, 9.ix.2007, L. Prendini and J. Huff, collected at night with UV light, 5 ♂, 2 ♀, 2 juv. (AMNH [ARA3117]), 5 ♂, 1 ♀, 3 juv. (IBUNAM [ARA2379]); Wickenburg, 57 km N, [34°11'22.93"N 113°03'13.75"W], 30.viii.1965, K. Hom, 1 juv. (AMNH). Warm Springs Wash, 4.5 km N Topock, 34°44'52.2"N 114°28'54.8"W, 147 m, 9.ix.2007, L. Prendini and J. Huff, dry riverbed on E bank of Colorado River, scattered mesquite trees and bushes, clayey-loam soil, 1 subad. ♂ (AMNH [LP 7159]). *Pima Co.*: along road Kit Peak, Kit Peak National, Quinlan Mountains, [31°57.83800'N 111°35.990166'W], 325 m, 20.viii.1970, Rice, 19 ex. (AMNH); Bopp Road, N of Ajo Road, [32°20.236866'N 112°51.042546'W], viii.2004, R. Barnhill, 1 juv. (AMNH [LP 3085]), 1 juv. (AMNH [LP 3086]); near Saguaro, National Mountains, [32°15'N 110°30'W], 12.x.1970, J. G. Rozen, 1 ♂ (AMNH); Organ Pipe Cactus

National Monument, 32°2.5020'N 112°52.52'W, 12.v.1973, F.J. Moore and R.L. Berry, 1 subad. ♂ (OSAL); Santa Catalina Mountains, Sabino Canyon, [32°26.580'N 110°47.28'W], 18.viii.1950, M. Cazier, 1 ♂ (AMNH); Sasebe, [31°29.31667'N 111°32.51666'W], 1.i.1941, S.A. Mulaik, 1 juv. (AMNH); Sells, 32 km E, 31°54.7200'N 111°52.87'W, 12.v.1973, F.J. Moore and R.L. Berry, 1 juv. (OSAL); Tucson, [32°13'18"N 110°55'35"W, 1952, 4 ♂ (AMNH); viii.1935, 1 juv. (AMNH), viii.1935, 1 juv. (AMNH), P. Steckler, ix.1936, 1 juv. (AMNH), 1 juv. (AMNH). *Santa Cruz Co.*: Atascosa Mountains, 31°25.582'N 111°10.185'W, 396 m, 14.ix.2007, M. Rubio, 8 ex. (AMNH); junction of Hwy 191, 7.6 km from, on Hwy 366, Foothills of Pinaleno Mountains, 32°41'33.9"N 109°45'13.3"W, 345 m, 25.vi.2007, J. Huff, collected at night with UV light, on sand, 18 ex. (AMNH). *Tucson Co.*: [32°13.30'N 110°55.5833'W], vii.1935, 5 ♀ (AMNH), P. Steckler, 1935, 1 subad. ♂ (AMNH), R.H. Crandall, 1953, 1 ♂(AMNH); Tucson, 21 km E, [32°13.30'N 110°55.5833'W], 15.vii.1950, C.M. Bogert, 1 subad. ♀ (AMNH). *Yavapai Co.*: Alamo Road, N side, 34°10'4.43"N 113°01'56.57"W, 867 m, 10.v.2008, Z.J. Valois and B. Hendrixson, found in flat open Sonora desert-grassland, 1 ♀ (AMNH [LP 8517]); N side of Alamo Road, 34°10'4.43"N 113°1'56.57"W, 867 m, 10.v.2008, Z.J. Valois and B. Hendrixson, 1 ♂, 5 ♀, 2 subad. ♂ (AMNH); Hwy 3262,17 km S, Kaibab National Forest, Ash Fork, 35°04'56.5"N 112°24'19.9"W, 1544 m, 8.ix.2007, L. Prendini and J. Huff, 1 juv. (AMNH). *Yuma Co.*: [32°41.533'N 114°36.9166'W], 1.vii.1941, S. Mulaik, 1 subad. ♀, 1 subad. ♂ (AMNH), 1.xii.1957, V. Roth, 1 juv. (AMNH), 13.v.1958, G. Loranze, 1 juv. (AMNH), 14.xii.1959, R. Grounds, 1 ♂, 2 ♀♀ (AMNH); 11.vii.1959, H. Pippin, 1 ♂ (AMNH). Cravey Well, [33°26.352018'N 113°50.279274'W], 29.x.1958, V. Roth, 1 subad. ♀ (AMNH); Fortuna Mine, [32°33.10311'N 114°19.84656'W], 15.ii.1954, O. Tuttle, 1 subad. ♀ (AMNH); Hoodoo Well, [33°20.535426'N 113°51.295896'W], 23.xi.1958, V. Roth, 1 subad. ♀ (AMNH); (AMNH),

11.v.1959, H. Schreiber, 1 juv. ♀ (AMNH); Palm Canyon, Kofa Mountains, [33°21.636'N 114°5.9118'W], 10.x.1968, A. Cazier, on Palo Verde, Iron Wood, 50 ex. (AMNH); Quartzsite, [33°39.90'N 114°13.25'W], 23.xi.1958, V. Roth, 1 subad. ♂ (AMNH); Salome, 48 km SE, Hovatters Ranch, [33°45.81667'N 113°36.5166'W], V. Roth, 1 subad. ♂ (AMNH); Sierra Pinta, [32°15.78667'N 113°32.578'W], 21.ii.1958, V. Roth, 1 juv. ♂ (AMNH). **Nevada:** *Clark Co.*: Morning Star, N side, Mine cutoff road, 35°21'45.70"N 115°25'22.54"W, 983 m, 10.v.2008, B. Hendrixson, 1 ♀ (AMNH). **New Mexico:** *Hidalgo Co.*: Granite Gap on Hwy 80, N of Rodeo, 32°05'34.2"N 108°58'12.1"W, 417 m, 22.vii.2007, J. Huff, 2 juv. (AMNH); Granite Gap, 32°5.3240'N 108°58.3948'W, 10.x.2008, K. McWest and D. Hendricks, collected at night with UV light, on grass, 1 juv. (AMNH), [32°5.3240'N 108°58.3948'W], 13.viii.1976, A. Cazier family, 15 ex. (AMNH); Granite Gap, Peloncillo Mountains, 32°05'43.1"N 108°58'13.7"W, 417 m, 4.ix.2007, L. Prendini and J. Huff, 13 ex. (AMNH).

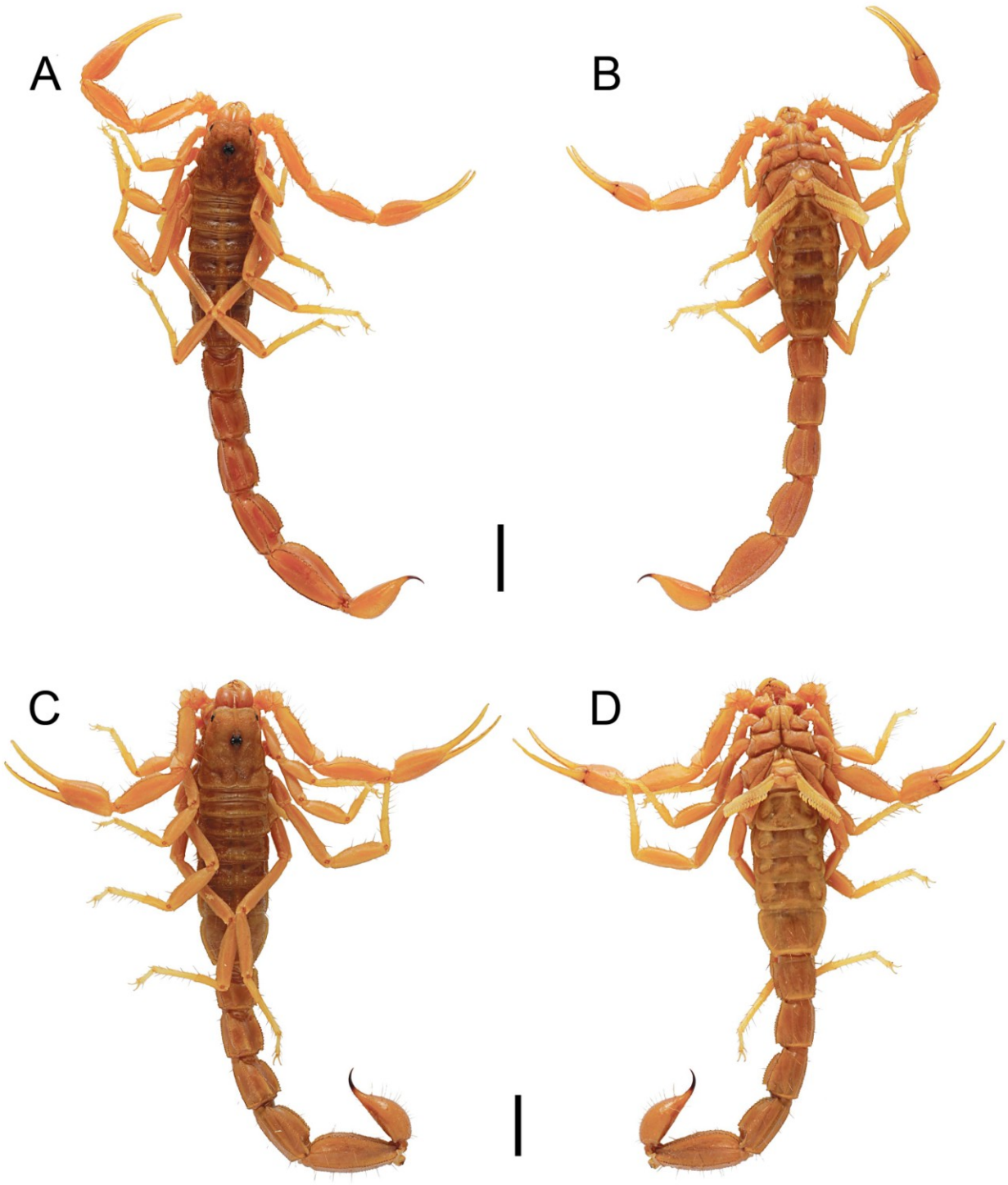


Figure 359. *Paravaejovis confusus* (Stahnke, 1940), habitus. **A**, **B**. ♂ (AMNH). **C**, **D**. ♀ (AMNH). **A**, **C**. Dorsal aspect. **B**, **D**. Ventral aspect. Scale bars = 5 mm.

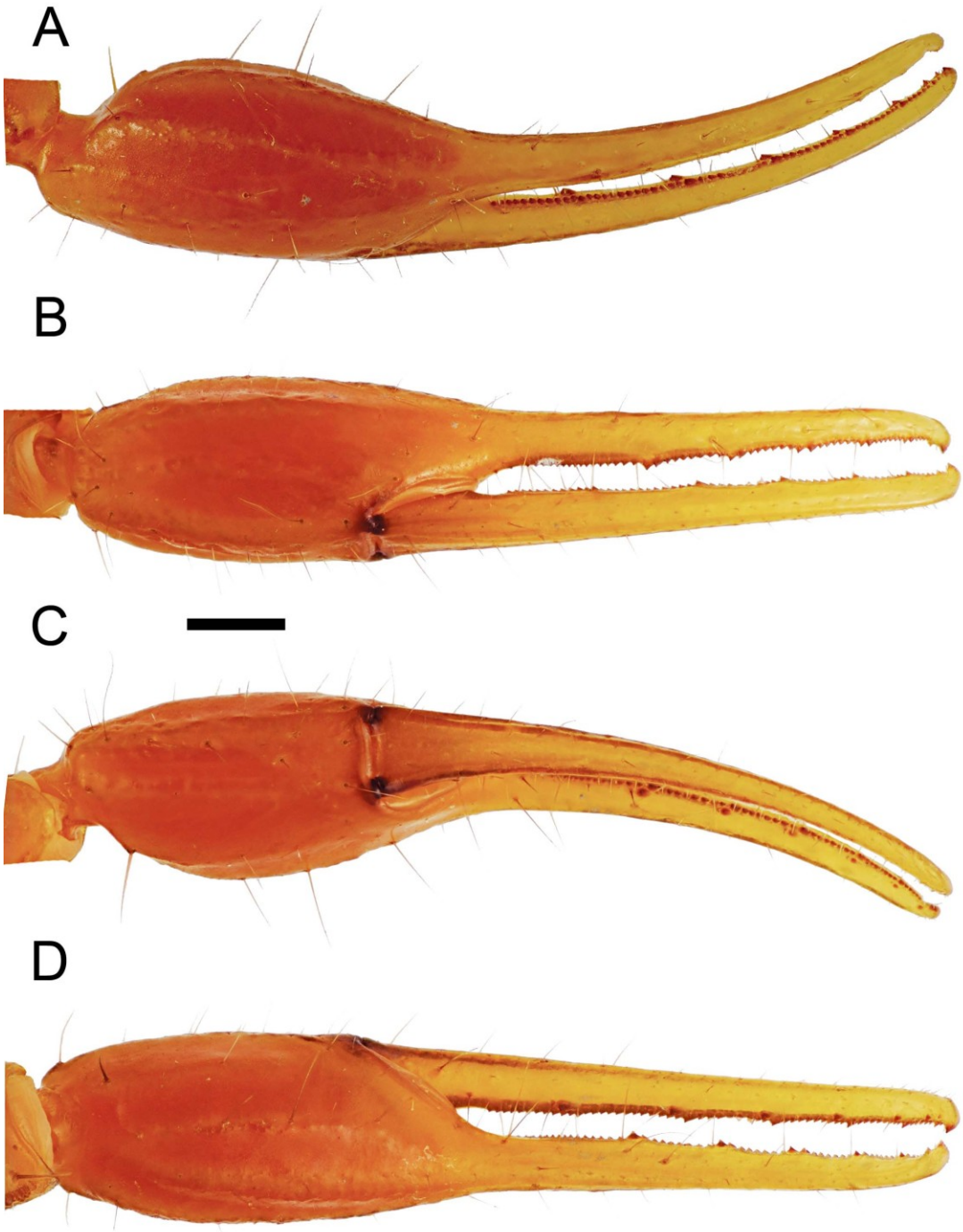


Figure 360. *Paravaejovis confusus* (Stahnke, 1940), ♂ (AMNH), dextral pedipalp chela. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

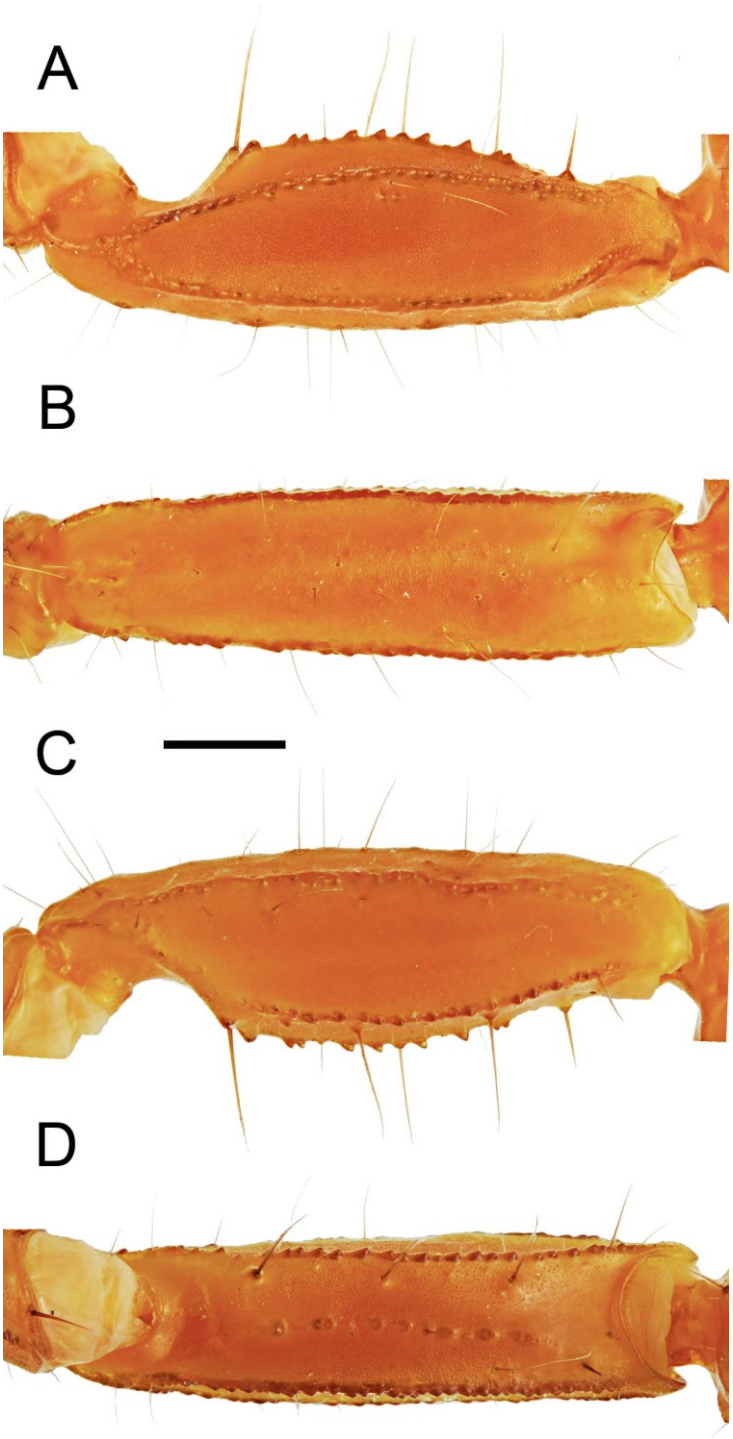


Figure 361. *Paravaejovis confusus* (Stahnke, 1940), ♂ (AMNH), dextral pedipalp patella. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

Table 16. Selected morphometrics for the species in the *Paravaejovis confusus* complex. Ratios length/width of pedipalp and metasomal segments of *Paravaejovis confusus* (Stahnke, 1940), *Paravaejovis elucidatus*, **n. sp.**, *Paravaejovis exploratus*, **n. sp.**, *Paravaejovis kino*, **n. sp.**, and *Paravaejovis waeringi* (Williams, 1970).

	P. confusus (n=5 ♂,♀)	*P. elucidatus* (n=5 ♂,♀)	*P. exploratus* (n=5 ♂,♀)	*P. kino* (n=3 ♂,♀)	*P. waeringi* (n=5 ♂,♀)
Ratio length/width Mean (STDEV) ♂					
Telson: vesicle	1.67 (0.04)	1.36 (0.07)	1.48 (0.15)	1.46 (0.10)	1.35 (0.05)
Pedipalp: chela	4.17 (0.39)	4.79 (0.16)	5.31 (0.09)	4.68 (0.27)	4.96 (0.16)
Ratio length/width Mean (STDEV) ♀					
Metasomal segment V	1.87 (0.16)	1.84 (0.10)	1.82 (0.27)	2.04 (0.04)	1.53 (0.04)
Telson: vesicle	1.56 (0.13)	1.12 (0.09)	1.36 (0.26)	1.51 (0.04)	1.44 (0.03)
Pedipalp: femur	3.16 (0.8)	3.25 (0.10)	2.94 (0.07)	3.10 (0.08)	3.06 (0.11)
Pedipalp: chela	4.12 (0.6)	4.04 (0.12)	4.05 (0.19)	4.16 (0.28)	4.86 (0.17)
Ratio length/width Mean (STDEV) ♂ and ♀					
Metasomal segment V	1.78 (0.12)	1.93 (0.09)	1.90 (0.11)	2.10 (0.04)	1.76 (0.10)
Telson: vesicle	1.62 (0.08)	1.24 (0.04)	1.42 (0.08)	1.48 (0.04)	1.40 (0.06)
Ratio length/height Mean (STDEV)					
Telson: vesicle ♂	2.47 (0.06)	2.09 (0.11)	3.09 (0.12)	1.93 (0.18)	2.15 (0.24)
Telson: vesicle ♀	2.36 (0.09)	2.25 (0.16)	2.88 (0.11)	1.85 (0.13)	2.21 (0.04)
Width Mean (STDEV) ♂					
Pedipalp: femur	1.32 (0.15)	1.25 (0)	1.25 (0.10)	1.26 (0.22)	1.38 (0.08)
Pedipalp: patella	1.60 (0.18)	1.50 (0)	1.43 (0.07)	1.50 (0.26)	1.60 (0.09)
Pedipalp: chela	1.83 (0.31)	1.39 (0.05)	1.27 (0.09)	1.53 (0.25)	1.50 (0.09)
Width Mean (STDEV) ♀					
Pedipalp: femur	1.58 (0.08)	1.45 (0.21)	1.53 (0.07)	1.15 (0.56)	1.65 (0.19)
Pedipalp: patella	1.97 (1.10)	1.80 (0.20)	1.78 (0.08)	1.50 (0.78)	1.94 (0.14)
Pedipalp: chela	2.20 (0.06)	1.95 (0.28)	1.92 (0.19)	1.50 (0.50)	2.08 (0.19)
Pectinal count Range (Mode)					
Pectines ♂	17–19 (18)	16–17 (16)	17–19 (19)	15–16 (16)	16–18 (17)
Pectines ♀	13–15 (14)	12–14 (13)	12–14 (13)	12–13 (12)	13–16 (14)

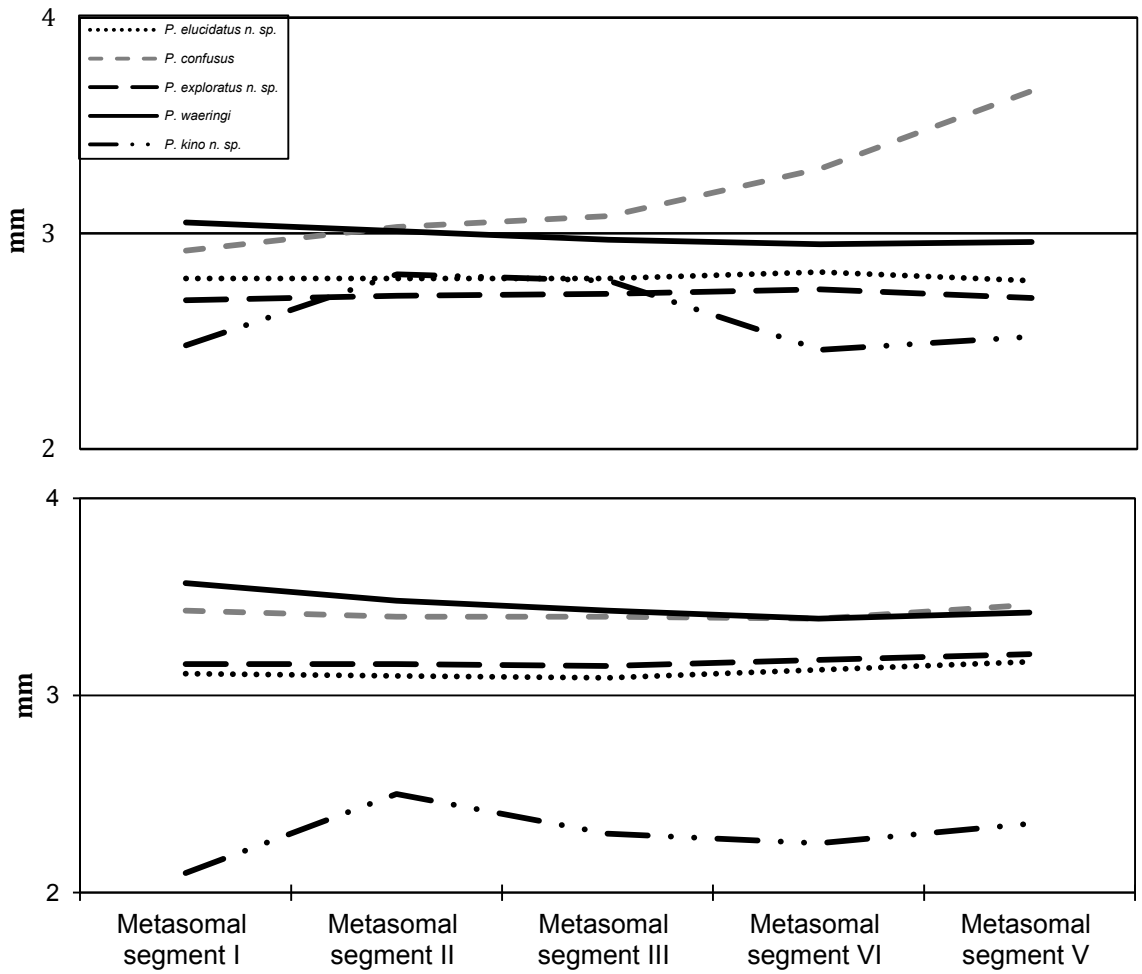


Figure 362. Plot of the width of metasomal segments I–V of ♂ (upper box) and ♀ (lower box) of *Paravaejovis confusus* (Stahnke, 1940), *Paravaejovis elucidatus*, **n. sp.**, *Paravaejovis exploratus*, **n. sp.**, *Paravaejovis kino*, **n. sp.**, and *Paravaejovis waeringi* (Williams, 1970) (n=10, except *Paravaejovis kino*, **n. sp.**).

Paravaejovis diazi (Williams, 1970)

Figures 352, 363–365, 408D, 415A, 418C, 419C, 424D, 427C, 430C

Vejovis diazi Williams, 1970c: 307–313, fig. 19, 20; 1970d: 410; Soleglad, 1973b: 359; Stahnke, 1974: 135.

Vaejovis diazi diazi: Williams, 1970a: 415; 1980: 59, 60, fig. 55A, 61, 62; Sissom, 2000: 531, 532; McWest, 2009: 19, tab. 1, 41, 55, 56, figs. 153–157, 58, 59, 117.

Vejovis diazi transmontanus: Williams, 1970a: 415–417; Díaz-Nájera, 1975: 6, 14; Williams, 1980: 55, 60, fig. 55A, 62, 63; Kovařík, 1998: 146; Sissom, 2000: 532.

Vaejovis diazi: Díaz-Nájera, 1975: 6, 14; Williams, 1980: 55, 58–60, fig. 55A, 61–63; Kovařík, 1998: 146; Beutelspacher, 2000: 80, 137, 153, map 53; Sissom, 2000: 531; Sissom and Hendrixson, 2005a: 128, tab. 6.2; Jiménez-Jiménez and Palacios-Cardiel, 2010: 74.

Vaejovis diazi "form" *transmontanus*: Beutelspacher, 2000: 80, 137, 153, map 53.

Hoffmannius diazi diazi: Soleglad and Fet, 2008: 4, 73, 91.

Hoffmannius diazi transmontanus: Soleglad and Fet, 2008: 91.

TYPE MATERIAL: **MEXICO: Baja California Sur:** *Vejovis diazi diazi*: Holotype ♂ (CAS, Type No. 10413), 34.4 km W El Crucero [Ciudad Constitución], 26.vii.1968, S.C. Williams and M.A. Cazier. Paratypes: 10 ♂, 10 ♀ (CAS, including ♀ allotype), same locality as holotype; 568 ♂, 826 ♀ (CAS), numerous additional specimens from other localities in Baja California Sur.

Vaejovis diazi transmontanus: Holotype ♂ (CAS, Type No. 10414), Punta San Telmo, 26.v.1969, S.C. Williams, coastal sand dunes. Paratypes: 7 ♂, 3 ♀ (CAS), same locality as holotype.

DIAGNOSIS: *P. diazi* is closely related to *P. nigroguerreroensis*, **n. sp.**, *P. voluptatis*, **n. sp.**, *P. pumilis*, *P. eusthenura*, and *P. hoffmanni*, with which it forms a monophyletic group (see *P. nigroguerreroensis*, **n. sp.** for details). *P. diazi* can be distinguished from *P. voluptatis*, **n. sp.** and *P. pumilis* by having rows of trichobothria V_{1-4} and Eb_{1-3} separate and distinguishable, and trichobothria *ib* and *it* on proximal third to median third of fixed finger, at or close to RD6 or between RD6 and RD5, instead of having trichobothria $V{+}Eb_{13-17}$ merge and undistinguishable, and trichobothria *ib* and *it* at base of fixed finger, proximal to associated macroseta of RD7. Additionally *P. diazi* can be separated from these species by having trichobothria *d* and *i* of pedipalp femur proximal, instead of having them distal. From *P. voluptatis*, **n. sp.**, *P. pumilis* and *P. nigroguerreroensis*, **n. sp.** may be separated by having five retrolateral denticles and five rows of median denticles in pedipalp fixed finger, instead of having six retrolateral denticles and six rows. From *P. eusthenura* can be distinguished by having telson and pedipalp manus moderately hirsute with five or less macrosetae in each carina, instead of having seven or more in each carina. *P. eusthenura* further differs from *P. diazi* by having ventral lateral of metasomal segments I–IV crenulated, instead of having this carina of metasomal segments I and II costate and smooth, and III and IV costate and smooth on proximal two thirds and weakly crenular on distal third. From *P. hoffmanni* differs by having proximal notch and median lobe of pedipalp fixed finger moderate, instead of lacking scallop. From *P. nigroguerreroensis*, **n. sp.**, differs by having metasomal segment V less than 2.0 times longer than wide in ♂, instead of having metasomal segment V more than 2.5 times longer than wide.

DESCRIPTION: This description supplements Williams' (1970c) original description and is based on the material mentioned below.

Color and infuscation: Base color uniformly yellow straw. Lacking infuscation. Median and lateral ocular tubercles moderately infuscate. Pectines pale whitish. Aculeus reddish.

Carapace: Carapace 1.19 times longer than posterior width. Anterior margin sublinear, with vestigial medial notch and three pairs of major macrosetae. Carapace shagreened, densely cover by minute and enlarge granules. Median ocular tubercle moderately raised. Superciliary carinae weak and smooth as height as median eyes. Position of median ocular tubercle on anterior half of carapace. Three pairs of lateral eyes, first anterior pair slightly larger than second pair and third pair half the size of first pair. Median eyes approximately two times the size of first lateral frontal pair. Anteromedian sulci deep with an anterior depression; posteromedian deep, anterolateral obsolete, posterolateral deep, posterior transverse vestigial to weak.

Sternum and coxal region: Sternum pentagonal subequilateral with three pairs of setae, one distal, two median pairs and one pair on the lobes, surface matte, median notch deep. Coxal region with scatter matte spots in ♂, in ♀ smooth. Anterior margin of coxa II entirely cover with scatter moderate and minute granules, subbasally three oblique slit-like structures, adjacent to a low granular protuberance. Proximal margin of coxal endite II with a deep depression each, median edge finely granular. Coxa IV 2.25 times longer than coxa II.

Chelicerae: Dorsal surface smooth, subdistal margin of manus with one macrosetae; distal margin with costate. Serrula present on ventral distal half of movable finger, tines numbering 12–14.

Pedipalps: Trichobothrial pattern Type C, orthobothriotaxic. Chela wider than patella, patella wider than femur. Femur: All intercarinal surfaces matted. Dorsal prolateral and dorsal retrolateral complete strongly granular with conical enlarged granules; ventral prolateral strongly granular with conical enlarged granules; retrolateral dorsosubmedian obsolete expressed by five

macrosetae on distal two thirds; retrolateral ventral vestigial expressed by row of enlarge granules; ventral prolateral and ventral retrosubmedian, vestigial expressed by a row of scatter crenatoserrate granules; prolateral ventrosubmedian vestigial, expressed by a bicuspid proximal enlarged spiniform tubercles followed by three to five irregular conical tubercles, subbasal and distal with a macroseta on top and few moderate intersperse granules; prolateral ventral vestigial expressed by a bicuspid proximal enlarged spiniform tubercle with a macroseta on top followed by two enlarged conical tubercles with a macroseta on base.

Patella: All intercarinal surface matte, except retrolateral smooth. Dorsal prolateral complete irregularly crenulate; ventral prolateral complete strong with enlarge subserrate granules; dorsal retrolateral complete weakly costate smooth; ventral retrosubmedian complete strong, weakly crenulated; retrolateral dorsosubmedian obsolete; ventral median vestigial, expressed by a proximal short irregular row of fine granules; prolateral median on a vaulted projection, protruding strongly medially, expressed by a proximal tubercle and a row of fine scatter granules, proximal, median and distal granules with a macroseta on top, the granules end at the level of trichobothrium *i*, followed by a smooth gap slanting gently towards subdistal end of dorsal prolateral carinae; prolateral ventral obsolete expressed by three major macrosetae adjacent to ventral prolateral carinae.

Chela: Manus smooth and incrassate in ♂, in ♀ elongate (chela 2.06–2.21 times longer than fixed finger). Intercarinal surface smooth. All other carinae obsolete. Trichobothrium *Db* positioned on dorsal retrolateral carina, subbasal on chelae; *Dt* positioned at mid manus.

Fingers: Fixed finger, PD = 6, MD rows = 6, RD = 6, proximal RD positioned by proximal third. All RD subpaired with corresponding PD. Movable finger, PD = 7, MD rows = 7, distal row bearing one minute granule, RD = 7, proximal RD positioned by proximal third. All

RD subpaired with corresponding PD. Trichobothria *ib* and *it* positioned subbasal on fixed finger, *ib* positioned between PD6 and PD7, PD7 lacking granule, *it* at the level of PD6 in ♂, in ♀ *ib* and *it* adjacent to PD6. Trichobothria series *db–dt* and *eb–et* distributed along the entire length of fixed finger. Trichobothria *db* and *eb* positioned basal on fixed finger. Fingers with moderate to strong scallop in ♂, proximal notch of fixed finger moderate, medina lobe weak, proximal notch of movable finger moderate and median lobe weak, gap created when fingers closed strong, fingers fit unevenly, in ♀ fingers with weak scalloping, proximal notch weak and medina lobe of fixed finger obsolete, proximal notch and medina lobe of fixed finger obsolete, gap created when fingers closed weak.

Legs: Spinules: Basitarsi I–II prolateral ventral, retrolateral ventral and retrolateral dorsal carinae with complete rows of spinules; prolateral ventral in III vestigial with few distal spinules, and IV absent; retrolateral ventral in III complete, spinules scatter, in IV absent; retrolateral dorsal carinae in III and IV vestigial, expressed as a row of spinules on distal thirds; retrolateral median rows in I–IV vestigial expressed as few terminal spinules. Telotarsi I–IV with two pairs of ventrodistal spinules in I–IV. Setae: Prolateral ventral, 3:4:4:5; retrolateral ventral, 3:7:10:8, intersperse minor and major macrosetae; retrolateral dorsal, 2:3:4:3; dorsal, 5:4:4:4; retrolateral dorsal and dorsal series in I and IV arranged in two independent rows, in II and III arranged in a sublinear row being dorsal median slightly offset, in ♀ I-III arranged in a sublinear row being dorsal median slightly offset, in IV dorsal and dorsal series arranged in two independent rows and macrosetae visibly more elongate.

Tergites: Pretergites matte, postergites with dorsal submedian carinae intercarinal surface matte, other surface shagreened with scattered coarse granules. Dorsal median and ventral submedian carinae in tergites I–VI vestigial expressed by few distal moderate to enlarge granules

on distal half. Tergite VII intercarinal surface shagreened, with few scattered moderate granules and dense minute granules; dorsal median carina moderately costate with few moderate granules, expressed on proximal half of the postergite; dorsal submedian vestigial expressed as a low short pair of proximal short oblique row of three or four granules; dorsal lateral and lateral supramedian comparatively stronger and complete; dorsal lateral carinae projecting and curving with scattered granules laterally approximating to lateral supramedian proximal margin, creating a semi horse show of strong and subserrated granules.

Genital operculum: Male genital operculum: wider than long, with three pairs of macrosetae. Sclerites free on longitudinal edge moving independently but unable to open more than 45°. Genital papillae protruding posteriorly. Female genital operculum: Wider than long, with three macrosetae. Sclerites fuse longitudinal.

Sternites: Sternites III–VII acarinated finely punctuated, and lustrous. Sternite V and VII lacking distal median glandular spot in both sexes. Sternite VII with ventral lateral carinae vestigial, expressed by a weak costa and two pairs of macrosetae; other carinae obsolete expressed by macrosetae. Spiracle elongated, slit-like, approximately two times longer than wide.

Pectines: Basal piece with median notch deep, with three pairs of macrosetae. Marginal lamella consist of three sclerites, medial lamella proximally fuse distally progressively forming a conspicuous rows of 7–9 beads. Fulcra with 24–26in ♂, in ♀ 20–22 beads. Pectinal tooth count 25–27 in ♂, in ♀21–23. Pectines relatively short, distal sclerite of marginal lamella slightly longer than coxa IV in ♂, in ♀ at the level of distal edge of coxa IV.

Hemispermatophore: Lamina 1.79 longer than trunk. Dorsal through margin long, narrow, curving proximally, and removed from ventral trough. Hemimating plug developed from

the inner lobe, distal barb margin with 10 elongated spinules. Primary and secondary hook positioned on the apex of lateral margin extension of the lamina (flange). Both hooks rounded low, separated slightly, forming a shallow notch. Median lobe ental terminus moderate and rounded. Basal plate of inner lobe removed from ventral trough. Spine of inner lobe moderate, secondary spine on ventromedian aspect of neck absent. Neck relatively short (0.40 times longer than basal plate). Measurements, lamina, 3.00; trunk, 1.68; dorsal trough/laminar hooks, 0.90; ventral trough/laminar hook, 0.48; neck, 0.24; basal plate, 0.60.

Metasoma: Intercarinal surfaces weakly matte to smooth lustrous, except dorsal intercarinal surface of segments I–III with scatter moderate few medial granules, ventral and lateral intercarinal surface of V moderately distal half shagreened with dense minute and moderate granules. Metasoma 1.4 times longer than mesosoma. Metasomal segments I–III wider than long. Carinae: Dorsal lateral and lateral median carinae in I–IV strongly crenatoserrated terminating in moderate enlarge spinoid granules pointing backwards; except lateral median in IV distal terminus strongly expanded laterally forming a triangular projection; dorsal lateral in V moderately crenatoserrate proximally, becoming weaker, medially with a field of fine crenulation, ending on at smooth costa. Lateral inframedian in I complete strongly crenatoserrated; in II incomplete moderately crenatoserrated, becoming weaker proximally, present on distal half, in III incomplete moderately crenatoserrated, becoming weaker proximally, present on distal third; in IV absent, in V vestigial with a proximal tubercle followed by moderate crenatoserrate granules, becoming weaker distally, present in distal two thirds; ventral lateral in I–IV moderately costate and smooth in proximal two thirds, distal third finely crenular, ventral submedian in I–IV vestigial weakly costate; ventral lateral and ventral median moderately crenatoserrate. Setae: In ♀, dorsal lateral, 0:1:3:4:8; lateral median, 0:1:1:2; lateral

inframedian, 1:0:0:0:3; ventral lateral, 2:2:2:3:6; ventral submedian, 2:2:2:3:2; ventral sublateral, 2.

Telson: Dorsal and ventral surface smooth lustrous, proximal ventral margin with low and broad crenulations. Ventral surface with 6–7 macrosetae. Ventral median carinae with subaculear tubercle obsolete, Microserration on laterobasal aculeus numbering 5–6.

DISTRIBUTION: *Paravaejovis diazi* is endemic to Baja California Sur, Mexico. It is distributed on both sides of the Sierra de la Giganta in low sandy valleys and drainages from San Rymundo area to Los Cabos, including the Magdalena Plain and the coastal flatlands created by deltas of intermittent rivers and other drainages to the Cortez Sea and Pacific Ocean. *P. diazi* also occurs on the following islands: El Carmen, Espiritu Santo, Magdalena, San José, San Francisco, and Partida.

ECOLOGY: *Paravaejovis diazi* is most common at lower elevations, from sea level to 305 m. According to Williams (1970c), in the Magdalena Plain *P. diazi* lives in relatively flat, rock-free terrain, where the soil was sedimentary, fine-textured, and moderately packed. In other parts of the geographic range, this species was found in predominantly rocky, volcanic habitats with loosely packed soils. Three morphological characters tended to vary over the geographic range: telson hirsuteness, body size, and emphasis of underlying dark pigment on the carapace and mesosomal dorsum. This is one of the most commonly encountered scorpions throughout much of its range. William's description and morphology (setal combs, pale coloration, and lack of infuscation) of this species is concordant with a psammophilous ecomorphotype.

REMARKS: Williams created the subspecies *Paravaejovis diazi transmontanus* Williams, 1970 to accommodate a population situated on the east side of the Sierra de la Giganta, at Punta San Telmo. Clearly, Williams assumed that Sierra de la Giganta was the product of a vicariant

event isolating the populations on the east (*transmontanus*) and west (typical form) flanks promoting the split of this species. Williams diagnosed *P. d. transmontanus* using one character: color of telson yellow instead of reddish as in *P. d. diazi*. The yellow telson was found in specimens along the distributional range and he noted a gradation from red to yellow in several specimens. Additionally, the results of the phylogenetic analyses conducted in chapter 1 and 4 consistently rejected the hypothesis of two lineages in this species on each flank of Sierra de la Giganta. Williams (1980) also reported the two subspecies inhabiting Espiritu Santo and Partida Islands, which most likely represent varieties of the same species. Base on this evidence, I proposed in chapter 1 the following synonym: *Vaejovis diazi transmontanus* Williams, 1970 = *Paravaejovis diazi* (Williams, 1970).

The type locality called El Crucero at the time S.C. Williams and M.A. Cazier collected the type material, changed to Ciudad Constitution officially between 1971 and 1972, (Enciclopedia de los Munícipios de México: http://www.e-local.gob.mx/work/templates/enciclo/EMM03bajacaliforniasur/municipios/03001a.html).

MATERIAL EXAMINED: **MEXICO: Baja California Sur:** *Municipio de Comondú*: Ciudad Constitución, 32 km W, 26 m, 11.vii.2004, 24°55'17"N 111°58'5.5"W, E. González, O. Francke, W.E. Savary, and A. Valdez, 5 ♂, 7 ♀, 22 juv. (AMNH), 1 ♀, 1 juv. (AMNH [LP 3165]), 24°55.2828'N 111°58.08'W, A. Valdez, E. González, O. Francke, and W.E. Savary, desert, on ground, collected at night with UV light, 2 ♂, 4 ♀, 1 subad. ♂, 3 subad. ♀, 3 juv. (AMNH [ARA2563]), 1 ♂, 2 ♀, 4 subad. ♂, 4 juv. (CAS [ARA1518]), 2 ♂, 2 ♀, 1 subad. ♂, 4 subad. ♀, 2 juv. (IBUNAM [ARA2055]); Ciudad Constitución, 43 km W, 24°51.7662'N 112°3.8328'W, 7 m, 11.vii.2004, A. Valdez, E. González, O. Francke, and W.E. Savary, collected at night with UV light, 2 ♂, 2 ♀, 1 subad. ♂, 1 subad. ♀, 4 juv. (AMNH [ARA2562]), 1 ♂, 1 ♀, 2 juv. (CAS

[ARA1517]), 1 ♂, 1 subad. ♂, 1 subad. ♀, 4 juv. (IBUNAM [ARA2054]), 24°51'46"N 112°3'50.8"W, E. González, O. Francke, W.E. Savary, and A. Valdez, 1 ♂, 1 ♀, 19 juv. (AMNH); S of El Cayuco “Fish Camp”, 24°34.6716'N 111°40.6446'W, 23 m, 24.v.2004, R. Mercurio and M. Nishiguchi, collected at night with UV light, 6 ♂, 2 ♀ (AMNH [ARA3133]), 2 ♂ (AMNH [LP 3481]), 1 juv. (AMNH [LP 3482]); El Cayuco Fish Camp, sand dunes, 24°34.6656'N 111°40.6326'W, 6 m, 11.vii.2005, W.E. Savary, E. González, L. Prendini, and R. Mercurio, desert, on ground, collected at night with UV light, 1 ♂, 2 ♀, 16 juv. (AMNH [LP 4425]), 1 ♂, 9 ♀ (AMNH [ARA2564]), 5 ♀ (CAS [ARA1519]), 1 ♂, 9 ♀ (IBUNAM [ARA2056]); 11.vii.2005, San Rymundo 8 miles NW, [26°30'24.55"N 112°30'14.64"W], 30.vi.1968 Cazier et al., 1 ♂, 1 ♀ (AMNH); San Hilario, 1.6 km SW, 26°12.1860'N 111°46.86'W, 274 m, 7.xi.1972, E.L. Sleeper and F.J. Moore, 1 ♂ (OSAL); Villa Constitución, 71 km S, [25°3.12950'N 111°40.230833'W], 30.i.1965, V. Roth, 2 ♂, 1 ♀ (AMNH); Isla Magdalena, [25°21'58.68"N 112°6'15.38"W], W. López-Forment, 3.ii.1979, 3 ♀ (IBUNAM), 31.iii.2010, 2 ♀ (IBUNAM). *Municipio de La Paz*: El Coyote, 2.3 km W, [24°20'29.48"N 110°16'24.43"W], A. Leviton, 31.xii.1959, 1 ♀ (AMNH), 30.xii.1958, 2 ♀ (AMNH); El Pilar, 2.4 km N, 24°28.7616'N 111°1.12'W, 305 m, 7.xi.1972, E.L. Sleeper and F.J. Moore, 1 ♂ (OSAL); El Pilar, ca. 20 km NE of Las Pocitas, 24°28.762'N 111°01.125'W, 92 m, 25.vi.2008, H. Montaño and E. González, desert, collected at night with UV light, 1 ♀, 1 subad. ♂, 1 subad. ♀, 2 juv. (AMNH [ARA2876]), 2 ♂, 6 ♀, 1 subad. ♂, 2 juv. (IBUNAM [ARA2264]), 1 ♀ (AMNH [LP 8805]); El Tecolote, 24°20.259'N 110°18.580'W, 2 m, 21.v.2004, R. Mercurio, M. Nishiguchi et al., collected at night with UV light, 2 ♂, 1 ♀ (AMNH [LP 3480]), 20 ♂, 3 ♀ (AMNH [ARA3137]); Isla Espiritu Santo, [24°30'N 110°22'W], W. López-Forment, 9.iv.2001, 1 ♀ (IBUNAM), 4.ii.2007, 1 ♂ (IBUNAM), 2.ii.2008, 1 ♂, 2 ♀ (IBUNAM), 1.iii.2009, 4 ♀

(IBUNAM); Isla Espíritu Santo, Playa Bonanza, 24°27.3636'N 110°18.47'W, 0–50 m, 31.v.2008, E. González and I.G. Nieto, desert, collected at night with UV light, 6 ♂, 6 ♀, 6 juv. (AMNH [ARA2861]), 6 ♂, 6 ♀, 6 juv. (IBUNAM [ARA2246]), 1 juv. (AMNH [LP 8799]); Isla San Francisco, [24°50'N 110°35'W], W. López-Forment, 12.i.2004, 2 ♂ (IBUNAM), 26.i.2004, 2 ♂ (IBUNAM), 23.xii.2005, 1 ♀ (IBUNAM), 2.i.2006, 1 ♂ (IBUNAM); Isla San José, Fishing camp Palma Sola, 25°3.0906'N 110°40.0368'W, 50 m, 3.vi.2008, E. González and I.G. Nieto, desert, collected at night with UV light, 2 ♂, 6 ♀, 2 juv. (AMNH [ARA2866]), 2 ♂ (AMNH [ARA2867]), 2 ♂, 6 ♀, 2 juv. (IBUNAM [ARA2251]), 3 ♂ (IBUNAM [ARA2252]); Isla San José, W side, 24°56.7216'N 110°38.9076'W, 0–50 m, 2.vi.2008, E. González and I.G. Nieto, desert, collected at night with UV light, 16 ♂, 11 ♀, 8 juv. (AMNH [ARA2916]), 15 ♂, 11 ♀, 9 juv. (IBUNAM [ARA2289]), 1 ♂ (AMNH [LP 8781]); La Huerta, 4 km E, 24°4.0020'N 110°13.00'W, 670 m, 9.x.1972, E.L. Sleeper and F.J. Moore, 1 ♂ (OSAL); La Paz, [24°10.00'N 110°18.00'W], V. Roth, 1–3.ii.1965, 2 ♀ (AMNH), 2–3.ii.1966, 1 ♂, 5 ♀ (AMNH), 8.x.1972, E.L. Sleeper and F.J. Moore, 6 ♂, 1 ♀ (OSAL); La Paz, 13 km SE, 24°10.0020'N 110°18'W, 305 m, 14.x.1972, E.L. Sleeper and F.J. Moore, 3 ♂, 3 ♀, 2 subad. ♀ (OSAL); La Paz, 18 km SE, 24°2'45.9"N 110°8'51.9"W, 626 m, 8.vii.2004, O. Francke, E. González, and A. Valdez, collected at night with UV light, 1 ♂, 1 ♀, 7 juv. (AMNH); La Paz, 21 km NW, on road to Rodríguez, [24°2'45.9"N 110°8'51.9"W], 1.viii.1959, A. Leviton, 1 juv. (AMNH); La Paz, 51 km NW, 24°5'56.2"N 110°4.3'41"W, 256 m, 7.vii.2004, O. Francke, E. González, and A. Valdez, desert, on ground, collected at night with UV light, 2 ♂, 4 ♀ ,1 subad. ♂, 1 subad. ♀, 7 juv. (AMNH [ARA2560]), 1 ♂, 3 ♀, 1 subad. ♂, 3 juv. (CAS [ARA1515]), 2 ♂, 3 ♀, 3 subad. ♀, 5 juv., (IBUNAM [ARA2052]), 6 ♂, 9 ♀, 21 juv. (AMNH); La Paz, 75 km NW, 24°05'56.2"N 110°45'41"W, 114 m, 7.vii.2004, O. Francke, E. González, and A. Valdez, desert, on ground,

collected at night with UV light, 2 ♂, 1 ♀, 14 juv. (AMNH), 1 ♂ (AMNH [LP 3169]), 1 ♂, 1 ♀, 1 subad. ♀, 5 juv. (AMNH [ARA2561]), 1 subad. ♀, 2 juv. (CAS [ARA1516]), 1 ♂, 1 ♀, 2 subad. ♀, 2 juv. (IBUNAM [ARA2053]); La Paz, ca. 20 km N, junction Route 1 and road to San Juan de La Costa, 24°13.383'N 110°35.766'W, 20 m, 9.vii.2005, E. González, W.E. Savary, L. Prendini, and R. Mercurio, desert, on ground, collected at night with UV light, 2 ♀ (AMNH [ARA2566]), L. Prendini, E. González, W.E. Savary, and R. Mercurio, 1 subad. ♂, 2 subad. ♀ (AMNH [LP 4414]); La Paz, ca. 38 km N, 1 km off Route 1 on Ley Federal de la Reforma Agraria, 24°03.609'N 110°36.777'W, 256 m, 9.vii.2005, W.E. Savary and E. González, collected at night with UV light, 1 ♀, 2 juv. (AMNH [LP 4423]), 2 ♀ (IBUNAM [ARA2058]); La Paz, ca. 5 km N, junction Route 1 and road to San Juan de la Costa, 24°08.500'N 110°28.566'W, 30 m, 9.vii.2005, W.E. Savary, E. González, L. Prendini, and R. Mercurio, collected at night with UV light, 2 ♀, 3 juv. (AMNH [LP 4436]), 1 ♂, 2 ♀ (AMNH [ARA2565]), 1 ♂, 2 ♀ (IBUNAM [ARA2057]); Las Cruces, 17.7 km NW, [24°13.5108'N 110°7.41'W], 122 m, 6.xii.1972, E.L. Sleeper and F.J. Moore, 1 ♂ (OSAL); Las Cruces, 4 km NW, 24°13.5108'N 110°7.41'W, 31 m, 24.vi.2008, H. Montaño and E. González, desert, collected at night with UV light, 3 ♂, 15 ♀, 8 juv. (AMNH [ARA2847]), 3 ♂, 14 ♀, 9 juv. (IBUNAM [ARA2234]), 1 ♀ (AMNH [LP 8804]); San Evaristo, 10–15 km S, dirt road, 24°47.757'N 110°40.502'W, 27–50 m, 12.vii.2008, H. Montaño and E. González, scrub-thorn and cacti, arroyo and sand banks, collected at night with UV light, 1 ♂ (AMNH [LP 8831]); San Evaristo, 5 km S, 24°52.901'N 110°41.404'W, 5–50 m, 12.vii.2008, H. Montaño and E. González, sand dunes, collected at night with UV light, 2 ♂, 5 ♀, 21 juv. (AMNH [ARA2850]), 2 ♂, 5 ♀, 20 juv. (IBUNAM [ARA2247]), 1 ♂ (AMNH [LP 8839]); Santa Rita, 3.2 km SE, [23°43.9980'N 110°13.99'W], 305 m, 17.xi.1972, E.L. Sleeper and F.J. Moore, 2 subad. ♀ (OSAL). *Municipio de Loreto*: Santa Anita, 5 km N, [23°9'N

109°43'W], 152 m, 2.xii.1972, E.L. Sleeper and F.J. Moore, 1 subad. ♂ (OSAL); Los Barriles, 5.6 km W, [23°36.3120'N 109°40.70'W], 152 m, 3.xii.1972, E.L. Sleeper and F.J. Moore, 1 subad. ♀ (OSAL); Isla del Carmen, [25°58'49.19"N 111°10'0.98"W], 6.i.2011, W. López-Forment, 1 ♀ (IBUNAM). *Municipio de Los Cabos*: Puerto Gatos, [25°19'N 110°57'W], 24.iii.2009, W. López-Forment, 1 ♀, 3 juv. (IBUNAM); Isla San José, [25°0.2167'N 110°37.8'W], 0–50 m, W. López-Forment, 26.ii.2009, W. López-Forment, 1 subad. ♂ (IBUNAM); 31.xii.2004, 1 juv. (IBUNAM). **Baja California:** *Municipio de Ensenada*: Misión San Luis Gonzaga, [24°54'29.76"N 111°17'29.89"W], 14.ii.1966, V. Roth, 1 ♀ (AMNH).

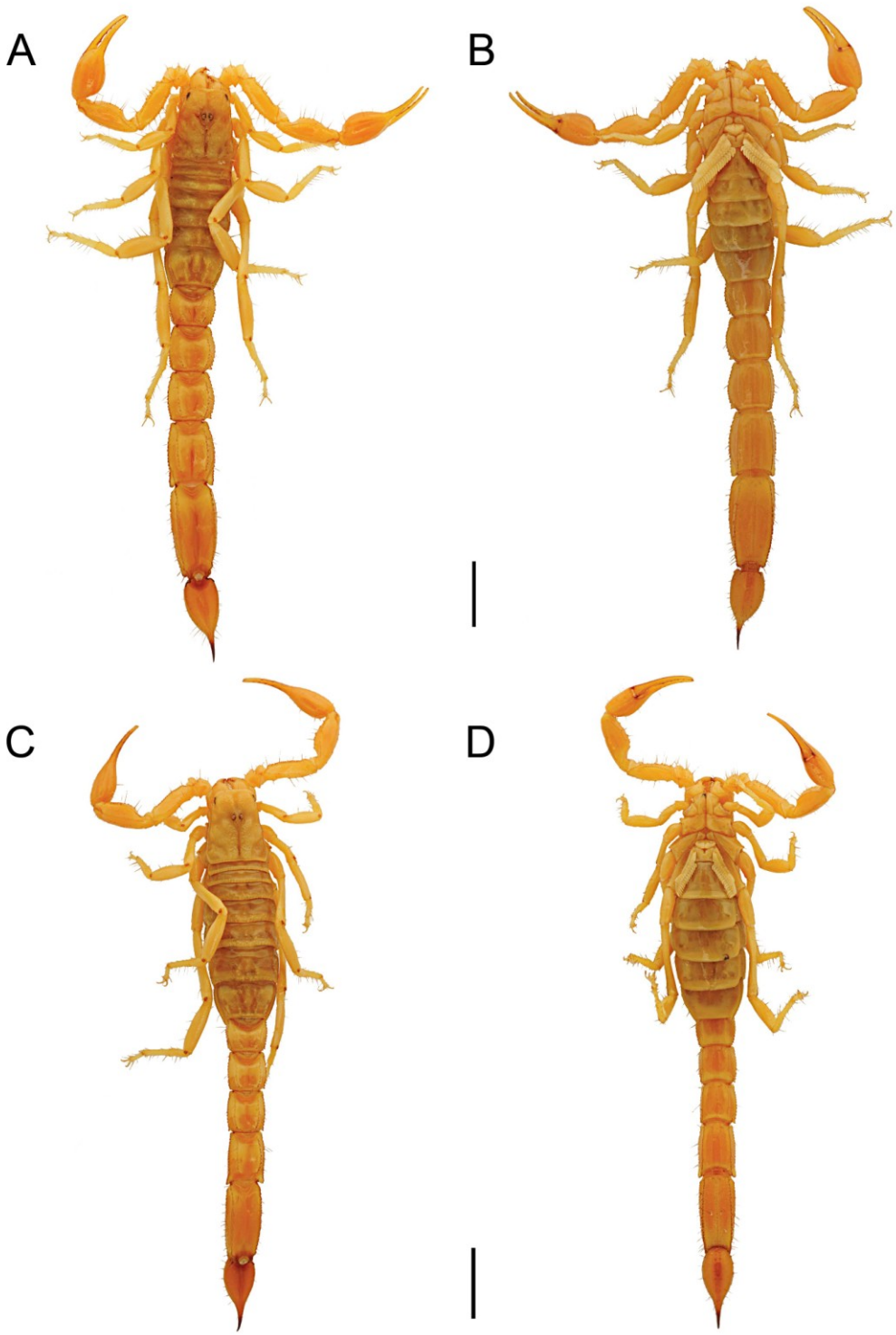


Figure 363. *Paravaejovis diazi* (Williams, 1970), habitus. **A**, **B**. Paratype ♂ (AMNH). **C**, **D**. ♀ (AMNH). **A**, **C**. Dorsal aspect. **B**, **D**. Ventral aspect. Scale bars = 5 mm.

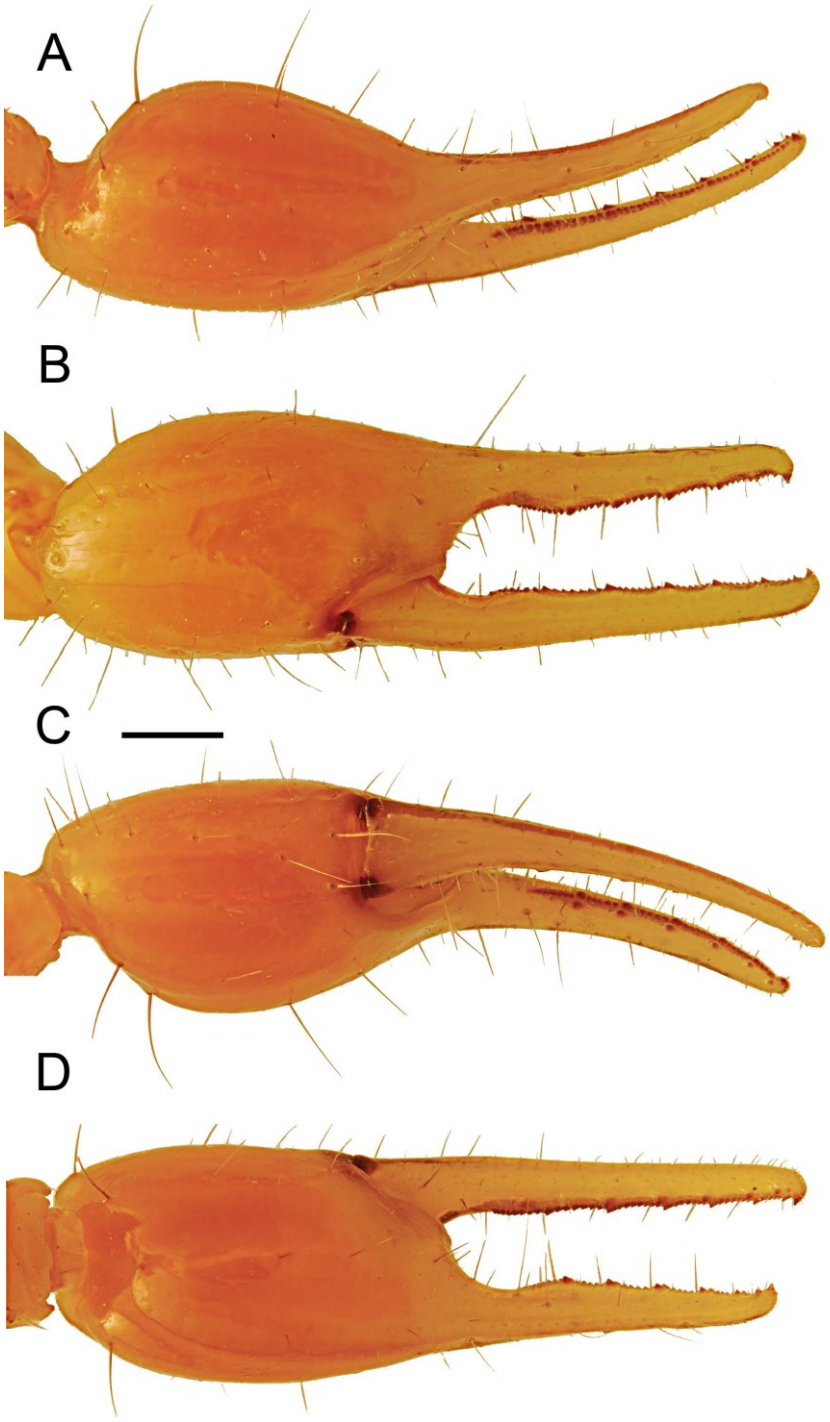


Figure 364. *Paravaejovis diazi* (Williams, 1970), paratype ♂ (AMNH), dextral pedipalp chela. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

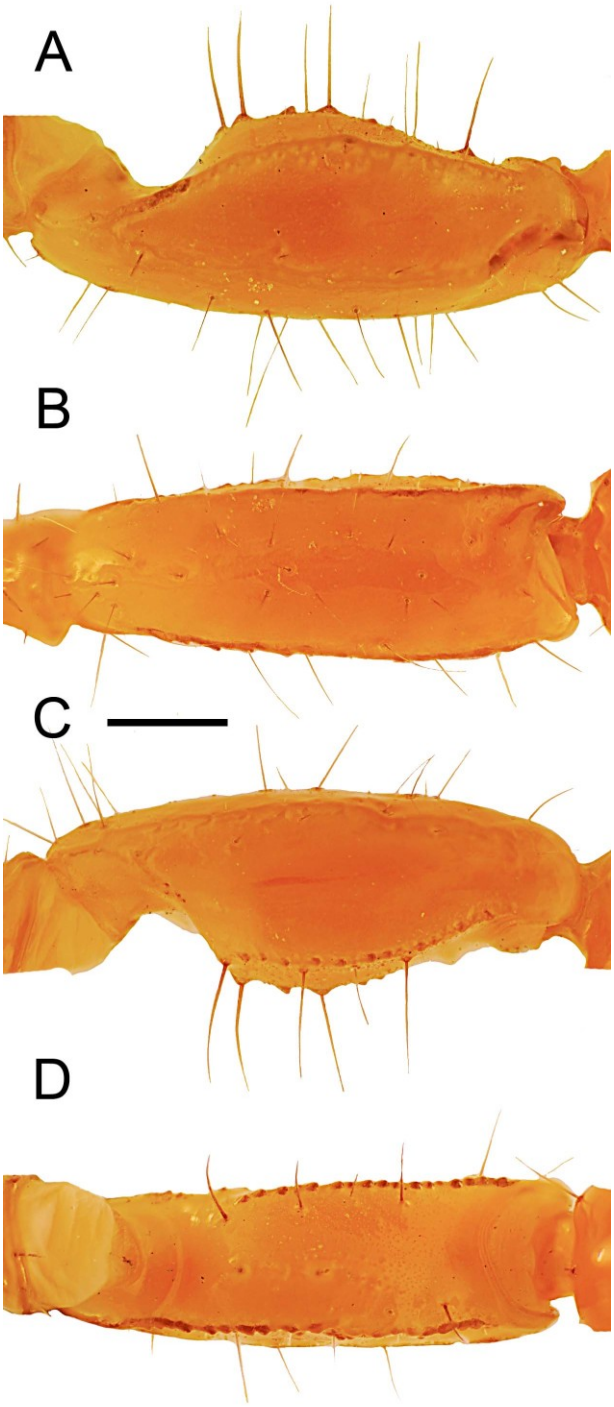


Figure 365. *Paravaejovis diazi* (Williams, 1970), paratype ♂ (AMNH), dextral pedipalp patella. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

Paravaejovis elucidatus, **n. sp.**

Figures 350, 362, 366–368, 409A, 415B, 418D, 419D, 425A, 427E, 430D; Table 16, 17

Vaejovis confusus: Allred, 1973a: 16; Allred, 1973b: 252; Allred, 1975: 406, tab. 4; Allred and Gertsch, 1975: 93–96, 99, tab. 7, Polis and McCormick, 1987: 333, 335, tab. 2, 3, 11, fig. 4; Fet et al. 1998: 615, tab. 3; McWest, 2009: 117, tab. 1, 2.

TYPE MATERIAL: **U.S.A.: California:** *Fresno Co.*: Holotype ♂ (AMNH) Panoche Road, 5 km W junction with Little Panoche Road, 36°36.8856'N 120°56.62'W, 23.x.2006, W.E. Savary and E. González, grassland, on ground, collected at night with UV light. Paratypes: 1 ♀, 2 subad. ♀ (AMNH [ARA1190]), same locality as holotype; 3 ♀, 3 subad. ♂, 3 subad. ♀ (AMNH [ARA1189]), J-1, 5.3 km SE, on access road to Panoche Hills, 36°42.4998'N 120°49.2828'W, 22.x.2006, W.E. Savary and E. González, grassland, on ground, collected at night with UV light; 1 subad. ♀ (IBUNAM), Panoche Hills, 36°42'30.40"N 120°49'17.70"W, 22.x.2006, W.E. Savary and E. González, grassland; 1 subad. ♂ (IBUNAM), Panoche Hills, 3.38 km along unpaved access road, 36°43'09.31"N 120°50'07.76"W, 22.x.2006, W.E. Savary and E. González, grassland; 1 subad. ♀ (AMNH [ARA1191]), Panoche Hills, 3.4 km along unpaved access road, 36°43.1496'N 120°50.1162'W, 22.x.2006, W.E. Savary and E. González, grassland, on ground, collected at night with UV light; 3 ♂, 2 ♀ (AMNH [ARA1188]), Panoche Valley, along Little Panoche Road, 7 km N of junction with Panoche Road, 36°40.0020'N 120°52.1706'W, 23.x.2006, W.E. Savary and E. González, grassland, on ground, collected at night with UV light; 3 ♂, 4 ♀, 1 juv. (AMNH [ARA1187]), Panoche Valley, along Panoche Road, 1.6 km E of junction with little Panoche Road, 36°36.2958'N 120°51.5106'W, 23.x.2006, W.E. Savary and E. González, grassland, on ground, collected at night with UV light; 6 ♂, 1 ♀ (AMNH

[ARA2535]), W Panoche Road, 8-16 km, W of I-5, 36°34.6662'N 120°44.0832'W, 374 m, 24.viii.2006, J. Huff, grassland, on ground, collected at night with UV light.

ETYMOLOGY: The species name *elucidatus* is a Latin adjective meaning clear up, enlighten, or explain. The name refers to the clarification of the species complex *P. confusus* Stahnke, 1940, which is split in three species, *P. elucidatus*, **n. sp.** being one of them.

DIAGNOSIS: *Paravaejovis elucidatus*, **n. sp.** is closely related to *P. confusus*, *P. exploratus*, *P. kino* and *P. waeringi* with which it forms a monophyletic group. These species may be distinguished from the other species in the genus by having elongated fingers with trichobothria *ib–it* in the medial third of the fixed finger, *ib* being at or close to PD6 and *it* between PD5 and PD6; carinae ventral submedian I–IV costate crenulated to finely granulated, setal combs on basitarsus I–III. *Paravaejovis elucidatus*, **n. sp.** differs from the above species by having dorsal retrolateral carinae of pedipalp chela, strongly costate with irregular fine crenulation, predominantly crenulated instead of smooth as in the other species. Pedipalp carinae dorsal retrosubmedian accessory, dorsal media/dorsal retrosubmedian, dorsal prolateral, and prolateral median costate, strongly angular, with fine crenulation, and scattered moderate granules, not weak, smooth to weakly crenulated. *Paravaejovis elucidatus*, **n. sp.** and *P. waeringi* are similar in having relatively wide vesicle of telson in ♂ but differs from *P. waeringi* and the other species by having the widest vesicle of telson in ♀ (table 16). *Paravaejovis elucidatus*, **n. sp.** further differs from the other species having pedipalp femur relatively slender (table 16). *P. elucidatus*, **n. sp.** and *P. exploratus* share relatively wider pedipalp chela in ♀ than the other species but differ in other morphometric ratios (table 16). *P. elucidatus*, **n. sp.** is the only species with lateral margin extension of the lamina trough and axial hook of the hemispermatophore partially fused (bilobed), not completely fuse and without an unguiform

unique hook as the other species. The surface of metasomal segment V in *P. elucidatus*, **n. sp.** is heavily shagreened, and tends to have more and larger granules than the other species. Pedipalp and metasomal segments with a mix of major and minor, but predominately minor macrosetae.

DESCRIPTION: The following description is based on the types and the specimens listed in material examined.

Color and infuscation (in alcohol): Base of color pale yellow, immaculate, lacking infuscation, if present very diffuse.

Carapace: Carapace anterior margin sublinear with a shallow median notch. Entire surface shagreened, dense minute and moderately large granules over most of the surface including sulci. Anterior edge with three pairs of minor spiniform macrosetae. Anteromedian and posteromedian sulcus moderate. Median ocular tubercle raised, with superciliary carinae granular, higher than median eyes. Three lateral eyes, two frontal pairs same size and posterior reduced approximately in half.

Sternum and coxal region: Sternum pentagonal subequilateral with three pairs of setae, one distal pair, one medial pair, and one pair on the lobes, median notch deep. Anterior margin of coxa II with three oblique slit-like structures, adjacent to a moderate protuberance with few fine granules, rest of the margin finely granulated. Base of coxal endite II with a broad depression each.

Chelicerae: Dorsal surface smooth, dentition of fixed and movable fingers as in typical Syntropinae. Subdistal margin of manus with one median macrosetae each. Serrula with 8 tines.

Pedipalps: Trichobothrial pattern Type C, orthobothriotaxic. Pedipalp segment average ratio length/wide (n=5), femur 3.21, patella 2.83, chela 4.79 in ♂, in ♀ femur 3.25, patella 2.71, chela 4.04 in ♂. Males with patella wider than chela and femur, in ♀ patella wider than chela and

femur. Femur: dorsal retrolateral, dorsal prolateral, and ventral prolateral carinae moderate and granular, retrolateral dorsosubmedian finely crenulated with three macrosetae becoming smaller distally, prolateral ventral complete, with scattered enlarged irregular granules without setae, prolateral ventrosubmedian expressed by few enlarged scattered granules on the proximal half of the segment and with three spiniform minor macrosetae, being the basal most larger than the others, ventral median vestigial with enlarged serrated granules, ventral retrosubmedian and retrolateral ventral vestigial expressed by few proximal enlarged scattered serrated granules. All intercarinal surfaces matte, covered with densely minute granules.

Patella: Intercarinal surfaces matte, covered with densely minute granules. Carinae, dorsal retrolateral dorsal prolateral, ventral retrolateral, and ventral prolateral carinae strongly granular, all retrolateral carinae obsolete, prolateral median and prolateral ventrosubmedian on a vaulted projection protruding above prolateral surface, complete arching towards the subdistal end of the dorsal prolateral carinae, with enlarged conical denticles and two spiniform macrosetae, being the basal one larger than the terminal, prolateral ventral carina obsolete indicated by a proximal tubercle and two macrosetae, being the basal one larger than the terminal.

Chela: Carinae, prolateral, prolateral dorsal, dorsal median, dorsal retrosubmedian accessory, dorsal retrolateral, prolateral median, and prolateral ventrosubmedian carinae strongly crenulated mix with irregular fine granulation, other carinae smooth to finally crenulated. Pedipalp manus slender, being patella slightly wider than chela.

Fingers: Fixed finger dentition: PD = 6, RD = 6, MD rows = 6; movable finger PD = 7, RD = 7, MD rows = 7, distal row with one median denticle. Trichobothrium *ib* positioned at the level of PD6 and *it* positioned between and PD5 and PD6. Trichobothria series *db–dt* and *eb–et*

distributed along the entire length of fixed finger. Trichobothria *db* and *eb* subbasal on fixed finger. Fingers lacking scalloping, gap created when fingers closed moderate, fingers fit unevenly in both sexes.

Legs: Spinules: Basitarsi I–II with prolateral ventral and retrolateral ventral carinae with complete rows of spinules; prolateral ventral in III and IV complete; retrolateral ventral in III and IV absent; retrolateral median rows in I–IV vestigial expressed as few terminal spinules; retrolateral dorsal in I–IV absent. Telotarsi I–IV ventrodistal, median and basal series of spinules spiniform and short, two pairs of ventrodistal spinules in I–IV. Setae: Prolateral ventral, 4:4:4:4, distal small and delicate; retrolateral ventral, 3:5:8:6, in III setae major and minor; retrolateral dorsal, 4:4:4:4; dorsal, 4:4:4:4; retrolateral dorsal and dorsal series arranged in a sublinear row forming setal combs with dorsal median setae offset. In ♂ all setae minor, in ♀ all setae major.

Tergites: All pretergites matte, densely covered by minute granules and postergite shagreened, with coarser granules. Median carinae absent in I, moderate to strong and granular in II–VI. Dorsal submedian carinae weak but granular. Tergite VII with dorsal median carina strong on proximal half and granular. Dorsal submedian as a pair of proximal blobs strongly granular. Dorsal lateral, lateral supramedian, and lateral inframedian strong and moniliform. All intercarinal surfaces with scattered granules.

Genital operculum: Male genital operculum: wider than long, with five pairs of macrosetae. Sclerites free on longitudinal edge moving independently but unable to open more than 45°. Genital papillae protruding posteriorly. Female genital operculum: Wider than long, with three macrosetae. Sclerites fuse longitudinal.

Sternites: Sternite III–VI acarinated matte. Sternite VII acarinated except ventral lateral carinae, which is strong and finely crenulated and with three pairs of setae. Ventrosubmedian

obsolete with two pairs of setae, lateral ventral vestigial expressed as a proximal small tubercle with one seta. Posteromedian third of sternite VII with a weak but visible whitish glandular spot, slightly protruding from adjacent surfaces.

Pectines: Distal margin of marginal lamella in ♂ evidently longer than distal margin of coxa VI, in ♀ slightly longer than distal margin of coxa VI. Basal piece in with three pairs of macrosetae. Marginal lamella consist of three sclerites, median lamella proximally fuse and with two rows of beads, one upper short subbasal with one to three beads and one lower complete row with 15–17 beads. Fulcra with 15–17 in ♂ and 11–13 beads in ♀. Pectinal tooth counts 16–18 in ♂, 12–14 ♀.

Hemispermatophore: Hemimating plug developed from the inner lobe, distal barb margin with 19 spinules. Dorsal through margin long, tapering and curving proximally. Primary and secondary hook positioned on the apex of the lateral margin extension of the lamina (flange), these two partially fused with trough hook slightly higher than axial carinae hook. Lamina 1.36 longer than trunk. Median lobe ental terminus moderate and rounded. Spine of inner lobe short. Neck shorter than basal plate (0.45). Measurements, lamina, 3.63; trunk, 2.66; dorsal trough/laminar hooks, 1.00; ventral trough/laminar hook, 0.50; inner lobe (mating plug) neck, 0.36; basal plate, 0.80. Ratio dorsal laminar hook/ventral trough = 2.00; lamina length/ventral trough = 7.26

Metasoma: Segments I–III and V with same wide, IV slightly wider than others in ♂, in ♀ progressively wider. Segment ratios length/wide (n=5), in ♂: I, 0.91, II, 1.08, III, 1.16, IV, 1.49, V, 2.01; in ♀: 0.94, II, 1.02, III, 1.08, IV, 1.41, V, 1.84. Carinae: Dorsal lateral and lateral median carinae I–IV serrated, terminus in I–II with a short to moderate spiniform projection, IV lateral median carinae with terminus moderate flared, V granular, mid segment with clusters of

granules becoming moniliform both distal- and proximally. Intercarinal surfaces between dorsal lateral carinae almost smooth just few scattered granules. Lateral supramedian I–III vestigial, with one to three distal granules. Lateral inframedian in I complete strong and serrated, in II present on distal half, serrated, becoming obsolete proximally, in III present on distal third, serrated, and becoming obsolete proximally, in IV absent, in V present on proximal third strong, serrated, and becoming obsolete proximally. Ventral lateral carinae I–V complete, moderate and crenatoserrate. Ventral submedian in I–IV complete, moderate, and finely crenatoserrate, becoming stronger in distal segments. Ventral median V, complete strong, and granular. Setae: Dorsal lateral, 0:0:1:1:3; lateral median, 0:1:1:2; lateral inframedian, 0:0:0:0:2; ventral lateral, 2:2:2:2:3; ventral submedian, 2:3:3:3:2; ventral sublateral, 3. All setae minor and all intercarinal surfaces matte, densely finely granular.

Telson: Vesicle relatively globose, (n=5) 1.36 times longer than wide in ♂ and 1.12 times in ♀. Lateral microserration at base of the aculeus with 9 sharp tines. Aculeus (n=5) short, 5.74 times shorter than telson in ♂ and 5.45 time in ♀. Subaculear tubercle vestigial to absent. Ventral carinae and intercarinal surfaces with broad flattened granules, each carina with two pairs of setae. Dorsal surface completely smooth and glabrous. Microserration on laterobasal aculeus numbering 3/3.

DISTRIBUTION: *Paravaejovis elucidatus*, **n. sp.** is endemic to the Mohave Desert, including the states of California and Nevada, U.S.A.

ECOLOGY: As in the other species of this complex, *P. elucidatus*, **n. sp.** is adapted to sandy habitats. It was collected from 103–1787 m altitude. This is a typical species of the Mojave Desert, considered a warm desert.

REMARKS: The number of prolateral denticles on the pedipalp movable finger varies from 6–7 sometimes even in the same specimen. This variation is consistent with other species of *Paravaejovis* such as *P. confusus* (Stahnke, 1940) and *P. spinigerus* (Wood, 1863) as reported by Sissom (1991b). The degree of crenulation and granulation in pedipalp chela varies considerably, however dorsal carinae are never predominantly smoother than crenular or granular. Similarly, ventral submedian carinae vary from fine crenulations to strong granulation.

MATERIAL EXAMINED: **U.S.A.: California:** *Fresno Co.*: J-1, 5.3 km SE, on access road to Panoche Hills, 36°42.4998'N 120°49.2828'W, 22.x.2006, W.E. Savary and E. González, grassland, on ground, collected at night with UV light, 3 ♀, 3 subad. ♂, 3 subad. ♀ (AMNH [ARA1189]); Panoche Hills, 36°42'30.40"N 120°49'17.70"W, 22.x.2006, W.E. Savary and E. González, grassland, 1 subad. ♀ (IBUNAM); Panoche Hills, 3.38 km along unpaved access road, 36°43'09.31"N 120°50'07.76"W, 22.x.2006, W.E. Savary and E. González, grassland, 1 subad. ♂ (IBUNAM); Panoche Hills, 3.4 km along unpaved access road, 36°43.1496'N 120°50.1162'W, 22.x.2006, W.E. Savary and E. González, grassland, on ground, collected at night with UV light, 1 subad. ♀ (AMNH [ARA1191]); Panoche Road, 5 km W junction with Little Panoche Road, 36°36.8856'N 120°56.62'W, 23.x.2006, W.E. Savary and E. González, grassland, on ground, collected at night with UV light, 1 ♂, 1 ♀, 2 subad. ♀ (AMNH [ARA1190]); Panoche Valley, 10 km W of Route 5, Little Panoche Road J1, 36°45'32.0"N 120°51'05.5"W, 240 m, 24.viii.2004, R. Mercurio, W.E. Savary, M. McCoy, and K. Bamba, along roadside, 1 ♂ (AMNH [LP 3225]); Panoche Valley, along Little Panoche Road, 7 km N of junction with Panoche Road, 36°40.0020'N 120°52.1706'W, 23.x.2006, W.E. Savary and E. González, grassland, on ground, collected at night with UV light, 3 ♂, 2 ♀ (AMNH [ARA1188]); Panoche Valley, along Panoche Road, 1.6 km E of junction with little Panoche Road, 36°36.2958'N 120°51.5106'W, 23.x.2006,

W.E. Savary and E. González, grassland, on ground, collected at night with UV light, 3 ♂, 4 ♀, 1 juv. (AMNH [ARA1187]); W Panoche Road, 8-16 km, W of I-5, 36°34.6662'N 120°44.0832'W, 374 m, 24.viii.2006, J. Huff, grassland, on ground, collected at night with UV light, 6 ♂, 1 ♀ (AMNH [ARA2535]), 2 ♀ (AMNH [LP 6294]). *Imperial Co.*: Palo Verde, 8.7 km S, [33°25.96667'N 114°43.933'W], 5.vi.1972, Berkenkamp and O. Francke, 2 juv. (AMNH). *Inyo Co.*: Alabama Hills Recreational Area, 11 km W Lone Pine, 36°35.991'N 118°11.005'W, 1787 m, 5.ix.2005, L. Prendini and R. Mercurio, collected at night with UV light, 1 ♂ (AMNH [LP 5018]); Alabama Hills Recreational Area, 3.2 km W Lone Pine, 36°35.712'N 118°06.175'W, 1324 m, 5.ix.2005, R. Mercurio and L. Prendini, collected at night with UV light, 2 juv. (AMNH [LP 5016]), 1 ♂ (AMNH [ARA1438]); Death Valley National Park, Grapevine Canyon, Saline Valley Road, 36°33.5898'N 117°35.2098'W, 1290 m, 4.ix.2005, R. Mercurio and L. Prendini, collected at night with UV light, 1 ♂ (AMNH [ARA1437]), 1 juv. (AMNH [LP 5040]); Death Valley National Park, Mesquite Springs Campground, 36°57.783'N 117°22.257'W, 529 m, 3.ix.2005, L. Prendini and R. Mercurio, collected at night with UV light, 2 juv. (AMNH [LP 5015]); Death Valley National Park, Saline Valley dunes, just off Saline Valley Road, 36°45.1878'N 117°51.79'W, 343 m, 4.ix.2005, R. Mercurio and L. Prendini, sand dunes, collected at night with UV light, 2 ♂ (AMNH [ARA1445]), 6 juv. (AMNH [LP 5020]); Death Valley National Park, Saline Valley Marsh, at junction of Saline Lake Road and road to Salt Lake, 36°41.0778'N 117°48.97'W, 330 m, 4.ix.2005, R. Mercurio and L. Prendini, desert, collected at night with UV light, 1 ♂ (AMNH [ARA1185]); Death Valley National Park, Saline Valley Road, dunes S of Salt Lake, 36°40.659'N 117°46.198'W, 337 m, 4.ix.2005, R. Mercurio and L. Prendini, desert, collected at night with UV light, 2 juv. (AMNH [LP 5022]), 2 ♂ (AMNH [ARA1182]); Death Valley National Park, South Pass, junction of Saline Valley Road and

Hunter Mountain Road, 36°36.2250'N 117°38.07'W, 836 m, 4.ix.2005, R. Mercurio and L. Prendini, desert, collected at night with UV light, 2 ♂ (AMNH [ARA1184]), 2 ♂ (IBUNAM [ARA2118]); Death Valley National Park, Travertine Springs, 36°26.409'N 116°49.834'W, 103 m, 2.ix.2005, R. Mercurio and L. Prendini, collected at night with UV light, 1 subad. ♀ (AMNH [LP 5041]), 36°26.4090'N 116°49.8336'W, 1 ♂ (AMNH [ARA1183]); NW side of Glacier Lodge Road, former pitfall trap site of D. Guiliani, 37°09'38.31"N 118°18'28.46"W, 1296 m, 6.viii.2008, Z.J. Valois, W.E. Savary, and D. Guiliani, low, open, rolling flats, sandy-loamy soil with large boulders, overgrazed by livestock, 1 juv. (AMNH [LP 8903]); Tungsten Hills, Tungsten road, near Tungsten mine, 37°21.3636'N 118°31.7058'W, 1536 m, 6.ix.2005, R. Mercurio and L. Prendini, collected at night with UV light, 1 ♂ (AMNH [ARA1436]). *Kern Co.*: E of Onyx, S side of SR-178, Walker Pass Road, 35°41'43.15"N 118°13'2.25"W, 844 m, 5.viii.2008, Z.J. Valois and W.E. Savary, few scattered oak, pine, juniper, sage steppe, foothills, among granite outcrops, 1 ♂ (AMNH [LP 8877]); Jawbone Canyon Road, 8 km NW intersection with Hwy 14, 35°19.0332'N 118°4.8498'W, 790 m, 13.ix.2007, L. Prendini and J. Huff, collected at night with UV light, 2 ♂ (AMNH [ARA3126]), 1 ♂ (IBUNAM [ARA2375]), 1 subad. ♂ (AMNH [LP 7273]); Jawbone Canyon Road, 8.5 km NW intersection with Hwy 14, 35°18.8496'N 118°5.3328'W, 808 m, 13.ix.2007, L. Prendini and J. Huff, collected at night with UV light, 3 ♂ (AMNH [ARA3123]), 3 ♂ (IBUNAM [ARA2374]), 1 ♂ (AMNH [ARA3101]); SE of Walker Pass, NE side of SR-178, Walker Pass Road, 35°38'36.54"N 117°59'8.29"W, 1369 m, 5.viii.2008, Z.J. Valois and W.E. Savary, Mohave desert scrub near chaparral integration, Joshua trees, creosote, sand-gravel, low rolling slopes and interconnected washes , 1 juv. (AMNH [LP 8874]); SW of Red Rock Canyon State Park, Alpine Canyon off Gold Canyon Road, 35°20'29.0"N 118°04'48.4"W, 880 m, 16.viii.2004, W.E. Savary, R. Mercurio, K. Bamba,

and M. McCoy, 2 ♂ (AMNH [LP 3228]). *Los Angeles Co.*: 10 km N of 138 between Pearblossum and Little Rock, 34°35'51.1"N 117°57'05.8"W, 815 m, 19.viii.2004, K. Bamba, M. McCoy, W.E. Savary, and R. Mercurio, 1 juv. (AMNH [LP 3220]), 31 ♂, 2 ♀, 1 subad. ♂ (AMNH [ARA3135]); 10 km N of 138 between Pearblossum and Little Rock, E of 110th Street, 34°36'07.8"N 117°54'29.7"W, 809 m, 19.viii.2004, K. Bamba, M. McCoy, W.E. Savary and R. Mercurio, 3 ♂, 1 juv. (AMNH [LP 3221]). *Riverside Co.*: Windy point, 8 km N of Palm spings, [33°49.4333'N 116°31.81666'W], 31.viii.1975, G.A. Polis, 2 juv. (AMNH). *San Benito Co.*: E of Paicines, Antelope Valley, Panoche Pass, 36°39'38.7"N 121°06'40.2"W, 465 m, 24.viii.2004, K. Bamba, M. McCoy, W.E. Savary, and R. Mercurio, 1 ♂ (AMNH [LP 3224]); Griswold Creek Canyon New Idria Road, 6 km S intersection with Panoche Road, 36°33'46.0"N 120°50'07.4"W, 352 m, 15.ix.2007, J. Huff, 2 juv. (AMNH); Griswold Hills, Griswold Creek Canyon, New Idria Road, 6 km S intersection with Panoche Road, 15.ix.2007, 36°33.3330'N 120°50.4498'W, 390 m, L. Prendini and J. Huff, collected at night with UV light, 5 ♂, 1 ♀, (AMNH [ARA3127]), 5 ♂ (IBUNAM [ARA2377]), 4 ♂, 1 ♀, 1 subad. ♀ (AMNH [ARA3116]), 36°33'20.8"N 120°50'27.0"W, 390 m, L. Prendini, J. Huff, and W.E. Savary, dry rocky canyon with sagebrush and grassy slopes, scattered sandstone boulders and sandstone cliffs, 2 juv. (AMNH [LP 7130]), 1 subad. ♂ (IBUNAM), 36°33'46.0"N 120°50'07.4"W, 352 m, L. Prendini, J. Huff, and W.E. Savary, dry creek with degraded rocky slope to E, dry grassland, 1 juv. (AMNH [LP 7123]), 1 subad. ♀ (IBUNAM); Griswold Hills, New Idria Road, 6.5 km S intersection with Panoche Road, 36°33.0996'N 120°50.3832'W, 407 m, 15.ix.2007, L. Prendini and J. Huff, collected at night with UV light, 1 ♂ (AMNH [ARA3113]), 1 ♂ (IBUNAM). *San Bernardino Co.*: Frontage Road, 34°35'16.39"N 117°15'37.03"W, 899 m, 4.viii.2008, Z.J. Valois and W.E. Savary, low washes and rocky slopes, 1 ♂ (AMNH [LP 8902]); SR-247, Barstow Road, 6.96 km NW, on

Lucerne Valley cutoff Road, 34°40'20.49"N 117°03'59.21"W, 1129 m, 4.viii.2008, Z.J. Valois and W.E. Savary, open creosote flats with loamy soil and interconnecting washes , 1 juv. (AMNH [LP 8913]); Twentynine Palms, 33 km E on Hwy 62, 34°6.6498'N 115°41.4498'W, 391 m, 11.ix.2007, L. Prendini and J. Huff, collected at night with UV light, 1 ♂, 1 ♀ (AMNH [ARA3108]); Twentynine Palms, 40 km E on Hwy 62, 34°5.7666'N 115°36.45'W, 521 m, 11.ix.2007, L. Prendini and J. Huff, collected at night with UV light, 2 ♂ (IBUNAM [ARA2277]); Twentynine Palms, 44 km E on Hwy 62, 34°04'37"N 115°34'03.8"W, 572 m, 11.x.2007, L. Prendini, 1 ♂ (AMNH); Twentynine Palms, 45 km E on Hwy 62, 34°04'37.0"N 115°34'03.8"W, 572 m, 11.ix.2007, L. Prendini and J. Huff, Mohave desert, sand dune on N side of sandy wash and sand dune against hillside S side of road, 2 juv. (AMNH [LP 7107]), 1 ♂ (AMNH [LP 7106]); Twentynine Palms, 48 km E on Hwy 62, 34°4.6164'N 115°34.05'W, 572 m, 11.ix.2007, L. Prendini and J. Huff, collected at night with UV light, 3 ♂, 1 ♀ (AMNH [ARA3128]), 2 ♂, 1 ♀, 1 subad. ♀ (IBUNAM [ARA2372]); *Santa Cruz Co.*: Ruby, 2 km SE, 36°58'12.80"N 121°57'47.05"W, 2.iv.1974, M. Kolner, 1 juv. (AMNH). *Tulare Co.*: Lemon Cove, Steve Barton Point, intersection Dry creek Road and Hwy 216, 36°24.0498'N 119°1.7496'W, 159 m, 14.ix.2007, L. Prendini and J. Huff, collected at night with UV light, 10 ♂ (AMNH [ARA3122]), 10 ♂ (IBUNAM [ARA2378]), 1 ♂ (AMNH [LP 7214]), 1 ♀, 1 subad. ♀ (IBUNAM). **Nevada:** *Mineral Co.*: between Garfield Flat Road and Black Dyke Mountain, W of Mina, 38°26.82876'N 118°12.64068'W, 17.viii.2005, L. Iacovelli, collected at night with UV light, 1 ♀ (AMNH [LP 4779]), 1 ♂ (AMNH [LP 4780]); Hawthorne, 38°31.51667'N 118°37.3833'W, 1.ix.2007, 4131 m, 0.87 km of wind-deposited sand, 1 ♀ (AMNH [LP 7252]), 1380 m, 4 ♂ (AMNH [LP 7253]), Z.J. Valois; Hawthorne, 5-17 km N along I-95 near Walker Lake, 38°37'14.5"N 118°44'23.1"W, 1321 m, 23.viii.2006, J. Huff, collected along rocky-sandy

slopes and along flat patches of the same substrate, sparse vegetation, collected at night with UV light, 3 ♂ (AMNH [LP 6292]). *Nye Co.*: Amargosa Desert, sand dunes 1.29 km N California, Nevada border on Route 373 (formerly Route 29), 36°25.949'N 116°25.285'W, 669 m, 2.ix.2005, L. Prendini and R. Mercurio, collected at night with UV light, 1 ♂ (AMNH [LP 5050]); Amargosa Desert, sand dunes 1.3 km N California, Nevada border on Route 373 (formerly Route 29), 36°25.9488'N 116°25.2846'W, 669 m, 2.ix.2005, R. Mercurio and L. Prendini, desert, collected at night with UV light, 1 ♂, 1 subad. ♀ (AMNH [ARA1186]); Mercury, [36°39.7335'N 115°59.4707'W], v-ix.1960, vi-ix.1961, vi-ix.1962, vi-ix.1963, 846 ex. (AMNH), 2.viii.1966, 2 ♂ (IBUNAM), 7.v.1966, 1 ♂ (IBUNAM). *Washoe Co.*: Sparks, Pyramid Way, Hwy 447, ca. 35.4 km from McCarran Boulevard across from shooting range, 39°51'19.1"N 119°39'21.5"W, 1295 m, 22.viii.2006, J. Huff and J. Courting, collected on sandy soil with sparse vegetation, collected at night with UV light, 1 ♂, 1 juv. (AMNH [LP 6293]).

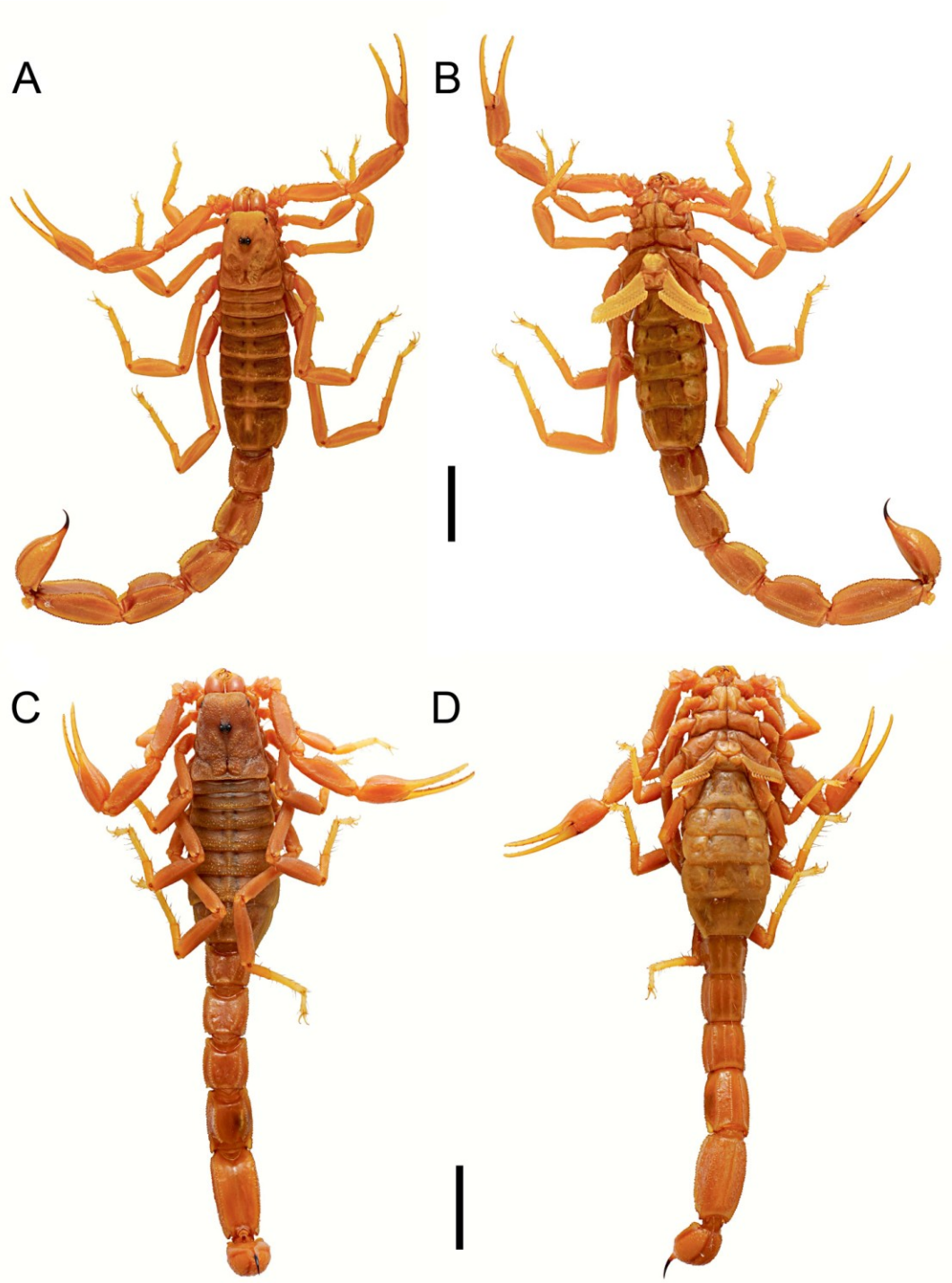


Figure 366. *Paravaejovis elucidatus*, **n. sp.**, habitus. **A**, **B**. Paratype ♂ (AMNH). **C**, **D**. ♀ (AMNH). **A**, **C**. Dorsal aspect. **B**, **D**. Ventral aspect. Scale bars = 5 mm.

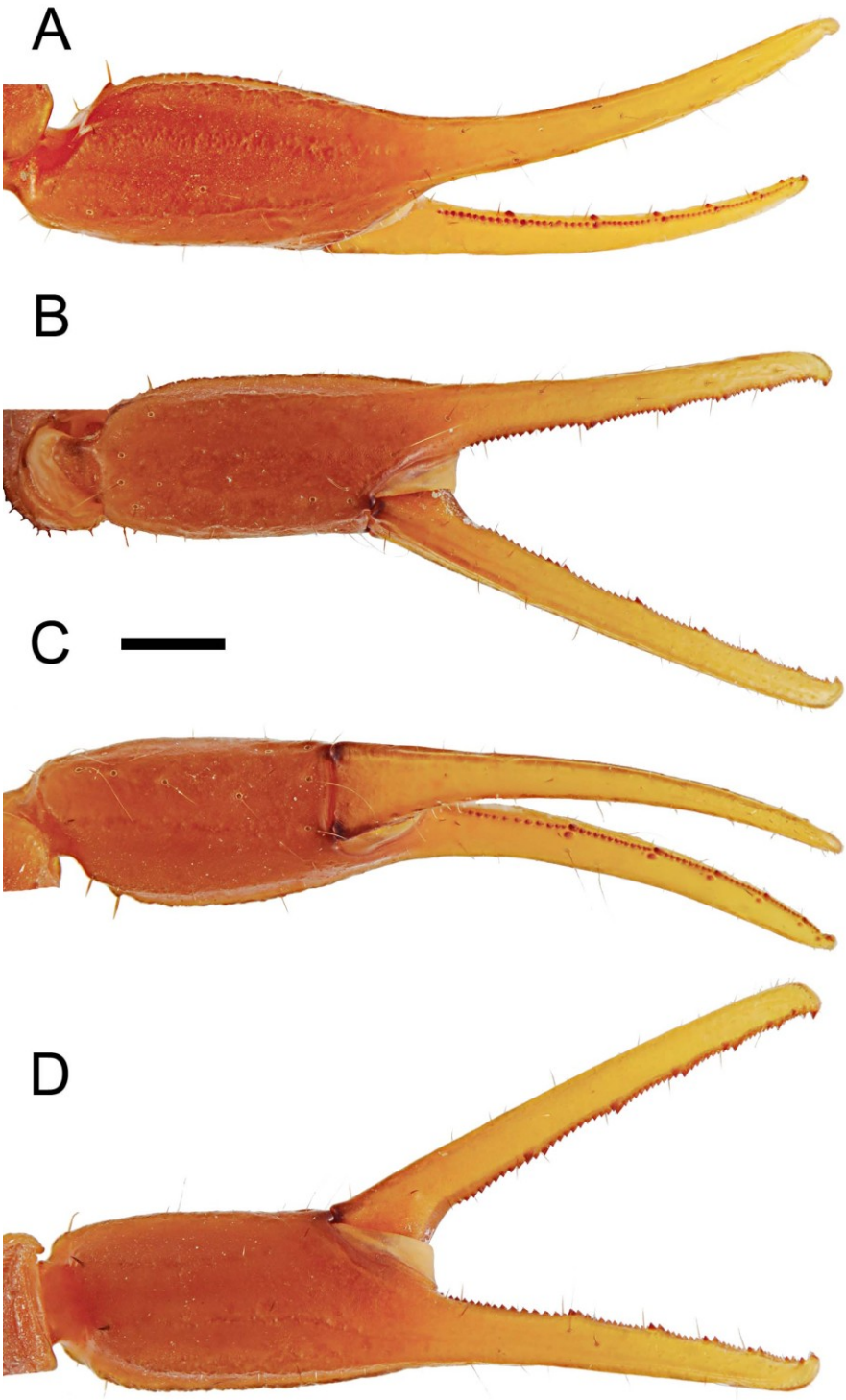


Figure 367. *Paravaejovis elucidatus*, **n. sp.**, paratype ♂ (AMNH), dextral pedipalp chela. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

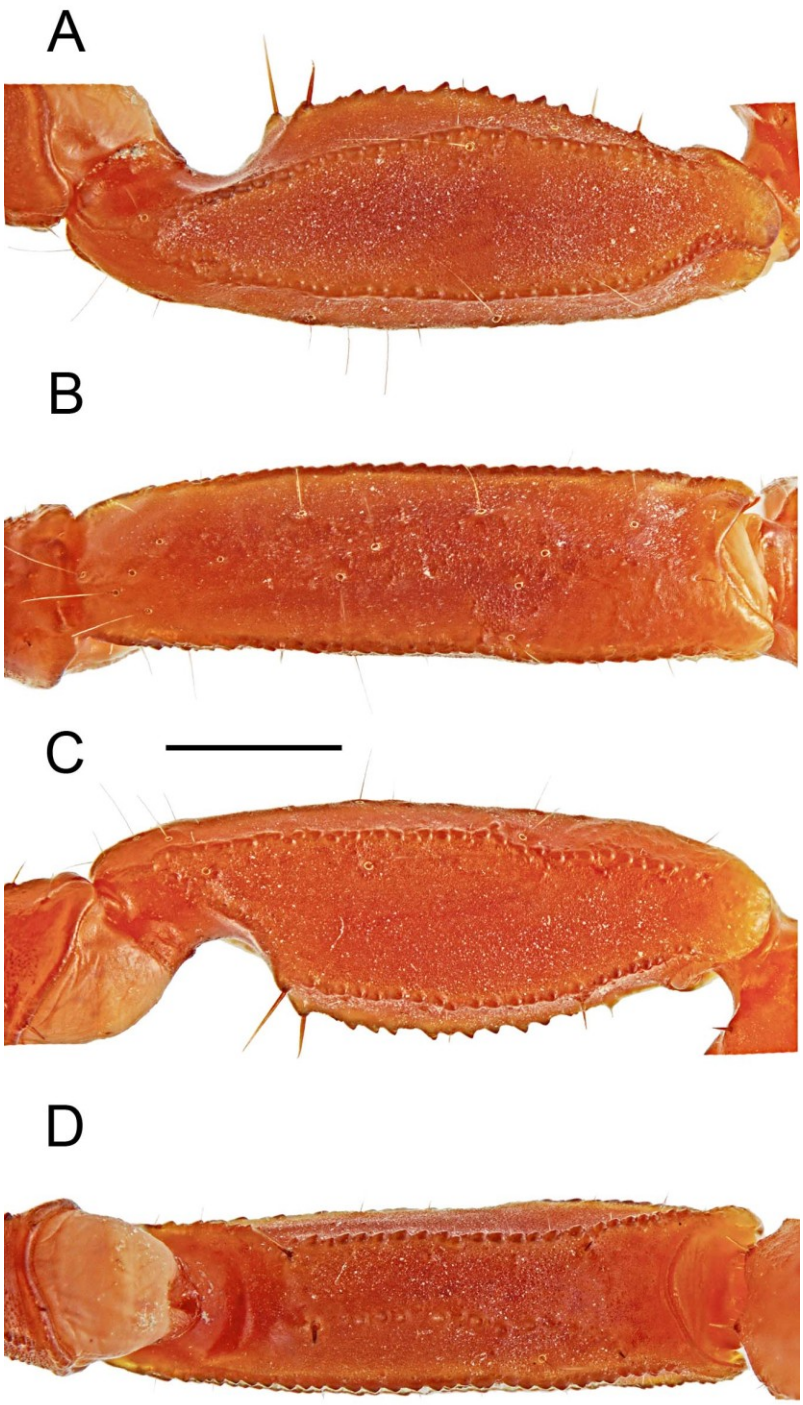


Figure 368. *Paravaejovis elucidatus*, **n. sp.**, paratype ♂ (AMNH), dextral pedipalp patella. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

Table 17. Measurements (mm) of *Paravaejovis cochimi*, **n. sp.**, *Paravaejovis elucidatus*, **n. sp.**, *Paravaejovis exploratus*, **n. sp.**, *Paravaejovis kino*, **n. sp.**, *Paravaejovis nigroguerreroensis*, **n. sp.**, and *Paravaejovis voluptatis*, **n. sp.** Abbreviations: H, Holotype.

	P. cochimi, **n. sp.**, ♂, H, AMNH	*P. elucidatus*, **n. sp.**, ♂, H, AMNH	*P. exploratus*, **n. sp.**, ♂, H, AMNH	*P. kino*, **n. sp.**, ♂, H, IBUNAM	*P. nigroguerreroensis* **n. sp.**, ♂, H, IBUNAM	*P. voluptatis*, **n. sp.**, ♂ H, IBUNAM
Length						
Carapace	6.70	4.50	4.6	4.50	3.50	3.60
Pedipalp: femur	5.50	3.70	3.9	3.85	3.10	2.40
Pedipalp: patella	6.00	4.10	4.3	4.25	3.60	3.00
Pedipalp: chela	9.50	6.20	6.7	6.35	5.60	4.50
Fixed finger	5.00	3.20	3.7	3.30	2.70	1.50
Movable finger	6.20	4.10	4.6	4.20	3.50	2.40
Mesosoma	14.80	9.90	8.3		7.20	7.10
Metasomal segment I	3.50	2.30	2.5	2.45	1.90	2.00
Metasomal segment II	4.30	2.70	3	2.95	2.20	2.40
Metasomal segment III	4.50	3.00	3.1	3.10	2.40	2.60
Metasomal segment IV	6.10	4.00	4.1	4.15	3.20	3.40
Metasomal segment V	7.90	5.40	5.1	5.40	4.80	4.30
Metasoma total	26.30	17.40	23	18.05	14.50	14.70
Telson: vesicle	4.90	3.50	3.3	3.15	3.00	3.10
Telson: aculeus	2.50	1.80	1.9	1.70	1.40	1.40
Telson total	7.40	5.30	5.2	4.85	4.40	4.50
Total L	55.20	37.10	41.10	38.3	29.60	29.90
Width						
Pedipalp: femur	1.60	1.20	1.3	1.25	1.00	1.00
Pedipalp: patella	2.00	1.80	1.4	1.45	1.30	1.30
Pedipalp: chela	2.00	1.30	1.2	1.4	1.70	2.10
Metasomal segment I	4.00	2.70	2.7	2.6	2.10	2.50
Metasomal segment II	4.00	2.70	2.7	2.55	1.90	2.50
Metasomal segment III	4.00	2.70	2.7	2.50	1.90	2.50
Metasomal segment IV	4.00	2.70	2.7	2.45	1.90	2.40
Metasomal segment V	4.00	2.70	2.7	2.35	1.90	2.40
Telson: vesicle	3.50	2.50	2.2	2.25	1.90	2.00
Depth						
Pedipalp: chela	1.90	1.30	1.3	1.75	1.70	2.00
Metasomal segment I	3.50	2.50	2.4	2.3	1.60	2.00
Metasomal segment II	3.50	2.50	2.2	2.3	1.70	2.00
Metasomal segment III	3.80	2.50	2.3	2.3	1.80	2.20
Metasomal segment IV	3.80	2.50	2.5	2.3	1.70	2.20
Metasomal segment V	3.90	2.20	2.5	2.3	1.60	2.00
Telson: vesicle	2.60	1.80	1.7	1.70	1.60	1.90

Paravaejovis eusthenura (Wood, 1863)

Figures 353, 369–371, 409B, 415C, 418E, 419C, 424E, 427D, 431A

Buthus eusthenura Wood, 1863a: 109.

Vejovis eusthenura: Gertsch, 1958: 13, 14; Williams, 1970a: 395; 1970b: 308; Stahnke, 1974: 135.

Vaejovis eusthenura: Díaz-Nájera, 1975: 6, 32; Williams, 1980: 55, 57, figs. 54M, 55B, 59, 60; Polis and Mohnac, 1990: 363, 364; Cokendolpher and Peek, 1991: 96; Sissom, 1993: 68; Kovařík, 1998: 146; Beutelspacher, 2000: 83, 137, 153, map 55; Sissom, 2000: 532; Soleglad and Fet, 2003a: 6, fig. 7; 2003b: 8, 67, 68, tab. 4, 142, 151, fig. B-1, 152, fig. B-2, 161, 163; Ponce-Saavedra and Sissom, 2004: 539, 541; Sissom and Hendrixson, 2005a: 128, tab. 6.2; Fet et al., 2006c: 269, 271, tab. 1; McWest, 2009: 7, fig. 20, 10, 19, tab. 1, 55–57, 101, 104, 116, 117; Jiménez-Jiménez and Palacios-Cardiel, 2010: 72, tab. 1.

Hoffmanius eusthenura: Soleglad and Fet, 2008: 4, 15, fig. 9, 28, tab. 1, 33, fig. 50, 39, fig. 79, 45, fig. 105, 46, 56, fig. 146.

TYPE MATERIAL: **MEXICO: Baja California Sur:** Syntypes: (USNM) "Cape St. Lucas", lost. **Neotype**: ♂ (AMNH [ARA3177]), San José del Cabo, ca. 10 km S off Route 1, 23°1.7622'N 109°43.49'W, 50 m, 10.vii.2005, W.E. Savary, E. González, and R. Mercurio, collected at night with UV light.

DIAGNOSIS: *P. eusthenura* is closely related to *P. nigroguerreroensis*, **n. sp.**, *P. voluptatis*, **n. sp**, *P. pumilis*, *P. hoffmanni*, and *P. diazi*, with which it forms a monophyletic group (see *P. nigroguerreroensis*, **n. sp.** for details). *P. eusthenura* may be distinguished from

the other species by having hirsute telson with more than seven macrosetae irregularly positioned along each carinae and a dense cluster of setae on dorsal base of aculeus, instead of being moderately hirsute with five or less macrosetae along each carinae and lacking cluster of setae on dorsal base of aculeus. *P. eusthenura* also has pedipalps more hirsute than the other species, in pedipalp manus each carinae has to seven macrosetae and additional intercarinal accessory macrosetae, instead of having in each carina to five macrosetae and lack accessory macrosetae. These species also have ventral lateral carinae of metasomal segments I and II costate and smooth, and III and IV costate and smooth on proximal two thirds and weakly crenular on distal third, instead of having all segments crenular to finely serrated. *P. eusthenura* also distinguishes by having distal margin of carapace with five pairs of macrosetae three major and two minor, instead of having only three pairs. *P. eusthenura* compares with the other species by having pedipalp chelae relatively slender, instead of having relatively incrassate chelae. *P. eusthenura* also differs by having dorsal submedian carinae in metasomal segments I–III and dorsal lateral in segments I–IV distal terminus with a enlarged spiniform tubercle, instead of having a rounded and similar serrated granule as the rest of the carina. *P. eusthenura* can be distinguished from *P. voluptatis*, **n. sp.** and *P. pumilis* by having rows of trichobothria V_{1-4} and Eb_{1-3} separate and distinguishable and trichobothria *ib* and *it* on proximal third to median third of fixed finger, at or close to RD6 or between RD6 and RD5, instead of having trichobothria $V+Eb_{13-17}$ merge and undistinguishable and trichobothria *ib* and *it* at base of fixed finger, proximal to associated macroseta of RD7. Additionally *P. eusthenura* can be separated from these species by having trichobothria *d* and *i* of pedipalp femur proximal, instead of having them distal. From *P. voluptatis*, **n. sp.**, *P. pumilis* and *P. nigroguerreroensis*, **n. sp.** may be separated by having six retrolateral denticles and six rows of median denticles in pedipalp fixed finger, instead of having

five retrolateral denticles and five rows. From *P. voluptatis*, **n. sp.**, *P. pumilis*, *P. nigroguerreroensis*, **n. sp.**, and *P. diazi* may be distinguished by lacking scallop in pedipalp fingers, instead of having at least moderate proximal notch of pedipalp fixed and movable fingers. From *P. hoffmanni* differs by having pedipalp fixed finger shorter than manus, instead of having fixed finger as long or slightly longer than manus.

DESCRIPTION: This description supplements Williams' (1970a) redescription, it is based on the material deposited in the collections mentioned below.

Color and infuscation: Base color uniformly yellow straw. Lacking infuscation. Median and lateral ocular tubercles moderately infuscate. Pectines pale whitish. Aculeus reddish.

Carapace: Carapace 1.19 times longer than posterior width. Anterior margin sublinear, with obsolete medial notch and five pairs of intersperse major and minor macrosetae. Carapace shagreened, densely cover by minute and enlarge granules. Median ocular tubercle moderately raised and broad. Superciliary carinae weak and smooth as height as median eyes. Position of median ocular tubercle on anterior half of carapace. Three pairs of lateral eyes, first and second pair same size, third pair half size prior two pairs. Median eyes approximately two times the size of first lateral frontal pair. Anteromedian sulci deep with an anterior depression; posteromedian deep and broad medially, anterolateral vestigial, posterolateral deep, posterior transverse vestigial.

Sternum and coxal region: Sternum pentagonal equilateral with four pairs of setae, one distal, two median pairs and one pair on the lobes, surface matte, median notch deep. Coxal region with scatter matte spots in ♂, in ♀ smooth. Anterior margin of coxa II entirely cover with minute granules, subbasally three oblique slit-like structures, adjacent to a low minutely granular

protuberance. Proximal margin of coxal endite II with a deep depression each, median edge finely granular. Coxa IV 2.21 times longer than coxa II.

Chelicerae: Dorsal surface smooth, subdistal margin of manus with one macrosetae; distal margin with costate, base of fixed finger with vestigial crenulation. Serrula present on ventral distal half of movable finger, tines numbering 13–15.

Pedipalps: Trichobothrial pattern Type C, orthobothriotaxic. Chela wider than patella, patella wider than femur. Femur: All intercarinal surfaces matte, dorsal intercarinal surface with few moderate median scatter granules. Dorsal prolateral and ventral prolateral strongly granular with conical enlarged granules, hirsute with six intersperse minor and major erect macrosetae; dorsal retrolateral complete granular to crenular with conical, hirsute with nine intersperse minor and major erect macrosetae; retrolateral dorsosubmedian obsolete expressed by seven macrosetae reducing in size distally; ventral prolateral vestigial expressed by a proximal subserrate granules; retrolateral ventral and ventral retrosubmedian obsolete; prolateral ventrosubmedian vestigial, expressed by proximal enlarged spiniform tubercle followed by four or five irregular conical tubercles, larger median and distal with a macroseta on top and few moderate intersperse smaller granules; prolateral ventral vestigial expressed by a proximal enlarged spiniform tubercle with a macroseta on top followed by two conical tubercles with a macroseta on base, and one basal and distal macrosetae.

Patella: All intercarinal surface matte, except retrolateral smooth. Dorsal prolateral complete irregularly and weakly crenular, hirsute with eight intersperse minor and major erect macrosetae; ventral prolateral complete strong with enlarge crenatoserrate granules; dorsal retrolateral complete weakly costate smooth, hirsute with seven to nine intersperse minor and major erect macrosetae; ventral retrosubmedian complete weakly costate and smooth; retrolateral

dorsosubmedian and retrolateral median obsolete; ventral median vestigial, expressed by a proximal short irregular row of fine granules; prolateral median vestigial on a vaulted projection, protruding moderately medially, expressed by a proximal tubercle and a row of weak crenulations or smooth weak costa, with five intersperse major and minor macrosetae, slanting gently towards subdistal end of dorsal prolateral carinae; prolateral ventral obsolete expressed by five intersperse major and minor macrosetae adjacent to ventral prolateral carinae.

Chela: Manus smooth and incrassate in ♂, in ♀ elongate. Intercarinal surface smooth and lustrous. All other carinae obsolete. Dorsal prolateral, dorsal median, dorsal retrolateral, prolateral median, ventral prolateral, ventral retrolateral, ventral median hirsute, with five or six erect macrosetae. Trichobothrium *Db* positioned on dorsal retrolateral carina, subbasal on chelae; *Dt* positioned at mid manus.

Fingers: Fixed finger, PD = 6, MD rows = 6, RD = 6, proximal RD positioned by proximal third. All RD subpaired with corresponding PD. Movable finger, PD = 7, MD rows = 7, distal row bearing one minute granule, RD = 7, proximal RD positioned by proximal third. All RD subpaired with corresponding PD. Trichobothria *ib* and *it* positioned subbasal on fixed finger, *ib* positioned between PD6 and PD7, PD7 lacking granule, *it* at the level of PD6 in ♂, in ♀ *ib* adjacent to PD6 and *it* between PD5 and PD6. Trichobothria series *db–dt* and *eb–et* distributed along the entire length of fixed finger. Trichobothria *db* and *eb* positioned basal on fixed finger. Fingers with scallop weak to moderate in ♂, proximal notch of fixed finger moderate, medina lobe absent, proximal notch of movable finger moderate and median lobe obsolete, gap created when fingers closed moderate, fingers fit unevenly, in ♀ fingers with scallop absent, gap created when fingers closed weak.

Legs: Basitarsi I–IV prolateral ventral and retrolateral ventral carinae with complete rows of spinules; retrolateral dorsal in I partial, expressed on distal half by a scatter row of spinules, in II complete with proximal third expressed by scatter spinules, III vestigial, expressed on distal third with proximal spinules becoming spiniform granules, in IV vestigial expressed by few distal spinules; retrolateral median rows in I–IV vestigial expressed as few terminal spinules. Telotarsi I–IV with two pairs of ventrodistal spinules in I–IV. Setae: Prolateral ventral 3:4:4:4; retrolateral ventral 3:6:8:8; retrolateral dorsal 2:3:4:3; dorsal 4:4:4:4; retrolateral dorsal and dorsal series in I and IV arranged in two independent rows, in II and III arranged in a sublinear row being dorsal median slightly offset, in ♀ I-III arranged in a sublinear row being dorsal median slightly offset, in IV dorsal and dorsal series arranged in two independent rows and macrosetae visibly more elongate.

Tergites: Pretergites matte, postergites with dorsal submedian carinae intercarinal surface matte, other surface shagreened with scattered coarse granules. Dorsal median and ventral submedian carinae in tergites I–VI vestigial expressed by few distal moderate to enlarge granules on distal half. Tergite VII intercarinal surface ventral lateral matte, other surface shagreened, with few scattered moderate granules and dense minute granules; dorsal median carina moderately costate with few moderate granules, expressed on proximal half of the postergite; dorsal submedian vestigial expressed as a low short pair of proximal short oblique row of three or four granules; dorsal lateral and lateral supramedian comparatively stronger and complete; dorsal lateral carinae projecting and curving with scattered granules laterally approximating to lateral supramedian proximal margin, creating a semi horse show of strong and subserrated granules.

Genital operculum: Male genital operculum: wider than long, with five pairs of macrosetae. Sclerites free on longitudinal edge moving independently but unable to open more than 45°. Genital papillae protruding posteriorly. Female genital operculum: Wider than long, with three macrosetae. Sclerites fuse longitudinal.

Sternites: Sternites III–VII acarinated finely punctuated, and lustrous, medially and laterally matte. Sternite V and VII lacking distal median glandular spot in both sexes. Sternite VII with ventral lateral carinae moderately costate and two pairs of macrosetae; other carinae obsolete expressed by macrosetae. Spiracle elongated, slit-like, approximately two times longer than wide.

Pectines: Basal piece with median notch deep, with three pairs of macrosetae. Marginal lamella consist of three sclerites, medial lamella proximally fuse distally progressively forming a conspicuous rows of 10–12 beads. Fulcra with 17–20 in ♂, in ♀ 15–16 beads. Pectinal tooth count 18–21 in ♂, in ♀ 16–17. Pectines relatively short, distal sclerite of marginal lamella slightly longer than coxa IV in ♂, in ♀ at the level of distal edge of coxa IV.

Hemispermatophore: Lamina 1.93 longer than trunk. Dorsal through margin long, narrow, curving proximally, and removed from ventral trough. Hemimating plug developed from the inner lobe, distal barb margin with 10 elongated spinules. Primary and secondary hook positioned on the apex of lateral margin extension of the lamina (flange). Both hooks rounded low, separated slightly, forming a shallow notch. Primary hook slightly rotated to the dorsal surface. Median lobe ental terminus moderate and rounded. Basal plate of inner lobe removed from ventral trough. Spine of inner lobe relatively long and strongly sclerotized, secondary spine on ventromedian aspect of neck absent. Neck relatively short (0.5 times longer than basal plate).

Measurements, lamina, 3.48; trunk, 1.80; dorsal trough/laminar hooks, 1.14; ventral trough/laminar hook, 0.54; neck, 0.30; basal plate, 0.60.

Metasoma: Intercarinal surfaces weakly matte, distal half of ventral intercarinal surface of V moderately shagreened with dense minute and moderate granules, lateral surface with weak crenulation. Metasomal segments I wider than long, II as long as wide, III longer than wide. Carinae: Dorsal lateral and lateral median carinae in I–IV strongly crenatoserrated terminating in moderate enlarge spiniform granules pointing backwards; except lateral median in IV distal terminus strongly expanded laterally forming a triangular projection; dorsal lateral in V strongly crenatoserrate proximally, becoming weaker distally ending on at smooth tubercle. Lateral inframedian in I complete strongly crenatoserrated; in II incomplete moderately crenatoserrated, becoming weaker proximally, present on distal third, in III incomplete moderately crenatoserrated, becoming weaker proximally, present on distal fourth; in IV absent, in V vestigial with a proximal tubercle followed by few weaker crenular granules becoming weaker distally, present in proximal half; ventral lateral in I–IV moderately costate and smooth, ventral submedian in I–III vestigial weakly costate, in IV weakly costate; ventral lateral and ventral median strongly crenatoserrate. Setae: In ♀, dorsal lateral carinae, 0:1:3:3:8; lateral median; 0:2:2:3; lateral inframedian, 1:0:0:0:4, ventral lateral, 2:3:3:3:14; ventral submedian, 2:2:3:3:2, ventral sublateral, 2.

Telson: Dorsal and ventral surface smooth lustrous, proximal ventral margin with low and broad crenulations. Ventral surface with 8–13 macrosetae in each carina and dorsal with a pair of rows with four macrosetae. Ventral median carinae with subaculear tubercle obsolete, Microserration on laterobasal aculeus numbering 5–8.

DISTRIBUTION: *Paravaejovis eusthenura* is endemic to the southern end of the Baja California Peninsula, in the state of Baja California Sur. *P. eusthenura* occurs from approximately 20 km south of La Paz to the Los Cabos area, excluding the Sierra de la Laguna.

ECOLOGY: This species is psammophilous, digs galleries on sandy substrate, morphologically exhibits setal combs and has a pale and immaculate cuticle. This species was collected from sea level to 626 m altitude.

REMARKS: Williams (1970a) used *P. eusthenura* for the first time to name and diagnose one the most diverse assembles of scorpions of North America. Sissom (2000) expanded the group to engulf 22 species and subspecies. More recently, Soleglad and Fet (2008) created *Hoffmannius* to replace the *eusthenura* group of *Vaejovis.* That genus was found not to be monophyletic and placed as a junior synonym of *Paravaejovis*, where *P. eusthenura* resides now (González-Santillán and Prendini, in prep.). There is little information about the syntype specimens. Williams (1980) indicate nothing but syntypes lost. Following Williams (1980) redescription and further study of fresh material, a neotype is designed here.

MATERIAL EXAMINED: **MEXICO: Baja California Sur:** *Municipio de La Paz*: La Paz, 18 km SE, 24°02'45.9"N 110°08'51.9"W, 625 m, 8.vii.2004, O. Francke, E. González, and A. Valdez, desert, on ground, collected at night with UV light, 1 ♂, 1 ♀, 1 juv. (AMNH [LP 3168]), 3 juv. (CAS [ARA1557]), 1 ♂, 1 subad. ♂, 1 subad. ♀ (AMNH [ARA1192]), 1 ♀, 2 subad. ♀ (IBUNAM [ARA2119]); Todos los Santos, 27 km, Arroyo Hondo, 23°25'47.6"N 110°11'36.1"W, 4.ii.1969, V. Roth, 1 ♂ (AMNH). *Municipio de Los Cabos*: Cabo San Lucas, 22°53.3833'N 109°54.933'W, 2.4 m, 19.vii.1968, S.C. Williams and M. Cazier, 4 ♂, 9 ♀ (MCZ); Cabo San Lucas, 24 km E, 22°53.3833'N 109°54.933'W, 1.vi.1999, M.E. Soleglad, 1 ♀ (AMNH [LP 1689]); Cabo San Lucas, 4.6 km N, 22°53.3833'N 109°54.933'W, 31.v.1974, L.R. Erickson and M. Soleglad, 2 ♂ (AMNH); Cabo San Lucas, 9.7 km N, 22°53.3833'N 109°54.933'W,

21.vii.1968, S.C. Williams and M. Cazier, 1 ♂, 1 ♀ (AMNH); San José del Cabo, ca. 10 km S off Route 1, 23°1.7622'N 109°43.49'W, 50 m, 10.vii.2005, W.E. Savary, E. González, and R. Mercurio, collected at night with UV light, 1 ♂, 1 ♀ (AMNH [ARA3177]), 1 ♀, 1 ♂ (IBUNAM [ARA2421]), 2 ♂, 2 juv. (AMNH [LP 4448]). *Municipio de San José del Cabo*: Punta Palmilla, 24 km NE, 23°2.74900'N 109°42.3366'W, vii.1968, S.C. Williams and M. Cazier, 3 ♂, 2 ♀ (MCZ).

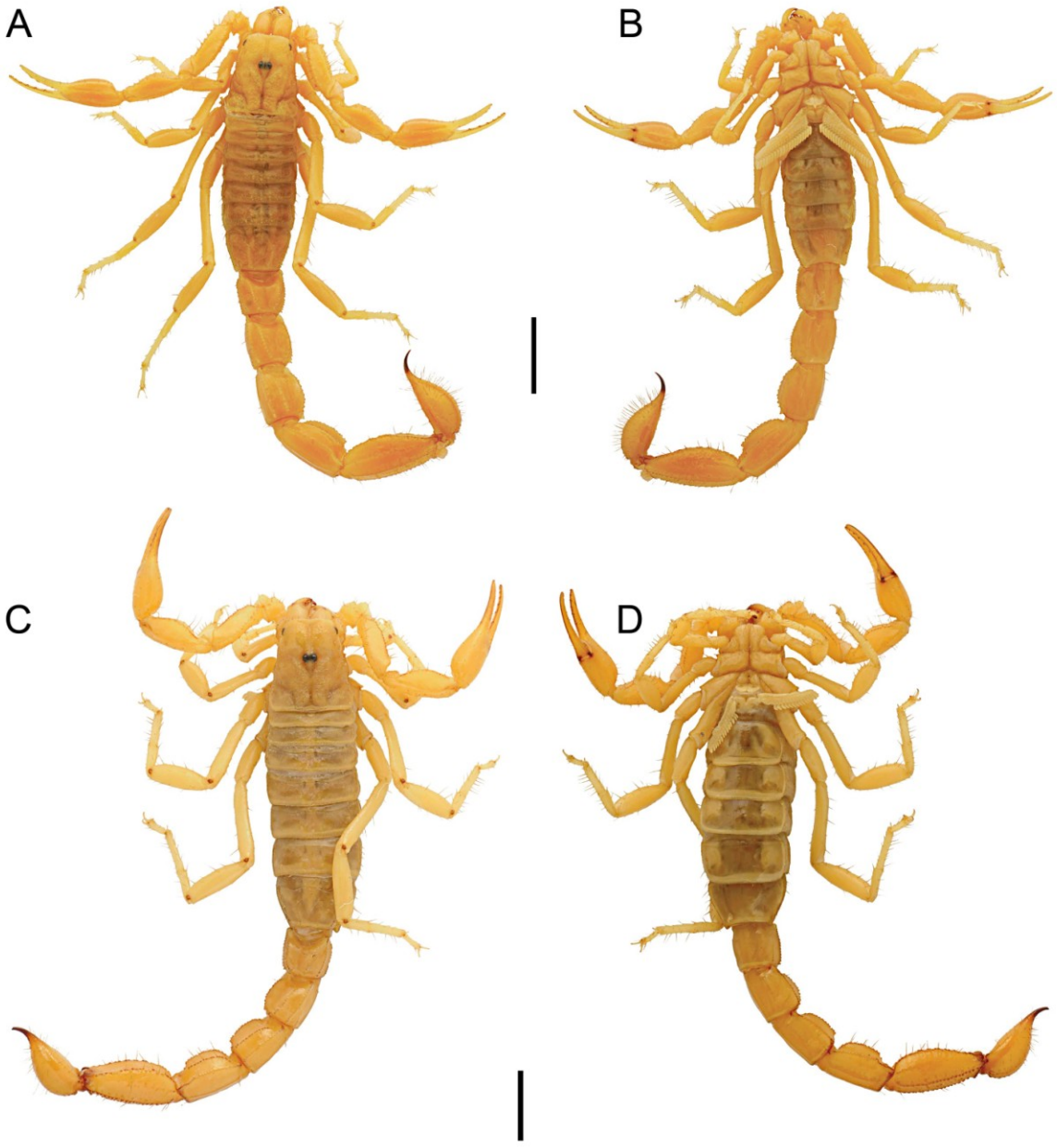


Figure 369. *Paravaejovis eusthenura* (Wood, 1863), habitus. **A**, **B**. Neotype ♂ (AMNH). **C**, **D**. ♀ (AMNH). **A**, **C**. Dorsal aspect. **B**, **D**. Ventral aspect. Scale bars = 5 mm.

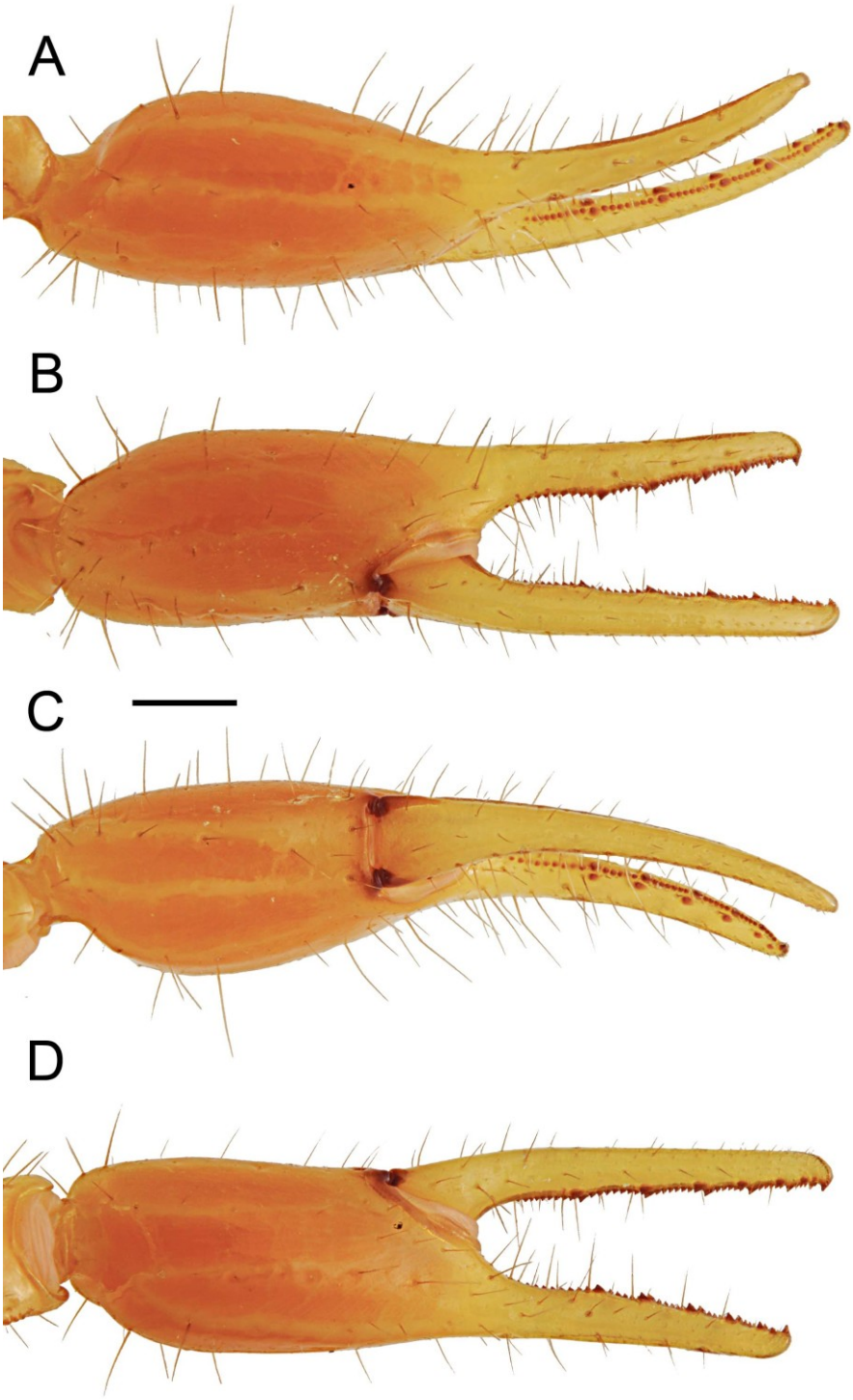


Figure 370. *Paravaejovis eusthenura* (Wood, 1863), neotype ♂ (AMNH), dextral pedipalp chela. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

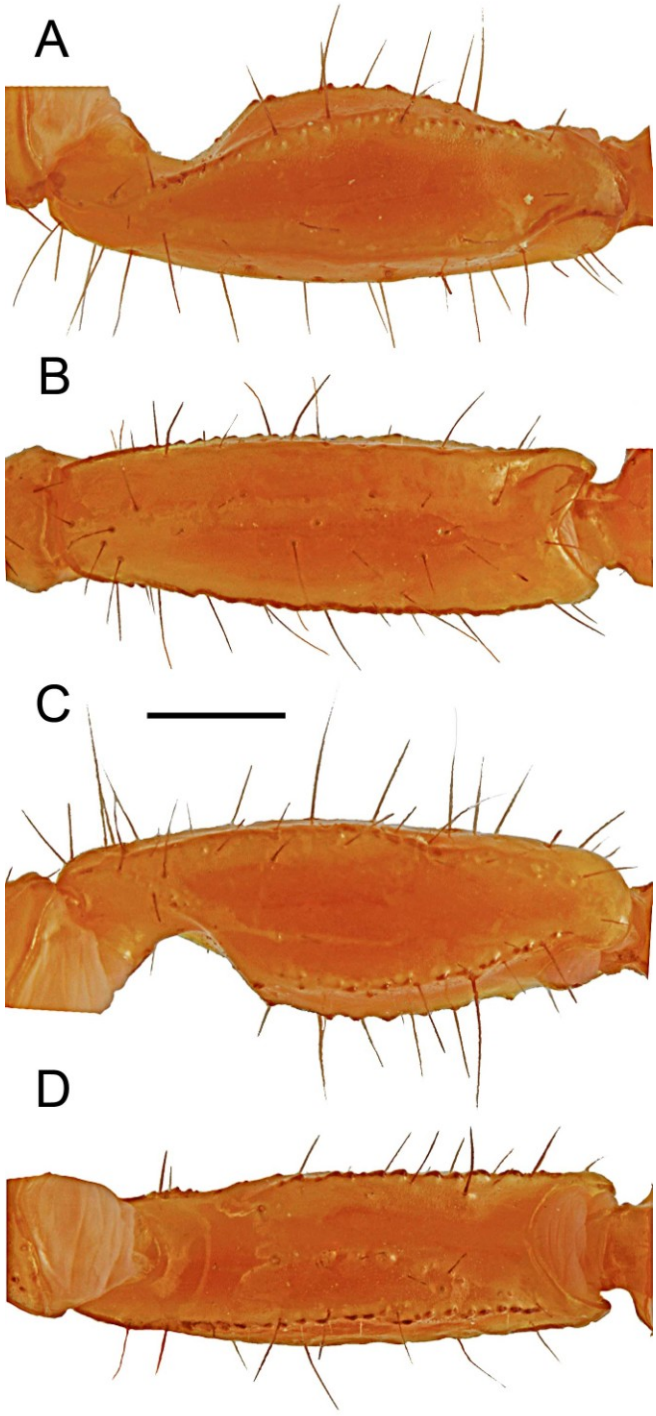


Figure 371. *Paravaejovis eusthenura* (Wood, 1863), neotype ♂ (AMNH), dextral pedipalp patella. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

Paravaejovis exploratus, **n. sp.**

Figures 352, 372–374, 409C, 415D, 420A, 421A, 425B, 428A, 431B; Table 16, 17

TYPE MATERIAL: **U.S.A.: Utah:** *Salt Lake Co.*: Holotype ♂ (AMNH) Dead Point State Park, 38°29.233'N 109°44.393'W, 1816 m, 7.viii.2007, W.D. Sissom, T. Anton, and G. Casper. Paratypes: 4 ♂ (AMNH), 3 ♂ (IBUNAM), same locality as holotype.

ETYMOLOGY: The species name *exploratus* is a Latin adjective meaning clarify, clear up, enlighten, or explain. The name refers to the clarification of the species complex *P. confusus* Stahnke, 1940, which is here split in three species, *P. exploratus*, **n. sp.** being one of them.

DIAGNOSIS: *Paravaejovis exploratus* is closely related to *P. confusus*, *P. elucidatus*, **n. sp.**, *P. kino*, **n. sp.**, and *P. waeringi*, with which it forms a monophyletic group. These species may be distinguished from the other species in the genus by having elongated fingers such that trichobothria *ib–it* are in the medial third of the fixed finger, *ib* being at or close to PD6 and *it* between PD5 and PD6; carinae ventral submedian I–IV costate crenulated to finely granulated, setal combs on basitarsus I–III. *Paravaejovis exploratus*, **n. sp.** differs from these species by having pedipalp and metasomal setation with minor macrosetae, not a mix of major and minor, predominately minor macrosetae. *Paravaejovis exploratus*, **n. sp.** is delicate, among the above species; it has the slenderest pedipalp chela in males, vesicle of the telson and pedipalp femur in females and shares with *P. elucidatus*, **n. sp.** the slenderest pedipalp chela in females (table 16). *Paravaejovis exploratus*, **n. sp.** is also the species with the shallowest vesicle of telson in males and females (table 16). Hemispermatophore lateral margin extension of the lamina trough and axial hooks fused forming a unique unguiform hook. Ventral submedian carinae of metasomal segments I–IV strong and crenular to granular. Ventral surface of metasomal segment V shagreened, moderately granular.

DESCRIPTION: The following description is based on the types and the specimens listed in material examined.

Color and infuscation (in alcohol): Base of color pale yellow, immaculate, lacking infuscation, if present very diffuse.

Carapace: Carapace anterior margin sublinear with a shallow median notch. Entire surface shagreened, dense minute and moderately large granules over most of the surface. Anterior edge with three pairs of minor spiniform macrosetae. Anteromedian sulcus moderate, posteromedian deep. Median ocular tubercle raised, with superciliary carinae granular, higher than median eyes. Three lateral eyes, two frontal pairs same size and posterior reduced approximately in half.

Sternum and coxal region: Sternum with four pairs of setae, one distal pair, two medial pairs, and one pair on the lobes, median notch deep. Anterior margin of coxa II with three oblique slit-like structures, adjacent to a moderate protuberance with few fine granules, rest of the margin finely granulated. Base of coxal endite II with a broad depression each.

Chelicerae: Dorsal surface smooth, dentition of fixed and movable fingers as in typical Syntropinae. Subdistal margin of manus with one median macrosetae each. Serrula with 9 tines.

Pedipalp: Trichobothrial pattern Type C, orthobothriotaxic. Pedipalp segment ratio length/wide, femur 3.00, patella 3.07, chela 5.58. Pedipalp chela slender, patella wider than chela and femur. Femur: Intercarinal surfaces matte, covered with densely minute granules. Carinae: Dorsal retrolateral, dorsal prolateral, and ventral prolateral carinae moderate and granular, retrolateral dorsosubmedian with scattered serrated granules and with three macrosetae being the median smaller, prolateral ventral complete, with scattered enlarged irregular conical granules lacking setae, prolateral ventrosubmedian expressed by few enlarged scattered granules on the

proximal half of the segment and with three spiniform minor macrosetae, being the basal most larger than the others, ventromedian vestigial with enlarged serrated granules, ventral retrosubmedian and retrolateral ventral vestigial expressed by few proximal enlarged scattered serrated granules.

Patella: Intercarinal surfaces matte, covered with densely minute granules. Carinae: Dorsal retrolateral dorsal prolateral, ventral retrolateral, and ventral prolateral carinae strongly granular, all retrolateral carinae obsolete, prolateral median/prolateral ventrosubmedian (internal carinae) complete curving towards the subdistal end of the dorsal prolateral carinae, with enlarged conical serrated denticles and two spiniform macrosetae, being the basal one larger than the terminal, prolateral ventral carina obsolete expressed by a proximal tubercle and two macrosetae, being the basal one larger than the terminal.

Chela: Intercarinal surfaces matte, covered with densely minute granules. Carinae, dorsal prolateral, prolateral dorsal, dorsal median, dorsal retrosubmedian accessory, prolateral median, and prolateral ventrosubmedian carinae finely crenular mix irregular fine granulation, other carinae smooth.

Fingers: Pedipalp fixed finger denticles: PD = 6, RD = 6, MD rows = 6; movable finger PD = 7, RD = 6, MD rows = 6, distal row with one median denticle. Trichobothrium *ib* positioned at the level of PD6 and *it* positioned between and PD5 and PD6. Trichobothria series *db–dt* and *eb–et* distributed along the entire length of fixed finger. Trichobothria *db* and *eb* subbasal on fixed finger. Fingers lacking scalloping, gap created when fingers closed moderate, fingers fit unevenly in both sexes.

Legs: Spinules: Basitarsi I–III prolateral ventral carinae with rows of spinules complete, retrolateral ventral in I–II complete, in III absent, prolateral ventral and retrolateral ventral in IV

absent, retrolateral median rows in I–IV vestigial expressed as few terminal spinules, retrolateral dorsal in I–III vestigial, expressed as few terminal spinules, in IV vestigial expressed as by few distal spinules. Telotarsi I–IV ventrodistal, median and basal series of spinules spiniform and short, two pairs of ventrodistal spinules in I–IV. Setae: Prolateral ventral, 4:4:4:4, distal small and delicate; retrolateral ventral, 3:6:7:8, in III setae major minor; retrolateral dorsal, 4:4:4:4; dorsal, 4:4:4:4. Retrolateral dorsal and dorsal series arranged in a sublinear row forming setal combs with dorsal median setae offset. In ♂ all setae minor, in ♀ all setae major.

Tergites: All pretergites matte, densely covered by minute granules and postergite shagreened, with coarser granules. Median carinae absent in I, moderate to strong and granular in II–VI. Dorsal submedian carinae weak but granular. Tergite VII with dorsal median carina strong on proximal third expresses as a broad tubercle with clusters of granules. Dorsal submedian as a pair of proximal weaker tubercles strongly granular on proximal third. Dorsal lateral, lateral supramedian, and lateral inframedian strong and moniliform. All intercarinal surfaces with scattered granules.

Genital operculum: Male genital operculum: wider than long, with five pairs of macrosetae. Sclerites free on longitudinal edge moving independently but unable to open more than 45°. Genital papillae protruding posteriorly. Female genital operculum: Wider than long, with three macrosetae. Sclerites fuse longitudinal.

Sternites: Sternites III–VI acarinated matte. Sternite V with a weak distomedian glandular spot. Sternite VII acarinated except ventral lateral carinae, which is strong and finely crenulated and with two pairs of setae. Ventrosubmedian obsolete with two pairs of setae, lateral ventral vestigial expressed as a small tubercle with one seta. Posteromedian third of sternite VII with a weak but visible whitish glandular spot, slightly raised.

Pectines: Distal margin of marginal lamella in ♂ evidently longer than distal margin of coxa VI, in ♀ slightly longer than distal margin of coxa VI. Basal piece in with three pairs of macrosetae. Marginal lamella consist of three sclerites, median lamella proximally fuse and with two rows of beads, one upper short subbasal with one to three beads and one lower complete row with 13–15 beads. Fulcra with 16–18 in ♂ and 11–13 beads in ♀. Pectinal tooth counts 17–19 in ♂, in ♀ 12–14.

Hemispermatophore: Hemimating plug developed from the inner lobe, distal barb margin with 10 spinules. Dorsal through margin long, tapering and curving proximally. Primary and secondary hook positioned on the apex of lateral margin extension of the lamina (flange), completely fused unable to distinguish them. The sole hook, sharp and strongly curved towards the dorsal trough. Lamina 1.34 longer than trunk. Median lobe ental terminus moderate and rounded. Basal plate of inner lobe removed from ventral trough, spine of inner lobe short. Neck shorter than basal plate (0.5). Measurements, lamina, 3.13; trunk, 2.33; dorsal trough/laminar hooks, 0.78; ventral trough/laminar hook, 0.60; inner lobe (mating plug) neck, 0.33; basal plate, 0.63.

Metasoma: Segments I–V with same width. Segment ratios length/width: I, 0.93, II, 1.11, III, 1.15, IV, 1.52, V, 1.89. Dorsal lateral and lateral median carinae I–IV serrated, terminus in I–II with a short to moderate spiniform projection, IV lateral median carinae with terminus moderate flared, V granular, mid segment with clusters of granules becoming moniliform both distal- and proximally. Intercarinal surfaces between dorsal lateral carinae matte with few scattered granules. Lateral supramedian I–III vestigial, with one to three distal granules and few scattered granules medially. Lateral inframedian in I complete strong and serrated, in II–III present on distal third, serrated, and becoming obsolete proximally, in IV absent, in V present

on proximal half strong, serrated, and becoming obsolete distally. Ventral lateral carinae I–V complete, moderate and crenatoserrate. Ventral submedian in I–IV moderate, and finely crenatoserrate, becoming stronger in distal segments. Ventromedian V, complete strong, and crenular. Setae: Dorsal lateral, 0:1:1:1:5; lateral median, 0:1:1:1; lateral inframedian, 0:0:0:0:2; ventral lateral, 2:2:2:2:6; ventral submedian, 2:3:3:3:1; ventral sublateral, 2. All setae minor and all intercarinal surfaces matte, densely finely granular.

Telson: Vesicle relatively globose, 1.50 times longer than wide. Lateral microserration at base of the aculeus with nine sharp tines. Aculeus relatively short, 2.7 times shorter than telson in. Subaculear tubercle vestigial. Ventral carinae and intercarinal surfaces with strongly granular, each carina with two pairs of minor setae. Dorsal surface completely smooth and glabrous.

DISTRIBUTION: *Paravaejovis exploratus*, **n. sp.** is endemic to the Great Basin Desert, including the states of Arizona, Nevada, Oregon, and Utah, U.S.A. This species may reach the southern limits of Idaho and western of Colorado.

ECOLOGY: As in the other species of this complex, *P. exploratus*, **n. sp.** has a psammophilous ecomorphotype. It was collected from 936–1816 m altitude. This is a typical species of the Great Basin Desert, which is consider a cold desert because most of its precipitation is in form of snow.

MATERIAL EXAMINED: **U.S.A.: Arizona:** *Coconino Co.*: Colorado River, Grand Canyon National Park, 116 km down river from Lee's Ferry, 36°3.31567'N 112°7.310166'W], 25.vi.1970, B. Fox, 1 subad. ♀, 1 juv. ♂ (AMNH); Lake Powell, 36°56.1660'N 111°29.04'W], 22.vii.1972, B.A. and C.A. Triplehorn, 2 ♂ (OSAL); Soap Creek Road, S off H-89A, 36°43'38.27"N 111°45'29.47"W, 1286 m, 10.vii.2007, Z.J. Valois, 1 juv. (AMNH); South off H-87A, Soap Creek Road, 36°43'33.66"N 111°45'24.00"W, 1284 m, 7.x.2007, Z.J. Valois, found in

both sandy and rocky areas (sedimentary rock, mudstone), 1 juv. (AMNH [LP 7697]). *Mohave Co.*: Black Mountains on Route 66, 35° 0'22.56"N 114°23'45.88"W, 8.x.2007, R.C. West, rocky slopes under rocks, 1 juv. (AMNH [LP 7686]). **Nevada:** *Clark Co.*: Christmas Tree Pass, 1.6 km W Laughlin off Route 163, 35°13.62600'N 114°41.136'W], 2.iv.2003, R.C. West, 1 ♀ (AMNH [LP 2453]), 1 ♀ (AMNH [LP 2454]); Davis Dam road, 35°11'13.60"N 111°47'18.16"W], 210 m, 21.iv.2008, Z.J. Valois, found along rocky hillside, above wash, 1 ♂ (AMNH [LP 8496]); Las Vegas, [36°10.5600'N 115°8.22'W], 14.x.1944, D.J. Zinn, 1 ♂ (AMNH); Las Vegas, 12.9 km NE, [36°20'19.52"N 115°22'42.35"W], vi.1944, D.J. Zinn, 1 ♀ (AMNH); Morning Star, N side, Mine cutoff road, 35°21'45.70"N 115°25'22.54"W, 983 m, 10.v.2008, Z.J. Valois and B. Hendrixson, found in rocky Mohave scrub with intersecting low washes, 1 subad. ♂ (AMNH [LP 8501]); Sandy Valley Road, 0.32 km NE, 35°48'43.57"N 115°22'50.66"W, 1024 m, 10.v.2008, Z.J. Valois and B. Hendrixson, 1 juv. (AMNH [LP 8511]); Sandy Valley Road, 0.5 km ENE, 35°48'43.57"N 115°22'50.66"W, 1023 m, 10.v.2008, Z.J. Valois and B. Hendrixson, 1 subad. (AMNH). *Lincoln Co.*: South off Hwy 375, 37°26'59.07"N 115°28'16.6"W, 1393 m, 1.ix.2007, Z.J. Valois and K. Neeley, under rock, 1 ♂ (AMNH [LP 7254]). **Utah:** Off Hwy 68, 40°10'57.23"N 111°57'22.17"W, 1509 m, 7.x.2006, Z.J. Valois, collected at night with UV light, 1 subad. ♀ (AMNH [LP 6404]); SE on Hwy 68, W off Mile Marker 16, 2 km NW off Hwy 68, Soldiers Pass Road, 40°10'29.98"N 111°57'12.69"W, 1470 m, 21.v.2006, Z.J. Valois, collected at night with UV light, 1 subad. ♂ (AMNH [LP 6405]), 1 ♂ (AMNH [LP 6406]). *Juab Co.*: Little Sahara Recreation Area, White Sands Campgrounds, 39°43.56667'N 112°18.4'W, 2007, Z.J. Valois and K. Neeley, 1 juv. (AMNH [LP 7269]); 39°39'11.10"N 113°6'05.99"W, 1615 m, 17.viii.2006, Z.J. Valois and K. Neeley, 1 ♂ (AMNH [LP 7091]); 39°41'11.10"N 113°04'30.80"W, 1660 m, Z.J. Valois and K. Neeley, 1 ♀ (AMNH [LP 7090]). *Salt Lake Co.*:

Salt Lake City, Warm Spring, 40°45'N 111°53'W], 5.v.1946, W. Ivie, 1 ♀ (AMNH); Bluff, 4 km SW, Sand Island Camp, 37°16'56.20"N 109°33'39.29"W], 29.vi.1974, M. Cazier, 1 subad. ♀ (AMNH); Dead Point State Park, 38°29.233'N 109°44.393'W, 1816 m, 7.viii.2007, W.D. Sissom, T. Anton, and G. Casper, 8 ♂ (AMNH); Deadhorse Point State Park, 38°29.233'N 109°44.393'W, 1816 m, 7.viii.2007, W.D. Sissom, T. Anton, and G. Casper, sandy area, Juniper, *Opuntia*, and *Ephedra*, 1 ♀ 1 juv. (AMNH [LP 7810]); Goosenecks Sate Park, 37°10.4833'N 109°55.61666667'W], 28.vi.1974, L. Draper and M. Cazier, 2 ♂♂ (AMNH). *Toole Co.*: Horseshoe Springs, exit at Mile Marker 77, South off I-90, 40°36'56.44"N 112°41'43.48"W, 1343 m, 24.vi.2006, Z.J. Valois, collected at night with UV light, 1 subad. ♀ (AMNH [LP 6402]); Little Mountain, Little Mountain Road, Warm Springs, 40°32.29583'N 109°41.9075'W], x.2006, B. Nielsen, collected at night with UV light, 1 subad. ♂ (AMNH [LP 6407]); Stansbury Mountains, 40°36.8773'N 112°41.0402'W, 27.v.2007, B. Nielsen, under rock, 1 ♀ (AMNH [LP 7072]). *Washington Co.*: Santa Clara, 37°8.21667'N 113°38.95'W], 4.vi.1936, W. Ivie, 1 ♀(AMNH); Warner Valley, 37°01'31.53"N 113°26'02.6"W, 936 m, 2.ix.2007, Z.J. Valois and K. Neeley, 1 ♂ (AMNH [LP 7255]); Hurricane Dunes, S side of Sand Hollow Reservoir, 37°05'55.1"N 113°22'31.3"W, 28.iv.2007, B.L. Nielsen, collected at night with UV light, 1 ♂ (AMNH [LP 6909]); Saint George, 37°5.71667'N 113°34.6833'W], 1926, A.M. Woodbury, 1 juv. (AMNH). **Oregon:** *Harney Co.*: Mickey Hot Springs, ca. 1 mi. SE, at N end of Alvord Desert, 42°39'52.36"N 118°19'40.94"W, 24.vii.2012, K. Jordan, 1 ♂ (AMNH [LP 11437]).

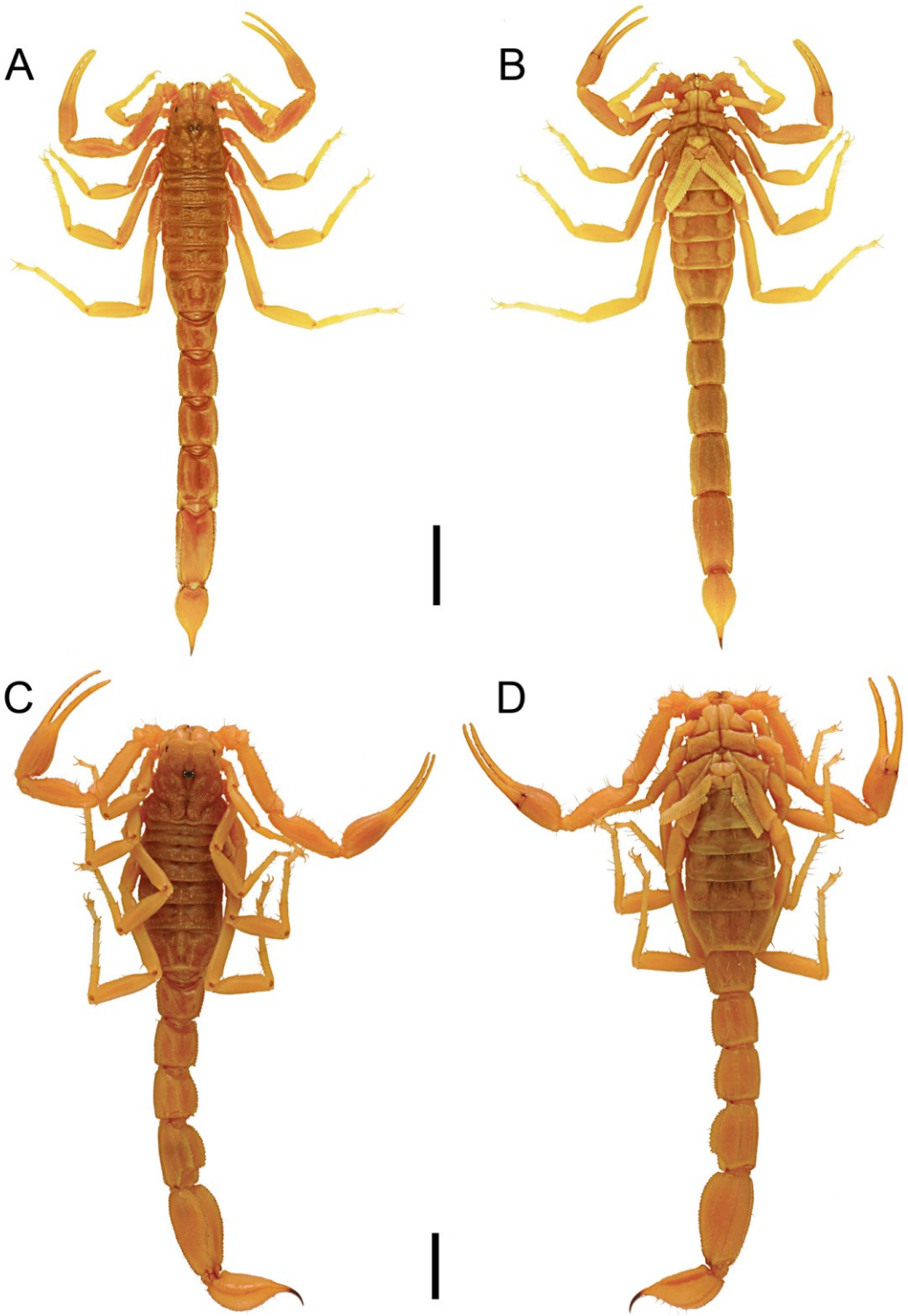


Figure 372. *Paravaejovis exploratus*, **n. sp.**, habitus. **A**, **B**. Paratype ♂ (AMNH). **C**, **D**. ♀ (AMNH). **A**, **C**. Dorsal aspect. **B**, **D**. Ventral aspect. Scale bars = 5 mm.

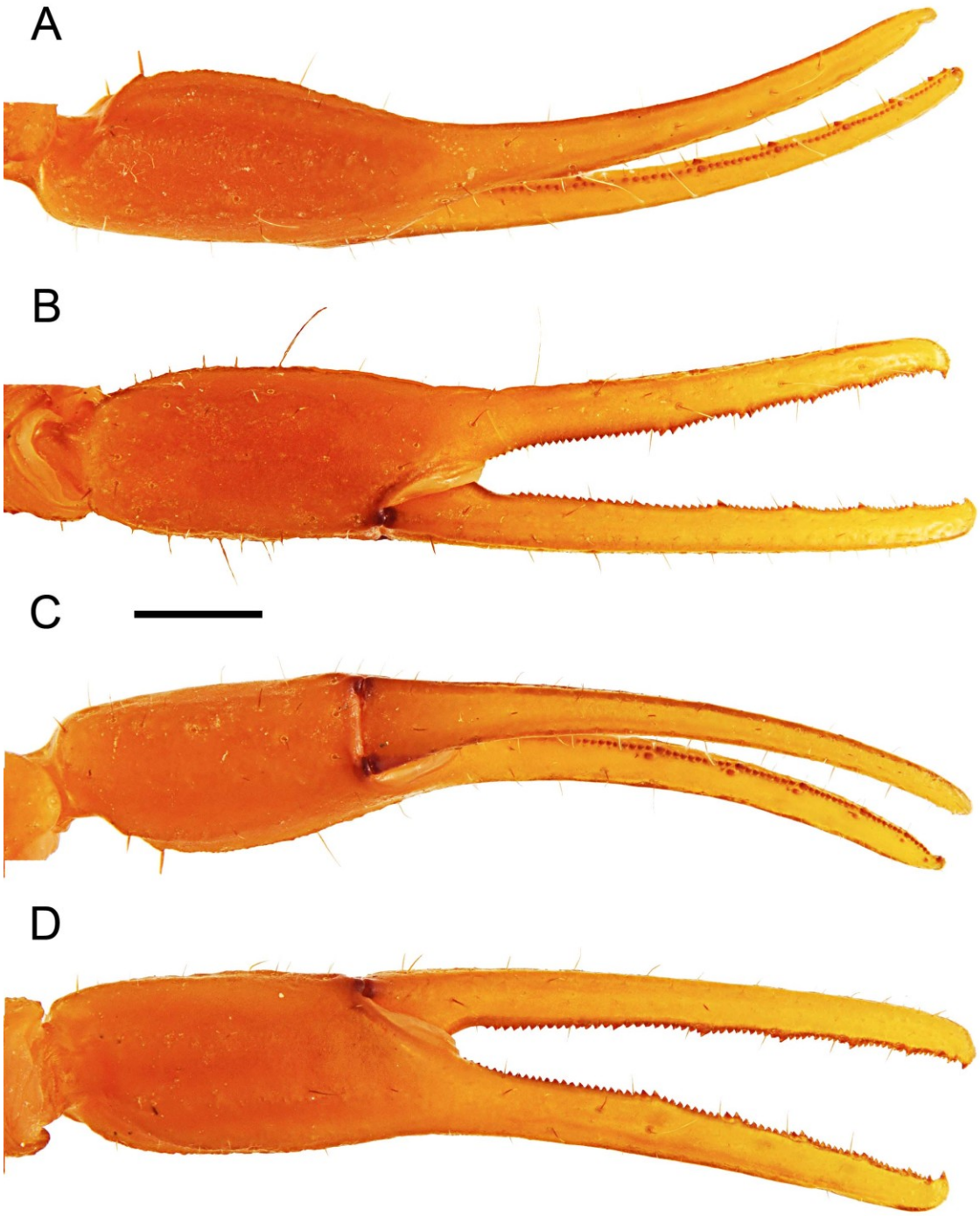


Figure 373. *Paravaejovis exploratus*, **n. sp.**, paratype ♂ (AMNH), dextral pedipalp chela. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

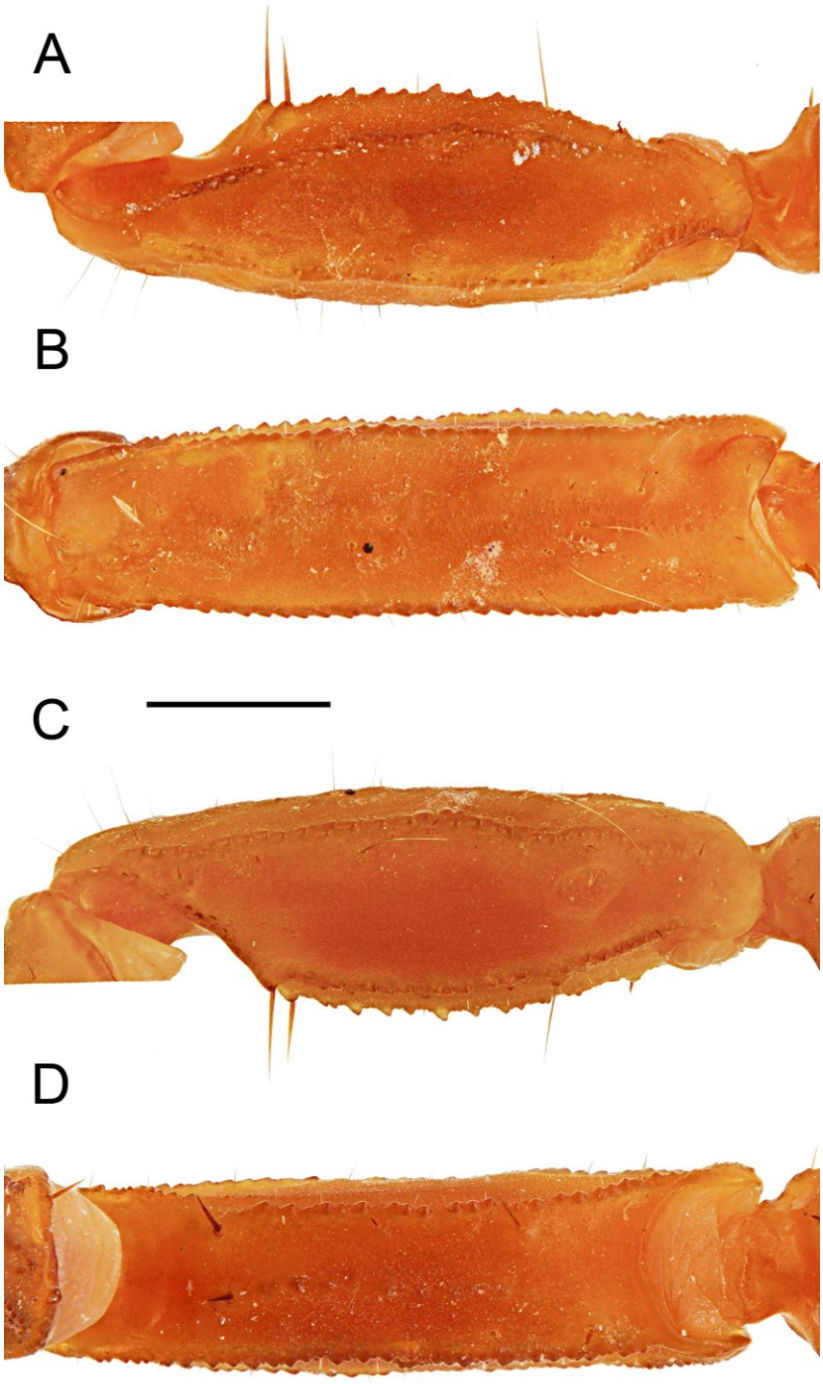


Figure 374. *Paravaejovis exploratus*, **n. sp.**, paratype ♂ (AMNH), dextral pedipalp patella. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

Paravaejovis galbus (Williams, 1970)

Figures 352, 375–377, 409D, 416C, 420B, 421B, 425C, 428B, 431C

Vejovis galbus Williams, 1970a: 403, 407–410, figs. 7, 8; Soleglad, 1973b: 359, tab. 4; Stahnke, 1974: 136.

Vaejovis galbus: Díaz-Nájera, 1975: 6, 14; Williams, 1980: 55, 60, 61, fig. 59, 64; Kovařík, 1998: 146; Beutelspacher, 2000: 83, 137, 153, map 56; Sissom, 2000: 532, 533; Sissom and Hendrixson, 2005a: 128, tab. 6.2.

Hoffmannius galbus: Soleglad and Fet, 2008: 73, 91.

TYPE MATERIAL: **MEXICO: Baja California Sur:** Holotype: ♂ (CAS, Type No. 10415), Loreto 8 km S [Nopoló], 16.v.1969, S.C. Williams. Paratypes: 9 ♂, 10 ♀ (CAS, ♀ allotype), same locality as holotype.

DIAGNOSIS: *Paravaejovis galbus* is closely related to the species in the clade (*P. nigroguerreroensi* (*P. voluptatis* + *P. pumilis*) (*P. eusthenura* (*P. hoffmanni* + *P. diazi*))). *P. galbus* shares with these species, the pale base color, absence of infuscation, obsolesces of pedipalp chela carinae and weak development of the ventral lateral and ventral submedian metasomal carinae. Furthermore, telotarsi I–III have retrolateral dorsal and dorsal series arranged in a sublinear row. *P. galbus* distinguishes from these species by having all macrosetae on pedipalps and legs minor, instead of major. From *P. voluptatis*, **n. sp.**, *P. pumilis*, *P. eusthenura*, *P. hoffmanni*, and *P. diazi* differs by having dorsal median, dorsal retrolateral, ventral retrolateral, ventral prolateral and prolateral median carinae of pedipalp chelae moderately costate, instead of obsolete, flat no protruding from adjacent surfaces. From *P. voluptatis*, **n. sp.** and *P. pumilis* differs by having rows of trichobothria $V_{1–4}$ and $Eb_{1–3}$ separate and

distinguishable, and trichobothria *ib* and *it* on proximal third to median third of fixed finger, at or close to RD6 or between RD6 and RD5, instead of having trichobothria $V+Eb_{13-17}$ merge and undistinguishable and trichobothria *ib* and *it* at base of fixed finger, proximal to associated macroseta of RD7. From *P. eusthenura* and *P. hoffmanni* differs by having proximal notch and median lobe of fixed and movable finger moderate, instead of having these structures obsolete. From *P. nigroguerreroensis*, **n. sp.** differs by having manus slender, instead of having it incrassate, furthermore *P. nigroguerreroensis*, **n. sp.** has ventral submedian metasomal segment II and III moderately costate and IV smooth on proximal half and crenulated on distal half, instead of having II–IV obsolete to weakly costate.

DESCRIPTION: This description supplements Williams' (1970a) original description, it is based on the material deposited in the collections mentioned below.

Color and infuscation: Base color uniformly yellow straw. Carapace and tergites with vestigial dusky markings of infuscation. Median and lateral ocular tubercles moderately infuscate. Pectines pale whitish. Aculeus reddish.

Carapace: Carapace 1.09 times longer than posterior width. Anterior margin sublinear, with vestigial medial notch and three pairs of minor macrosetae. Carapace shagreened, densely cover by minute and enlarge granules. Median ocular tubercle moderately raised and broad. Superciliary carinae moderate and weakly finely crenulate as height as median eyes. Position of median ocular tubercle on anterior half of carapace. Three pairs of lateral eyes, first slightly larger than second pair, third pair half size first pair. Median eyes approximately two times the size of first lateral frontal pair. Anteromedian sulci deep with an anterior depression; posteromedian deep and broad medially, anterolateral vestigial, posterolateral moderate, posterior transverse vestigial.

Sternum and coxal region: Sternum pentagonal equilateral with four pairs of setae, one distal, two median pairs and one pair on the lobes, surface matte, median notch deep. Coxal region with scatter matte spots in ♂, in ♀ smooth. Anterior margin of coxa II entirely cover with minute granules, subbasally three oblique slit-like structures, adjacent to a low minutely granular protuberance. Proximal margin of coxal endite II with a deep depression each, median edge finely granular. Coxa IV 2.40 times longer than coxa II.

Chelicerae: Dorsal surface smooth, subdistal margin of manus with one macrosetae; distal margin costate. Serrula present on ventral distal half of movable finger, tines numbering 8.

Pedipalps: Trichobothrial pattern Type C, orthobothriotaxic. Chela wider than patella, patella wider than femur. Femur: All intercarinal surfaces matte. Dorsal prolateral and dorsal retrolateral irregularly granular with conical moderate granules; ventral prolateral complete granular; retrolateral dorsosubmedian obsolete expressed by three or four macrosetae; ventral prolateral vestigial expressed by a row of proximal subserrate granules; retrolateral ventral and ventral retrosubmedian obsolete; prolateral ventrosubmedian vestigial, expressed by a proximal enlarged bicuspid spiniform tubercle followed by two enlarge conical tubercles with a setae at base and two or three intersperse moderate granules; prolateral ventral vestigial expressed by a proximal enlarged spiniform tubercle with a macroseta on top followed by two conical tubercles with a macroseta at base.

Patella: All intercarinal surface matte. Dorsal prolateral and ventral prolateral complete finely granular; dorsal retrolateral and ventral retrosubmedian complete finely crenular; retrolateral dorsosubmedian and retrolateral median obsolete expressed as a vestigial costa; ventral median vestigial, expressed by a proximal short irregular row of fine granules; prolateral median vestigial on a vaulted projection, protruding moderately medially, expressed by a

proximal tubercle and a row of moderate serrate granules, with three intersperse major macrosetae, the row ending at the level of trichobothrium d_2, followed by a gap of smooth surface, slanting gently towards subdistal end of dorsal prolateral carinae; prolateral ventral obsolete expressed by one proximal and one distal major macrosetae and a median minor macrosetae, these adjacent to ventral prolateral carinae.

Chela: Manus smooth and moderate in both sexes. Intercarinal surface smooth and lustrous. All carinae obsolete. Dorsal prolateral, dorsal median, dorsal retrolateral, prolateral median, ventral prolateral, ventral retrolateral, ventral median, and retrolateral median with a vestigial costa. Trichobothrium *Db* positioned on dorsal retrolateral carina, subbasal on chelae; *Dt* positioned at mid manus.

Fingers: Fixed finger, PD = 6, MD rows = 6, RD = 6, proximal RD positioned by proximal third. All RD paired with corresponding PD. Movable finger, PD = 7, MD rows = 7, distal row bearing one minute granule, RD = 7, proximal RD positioned by proximal third. All RD paired with corresponding PD. Trichobothria *ib* and *it* positioned subbasal on fixed finger, *ib* positioned between PD6 and PD7, PD7 lacking granule, *it* at the level of PD6. Fingers with scallop weak in ♂, proximal notch of fixed finger weak, medina lobe absent, proximal notch of movable finger weak and median lobe absent, gap created when fingers closed moderate, fingers fit unevenly, in ♀ fingers with scallop absent, gap created when fingers closed weak.

Legs: Basitarsi I–II prolateral ventral and retrolateral ventral carinae with complete rows of spinules; prolateral ventral in III and IV absent; retrolateral ventral in III complete, in IV absent; retrolateral dorsal in I partial, expressed on distal half by a scatter row of spinules, in II complete, in III vestigial, expressed on distal third with proximal spinules, in IV absent; retrolateral median rows in I–IV vestigial expressed as few terminal spinules. Telotarsi I–IV with

two pairs of ventrodistal spinules in I–IV. Setae: Prolateral ventral, 2:3:4:4; retrolateral ventral, 3:5:5:6; retrolateral dorsal, 2:3:4:3; dorsal, 4:4:4:4; retrolateral dorsal and dorsal series in I and IV arranged in two independent rows, in II and III arranged in a sublinear row being dorsal median slightly offset and all macrosetae minor in ♂, in ♀ I–III arranged in a sublinear row being dorsal median slightly offset, in IV retrolateral dorsal and dorsal series arranged in two independent rows and all macrosetae major visibly more elongate, except dorsal median expressed as minor. Ungues and dactyl relatively enlarged.

Tergites: Pretergites matte, postergites with dorsal submedian carinae intercarinal surface matte, other surface shagreened with scattered coarse granules. Dorsal median and ventral submedian carinae in tergites I–VI vestigial expressed by few distal fine granules on distal half. Tergite VII intercarinal surface ventral lateral matte, other surface shagreened, with few scattered moderate granules and dense minute granules; dorsal median carina moderately costate with few moderate granules, expressed on proximal half of the postergite; dorsal submedian vestigial expressed as a low short pair of proximal short oblique row of three or four granules; dorsal lateral and lateral supramedian comparatively stronger and complete strongly serrate with elongate granules; dorsal lateral carinae projecting and curving with scattered granules laterally approximating to lateral supramedian proximal margin, creating a semi horse show of strong and subserrated granules.

Genital operculum: Male genital operculum: wider than long, with three pairs of macrosetae. Sclerites free on longitudinal edge moving independently but unable to open more than 45°. Genital papillae protruding posteriorly. Female genital operculum: Wider than long, with three macrosetae. Sclerites fuse longitudinal.

Sternites: Sternites III–VII acarinated finely punctuated, and lustrous, medially and laterally matte. Sternite V and VII lacking distal median glandular spot in both sexes. Sternite VII with ventral lateral carinae vestigial weakly crenular and two pairs of macrosetae; other carinae obsolete expressed by macrosetae. Spiracle elongated, slit-like, approximately two times longer than wide.

Pectines: Basal piece with median notch deep, with one median macrosetae. Marginal lamella consist of three sclerites, medial lamella proximally fuse distally progressively forming a conspicuous rows of 6–8 beads. First proximal pectine attached almost at the level of the proximal margin of the proximal sclerite of medial lamella in ♂, in ♀ first pectine attached to mid length of the proximal sclerite of medial lamella. Fulcra with 15–19 in ♂, in ♀ 11–14 beads. Pectinal tooth numbering 16–18 in ♂, in ♀12–15. Pectines relatively short, distal sclerite of marginal lamella slightly longer than coxa IV in ♂, in ♀ at the level of distal edge of coxa IV.

Hemispermatophore: unknown

Metasoma: Intercarinal surfaces weakly matte, distal half of ventral intercarinal surface of V with few lateral crenulations. Carinae: Dorsal lateral and lateral median carinae in I–IV strongly crenatoserrated terminating in moderate enlarge spiniform granules pointing backwards; except lateral median in IV distal terminus moderately expanded laterally forming a triangular projection; dorsal lateral in V moderately crenatoserrate proximally, medially with clusters of crenulations, distally becoming moniliform and ending on at smooth elongate bicuspid tubercle. Lateral inframedian in I complete strongly crenatoserrated; in II incomplete moderately crenatoserrated, becoming weaker proximally, present on distal third, in III incomplete moderately crenatoserrated, becoming weaker proximally, present on distal fourth; in IV absent, in V partial with proximal crenulation becoming weaker distally crenular, present in proximal

half. Ventral lateral in I–IV moderately costate and smooth to finely crenulate, ventral submedian in I–IV vestigial weakly costate; ventral lateral and ventral median in V moderately crenatoserrate. Setae: In ♀, dorsal lateral, 0:1:3:4:7, in IV intersperse major and minor macrosetae; lateral median, 0:2:2:4; lateral inframedian, 1:0:0:0:3; ventral lateral, 2:3:3:3:8; ventral submedian, 2:3:3:3:2; ventral sublateral, 2. In ♂ all macrosetae reduced to microsetae or absent.

Telson: Dorsal and ventral surface smooth lustrous, proximal ventral margin with strong broad crenulations, all surface moderately crenulated. Ventral surface with 5–6 macrosetae in each carinae. Ventral median carinae with subaculear tubercle obsolete, Microserration on laterobasal aculeus numbering 6.

DISTRIBUTION: *Paravaejovis galbus* is endemic to Baja California Sur, restricted to the area of Nopoló (Williams, 1970a). Williams (1980) added localities from the Comondús area, Danzante Island, 27 Km N Colonia la Toba (most likely in the vicinity of Ciudad Insurgentes), and Santa Rita [these last two localities probably correspond to the Magdalena Plain].

ECOLOGY: *Paravaejovis galbus* was not collected during this project. There is no published information about its biology. However, the presence of setal combs, enlarged ungues, and pale color indicate that is psammophilous.

REMARKS: The type locality of *P. galbus* today is a resort where a Golf course has been constructed. It is uncertain whether the species still exist there. The records other than the type locality indicate a disjunct distribution. One possible explanation for this discontinuity is that these records may represent misidentifications. I was unable to find the locality reported by Williams (1980): 35 km N San José de Comondú. However, the specimens from Colonia de la Taboda (most likely in the Magdalena Plain, a few kilometers east of Ciudad Constitución) were

not conspecific with *P. galbus*, but rather juveniles of *P. diazi.* Williams also cited specimens from Danzante Island; I collected intensely for two days on that island and was unable to find this species. More fieldwork is necessary to clarify the distribution of this species.

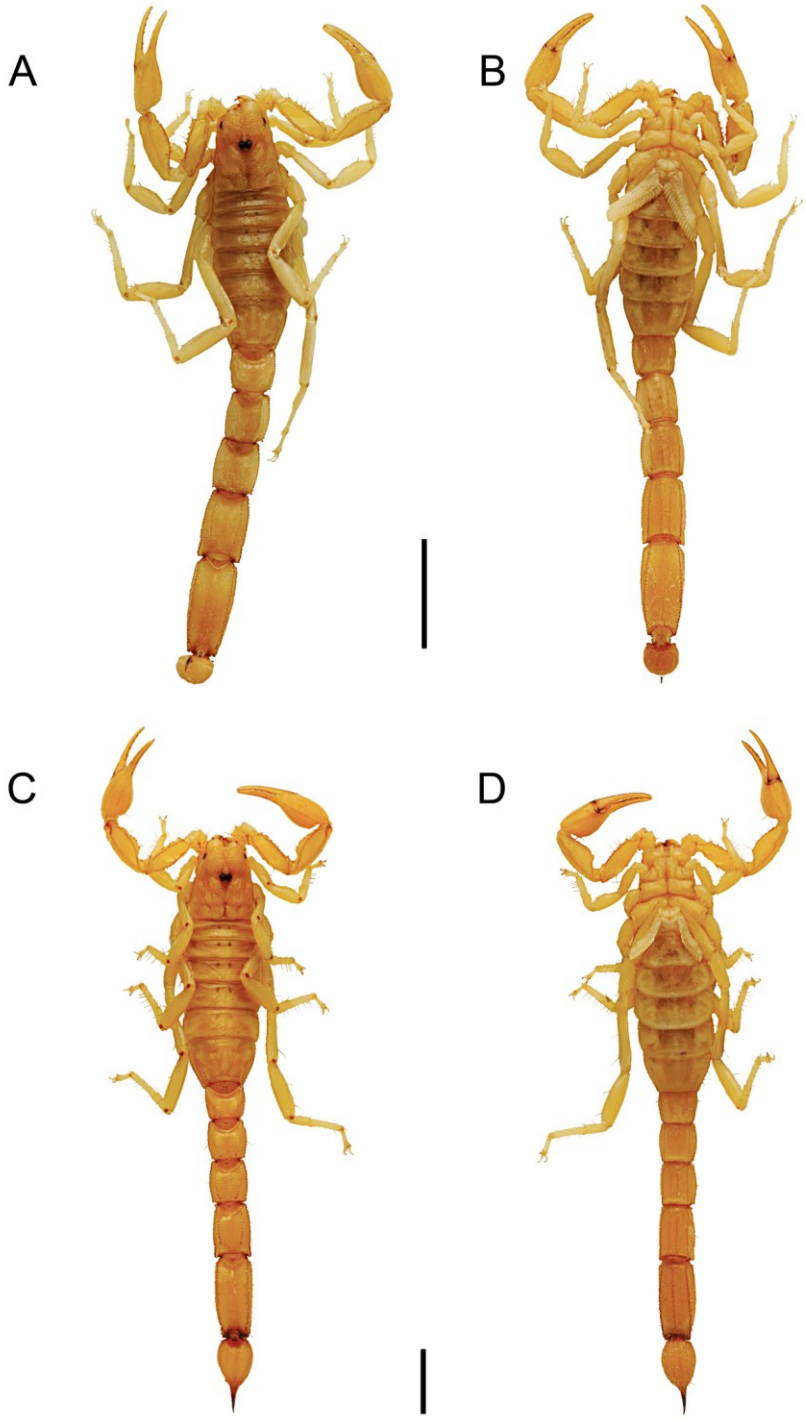


Figure 375. *Paravaejovis galbus* (Williams, 1970), habitus. **A**, **B**. Holotype ♂ (CAS). **C**, **D**. ♀ (CAS). **A**, **C**. Dorsal aspect. **B**, **D**. Ventral aspect. Scale bars = 5 mm.

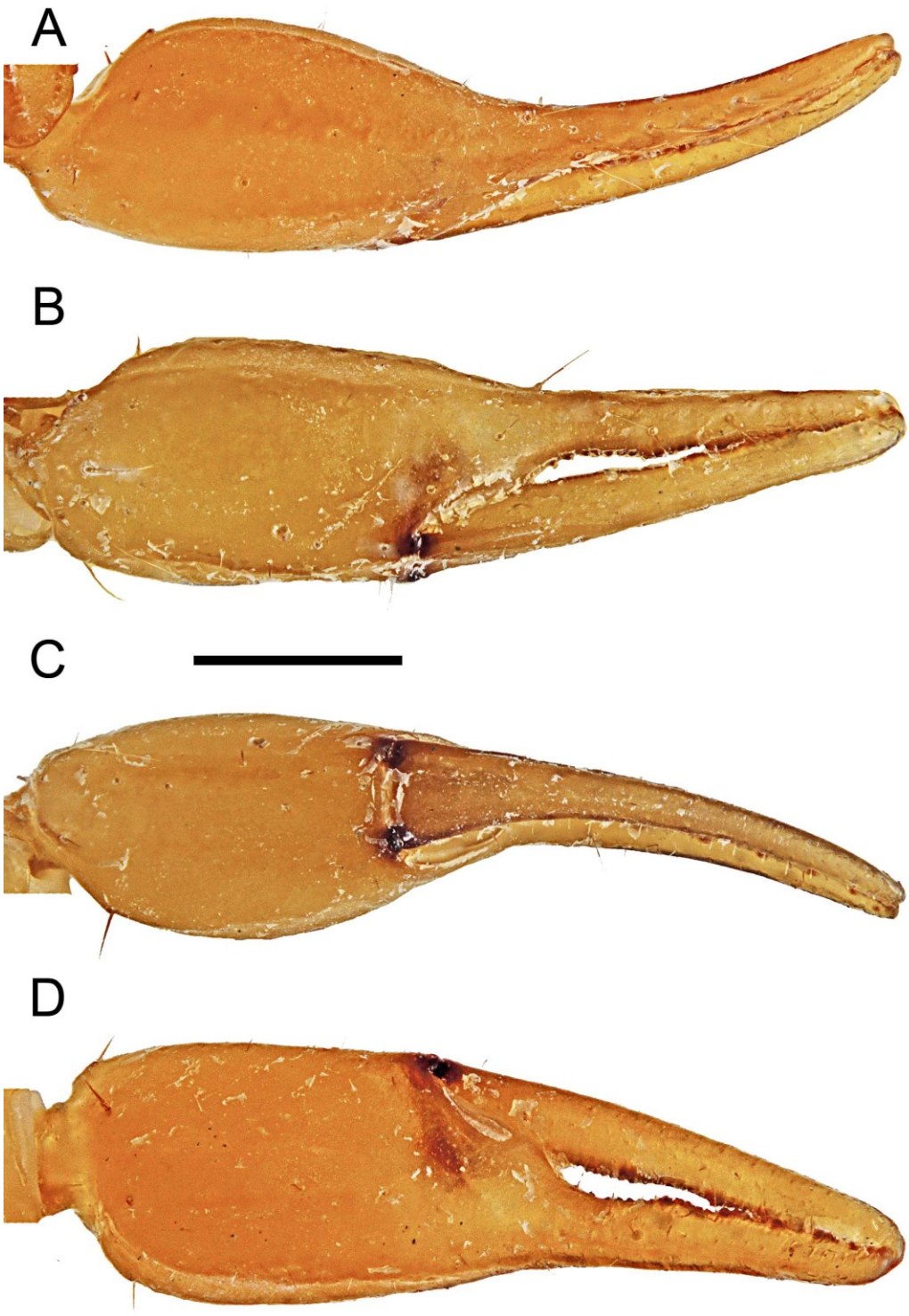


Figure 376. *Paravaejovis galbus* (Williams, 1970), holotype ♂ (CAS), dextral pedipalp chela. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

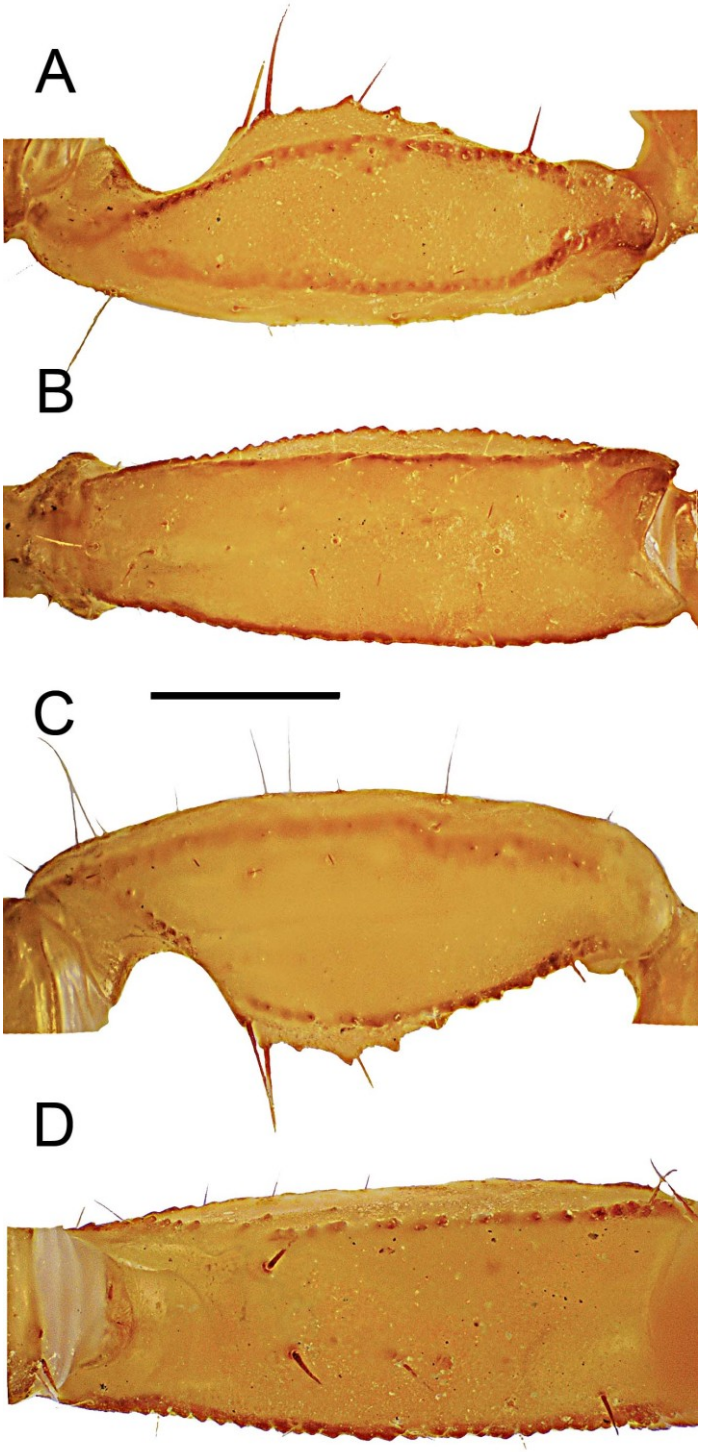


Figure 377. *Paravaejovis galbus* (Williams, 1970), holotype ♂ (CAS), dextral pedipalp patella. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

Paravaejovis gravicaudus (Williams, 1970)

Figures 354, 378–380, 410A, 416B, 420C, 421C, 425D, 428C, 431D

Vejovis spinigerus: Díaz-Nájera, 1964: 21 (in part and probable misidentification).

Vejovis gravicaudus Williams, 1970c: 325–331, figs. 29, 30; Stahnke, 1974: 135.

Vaejovis gravicaudus: Díaz-Nájera, 1975: 6, 14; Williams, 1980: 55, 61, 62, fig. 65, 66; Sissom, 1991a: 215–217; Kovařík, 1998: 147; Yahia and Sissom, 1996: 87; Beutelspacher, 2000: 88, 136, 137, 153, map 61 (in part); Sissom, 2000: 533; Hendrixson, 2001: 49; Soleglad and Fet, 2003b: 8, 161; Sissom and Hendrixson, 2005a: 128, tab. 6.2; McWest, 2009: 19, tab. 1, 55, 56, 59, figs. 159–163, 60, 118; Jiménez-Jiménez and Palacios-Cardiel, 2010: 70, 72, tab. 1, 74.

TYPE MATERIAL: **MEXICO: Baja California Sur:** Holotype ♂ (CAS, Type No. 10418), 34.4 km W Los Aripes, 900 ft, 25.vii.1968, S.C. Williams, J. Bigelow, and M.M. Bentzien. Paratypes: 13 ♂, 15 ♀ (CAS, including ♀ allotype), same locality as holotype.

DIAGNOSIS: *Paravaejovis gravicaudus* is closely related to *P. cochimi*, **n. sp.** and *P. spinigerus*, with which forms a monophyletic group (see *P. puritanus* for details). *P. gravicaudus* may be distinguished from *P. cochimi*, **n. sp.** by having pedipalp manus incrassate and fingers short and stout, instead of having manus and fingers gracile. From *P. spinigerus* differs by having weak dusky marking on the carapace and ventral median and ventral submedian carinae of metasomal segments I–IV diffusely outlined with infuscation, instead of having carapace and metasomal carinae outline intensely and broadly infuscated. *P. cochimi*, **n. sp.** has six retrolateral granules and six rows of median granules on pedipalp movable finger, instead of having seven retrolateral granules and seven rows of median denticles. Furthermore, *P. cochimi*, **n. sp.** has the

distal end of ventral median carinae of metasomal segment V weakly bifurcated, with two or three paired granules, instead of having this carinae bifurcated at least on distal half by two rows of large conical granules.

DESCRIPTION: This description supplements Williams' (1970c) original description, it is based on the material deposited in the collections mentioned in material examined.

Color and infuscation: Base color yellow straw. Carapace and tergites with vestigial traces of diffusely infuscation. Median and lateral ocular tubercles intensely infuscate. Pedipalp femur and patella, and legs slightly paler than carapace and tergites. Genital operculum and pectines pale yellowish to whitish. Ventral median and ventral submedian carinae finely infuscate. Ventral lateral and ventral submedian carinae of metasomal segments I-IV and ventral lateral and ventral median carinae in V weakly and finely infuscate. Aculeus base reddish, median and distal dark brownish.

Carapace: Carapace 1.06 times longer than posterior width. Anterior margin sublinear, with vestigial medial notch and five pairs of major macrosetae. Carapace shagreened, densely cover by minute granules and scattered moderate and enlarge granules. Median ocular tubercle moderately raised. Superciliary carinae moderate and smooth higher than median eyes. Position of median ocular tubercle on anterior half of carapace. Three pairs of lateral eyes, first anterior pair slightly larger than second pair and third pair slightly half the size of first pair. Median eyes approximately two times the size of first lateral frontal pair. Anteromedian sulci deep with a anterior depression; posteromedian moderate on proximal half and deep distally, anterolateral deep, posterolateral deep, posterior transverse vestigial to weak.

Sternum and coxal region: Sternum pentagonal subequilateral with three pairs of setae, one distal, two median pairs and one pair on the lobes, surface matte, median notch deep. Coxal

region with scatter matte spots in ♂, in ♀ smooth. Anterior margin of coxa II entirely cover with scatter moderate and minute granules, subbasally with three oblique slit-like structures, adjacent to a low, scattered, completely granulated protuberance; Proximal margin of coxal endite II with a deep depression each, median edge finely granular. Coxa IV 2.04 times longer than coxa II.

Chelicerae: Dorsal surface smooth, subdistal margin of manus with one macrosetae; distal margin with costate. Serrula present on ventral distal half of movable finger, tines numbering 12–14.

Pedipalps: Trichobothrial pattern Type C, orthobothriotaxic. Chela wider than patella, patella wider than femur. Femur: All intercarinal surfaces matted. Dorsal prolateral and dorsal retrolateral complete strongly granular with conical enlarged granules and hirsute, with eight to nine erect macrosetae; ventral prolateral strongly granular with conical enlarged granules; retrolateral dorsosubmedian obsolete expressed by eight or nine macrosetae reducing in size distally and one or two moderate granules; retrolateral ventral vestigial expressed by row of moderate conical granules; ventral prolateral and ventral retrosubmedian, vestigial expressed by a row of scatter enlarge crenatoserrate granules; prolateral ventrosubmedian vestigial, expressed by a two proximal enlarged spiniform tubercles followed by five irregularly positioned enlarge to moderate enlarged conical granules with a macroseta on top; prolateral ventral vestigial expressed by two pairs of proximal enlarged tubercles with a macroseta on top followed by two enlarged conical tubercles with a macroseta on base and three intersperse macrosetae. Prolateral surface, on ventral lateral and ventral prolateral intercarinal surface with a row of three or five macrosetae.

Patella: All intercarinal surface matte. All intercarinal surface matte. Dorsal prolateral complete strong with enlarge subserrate granules, hirsute with seven or eight erect macrosetae;

ventral prolateral complete strong with enlarge subserrate granules; dorsal retrolateral complete strong, moderately crenulated and hirsute with seven or eight erect macrosetae; ventral retrosubmedian complete strong, moderately crenulated and hirsute with eight or seven erect macrosetae; retrolateral dorsosubmedian and retrolateral median vestigial, expressed by a vestigial low costa; ventral median vestigial, expressed by a moderate proximal row of irregular fine granules; prolateral median on a vaulted projection protruding strongly medially, expressed by a proximal tubercle and a row of three or four scattered and coarse crenatoserrate granules, proximal, median and distal granules with a macroseta on top and one minor intersperse macrosetae, the row of macrosetae slanting gently towards subdistal end of dorsal prolateral carinae; prolateral ventral obsolete expressed by five to six major macrosetae adjacent to ventral prolateral carinae. Dorsal prolateral and prolateral median intercarinal surface with one or two macrosetae.

Chela: Manus smooth and incrassate in both sexes (manus 1.45 times longer than fixed finger). All carinae obsolete. Dorsal prolateral, dorsal median, dorsal retrolateral, ventral retrolateral, prolateral median, ventral median, and ventral retrolateral hirsute with four major macrosetae and tree or four intersperse minor macrosetae. Trichobothrium *Db* positioned on dorsal retrolateral carina, subbasal on chelae; *Dt* positioned at mid manus.

Fingers: Fixed finger, PD = 6, MD rows = 6, RD = 6, proximal RD positioned by proximal third. All RD subpaired with corresponding PD. Movable finger, PD = 7, MD rows = 6, distal row bearing one minute granule, RD = 6, proximal RD positioned by mid finger. All RD subpaired with corresponding PD. Trichobothria *ib* and *it* positioned subbasal on fixed finger, *ib* positioned between PD6 and PD7, adjacent to PD6, PD7 lacking granule; *it* between PD5 and PD6, adjacent to PD6. Distal retrolateral denticles in both fingers enlarged claw-like. Fingers

with vestigial scallop in ♂, proximal notch and medina lobe of fixed and movable finger vestigial, gap created when fingers closed moderate, fingers fit unevenly, in ♀ fingers lacking scalloping, gap created when fingers closed weak.

Legs: Basitarsi I–II prolateral ventral and retrolateral ventral carinae with complete rows of spinules; prolateral ventral in III and IV absent; retrolateral dorsal carinae in III partial, expressed as a row of spinules on distal two thirds, in IV vestigial expressed on distal third by scatter spinules; retrolateral dorsal in I partial, expressed as a row of spinules on distal two thirds, proximally expressed by spiniform granules, in II complete, distally spinules scatter, in III vestigial, expressed on distal third as a scatter row of spinules, in IV vestigial, expressed by few distal spinules; retrolateral median rows in I–IV vestigial expressed as few terminal spinules. Telotarsi I–IV with two or three pairs of ventrodistal spinules in I–IV. Setae: Prolateral ventral 3:3:5:5; subdistal two IV stout; retrolateral ventral, 3:7:8:8; retrolateral dorsal, 2:4:4:4; dorsal, 4:4:4:4; intersperse minor and major macrosetae in retrolateral ventral, retrolateral dorsal and retrolateral ventral; retrolateral dorsal and dorsal series arranged in two independent rows, in ♀ macrosetae visibly more elongate and with one or two intersperse accessory minor macrosetae.

Tergites: Pretergites matte, postergites with ventral submedian carinae intercarinal surface matte, other surface with scattered coarse granules. Dorsal median and ventral submedian carinae in tergites I–VI weak expressed by few distal moderate granules on distal half. Tergite VII dorsal lateral intercarinal surface matte, other intercarinal surface shagreened with few scattered moderate granules and dense minute granules; dorsal median carina weakly costate with few moderate granules, expressed on proximal half of the postergite; dorsal submedian vestigial expressed two or three oblique row of granules; dorsal lateral and lateral supramedian comparatively stronger and complete, distal extreme with an enlarged subserrate granules; dorsal

lateral carinae projecting and curving with scattered granules laterally approximating to lateral supramedian proximal margin, creating a semi horse show of strong and subserrated granules.

Genital operculum: Male genital operculum: wider than long, with four pairs of macrosetae. Sclerites free on longitudinal edge moving independently but unable to open more than 45°. Genital papillae protruding posteriorly. Female genital operculum: Wider than long, with three macrosetae. Sclerites fuse longitudinal.

Sternites: Sternites I–VII acarinated smooth, finely punctuated, and lustrous. Sternite V with distal median glandular spot obsolete in both sexes. Sternite VII with ventral lateral carinae vestigial, weakly costate with three pairs of macrosetae; other carinae obsolete expressed by macrosetae. Distomedian glandular spot obsolete in both sexes. Spiracle elongated, slit-like, approximately four times longer than wide.

Pectines: Basal piece with median notch deep, with five pairs of macrosetae. Marginal lamella consist of three sclerites, medial lamella proximally fuse distally progressively forming two conspicuous rows of beads, a proximal with 3 smaller beads and a median with 14–17 beads. Fulcra with 23–26 in ♂, in ♀ 18–22 beads. Pectinal tooth numbering 24–27 in ♂, in ♀ 19–23. Pectines relatively long, second sclerite of marginal lamella at the level of distal edge of coxa IV in ♂, in ♀ mid distal sclerite at the level of distal edge of coxa IV.

Hemispermatophore: Lamina 1.73 longer than trunk. Dorsal through margin long, narrow, curving proximally, and removed from ventral trough. Hemimating plug developed from the inner lobe, distal barb margin with 14 elongated spinules. Primary and secondary hook positioned on the apex of lateral margin extension of the lamina (flange). Both hooks rounded low, separated slightly, forming a shallow notch. Primary hook slightly rotated towards ventral surface. Median lobe ental terminus rounded, slightly protruding towards ental margin. Basal

plate of inner lobe removed from ventral trough. Spine of inner lobe relatively long and strongly sclerotized, secondary spine on ventromedian aspect of neck absent. Neck moderate (0.61 times longer than basal plate). Measurements, lamina, 4.68; trunk, 2.70; dorsal trough/laminar hooks, 1.62; ventral trough/laminar hook, 0.90; neck, 0.48; basal plate, 0.78.

Metasoma: Intercarinal surfaces smooth lustrous, ventral intercarinal surface of segments V moderately matte, distal half with scatter moderate granules. Carinae: Dorsal lateral and lateral median carinae in I–IV strongly crenatoserrated terminating in moderate enlarge spinoid granules pointing backwards; except lateral median in IV distal terminus strongly expanded laterally forming a triangular projection; dorsal lateral in V strong and serrated proximally, becoming weaker and crenulated, medially with a field of fine crenulation, ending on at low tubercle. Lateral inframedian in I complete strongly crenatoserrated; in II and III incomplete moderately crenatoserrated, becoming weaker proximally, present on distal third; in IV absent, in V vestigial with one or two proximal tubercles the rest obsolete; ventral lateral in I–IV moderately costate and smooth, ventral submedian in I–IV obsolete; ventral lateral and ventral median moderately crenatoserrate. Setae: In ♀, dorsal lateral carinae, 0:1:2:3:9; lateral median, 0:2:2:5; lateral inframedian, 2:1:1:0:6, ventral lateral, 3:5:4:6:16, setae in IV and V positioned in both sides of carinae; ventral submedian, 3:3:3:4:4, ventral sublateral, 2. Two to three accessory major macrosetae in ventral submedian intercarinal surfaces in segments I–IV. In ♂ all macrosetae reduced to minor macrosetae or absent.

Telson: Dorsal and ventral surface smooth. Ventral surface hirsute with 7–9 macrosetae in each carina, one or two occasionally minor in each row in ♀, in ♂ relatively bald, all macrosetae reduced to minor macrosetae, microsetae or absent. Ventral median carinae with subaculear tubercle vestigial. Microserration on laterobasal aculeus numbering 5.

DISTRIBUTION: *Paravaejovis gravicaudus* is endemic to the Sierra de la Giganta, from San Ignacio to La Paz, and to the following islands: San Marcos, Carmen, San Jose, and San Francisco, in Baja California Sur, Mexico.

ECOLOGY: Williams (1970c, 1980) indicated that he collected this species in volcanic habitats inland on the peninsula, but not similar areas close to the coast. The microhabitat preferred for *P. gravicaudus* was the bottom of canyons and washes, where volcanic outcrops and moderately packed soil were adjacent each other. These ecological observations were corroborated during my own fieldtrips. Although *P. gravicaudus* is associated with volcanic habitats, it is adapted to low altitudes, from 5 to 256 m.

REMARKS: Williams (1980) recorded specimens from Baja California Sur: 37 km S El Mármol, Rancho San Luis, 12.i.1965, Roth, AMNH. I was unable to find these specimens. El Mármol is a locality right in the center of Baja California, ca. 300 km from the border with Baja California Sur. It is probable that these specimens were either misidentified or mislabeled. For these reasons, I consider the distribution of *P. gravicaudus* to be restricted to Baja California Sur. This distribution also agrees with the distribution of other species and the hypothetical sea introgression across the Vizcaino Desert to the north and the sea pass at the Isthmus of La Paz. Although *P. cochimi*, **n. sp.** overlaps its distribution from San Ignacio to Loreto, the southern half of Baja California is only habited by *P. gravicaudus*, this distribution is also reflected in the islands where this species has been recorded. San Marcos Island has more similarities in vegetation and origin compared to the group of islands *P. gravicaudus* inhabits.

MATERIAL EXAMINED: **MEXICO: Baja California Sur:** *Municipio de Comondú*: Ciudad Constitución, 32 km W, 24°55.2828'N 111°58.08'W, 26 m, 11.vii.2004, A. Valdez, E. González, O. Francke, and W.E. Savary, desert, on ground, collected at night with UV light, 3 ♂, 3 ♀, 1

juv. (IBUNAM [ARA2038]); San José Comondú, Canyon, [25°59'59.57"N 111°59'59.75"W], 15.ii.1966, V. Roth, 2 ♀ (AMNH); San Miguel de Comondú, 26°2.4330'N 111°49.9164'W, 220 m, 12.vii.2004, A. Valdez, E. González, O. Francke, and W.E. Savary, desert, on ground, collected at night with UV light, 1 ♂ (CAS [ARA1503]); San Miguel de Comondú, 2 km SW, 12.vii.2004, 26°0'18.5"N 111°52'1.3"W, 169 m, E. González, O. Francke, W.E. Savary, and A. Valdez, collected at night with UV light, 4 ♂, 9 ♀, 4 juv. (AMNH), 26°01'48.3"N 111°50'57"W, 199 m, O. Francke, W.E. Savary, E. González, and A. Valdez, 1 ♂, 3 juv. (AMNH [LP 3163]), 26°0.3'N 111°52.0164'W, 169 m, A. Valdez, E. González, O. Francke, and W.E. Savary, 2 ♂, 4 ♀ (AMNH [ARA2542]), 1 ♂, 2 ♀, 2 juv. (IBUNAM [ARA2015]). *Municipio de La Paz*: El Pilar, ca. 20 km NE of Las Pocitas, 24°28.7616'N 111°1.12'W, 92 m, 25.vi.2008, H. Montaño and E. González, desert, collected at night with UV light, 10 ♂, 9 ♀, 8 juv. (AMNH [ARA2858]), 10 ♂, 9 ♀, 9 juv. (IBUNAM [ARA2237]), 1 ♀ (AMNH [LP 8793]); Isla San Francisco, [24°50'N 110°35'W], 30.v.1921, 1 ♂ (AMNH), B. Firstman, 24.iii.1953, 1 ♂ (AMNH), W. López-Forment, 5.i.2007, 5 ♂, 2 juv. (IBUNAM), 19.i.2007, 1 juv. (IBUNAM), 5.iii.2008, 1 ♀ (IBUNAM), 18.xii.2008, 1 ♀ (IBUNAM), 2.i.2009, 4 ♀ (IBUNAM), 25.ii.2009, 2 ♀, 1 juv. (IBUNAM), 26.ii.2009, 1 ♂, 2 ♀ (IBUNAM), 25.xii.2009, 2 ♀ (IBUNAM), 24.xii.2011, 4 ♀, 2 juv. (IBUNAM); Isla San José, Fishing camp Palma Sola, 25°03.091'N 110°40.037'W, 0–50 m, 3.vi.2008, E. González and I.G. Nieto, desert, collected at night with UV light, 1 ♂ (AMNH [LP 8783]), 8 ♂, 4 ♀, 15 juv. (AMNH [ARA2860]), 6 ♂, 3 ♀, 9 juv. (AMNH [ARA2865]), 8 ♂, 4 ♀, 14 juv. (IBUNAM [ARA2231]), 6 ♂, 3 ♀, 10 juv., (IBUNAM [ARA2249]); Isla San José, W side, 24°56.722'N 110°38.908'W, 0–50 m, 2.vi.2008, E. González and I.G. Nieto, arroyo wash, stones and boulders, thorn-scrub and cacti, collected at night with UV light, 1 ♂ (AMNH [LP 8780]), 8 ♂, 4 ♀, 10 juv. (AMNH [ARA2852]), 9 ♂, 4 ♀, 10 juv.

(IBUNAM [ARA2232]); La Paz, [24°10.0020'N 110°18'W], 30.xii.1974, 1 juv. (IBUNAM); La Paz, 29 km W, [24°10.0020'N 110°18'W], 61 m, 8.x.1972, E.L. Sleeper and F.J. Moore, 1 ♂ (OSAL); La Paz, 41 km NW, 24°4'36.2"N 110°36'57.1"W, 256 m, 7.vii.2004, O. Francke, E. González, and A. Valdez, collected at night with UV light, 2 ♂, 4 ♀ (AMNH), 1 ♂, 2 subad. ♀ (AMNH [ARA2541]), 1 ♀, 2 juv. (CAS [ARA1502]), 1 ♂, 1 ♀, (IBUNAM [ARA2014]); La Paz, 50 km NW, 24°05'56.2"N 110°43'41"W, 256 m, 7.vii.2004, O. Francke, E. González, and A. Valdez, collected at night with UV light, 1 ♂, 1 juv. (AMNH [LP 3161]); La Paz, 51 km NW, 24°8'56.2"N 110°49'27.60"W, 256 m, 7.vii.2004, O. Francke, E. González, and A. Valdez, collected at night with UV light, 1 ♂, 6 ♀, 9 juv. (AMNH), 3 ♀, 2 juv. (AMNH [ARA2037]), 1 ♂, 4 ♀, 2 juv. (AMNH [ARA2543]), 1 ♂, 1 ♀, 2 juv. (CAS [ARA1504]); La Paz, 75 km NW, 24°05'56.2"N 110°45'41"W, 256 m, 7.vii.2004, collected at night with UV light, 1 ♀ (AMNH), 24°5.9328'N 110°45.6828'W, 114 m, 7.vii.2004, desert, on ground, collected at night with UV light, 1 ♀ (CAS [ARA1505]), O. Francke, E. González, and A. Valdez; La Paz, ca. 20 km N, junction Route 1 and road to San Juan de La Costa, 24°13.3830'N 110°35.76'W, 20 m, 9.vii.2005, E. González, W.E. Savary, L. Prendini, and R. Mercurio, desert, collected at night with UV light, 1 ♂, 1 ♀ (AMNH [ARA3018]), 1 ♂, 1 ♀ (IBUNAM [ARA2332]), 1 subad. ♂, 1 subad. ♀, 1 juv. (AMNH [LP 4415]); La Paz, ca. 38 km N, 1 km off Route 1 on Ley Federal de la Reforma Agraria, 24°03.609'N 110°36.777'W, 256 m, 9.vii.2005, W.E. Savary and E. González, collected at night with UV light, 1 ♀ (AMNH [LP 4421]); Northwest end Isla San José, [25°0.2167'N 110°37.8'W], 14.i.1991, R. Medina and L. Cervantes, 1 ♂ (IBUNAM); San Evaristo, 10-15 km S, dirt road, 12.vii.2008, 24°47.7570'N 110°40.5018'W, 50 m, desert, collected at night with UV light, 4 ♂, 4 ♀, 8 juv. (AMNH [ARA2846]), 4 ♂, 4 ♀, 8 juv. (IBUNAM [ARA2235]), 24°47.757'N 110°40.502'W, 27–50 m, scrub-thorn and cacti, arroyo

and sand banks, collected at night with UV light, 1 ♀, 1 subad. ♀ (AMNH [LP 8829]), H. Montaño and E. González; San Evaristo, 5 km S, 12.vii.2008, 24°52.9008'N 110°41.4036'W, 50 m, desert, collected at night with UV light, 2 ♂, 2 ♀, 4 juv. (AMNH [ARA2848]), 2 ♂, 2 ♀, 4 juv. (IBUNAM [ARA2244]), 24°52.901'N 110°41.404'W, 5–50 m, sand dunes, collected at night with UV light, 1 ♂ (AMNH [LP 8835]), H. Montaño and E. González. *Municipio de Loreto*: Canipole, 8 km W, [26°24.16667'N 111°39.3666'W], 16.ii.1966, V. Roth, 2 (AMNH); Isla del Carmen, [25°58'49.19"N 111°10'0.98"W], W. López-Forment, 21.xii.2004, 1 ♀ (IBUNAM), 12.iii.2007, 1 ♀, 1 juv. (IBUNAM), 30.ii.2008, 3 ♀, 5 juv. (IBUNAM), 2.iii.2010, 2 juv. (IBUNAM), 13.iv.2010, 1 ♀ (IBUNAM), 21.xii.2010, 4 ♀ (IBUNAM); Isla del Carmen, Puerto Balandra, [25°58'49.19"N 111°10'0.98"W], 21.v.1921, 5 (AMNH); Isla Santa Catalina, [25°37.800'N 110°47.1'W], 10.ii.2009, W. López-Forment, 1 ♂, 1 subad. ♂, 1 juv. (IBUNAM); Juncalito, 5 m, 20.v.2004, 25°49.8918'N 111°19.6908'W, R. Mercurio and M. Nishiguchi, collected at night with UV light, 1 ♀, 3 ♂ (AMNH [ARA3134]), 25°49.892'N 111°19.691'W, R. Mercurio, M. Nishiguchi et al., collected at night with UV light, 2 ♂, 1 juv. (AMNH [LP 3484]); Loreto Base of La Giganta, 12.9 km S, [26°0.76667'N 111°20.6'W], 27.i.1965, V. Roth, 8 (AMNH); Loreto, 12 km W, 25°58.6998'N 111°27.1662'W, 190 m, 13.vii.2004, A. Valdez, E. González, O. Francke, and W.E. Savary, desert, on ground, collected at night with UV light, 2 ♂, 1 ♀, 2 subad. ♀, 5 juv. (AMNH [ARA2544]); Loreto, 13 km W to San Javier, provisional dirt road, 25°59.733'N 111°25.116'W, 176 m, 26.vi.2008, H. Montaño and E. González, arroyo wash, stones and boulders, thorn-scrub and cacti, sandy area, collected at night with UV light, 1 subad. ♀ (AMNH [LP 8791]); Loreto, 25 km S on gravel road ca. 250 m E Route 1, 25°48.6660'N 111°19.26'W, 6 m, 7.vii.2005, W.E. Savary, E. González, L. Prendini, and R. Mercurio, collected at night with UV light, 1 subad. ♂, 5 subad. ♀, 6 juv. (AMNH [ARA2545]), 2 ♀, 3

subad. ♂, 1 subad. ♀, 2 juv. (CAS [ARA1501]), 1 ♂, 5 ♀, 2 subad. ♂, 5 subad. ♀, 2 juv. (IBUNAM [ARA2013]); Loreto, 25 km S on gravel road just off Route 1, 25°48.6660'N 111°19.26'W, 6 m, 7.vii.2005, W.E. Savary, E. González, L. Prendini, and R. Mercurio, desert, on ground, collected at night with UV light, 4 ♂, 3 ♀ (AMNH [ARA2545];) Loreto, 25 km S, on gravel road ca. 0.25 km E Route 1, 25°48.666'N 111°19.266'W, 6 m, 7.vii.2005, W.E. Savary, L. Prendini, R. Mercurio, and E. González, collected at night with UV light, 3 juv. (AMNH [LP 4417]); Loreto, 25 km S, on gravel road just off Route 1, 25°48.666'N 111°19.266'W, 6 m, 7.vii.2005, E. González, W.E. Savary, L. Prendini, and R. Mercurio, collected at night with UV light, 5 juv. (AMNH [LP 4416]), 1 ♀ (AMNH [LP 5095]), Loreto, 3.2 km S, [25°48.666'N 111°19.266'W], 27.i.1965, V. Roth, 1 ♀, 4 juv. (AMNH); Loreto, 30 km S, [25°48.666'N 111°19.266'W], 4.viii.2004, P. Berea, 1 ♂ (AMNH); Loreto, 4.8 km N, [26°1.0020'N 111°21'W], 30 m, 11.xi.1972, E.L. Sleeper and F.J. Moore, (OSAL); Misión San Ignacio, [26°39'N 111°42'W], 1965, V. Roth, 1 (AMNH); Puerto Escondido, [27°33'0.04"N 114°44'15.92"W], 5.vii.1995, W. López-Forment, 3 ♀ (IBUNAM); Puerto Escondido, 1.6 km S, [25°48.6'N 111°18.55'W], 12 m, 12.xi.1972, E.L. Sleeper and F.J. Moore, 1 ♀, 1 subad. ♂ (OSAL); Puerto Escondido, 40 km S of Loreto, [25°48'24.96"N 111°18'55.27"W], 19.i.1996, W. López-Forment, 9 ♂, 7 ♀, 1 subad. ♂, 1 subad. ♀, 7 juv. (IBUNAM), 3 ♀ (IBUNAM); Top of grade, 21 km S Loreto, [26°0.76667'N 111°20.6'W], 29.i.1965, V. Roth, 2 ♂ (AMNH). *Municipio de Los Cabos*: Puerto Gatos, [25°19'N 110°57'W], 5.ii.2004, W. López-Forment, 1 juv. (IBUNAM). *Municipio de Mulegé*: Bahía Concepción, near El Coyote, [26°23'59.64"N 111°30'0.15"W], 17.ii.1966, V. Roth, 7 (AMNH), 2 ♀ 1 juv. (AMNH); Isla San Marcos, [27°11'37.07"N 112°4'53.21"W], W. López-Forment, 22.iii.2009, 1 juv. (IBUNAM), M. Soule, 29.iii.1962, 1 ♀ (AMNH); Mulegé, [26°53'4.8"N 111°56'33.1"W], 14.v.1921, 2 ♀ (AMNH), V. Roth, 26.i.1965, 4 (AMNH), 1 ♂, 1

♀, 3 juv. (AMNH), 1 ♀, 9 juv. (AMNH); Mulegé, 11.2 km S, [26°53'4.8"N 111°56'33.1"W], 4.viii.1980, N.V. Horner, 7 (AMNH); San Ignacio, 4.8 km NW, [27°16.533'N 112°53.366'W], 22.ii.1966, V. Roth, 6 (AMNH); Santa Rosalía, [27°20.333'N 112°16.01666667'W], 8.v.2008, 1 ♂ (IBUNAM); Santa Rosalía, 18 km S, [27°20.333'N 112°16.01666667'W], 17.ii.1966, V. Roth, 1 ♀, 1 juv. (AMNH); Isla Coronados, Punta Manial, [26°7'8.94"N 111°16'32.02"W], 27.ii.2001, H. Brailowsky, 2 ♀ (IBUNAM).

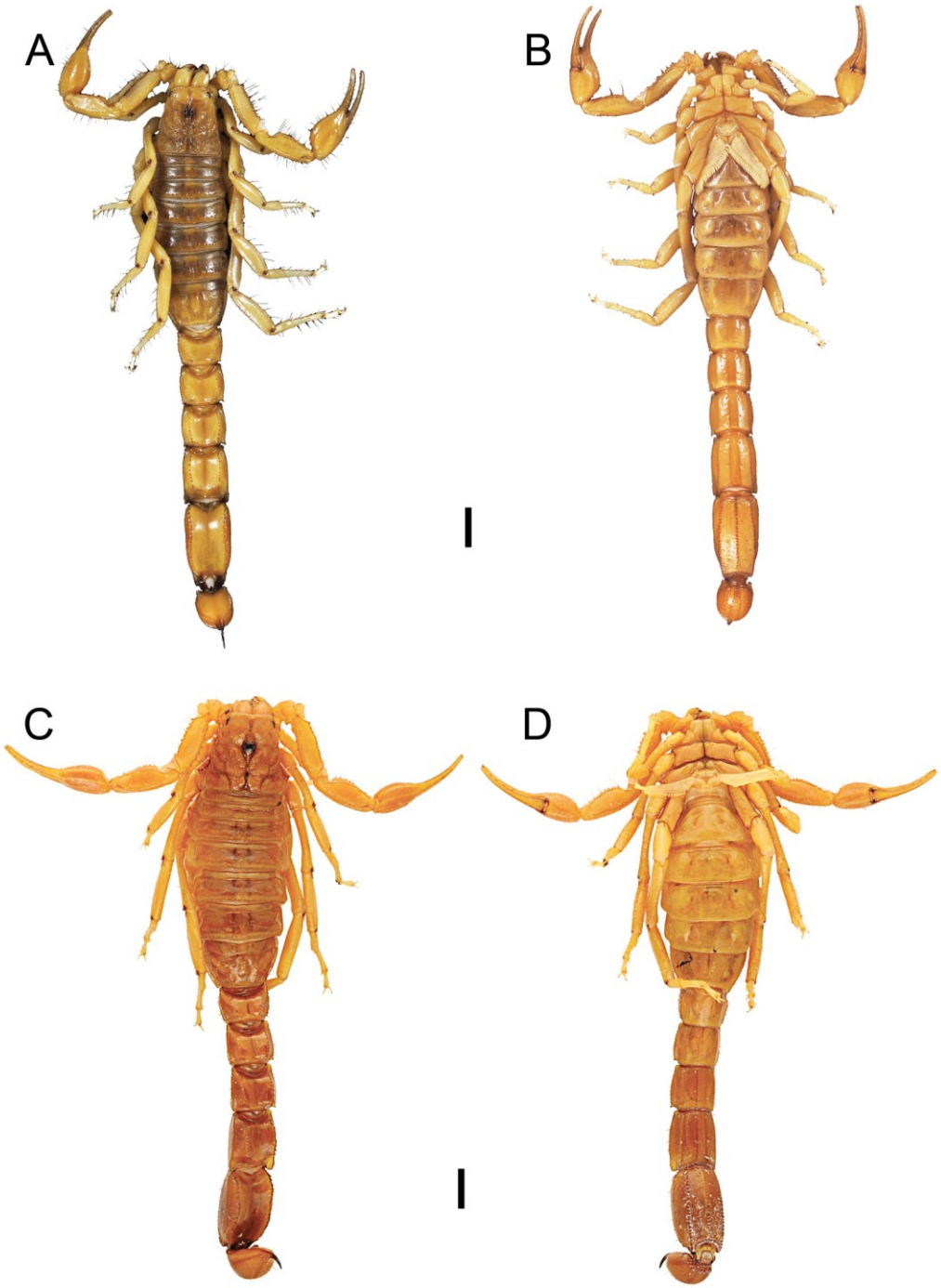


Figure 378. *Paravaejovis gravicaudus* (Williams, 1970), habitus. **A**, **B**. Paratype ♂ (AMNH). **C**, **D**. ♀ (AMNH). **A**, **C**. Dorsal aspect. **B**, **D**. Ventral aspect. Scale bars = 5 mm.

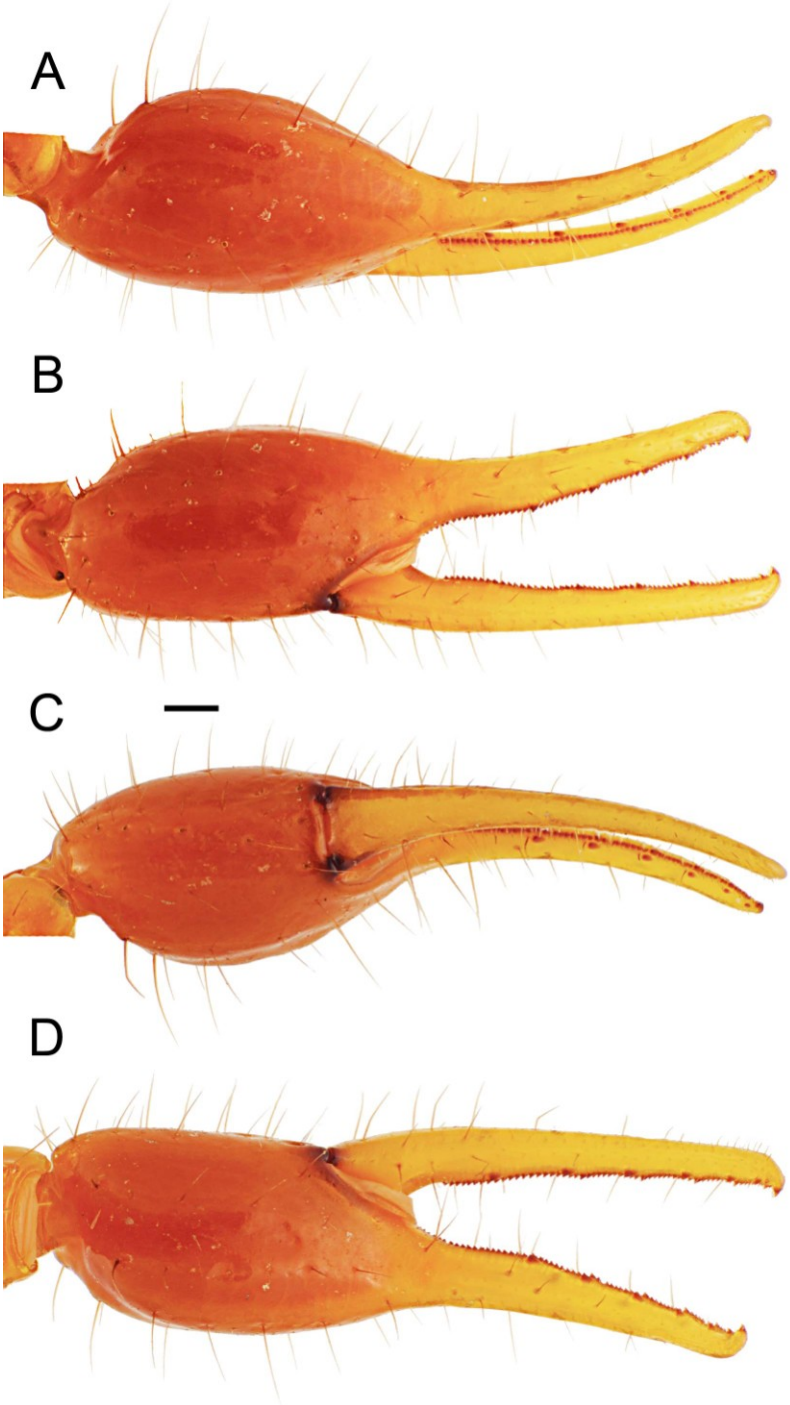


Figure 379. *Paravaejovis gravicaudus* (Williams, 1970), paratype ♂ (AMNH), dextral pedipalp chela. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

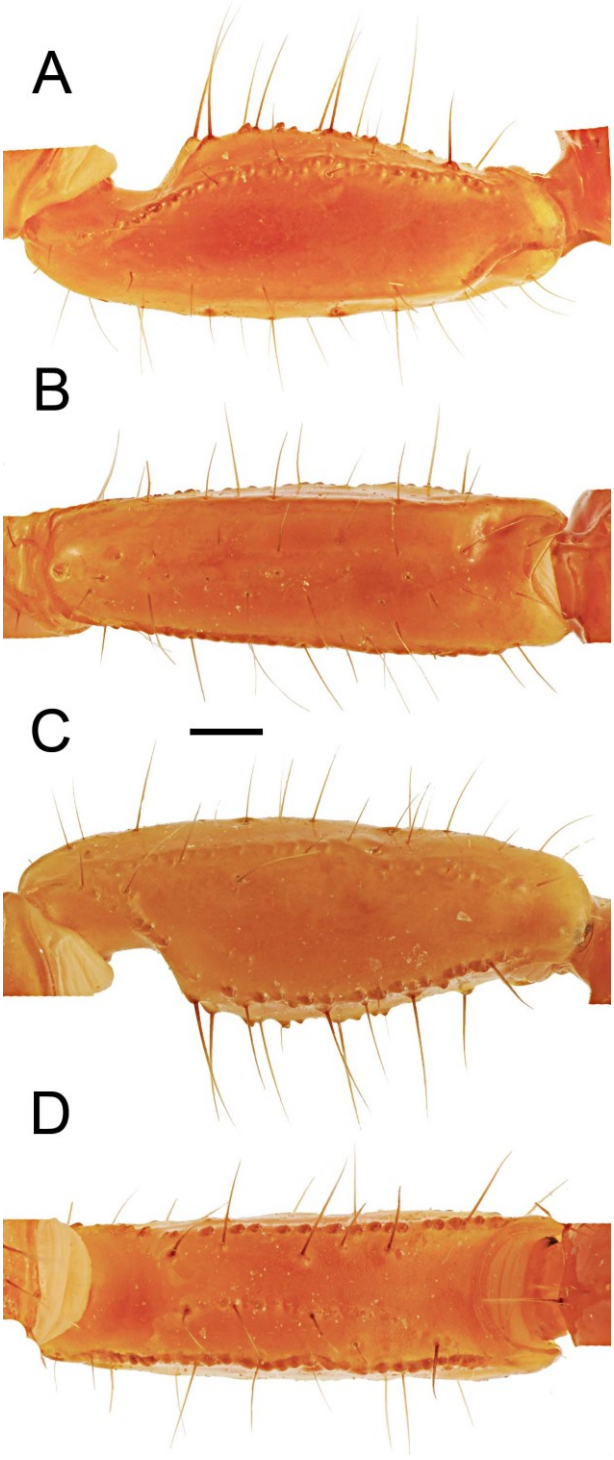


Figure 380. *Paravaejovis gravicaudus* (Williams, 1970), paratype ♂ (AMNH), dextral pedipalp patella. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

Paravaejovis hoffmanni (Williams, 1970)

Figures 353, 381–383, 410C, 414B, 420E, 421E, 425F, 428E, 432B

Vejovis hoffmanni Williams, 1970c: 313–317, fig. 21, 22; Soleglad, 1973b: 359, tab. 4; Stahnke, 1974: 135.

Vaejovis hoffmanni hoffmanni: Williams, 1970a: 413; 1980: 64, fig. 62, 67; Sissom, 2000: 533; McWest, 2009: 20, tab. 1, 59, 118.

Vejovis hoffmanni fuscus Williams, 1970a: 413–415.

Vaejovis hoffmanni: Díaz-Nájera, 1975: 6, 10, 15; Williams, 1980: 55, 64, fig. 62, 67, 68; Kovařík, 1998: 147; Beutelspacher, 2000: 89, 137, 138, 153, map 65; Sissom, 2000: 533; Sissom and Hendrixson, 2005a: 128, tab. 6.2; Jiménez-Jiménez and Palacios-Cardiel, 2010: 72, tab. 1.

Vaejovis hoffmanni fuscus: Díaz-Nájera, 1975: 6, 36; Williams, 1980: 55, 64, fig. 62, 68; Kovařík, 1998: 147; Sissom, 2000: 533, 534.

Vaejovis hoffmanni "form" *fuscus*: Beutelspacher, 2000: 89, 138, 153, map 65.

Hoffmannius hoffmanni hoffmanni: Soleglad and Fet, 2008: 4, 71, 73, 91.

Hoffmannius hoffmanni fuscus: Soleglad and Fet, 2008: 91.

TYPE MATERIAL: **MEXICO: Baja California Norte:** Holotype ♂ (CAS, Type No. 10420), 4.8 km N Manuela, 22.vi.1968, S.C. Williams and M.A. Cazier. Paratypes: 74 ♂, 64 ♀ (CAS, including ♀ allotype), same locality as holotype.

Vejovis hoffmanni fuscus: **MEXICO: Baja California Sur:** Holotype ♂ (CAS, Type No. 10421), 39 km NE San Jose de Comondu, 15.v.1969, S.C. Williams. Paratypes: 10 ♂, 3 ♀ (CAS, including ♀ allotype), same locality as holotype.

DIAGNOSIS: *P. hoffmanni* is closely related to *P. nigroguerreroensis*, **n. sp.** *P. voluptatis*, **n. sp**, *P. pumilis*, *P. eusthenura*, and *P. diazi*, with which forms a monophyletic group (see *P. nigroguerreroensis*, **n. sp.** for details). *P. hoffmanni* can be distinguished from *P. voluptatis*, **n. sp.** and *P. pumilis* by having rows of trichobothria $V_{1–4}$ and $Eb_{1–3}$ separate and distinguishable, and trichobothria *ib* and *it* on proximal third to median third of fixed finger, at or close to RD6 or between RD6 and RD5, instead of having trichobothria $V{+}Eb_{13–17}$ merge and undistinguishable, and trichobothria *ib* and *it* at base of fixed finger, proximal to associated macroseta of RD7. Additionally *P. hoffmanni* can be separated from these species by having trichobothria *d* and *i* of pedipalp femur proximal, instead of having them distal. From *P. voluptatis*, **n. sp.**, *P. pumilis* and *P. nigroguerreroensis*, **n. sp.** may be separated by having five retrolateral denticles and five rows of median denticles in pedipalp fixed finger, instead of having six retrolateral denticles and six rows. From *P. eusthenura* can be distinguished by having telson and pedipalp manus moderately hirsute with five or less macrosetae in each carina, instead of having seven or more in each carina. *P. eusthenura* further differs from *P. hoffmanni* by having ventral lateral of metasomal segments I–IV weakly crenulated, instead of having this carina of metasomal segments I and II costate and smooth, and III and IV costate and smooth on proximal two thirds and weakly crenular on distal third. From *P. diazi* differs by lacking scallop in pedipalp fingers, instead of having proximal notch and median lobe of pedipalp fixed finger moderate. From *P. nigroguerreroensis*, **n. sp.**, differs by having metasomal segment V less than 2.0 times longer than wide in ♂, instead of having metasomal segment V more than 2.5 times longer than wide.

DESCRIPTION: This redescription supplements Williams' (1970c) redescription, it is based on the material deposited in the collections mentioned in material examined.

Color and infuscation: Base color uniformly yellow straw. Carapace with median posterior surface weakly infuscate. Tergites with proximal surface of postergites weakly infuscate. Prolateral and retrolateral margin of femur and patella moderately infuscate. Median and lateral ocular tubercles intensely infuscate. Pectines pale whitish. Aculeus reddish.

Carapace: Carapace 1.09 times longer than posterior width. Anterior margin linear, with obsolete medial notch and three pairs of erect major macrosetae. Carapace shagreened, densely cover by minute and enlarge granules. Median ocular tubercle moderately raised and broad. Superciliary carinae weak and smooth lower than median eyes. Position of median ocular tubercle on anterior half of carapace. Three pairs of lateral eyes, two distal pair same size, third pair half the size of first two pairs. Median eyes approximately two times the size of first lateral frontal pair. Anteromedian sulci deep with an anterior depression; posteromedian and posterolateral moderate, anterolateral obsolete, posterior transverse vestigial to weak.

Sternum and coxal region: Sternum pentagonal subequilateral with three pairs of setae, one distal, one median pairs and one pair on the lobes, surface matte, median notch deep. Coxal region with scatter matte spots in ♂, in ♀ smooth. Anterior margin of coxa II entirely cover with scatter moderate and minute granules, subbasally three oblique slit-like structures, adjacent to a moderate granular protuberance with a macroseta on top. Proximal margin of coxal endite II with a deep elongate depression each extending to proximal third, median edge finely granular. Coxa IV 2.72 times longer than coxa II.

Chelicerae: Dorsal surface smooth, subdistal margin of manus with one macrosetae; distal margin with costate. Serrula present on ventral distal half of movable finger, tines numbering 5–8.

Pedipalps: Trichobothrial pattern Type C, orthobothriotaxic. Chela wider than patella, patella wider than femur. Femur: All intercarinal surfaces matted, except ventral with proximal half with dense slightly larger granules. Dorsal prolateral, dorsal retrolateral and ventral prolateral complete moderately granular; retrolateral dorsosubmedian obsolete expressed by five macrosetae on distal two thirds; retrolateral ventral vestigial expressed by three or four low crenatoserrate granules; ventral prolateral vestigial expressed by a short row of proximal moderate granules; ventral retrosubmedian, vestigial expressed by a proximal field of scatter crenatoserrate granules; prolateral ventrosubmedian vestigial, expressed by a proximal enlarged spiniform tubercles followed by row of irregular conical tubercles, subbasal and distal with a macroseta on top and few moderate intersperse granules; prolateral ventral vestigial expressed by a proximal moderate spiniform tubercle with a macroseta on top followed by two low tubercles with a macroseta on base.

Patella: All intercarinal surface matte, except retrolateral smooth. Dorsal prolateral complete irregularly and finely crenular; ventral prolateral complete with moderate rounded granules; dorsal retrolateral obsolete; ventral retrosubmedian complete weakly and finely crenulated; retrolateral dorsosubmedian and retrolateral median obsolete; ventral median vestigial, expressed by a proximal short irregular row of fine granules; prolateral median on a vaulted projection, protruding moderately medially, expressed by a proximal tubercle and a row of fine scatter granules, median and distal granules with a macroseta on top, becoming weaker distally forming a weak row of fine granules gently slanting towards subdistal end of dorsal prolateral carinae; prolateral ventral obsolete expressed by three major macrosetae adjacent to ventral prolateral carinae.

Chela: Manus smooth and elongate in both sexes. All carinae obsolete and moderately hirsute with three or four macrosetae, except prolateral median with six or seven macrosetae. Trichobothrium *Db* positioned on dorsal retrolateral carina, subbasal on chelae; *Dt* positioned at mid manus.

Fingers: Fixed finger, PD = 6, MD rows = 6, RD = 6, proximal RD positioned by proximal third. All RD subpaired with corresponding PD. Movable finger, PD = 7, MD rows = 6, distal row bearing one minute granule, RD = 6, proximal RD positioned by proximal third. All RD subpaired with corresponding PD. Trichobothria *ib* and *it* positioned subbasal on fixed finger, *ib* positioned between PD6 and PD7, PD7 lacking granule, *it* at the level of PD6 in ♂, in ♀ *ib* and *it* adjacent to PD6. Fingers with weak to strong scallop in ♂, proximal notch and median lobe of fixed finger weak, proximal notch and median lobe of movable finger obsolete, gap created when fingers closed strong, fingers fit unevenly, in ♀ fingers with obsolete scalloping, gap created when fingers closed weak.

Legs: Basitarsi I–II prolateral ventral, retrolateral ventral carinae with complete rows of spinules; prolateral ventral in III and IV absent; retrolateral ventral in III complete, expressed by a row of scatter spinules, in IV absent; retrolateral dorsal carinae in I vestigial expressed on distal third, in II complete, in III complete, expressed by a row of scatter spinules, becoming proximally spinoid granules, in IV vestigial, expressed as a row of scatter spinules on distal thirds; retrolateral median rows in I–IV vestigial expressed as few terminal spinules. Telotarsi I–IV with two pairs of ventrodistal spinules in I–IV. Setae: Prolateral ventral 2:4:4:4; retrolateral ventral 3:7:7:7, intersperse minor and major macrosetae; retrolateral dorsal 2:3:4:4; dorsal 4:4:4:4; retrolateral dorsal and dorsal series in I and IV arranged in two independent rows, in II and III arranged in a sublinear row being dorsal median slightly offset and expressed as a

macrosetae, in ♀ I–III arranged in a sublinear row being dorsal median slightly offset, all macrosetae pointing towards the retrolateral side, in IV dorsal and dorsal series arranged in two independent rows and macrosetae visibly more elongate.

Tergites: Pretergites matte, postergites with dorsal submedian carinae intercarinal surface matte, other surface with scatter coarse crenulations. Dorsal median and ventral submedian carinae in tergites I–VI vestigial expressed by few distal weak granules on distal half. Tergite VII intercarinal surface shagreened, with few scattered moderate granules and dense minute granules; dorsal median carina moderately costate with few moderate granules, expressed on proximal half of the postergite; dorsal submedian vestigial expressed as a low short pair of proximal short oblique row of three or four granules; dorsal lateral and lateral supramedian comparatively stronger and complete; dorsal lateral carinae projecting and curving with scattered granules laterally approximating to lateral supramedian proximal margin, creating a semi horse show of strong and subserrated granules.

Genital operculum: Male genital operculum: wider than long, with four pairs of macrosetae. Sclerites free on longitudinal edge moving independently but unable to open more than 45°. Genital protruding posteriorly. Female genital operculum: Wider than long, with three macrosetae. Sclerites fuse longitudinal.

Sternites: Sternites III–VII acarinated finely punctuated, and lustrous in ♀, in ♂ medially smooth and finely punctuated and laterally matte. Sternite V and VII lacking distal median glandular spot in both sexes. Sternite VII with ventral lateral carinae vestigial, expressed by a weak costa weakly crenulate and two pairs of macrosetae; other carinae obsolete expressed by macrosetae. Spiracle elongated, slit-like, approximately two times longer than wide.

Pectines: Basal piece with median notch deep, with three pairs of macrosetae. Marginal lamella consist of three sclerites, medial lamella proximally fuse distally progressively forming a conspicuous rows of 12 beads. Fulcra with 24–26in ♂, in ♀ 20–22 beads. Pectinal tooth numbering 25–27 in ♂, in ♀21–23. Pectines relatively long, second sclerite of marginal lamella at the level of distal edge of coxa IV in ♂, in ♀ mid distal sclerite at the level of distal edge of coxa IV.

Hemispermatophore: Lamina 3.00 longer than trunk. Dorsal through margin long, straight, tapering and curving proximally, and removed from ventral trough. Hemimating plug developed from the inner lobe, distal barb margin with 7 elongated spinules. Primary and secondary hook positioned on the apex of lateral margin extension of the lamina (flange). Both hooks rounded low, separated slightly, forming a shallow notch. Median lobe ental terminus moderate and rounded. Basal plate of inner lobe removed from ventral trough. Spine of inner lobe moderate, secondary spine on ventromedian aspect of neck absent. Neck relatively short (0.40 times longer than basal plate). Measurements, lamina, 3.00; trunk, 1.62; dorsal trough/laminar hooks, 0.84; ventral trough/laminar hook, 0.42; neck, 0.24; basal plate, 0.60.

Metasoma: Intercarinal surfaces weakly matte to smooth lustrous, except ventral surface of segments I–III smooth, distal half of ventral surface of V with lateral moderate granulation. Carinae: Dorsal lateral and lateral median carinae in I–IV strongly crenatoserrated terminating in moderate enlarge spinoid granules pointing backwards; except lateral median in IV distal terminus moderate expanded laterally forming a triangular projection; dorsal lateral in V moderately crenatoserrate proximally, becoming moderate, ending on at smooth tubercle. Lateral inframedian in I complete finely crenatoserrated; in II partial with scatter weak crenatoserrate granules, becoming weaker proximally, present on distal half, in III partial moderately

crenatoserrated, becoming weaker proximally, present on distal third; in IV absent, in V vestigial with a proximal tubercle followed by weak scatter row of crenulations granules, becoming weaker distally, present in distal half; ventral lateral in I–IV weakly costate and smooth in proximal two thirds, distal third finely crenular, ventral submedian in I–IV obsolete; ventral lateral and ventral median strongly crenatoserrate. Setae: In ♀, dorsal lateral, 0:1:3:4:8; lateral median, 0:1:1:2; lateral inframedian, 2:0:0:0:2; ventral lateral, 2:2:2:2:6; ventral submedian, 3:3:3:3:2; ventral sublateral, 2.

Telson: Dorsal and ventral surface smooth lustrous, proximal ventral margin with vestigial crenulations. Ventral surface with 6–7 macrosetae. Ventral median carinae with subaculear tubercle obsolete, Microserration on laterobasal aculeus numbering 6–8.

DISTRIBUTION: *Paravaejovis hoffmanni* is distributed in the lowlands contiguous to the Sierra de la Giganta, from the southern half of Baja California Sur to the northern limit in the southern portion of that Sierra in the state of Baja California, Mexico. This territory includes the Magdalena Plains and the Vizcaino Desert.

ECOLOGY: *Paravaejovis hoffmanni* is yet another psammophilous species; it is found exclusively in sandy habitats and presents setal combs, lacks infuscation and is very pale. *P. hoffmanni* was collected from 42 to 380 altitude. The dominant vegetation in which it has been collected is the unique association of thorn-scrub and cacti established in sandy regions of the Magdalena Plains and the Vizcaino Desert, as well as the sandy washes on the foothills of Sierra de la Giganta.

REMARKS: Williams (1970a, 1980) described *Vaejovis hoffmanni fuscus* from the Los Comondus area, a rather distinctive volcanic area. I studied these specimens and other from the area, as well as other northern locations of volcanic origin at San Borja Mission, both lots of

scorpions are referable to *P. hoffmanni*. Williams (1970a) commented that this taxon penetrates into the mountains through sandy canyons reaching oases far from the sandy plains where other populations thrive. I proposed the synonym of that subspecies because I did not find consistency in the characters proposed by Williams and did not observe genetic differences among these populations.

Paravaejovis hoffmanni is of particular interest, because its distribution proves a clear connection between the Magdalena Plains and the Vizcaino Desert. These low coastal deserts today are barely united by the coast line. It is probable that in other times these were a sole extended plain. This is further support by the distribution of *P. pumilis* in the Magdalena Plain and *P. voluptatis*, **n. sp.** in the Vizcaino Desert.

MATERIAL EXAMINED: **MEXICO: Baja California Sur:** *Municipio de Comondú*: Casa Viejas, [26°2.9040'N 111°51.10'W], 29.x.1972, E.L. Sleeper and F.J. Moore, 1 ♀ (OSAL); Isla Magdalena, Bahía Santa María, 1.5 km N of Punta Hughes, [25°21.9780'N 112°6.2563'W], 9.vii.1983, D. Weisman and V.F. Lee, 1 ex. (CAS); San Carlos, near Constitución, [25°1.933'N 111°40.21666'W], 9.ii.2007, W. López-Forment, 1 ♂ (IBUNAM); San José de Comondú, 39 km NE, [26°12'0.15"N 111°23'59.28"W], 274 m, 15.v.1969, S.C. Williams, 1 ex. (CAS). *Municipio de Guerrero Negro*: Punta Abreojos, 6 km, 27°17'23.6"N 113°09'28.1"W, 104 m, 17.vii.2004, O. Francke, W.E. Savary, E. González, and A. Valdez, collected at night with UV light, 1 ♀, 1 juv. (AMNH [LP 3164]); Vizcaino desert, 27°29'54.7"N 114°17'35.6"W, 223 m, 16.vii.2004, O. Francke, W.E. Savary, E. González, and A. Valdez, collected at night with UV light, 3 ♀ (AMNH [LP 3166]); Vizcaino desert, 20 km W, 27°34'26.1"N 113°32'32.7"W, 42 m, 16.vii.2004, O. Francke, W.E. Savary, E. González, and A. Valdez, collected at night with UV light, 1 juv. (AMNH [LP 3172]). *Municipio de Mulegé*: Colonia de La Toba, 27 km N, [25°10'N

111°30'W], 25.i.1965, V. Roth, 2 (AMNH-Paratypes); Microwave station "El Abulón", 27°17.483'N 113°01.916'W, 141 m, 14.vii.2004, W.E. Savary and E. González, collected at night with UV light, 4 juv. (AMNH [LP 5096]), A. Valdez, E. González, O. Francke, and W.E. Savary, desert, on ground, collected at night with UV light, 1 ♀, 1 subad. ♂ (AMNH [ARA1456]), 1 ♀ (CAS [ARA1548]), 1 ♂, 2 ♀ (IBUNAM [ARA2102]); Microwave station "El Abulón", San Ignacio, 27°17'29.4"N 113°01'55.2"W, 141 m, 14.vii.2004, O. Francke, W.E. Savary, E. González, and A. Valdez, collected at night with UV light, 1 ♀, 1 juv. (AMNH [LP 3167]); Road Punta Abreojos, marker km 6, 27°17'23.6"N 113°9'28.1"W, 104 m, 17.vii.2004, A. Valdez, E. González, O. Francke, and W.E. Savary, collected at night with UV light, 1 ♂, 5 ♀, 18 juv. (AMNH), 1 ♂, 2 ♀, 4 subad. ♂, 4 subad. ♀, 2 juv. (AMNH [ARA1457]), 1 ♀, 3 subad. ♂, 2 subad. ♀ (CAS [ARA1549]), 3 ♀, 5 subad. ♂, 2 subad. ♀ (IBUNAM [ARA2103]); desert, on ground, collected at night with UV light, Route 1, 7 km SW turnoff to Punta Abreojos, 27°17.05'N 113°09.866'W, 76 m, 5.vii.2005, W.E. Savary, E. González, L. Prendini, and R. Mercurio, desert, on ground, collected at night with UV light, 1 subad. ♂ (AMNH [LP 4446]), 2 ♂, 5 ♀ (AMNH [ARA1460]), 1 ♂, 7 ♀ (AMNH [ARA2105]); Route 1, ca. 9 km SW turnoff to Punta Abreojos, 27°15.866'N 113°11.300'W, 64 m, 5.vii.2005, W.E. Savary, L. Prendini, E. González, and R. Mercurio, collected at night with UV light, 2 ♂, 2 ♀, 10 juv. (AMNH [LP 4438]); San Angel Dunes, 27°14'05"N 113°13'46.5"W, 25 m, 14.vii.2004, A. Valdez, E. González, O. Francke, and W.E. Savary, collected at night with UV light, 2 ♂, 5 juv. (AMNH [LP 3152]), 1 ♂, 3 ♀, 1 subad. ♂, 4 subad. ♀ (AMNH [ARA1465]), 1 ♂, 1 ♀, 3 subad. ♂, 1 subad. ♀, 1 juv. (CAS [ARA1547]), 1 ♂, 3 ♀, 1 subad. ♂, 4 subad. ♀ (IBUNAM [ARA2101]); San Ignacio, 15 km W, [27°16.533'N 112°53.366'W], 13.i.1984, 1 ♀ (IBUNAM); Sierra del Placer, 21 km to junction Bahía Tortugas and Bahía Asunción, 98 km E of Vizcaino towards

Bahía Tortugas, 27°28.9278'N 114°17.0928'W, 262 m, 28.vi.2008, H. Montaño and E. González, desert, collected at night with UV light, 1 ♂ (AMNH [ARA2891]), 12 ♂, 10 ♀, 23 juv. (AMNH [ARA2864]), 12 ♂, 10 ♀, 26 juv. (IBUNAM [ARA2243]), 1 ♀ (AMNH [LP 8812]); Vizcaino desert II, 27°29.6166'N 113°46.7328'W, 47 m, 16.vii.2004, A. Valdez, E. González, O. Francke, and W.E. Savary, desert, on ground, collected at night with UV light, 1 ♂ (AMNH [ARA1459]); Vizcaino desert, 16.vii.2004, 27°29'37"N 113°46'44.7"W, 47 m, collected at night with UV light, 1 (AMNH), 27°29'54.7"N 114°17'35.6"W, 223 m, collected at night with UV light, 2 ♂, 1 ♀, 11 juv. (AMNH), E. González, O. Francke, W.E. Savary, and A. Valdez; Vizcaino desert, 20 km W, 27°34'26.1"N 113°32'32.7"W, 42 m, 16.vii.2004, E. González, O. Francke, W.E. Savary, and A. Valdez, collected at night with UV light, 3 ♂, 4 ♀, 3 juv. (AMNH), 2 ♂, 3 ♀, 5 juv. (AMNH [ARA1458]), 1 ♂, 1 ♀, 2 juv. (CAS [ARA1550]), 1 ♂, 2 ♀, 2 subad. ♂, 2 subad. ♀, 2 juv. (IBUNAM [ARA2104]). **Baja California:** *Municipio de Ensenada*: Laguna Manuela, 4.8 km N, [28°14.78350'N 114°4.418166'W], 152 m, 22.vi.1968, S.C. Williams and M. Cazier, 2 (AMNH-Paratypes), 1 (AMNH), 1 ♂, 1 ♀, 1 subad. ♂, 1 subad. ♀ (AMNH); Misión de San Francisco de San Borja de Adac, 5 km W, 28°44.558'N 113°47.935'W, 380 m, 30.vi.2008, H. Montaño and E. González, desert, collected at night with UV light, 7 ♂, 2 ♀, 7 juv. (AMNH [ARA2885]), 8 ♂, 2 ♀, 6 juv. (IBUNAM [ARA2273]), 1 ♂ (AMNH [LP 8797]).

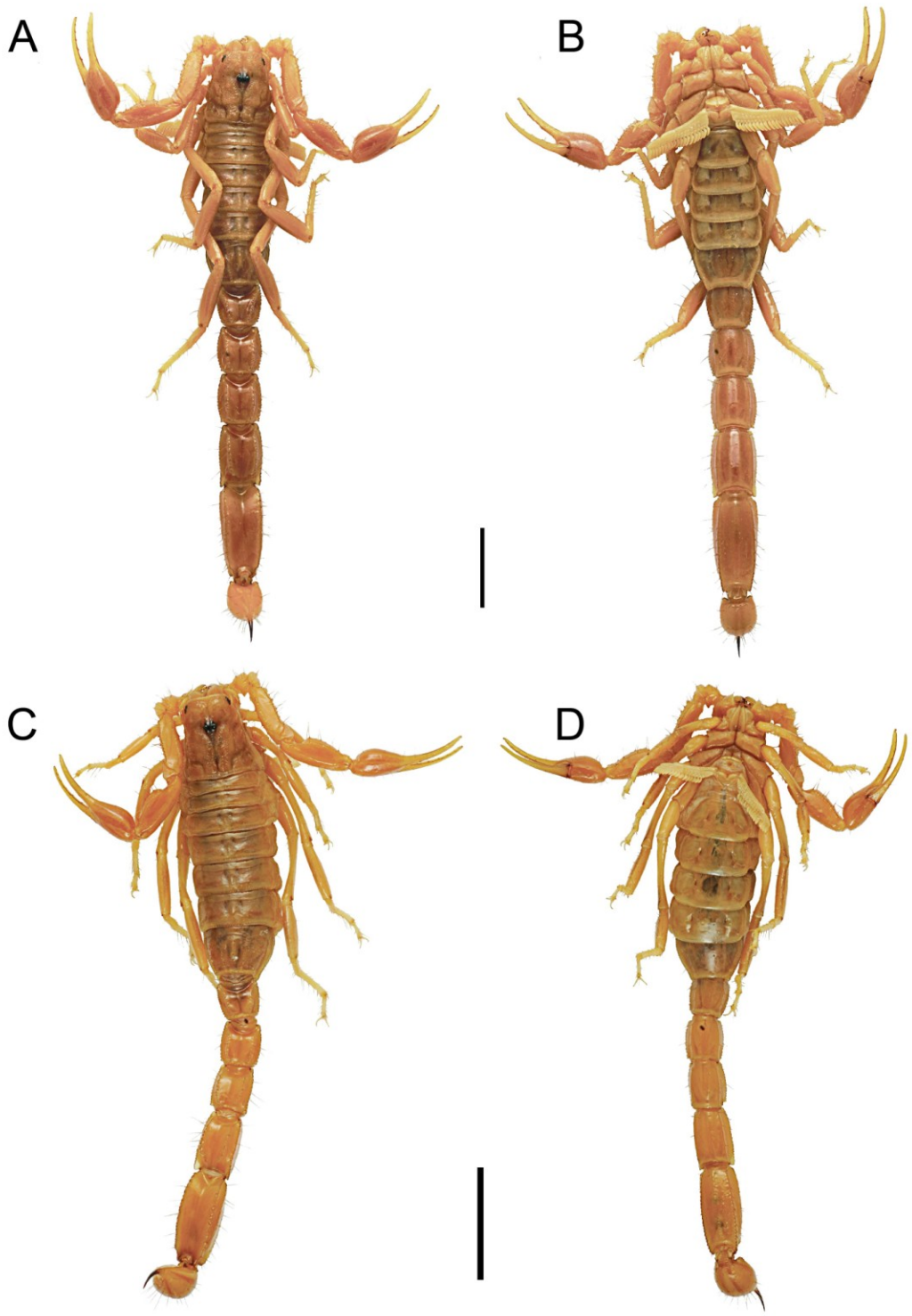


Figure 381. *Paravaejovis hoffmanni* (Williams, 1970), habitus. **A**, **B**. Paratype ♂ (AMNH). **C**, **D**. ♀ (AMNH). **A**, **C**. Dorsal aspect. **B**, **D**. Ventral aspect. Scale bars = 5 mm.

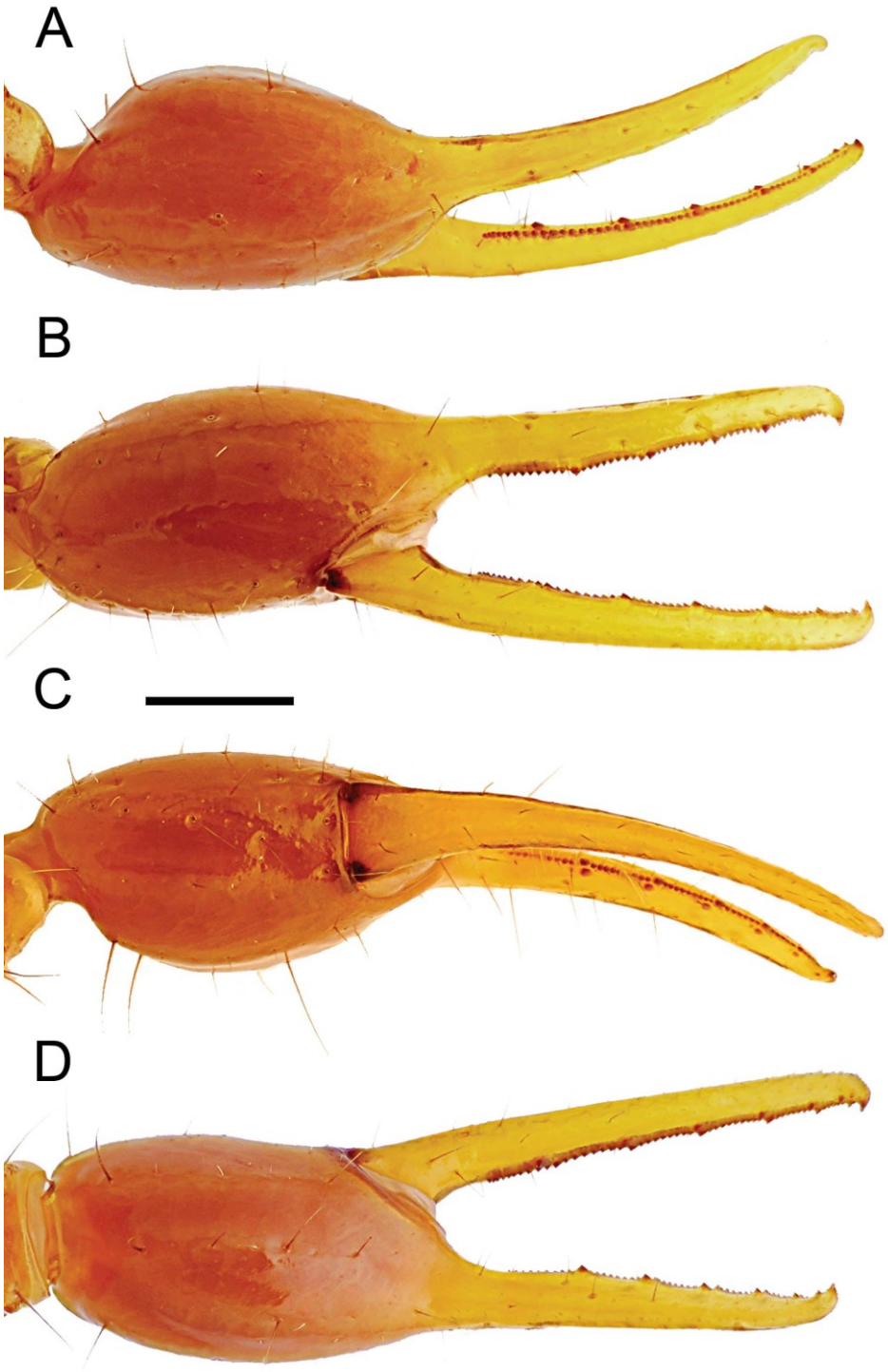


Figure 382. *Paravaejovis hoffmanni* (Williams, 1970), paratype ♂ (AMNH), dextral pedipalp chela. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

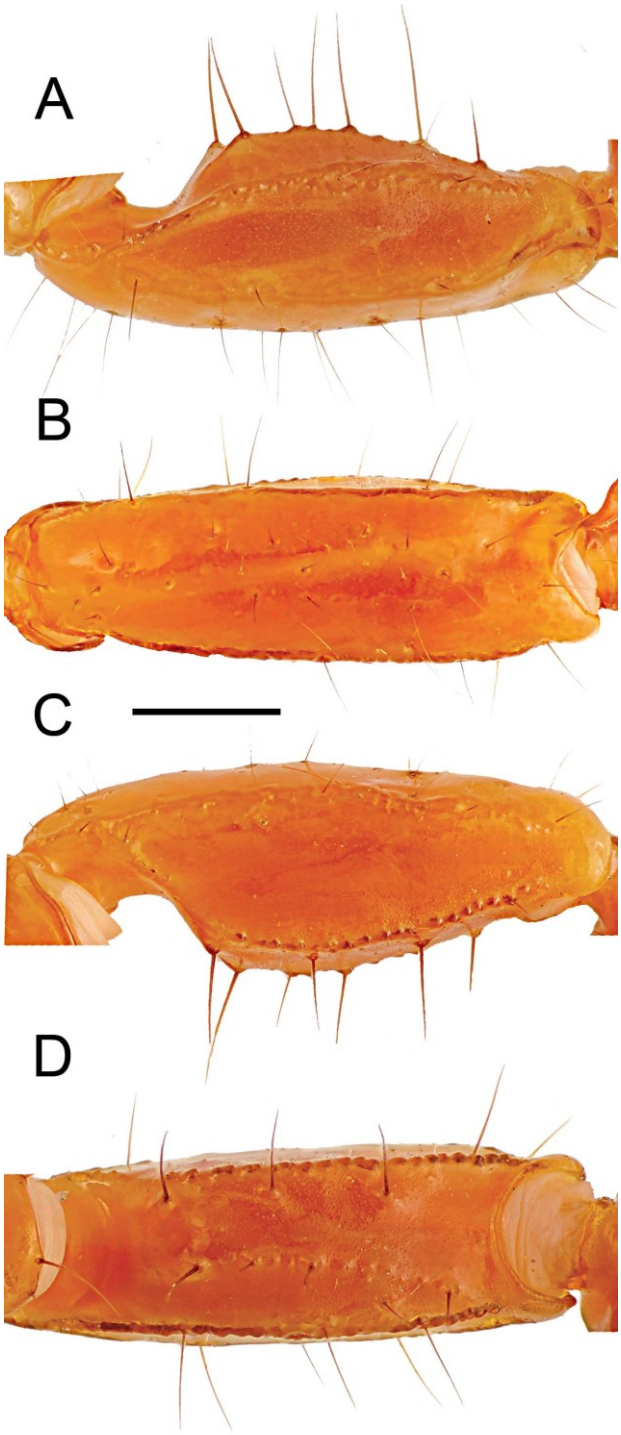


Figure 383. *Paravaejovis hoffmanni* (Williams, 1970), paratype ♂ (AMNH), dextral pedipalp patella. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

Paravaejovis kino, **n. sp.**

Figures 355, 362, 384–386, 410D, 417, 420F, 421F, 426A, 428F, 432C; Table 16, 17

Vaejovis confusus Stahnke, 1940: Sissom, 1991b, 220 (specimens from southern Sonora and Isla Tiburon only).

TYPE MATERIAL: **MEXICO: Sonora:** *Municipio de Hermosillo*: Holotype ♂ (IBUNAM), Nuevo Kino Bay, 5 km NW, 28°53.415'N 112°02.010'W, 30 m, P. Berea and E. González, 28.vi.2006, collected at night with UV light. Paratype 1 ♀ (AMNH [ARA2537]), 1 ♀ (AMNH [ARA2523]), Nuevo Kino Bay, 16 km NW dirt road, 28°55.249'N 112°02.572'W, 116 m, 2.vii.2006, E. González, collected at night with UV light.

ETYMOLOGY: The species name *kino* refers to the type locality New Kino Bay (Bahía Nuevo Kino), in Sonora Mexico. The name is a noun in apposition.

DIAGNOSIS: *Paravaejovis kino*, **n. sp.** is closely related to *P. confusus*, *P. elucidatus*, **n. sp.**, *P. exploratus*, **n. sp.**, and *P. waeringi*, with which forms a monophyletic group. The scheme of relation retrieved is: (*P. kino* (*P. confusus* (*P. waeringi* (*P. exploratus P. elucidatus*)))). This monophyletic group is basal and sister to all other species in the genus. These species may be distinguished from the other species in the genus by having elongated fingers such that trichobothria *ib–it* are in the medial third of the fixed finger, being *ib* at or close to PD6 and *it* between PD5 and PD6; carinae ventral submedian I–IV costate crenulated to finely granulated, setal combs on basitarsus I–III. *Paravaejovis kino*, **n. sp.** is the smoothest species among the species complex. The ventral surface of metasomal segment V is almost completely smooth albeit few distal granules. This species also has the smoothest ventral vesicle of the telson, scattered broad granules are present on the proximal half progressively disappearing completely

at the base of the aculeus; the other species have profuse granulation on all the ventral surface of the segment V and the vesicle. *Paravaejovis kino*, **n. sp.** is the species with the slenderest metasomal segment IV in males and in V segments males and females among the aforementioned species, the chelae and the patella have the same width in both male and female but more obvious in females, the telson is the deepest in both sexes, and is the only species with metasomal segment II and III wider than I, IV, and V (table 16).

DESCRIPTION: The following description is based on the types and the specimens listed in material examined.

Color and infuscation: Base color pale yellow straw. Median and lateral eyes intensely infuscate. Genital operculum and pectines pale yellowish to whitish. Aculeus base reddish, median and distal dark brownish.

Carapace: Anterior margin sublinear, with obsolete notch and with three pairs of minor macrosetae. Entire surface shagreened, dense minute and moderately large granules over most of the surface. Anteromedian sulci deep with an anterior shallow depression; posteromedian shallow on proximal half, medially broad, and deep distally; anterolateral moderate, posterolateral deep, posterior transverse vestigial. Median ocular tubercle raised, with superciliary carinae granular, higher than median eyes.

Sternum and coxal region: Sternum pentagonal equilateral with three pairs of setae, one distal, one median pairs and one pair on the lobes, surface matte, median notch deep. Coxal region matte in ♂, in ♀ smooth. Anterior margin of coxa II with few scatter minute granules, subbasally three oblique slit-like structures, adjacent to a weak, scattered granular protuberance. Proximal margin of coxal endite II with a moderate elongate depression each, median edge finely crenular. Coxa IV 2.20 times longer than coxa II.

Chelicerae: Dorsal surface smooth, subdistal margin of manus with one macrosetae; distal margin with costate and base of movable finger with vestigial crenulation. Serrula present on ventral distal half of movable finger, tines numbering 6

Pedipalp: Trichobothrial pattern Type C, orthobothriotaxic. Pedipalp segment ratio length/width, femur 3.23, patella 3.12, chela 5.00. Femur dorsal retrolateral, dorsal prolateral, and ventral prolateral carinae strong and granular, retrolateral dorsosubmedian finely crenatoserrate with three macrosetae, being the median the longest, prolateral ventral complete, with scattered, enlarged, and irregular granules with two major macrosetae approximately of the same length, prolateral ventrosubmedian expressed by a proximal tubercle and three major macrosetae, ventromedian, ventral retrosubmedian, and retrolateral ventral vestigial with scattered enlarged serrated granules. All intercarinal surfaces matte, covered with densely minute granules. Patella dorsal retrolateral dorsal prolateral, ventral retrolateral, and ventral prolateral carinae strongly crenular, all retrolateral carinae obsolete, prolateral median/prolateral ventrosubmedian (internal carinae) complete curving towards the subdistal end of the dorsal prolateral carinae, with enlarged conical denticles and three spiniform macrosetae, prolateral ventral carina obsolete indicated by a proximal tubercle and three macrosetae. All intercarinal surfaces matte, covered with densely minute granules. Chela dorsal prolateral, prolateral dorsal, dorsal median, dorsal retrosubmedian accessory, dorsal retrolateral, prolateral median, and prolateral ventrosubmedian carinae strongly angular and moderately crenulated with a mix of irregular fine granulation, other carinae less angular and smooth. Pedipalp chela slender, being patella and chela almost of the same width but wider than femur. Pedipalp fixed finger denticles: PD = 6, RD = 6, MD rows = 6; movable finger PD = 7, RD = 7, MD rows = 7, distal row with one median denticle.

Legs: Basitarsi I–II with retrolateral ventral and retrolateral dorsal carinae with complete rows of spinules, in III retrolateral ventral the row is complete but retrolateral dorsal is absent, retrolateral and prolateral ventral rows in I–III vestigial, expressed as few terminal spinules, IV devoid of spinules on these carinae. Prolateral ventral macrosetea I 2, in II–IV 4, being the distal smaller and delicate; retrolateral ventral I, 3, II, 5, III, 6, IV, 6, retrolateral dorsal, I–IV 4, dorsal, 3 plus dorsal median. Retrolateral dorsal and dorsal series arranged in a sublinear row forming setal combs. Telotarsi I–IV ventrodistal, median and basal series of spinules spiniform and short, two pairs of ventrodistal spinules in I–IV.

Tergites: All pretergites matte, densely covered by minute granules and postergite shagreened, with coarser granules. Median carinae absent in I, moderate and granular in II–VI. Dorsal submedian carinae moderate and granular. Tergite VII with dorsal median carina strong on proximal half and granular. Dorsal submedian as a pair of proximal vestigial, express as a paired prominent granular with few enlarged tubercles. Dorsal lateral, lateral supramedian, and lateral inframedian strong and moniliform with subserrated enlarged granules. Lateral supramedian continues curving almost merging with lateral inframedian, creating a broken oval of granules. All intercarinal surfaces with enlarged scattered subserrated granules.

Genital operculum: Male genital operculum: wider than long, with three pairs of macrosetae. Sclerites free on longitudinal edge moving independently but unable to open more than 45°. Genital papillae protruding posteriorly. Female genital operculum: Wider than long, with three macrosetae. Sclerites fuse longitudinal.

Sternites: Sternites III–VI acarinated and matte. Sternite VII acarinated except ventral lateral carinae, which is strongly crenulated and with two pairs of setae. Ventrosubmedian obsolete with two pairs of setae, lateral ventral vestigial expressed as a proximal moderate

tubercle and one seta. Posteromedian third of sternite VII with a weak but visible whitish glandular spot, slightly raised.

Pectines: Basal piece with median notch deep, with one pairs of macrosetae. Marginal lamella consist of three sclerites, medial lamella proximally fuse distally progressively forming a conspicuous rows with 9–14 beads. Fulcra with 14–15 in ♂, in ♀ 11–12 beads. Pectinal tooth count 15–16 in ♂, in ♀ 12–13. Pectines relatively short, with second sclerite of marginal lamella at the level of distal margin of coxa IV in ♂, in ♀ total length of marginal lamella slightly shorter than distal margin of coxa IV.

Hemispermatophore: Lamina 1.89 longer than trunk. Dorsal through margin long, narrow, curving proximally, and removed from ventral trough. Hemimating plug developed from the inner lobe, distal barb margin with 7 elongated spinules. Primary and secondary hook positioned on the apex of lateral margin extension of the lamina (flange). Primary and secondary hook positioned on the apex of lateral margin extension of the lamina (flange), completely fused and undistinguished. The sole hook sharp and strongly curved towards the dorsal trough. Median lobe ental terminus moderate and rounded. Basal plate of inner lobe removed from ventral trough. Spine of inner lobe strong. Neck relatively short (0.33 times longer than basal plate). Measurements, lamina, 3.06; trunk, 1.62; dorsal trough/laminar hooks, 0.66; ventral trough/laminar hook, 0.36; neck, 0.18; basal plate, 0.54.

Metasoma: Segments II wider than the others in males and females and III wider than I, IV and V in males. Segment ratios length/wide: I, 0.96, II, 1.00, III, 1.00, IV, 1.65, V, 2.09. Dorsal lateral and lateral median carinae I–IV serrated, terminus in I–III with a short spiniform projection, IV lateral median carinae with terminus moderate flared, V dorsal lateral granular, mid segment with clusters of granules becoming moniliform both distal- and proximally.

Intercarinal surfaces between dorsal lateral carinae smooth. Lateral supramedian I–III obsolete, with one distal granule. Lateral inframedian in I complete strong and serrated, in II present on distal third, serrated, becoming obsolete proximally, in III present on distal fourth, serrated, and becoming obsolete proximally, in IV absent, in V present on proximal third strong, serrated, and becoming obsolete distally. Ventral lateral carinae I–V complete, moderate and crenatoserrate. Ventral submedian in I–IV complete, moderate, smooth proximally becoming finely crenatoserrate distally. Ventromedian V, complete, moderate, and crenatoserrate. Setae: Dorsal lateral, 0:0:1:1:3; lateral median, 1:1:2:2; lateral inframedian, 0:0:0:0:3; ventral lateral, 2:2:2:2:6; ventral submedian, 2:3:3:3:2; ventral sublateral, 2. All setae minor and all intercarinal surfaces matte, densely finely granular.

Telson: Vesicle relatively globose, 2.45 times longer than wide. Lateral microserration at base of the aculeus with seven sharp tines. Aculeus relatively short, 2.8 times shorter than telson. Subaculear tubercle vestigial expressed as a broad low tubercle. Ventral carinae and intercarinal surface with proximal half covered with broad scattered and flattened granules, distal half with granules becoming more scattered and flattened, each carina with two pairs of minor setae. Dorsal surface completely smooth and glabrous.

DISTRIBUTION: *Paravaejovis kino*, **n. sp.** is distributed in the southern extreme of the Sonoran Desert, following the coast of the Cortez sea, in the state of Sonora, Mexico.

ECOLOGY: Like other *Paravaejovis* of the *confusus* complex, *P. kino*, **n. sp.** is a semi-psammophilous, inhabit typical Sonoran Desert vegetation in areas with patches of sand dunes and granitic outcrops. This species has been collected at low altitudes from 30 to 116 m.

REMARKS: Sissom (1991b) discussed the relationship of the species in the *confusus* group. He identified some populations in the Kino Bay and Isla Tiburon region as having slight

differences from the populations from Arizona and northern Sonora. Although I did not studied the populations of Isla Tiburon, I found several distinctive features in the populations from the Sonora mainland that allowed diagnose and describe these last populations as a new species. Further sampling in that island is necessary to establish whether is the same or other lineage

MATERIAL EXAMINED: **MEXICO: Sonora:** *Municipio de Hermosillo*: Nuevo Kino Bay, 16 km NW dirt road, 28°55.249'N 112°02.572'W, 116 m, 2.vii.2006, E. González, collected at night with UV light, 1 juv. (AMNH [LP 6332]); Nuevo Kino Bay, 5 km NW, 28°53.415'N 112°02.010'W, 30 m, P. Berea and E. González, 28.vi.2006, collected at night with UV light, 1 ♀ (AMNH [LP 6319]), 1 ♂, 1 ♀, P. Berea and E. González; 2.vii.2006, desert, on ground, collected at night with UV light, 1 ♂, 1 juv. (AMNH [ARA2538]), E. González; Hermosillo, Bahía Kino, [28°59'N 111°56'W], 4.v.2000, P. Berea, 1 ♂ (AMNH); Punta Chueca, 3.2 km, [29°0.900'N 112°9.7'W], 18.i.1974, V. Roth, 1 ♀ (AMNH). *Municipio de Guaymas*: San Luis, [27°55.10'N 110°53.933'W], 1 (AMNH).

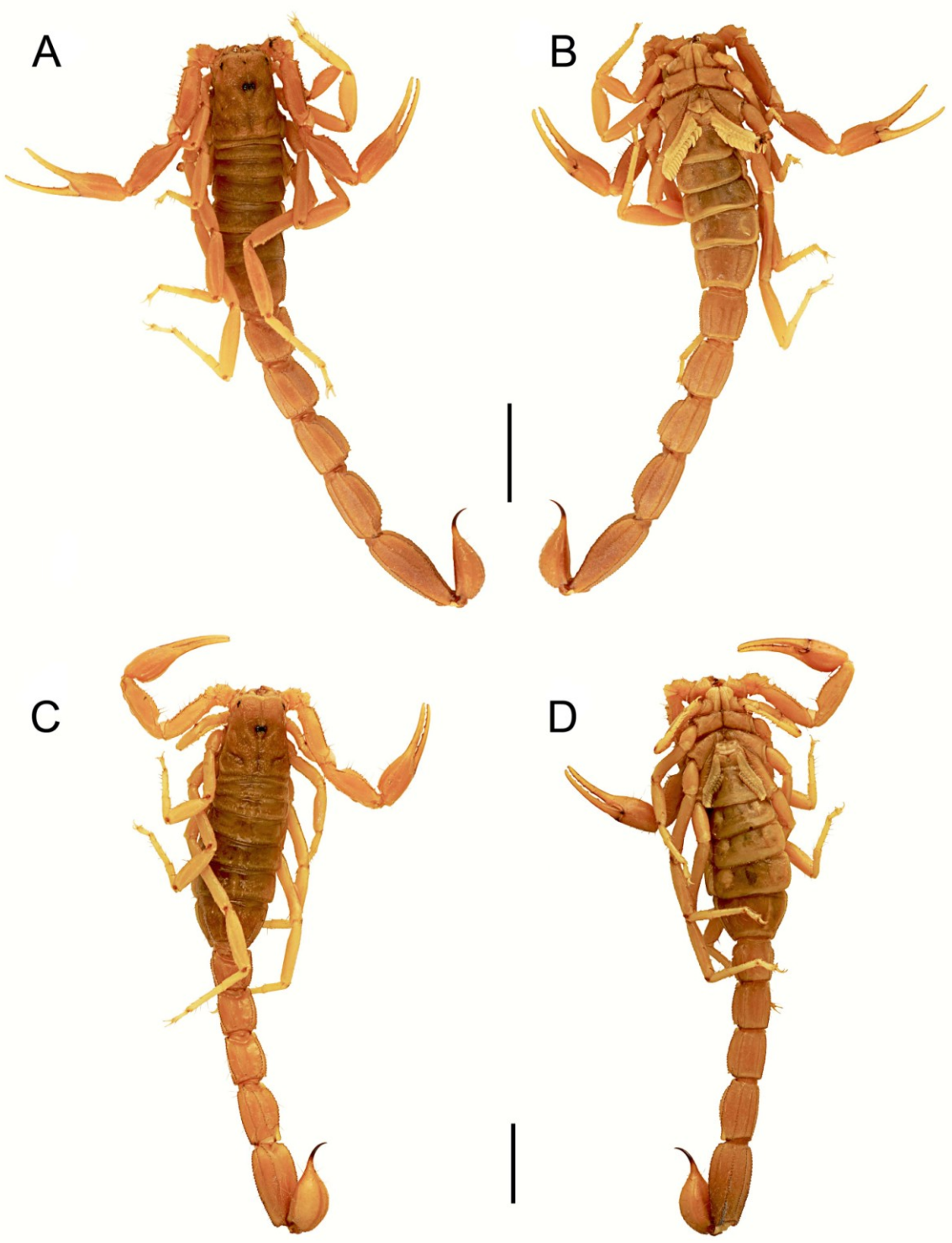


Figure 384. *Paravaejovis kino*, **n. sp.**, habitus. **A**, **B**. Paratype ♂ (AMNH). **C**, **D**. ♀ (AMNH). **A**, **C**. Dorsal aspect. **B**, **D**. Ventral aspect. Scale bars = 5 mm.

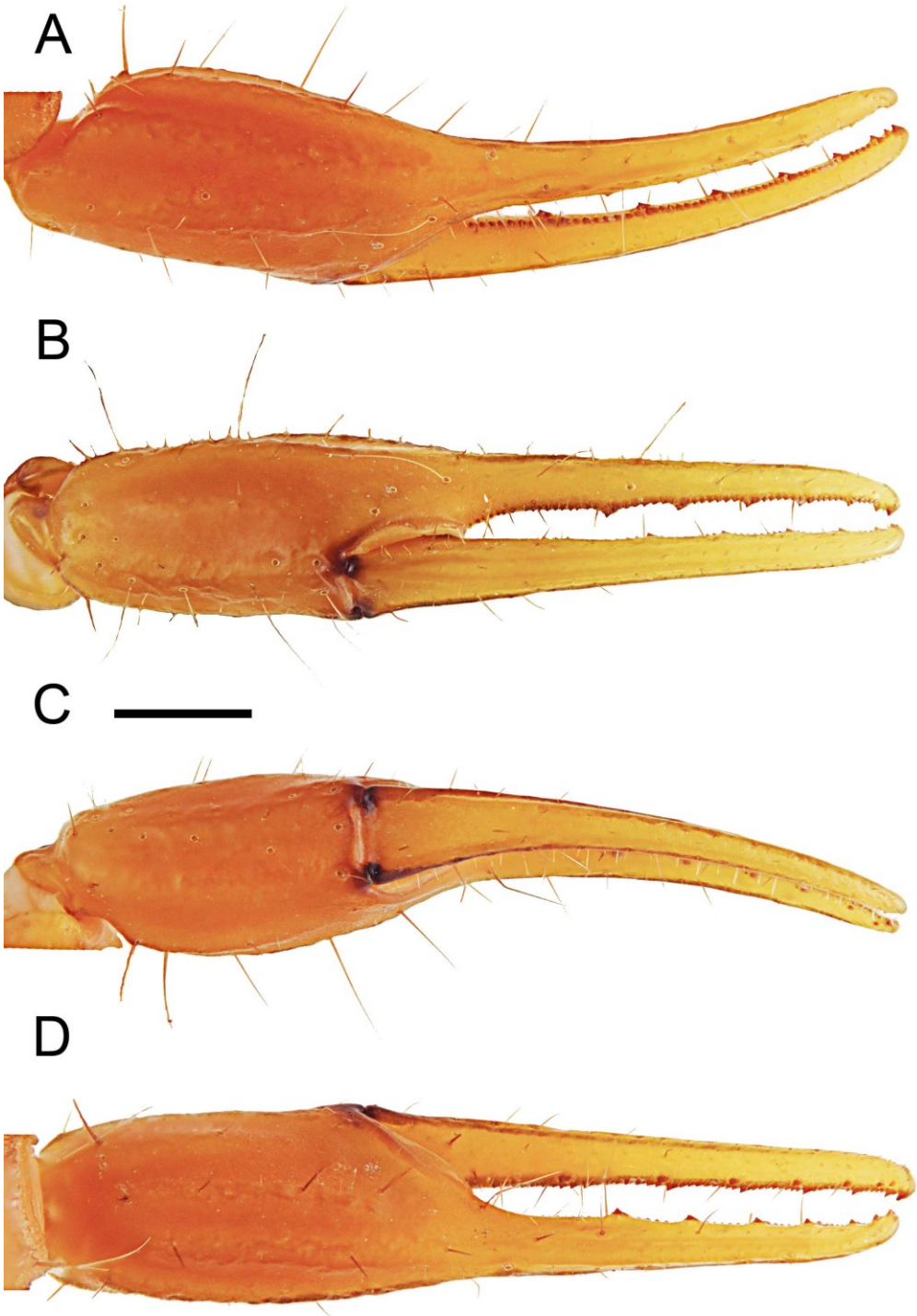


Figure 385. *Paravaejovis kino*, **n. sp.**, paratype ♂ (AMNH), dextral pedipalp chela. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

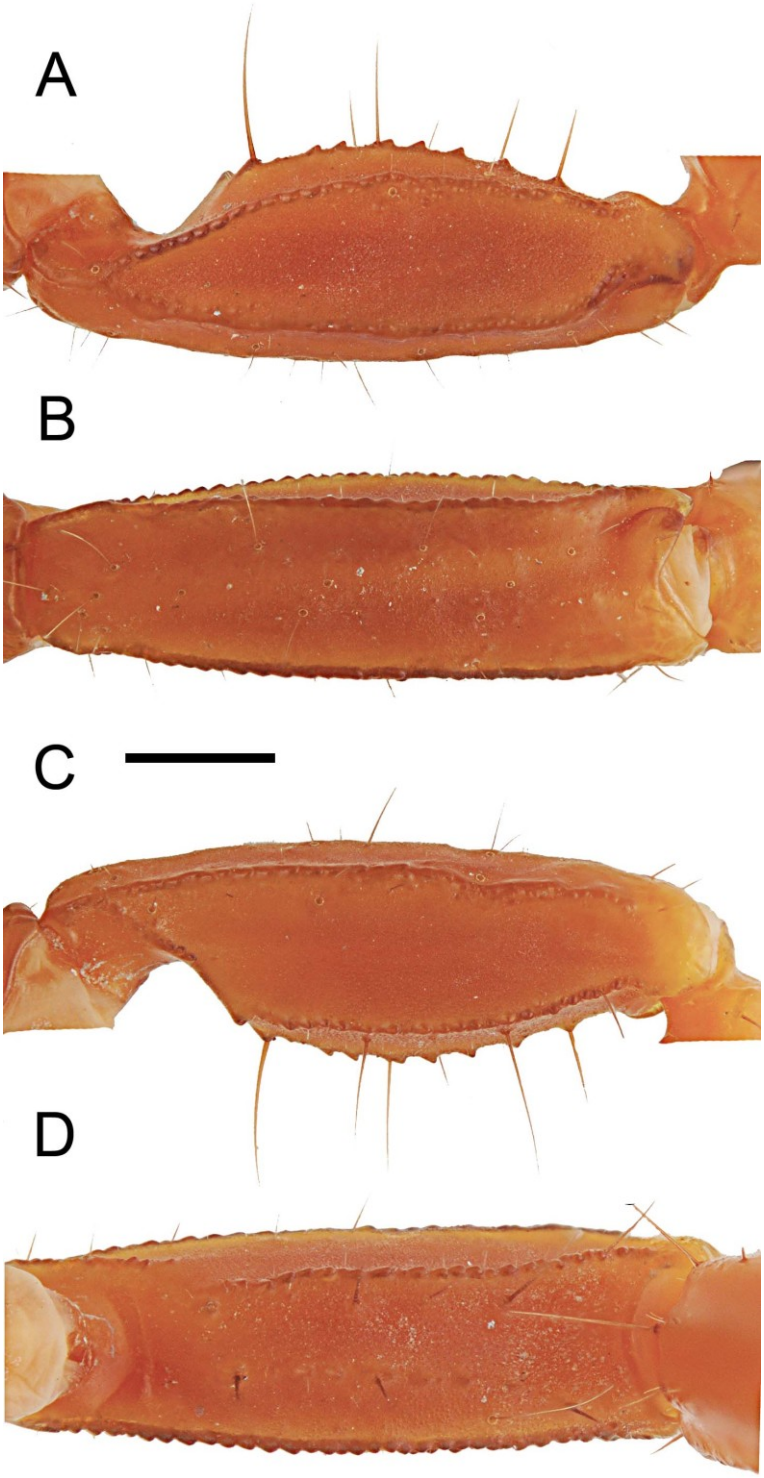


Figure 386. *Paravaejovis kino*, **n. sp.**, paratype ♂ (AMNH), dextral pedipalp patella. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

Paravaejovis nigroguerreroensis, **n. sp.**

Figures 352, 387–389, 410B, 416A, 420D, 421D, 425E, 428D, 432A; Table 17

TYPE MATERIAL: **MEXICO: Baja California Sur:** *Municipio de Mulegé*: Holotype ♂ (IBUNAM) Guerrero Negro, 12 km S, 27°56'05.8"N 113°54'23.1"W, 25 m, 15.vii.2004, O. Francke, W.E. Savary, A. Valdez, and E. González, collected at night with UV light.

ETYMOLOGY: The species name *nigroguerreroensis* refers to the type locality, Guerrero Negro in the state of Baja California Sur, Mexico. The name is a noun in apposition.

DIAGNOSIS: *P. nigroguerreroensis*, **n. sp.** is closely related to *P. voluptatis*, **n. sp**, *P. pumilis*, *P. eusthenura*, *P. hoffmanni*, and *P. diazi*, with which forms a monophyletic group. The scheme or relation retrieved from the phylogenetic analysis presented in chapter 4 is: (*P. nigroguerreroensi* (*P. voluptatis* + *P. pumilis*) (*P. eusthenura* (*P. hoffmanni* + *P. diazi*))). *P. nigroguerreroensis*, **n. sp.** may be distinguished from the other species by having dorsal median, dorsal retrolateral, ventral retrolateral, ventral prolateral and prolateral median carinae of pedipalp chelae moderately costate, instead of obsolete, flat no protruding from adjacent surfaces. *P. nigroguerreroensis*, **n. sp.** is the only species with ventral submedian metasomal segment II and III moderately costate and IV smooth on proximal half and crenulated on distal half, instead of having II–IV obsolete to weakly costate or finely granular. From *P. voluptatis*, **n. sp.** and *P. pumilis* differs by having rows of trichobothria V_{1-4} and Eb_{1-3} separate and distinguishable, and trichobothria *ib* and *it* on proximal third to median third of fixed finger, at or close to RD6 or between RD6 and RD5, instead of having trichobothria $V{+}Eb_{13-17}$ merge and undistinguishable and trichobothria *ib* and *it* at base of fixed finger, proximal to associated macroseta of RD7. Whereas *P. nigroguerreroensis*, **n. sp.** has relatively globose telson vesicle,

P. voluptatis has strongly globose vesicle, expanded dorso-ventrally and *P. pumilis* has vesicle comparatively more gracile. From *P. eusthenura* and *P. hoffmanni* differs by having proximal notch and median lobe of fixed and movable finger moderate to strongly develop, instead of having these structures obsolete. From *P. diazi* and *P. hoffmanni* differs by having metasomal segment V more than 2.5 times longer than wide, instead of having that segment less than 2.0 times longer than wide in ♂. From *P. eusthenura* differs by having relatively incrassate manus, instead of having relatively slander manus.

DESCRIPTION: The following description is based on the holotype.

Color and infuscation: Base color uniformly yellow straw. Carapace with interocular surface weakly infuscate. Retrolateral margin of femur and patella moderately infuscate. Median and lateral ocular tubercles intensely infuscate. Pectines pale whitish. Aculeus reddish to brownish.

Carapace: Carapace 1.07 times longer than posterior width. Anterior margin linear, with obsolete medial notch and three pairs of major macrosetae. Carapace shagreened, densely cover by minute and enlarge granules. Median ocular tubercle moderately raised and broad. Superciliary carinae weak and smooth lower than median eyes. Position of median ocular tubercle on anterior half of carapace. Three pairs of lateral eyes, first anterior pair slightly larger than second pair and third pair half the size of first pair. Median eyes approximately two times the size of first lateral frontal pair. Anteromedian sulci deep with a weak anterior depression; posteromedian and posterolateral moderate, anterolateral weak, posterior transverse vestigial to weak.

Sternum and coxal region: Sternum pentagonal subequilateral with three pairs of setae, one distal, one median pairs and one pair on the lobes, surface matte, median notch deep. Coxal

region with scatter matte spots. Anterior margin of coxa II entirely cover with scatter moderate and minute granules, subbasally three oblique slit-like structures, adjacent to a moderate granular protuberance with a macroseta on top. Proximal margin of coxal endite II with a deep elongate depression each extending to proximal third, proximal median edge finely granular. Coxa IV 2.39 times longer than coxa II.

Chelicerae: Dorsal surface smooth, subdistal margin of manus with one macrosetae; distal margin with costate. Serrula present on ventral distal half of movable finger, tines numbering 8.

Pedipalps: Trichobothrial pattern Type C, orthobothriotaxic. Chela wider than patella, patella wider than femur. Femur: All intercarinal surfaces densely matted. Dorsal prolateral, dorsal retrolateral and ventral prolateral complete moderately granular; retrolateral dorsosubmedian obsolete expressed by four major macrosetae positioned on distal two thirds; retrolateral ventral vestigial expressed by three or four low crenatoserrate granules; ventral prolateral vestigial expressed by a short row of proximal crenatoserrate granules; ventral retrosubmedian, vestigial expressed by proximal scatter crenatoserrate granules; prolateral ventrosubmedian complete, expressed by a proximal bicuspid enlarged spiniform tubercles followed by row of irregular scatter conical sharp granules, subbasal and distal with a macroseta on top and scatter moderate, minute and strong intersperse granules; prolateral ventral vestigial expressed by a proximal moderate spiniform tubercle with a macroseta on top followed by two moderate tubercles with a macroseta on base.

Patella: All intercarinal surface matte, except retrolateral smooth. Dorsal prolateral complete irregularly and finely crenular; ventral prolateral complete with strong with rounded granules; dorsal retrolateral weakly and finely crenular to smooth; ventral retrosubmedian

complete weakly and finely crenulated; retrolateral dorsosubmedian and retrolateral median obsolete; ventral median vestigial, expressed by a proximal short irregular row of fine granules; prolateral median on a vaulted projection, protruding moderately medially, expressed by a proximal tubercle and a row of fine scatter serrate granules, median and distal granules with a macroseta on top, becoming weaker distally forming a weak row of fine granules gently slanting towards subdistal end of dorsal prolateral carinae; prolateral ventral obsolete expressed by three major macrosetae adjacent to ventral prolateral carinae.

Chela: Manus smooth and incrassate (manus 1.07 times longer than fixed finger). Intercarinal surface smooth. All carinae obsolete and moderately hirsute with three or four macrosetae. Trichobothrium *Db* positioned on dorsal retrolateral carina, subbasal on chelae; *Dt* positioned at mid manus.

Fingers: Fixed finger, PD = 6, MD rows = 5, RD = 5, proximal RD positioned by proximal half. All RD subpaired with corresponding PD. Movable finger, PD = 7, MD rows = 6, distal row bearing one minute granule, RD = 6, proximal RD positioned by proximal third. All RD subpaired with corresponding PD. Trichobothria *ib* and *it* positioned subbasal on fixed finger, *ib* positioned between PD6 and PD7, PD7 lacking granule, *it* at the level of PD6. Fingers with moderate to strong scallop, proximal notch of fixed finger moderate to strong and median lobe moderate, proximal notch and median lobe of movable finger moderate, gap created when fingers closed strong, fingers fit unevenly.

Legs: Basitarsi I–II prolateral ventral, retrolateral ventral carinae with complete rows of spinules; prolateral ventral in III and IV absent; retrolateral ventral in III complete, expressed by a row of scatter spinules, in IV absent; retrolateral dorsal carinae in I vestigial expressed on distal third, in II complete, in III complete, expressed by a row of scatter spinules, becoming

proximally spinoid granules, in IV vestigial, expressed as a row of scatter spinules on distal thirds; retrolateral median rows in I–IV vestigial expressed as few terminal spinules. Telotarsi I–IV with two pairs of ventrodistal spinules in I–IV. Setae: Prolateral ventral, 3:3:4:4; retrolateral ventral, 2:6:6:6; retrolateral dorsal, 2:3:4:4; dorsal, 4:4:4:4; retrolateral dorsal and dorsal series in I and IV arranged in two independent rows, in II and III arranged in a sublinear row being dorsal median slightly offset and expressed as a macrosetae.

Tergites: Pretergites matte, postergites with dorsal submedian carinae intercarinal surface matte, other surface shagreened with scattered coarse granules. Dorsal median and ventral submedian carinae in tergites I–VI weak expressed by few distal moderate to enlarge granules on distal half. Tergite VII intercarinal surface shagreened, with few scattered moderate granules and dense minute granules; dorsal median carina moderately costate with few moderate granules, expressed on proximal half of the postergite; dorsal submedian vestigial expressed as a low short pair of proximal short oblique row of three or four granules; dorsal lateral and lateral supramedian comparatively stronger and complete; dorsal lateral carinae projecting and curving with scattered granules laterally approximating to lateral supramedian proximal margin, creating a semi horse show of strong and subserrated granules.

Genital operculum: Male genital operculum: wider than long, with four pairs of macrosetae. Sclerites free on longitudinal edge moving independently but unable to open more than 45°. Genital papillae protruding posteriorly. Female genital operculum: Wider than long, with three macrosetae. Sclerites fuse longitudinal.

Sternites: Sternites III–VII acarinated finely punctuated, smooth and lustrous medially and laterally matte. Sternite V and VII lacking distal median glandular spot. Sternite VII with ventral lateral carinae vestigial, expressed by a weak costa weakly crenulate and two pairs of

macrosetae; other carinae obsolete expressed by macrosetae. Spiracle elongated, slit-like, approximately two times longer than wide.

Pectines: Basal piece with median notch deep, with three pairs of macrosetae. Marginal lamella consist of three sclerites, medial lamella proximally fuse distally progressively forming a conspicuous rows of 8 beads. Fulcra with 14–14 beads. Pectinal tooth numbering 15–15. Pectines relatively long, second sclerite of marginal lamella at the level of distal edge of coxa IV.

Hemispermatophore: Lamina 2.45 longer than trunk. Dorsal through margin short, wide distally, tapering and curving proximally, and removed from ventral trough. Hemimating plug developed from the inner lobe, distal barb margin with 12 elongated spinules. Primary and secondary hook positioned on the apex of lateral margin extension of the lamina (flange). Hooks fused in a rounded digitiform hook curving dorsally, lacking notch. Median lobe ental terminus moderate and rounded. Basal plate of inner lobe adjacent to ventral trough. Spine of inner lobe relatively long and sclerotized. Neck relatively short (0.38 times longer than basal plate). Measurements, lamina, 2.94; trunk, 1.20; dorsal trough/laminar hooks, 0.66; ventral trough/laminar hook, 0.39; neck, 0.18; basal plate, 0.48.

Metasoma: Intercarinal surfaces weakly matte to smooth lustrous. Metasoma 2.01 times longer than mesosoma. Metasomal segments I wider than long, II and III longer than wide. Carinae: Dorsal lateral and lateral median carinae in I–IV strongly crenatoserrated terminating in moderate enlarge spinoid granules pointing backwards; except lateral median in IV distal terminus moderate expanded laterally forming a triangular projection; dorsal lateral in V moderately crenatoserrate proximally, becoming moderate, ending on at smooth tubercle. Lateral inframedian in I complete finely crenatoserrated; in II partial with scatter weak crenatoserrate granules, becoming weaker proximally, present on distal half, in III partial moderately

crenatoserrated, becoming weaker proximally, present on distal third; in IV absent, in V partial with proximal row of moderate crenular granules, becoming weaker distally, present in distal half; ventral lateral in I–IV finely to moderately crenular, ventral submedian in I–III costate and smooth, in IV proximal three fourths costate and smooth distal fourth finely crenular; ventral lateral and ventral median strongly crenatoserrate. Setae: Dorsal lateral, 0:1:2:2:6; lateral median; 0:1:1:2; lateral inframedian, 1:0:0:0:2, ventral lateral, 2:2:2:3:6; ventral submedian, 3:3:3:3:2, ventral sublateral, 2.

Telson: Telson 2.5 times longer than wide. Metasomal segment V 1.3 times wider than telson. Vesicle 2.3 times longer than aculeus. Telson globose. Dorsal and ventral surface smooth lustrous, with broad low crenulation. Ventral surface with 3–4 macrosetae. Ventral median carinae with subaculear tubercle vestigial expressed as a broad and low tubercle, microserration on laterobasal aculeus numbering 8.

DISTRIBUTION: *Paravaejovis nigroguerreroensis*, **n. sp.** has been recorded in one locality within the Vizcaino Desert, Baja California Sur, Mexico

ECOLOGY: *Paravaejovis nigroguerreroensis*, **n. sp.** is a psammophilous species; besides well-developed setal combs, its ungues are also elongated. The type was collected at an altitude of 25 m, using ultraviolet detection.

REMARKS: The discovery of this species in the Vizcaino Desert may indicate a great deal of hidden diversity. It is probable that collection events carried out at different times of the year are necessary to coincide with the activity on the surface of some rare scorpions, such *P. nigroguerreroensis*, **n. sp.** Now that most of the diversity hotspots have been localized, it would be advisable to start surveying more intensively than extensively.

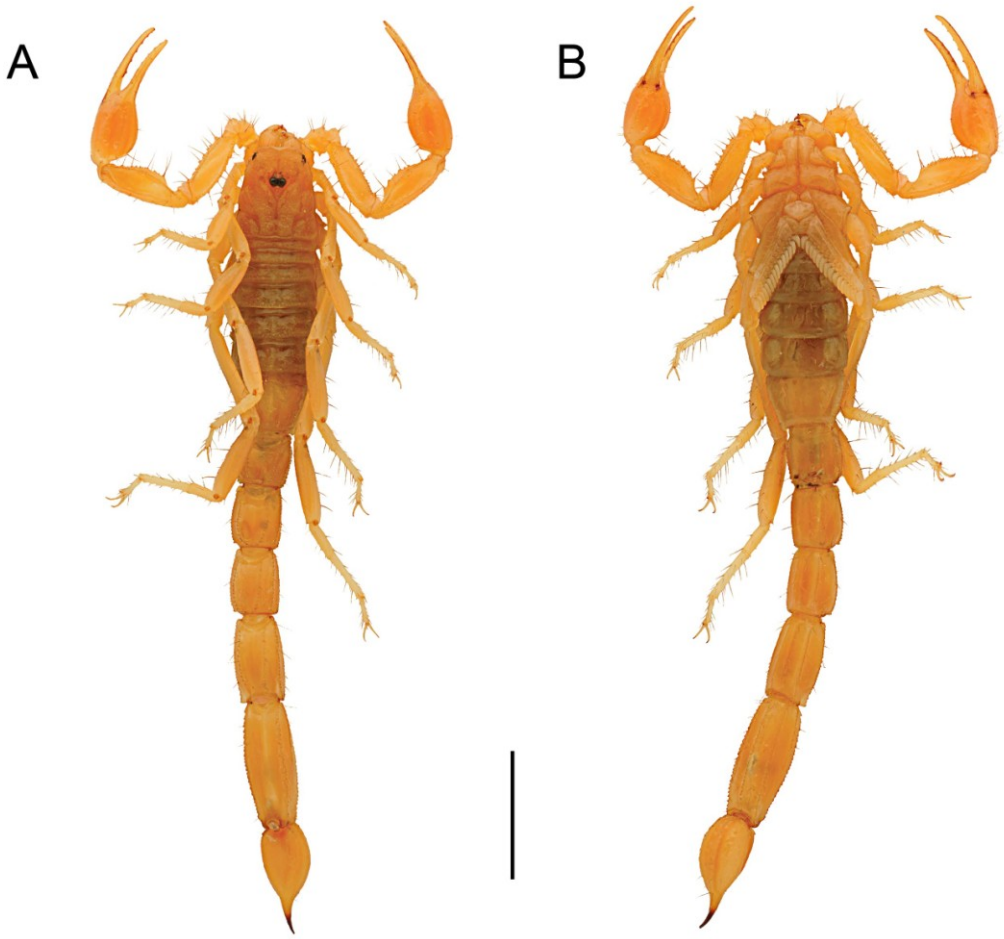


Figure 387. *Paravaejovis nigroguerreroensis*, **n. sp.**, paratype ♂ (AMNH), habitus. **A**. Dorsal aspect. **B**. Ventral aspect. Scale bar = 5 mm.

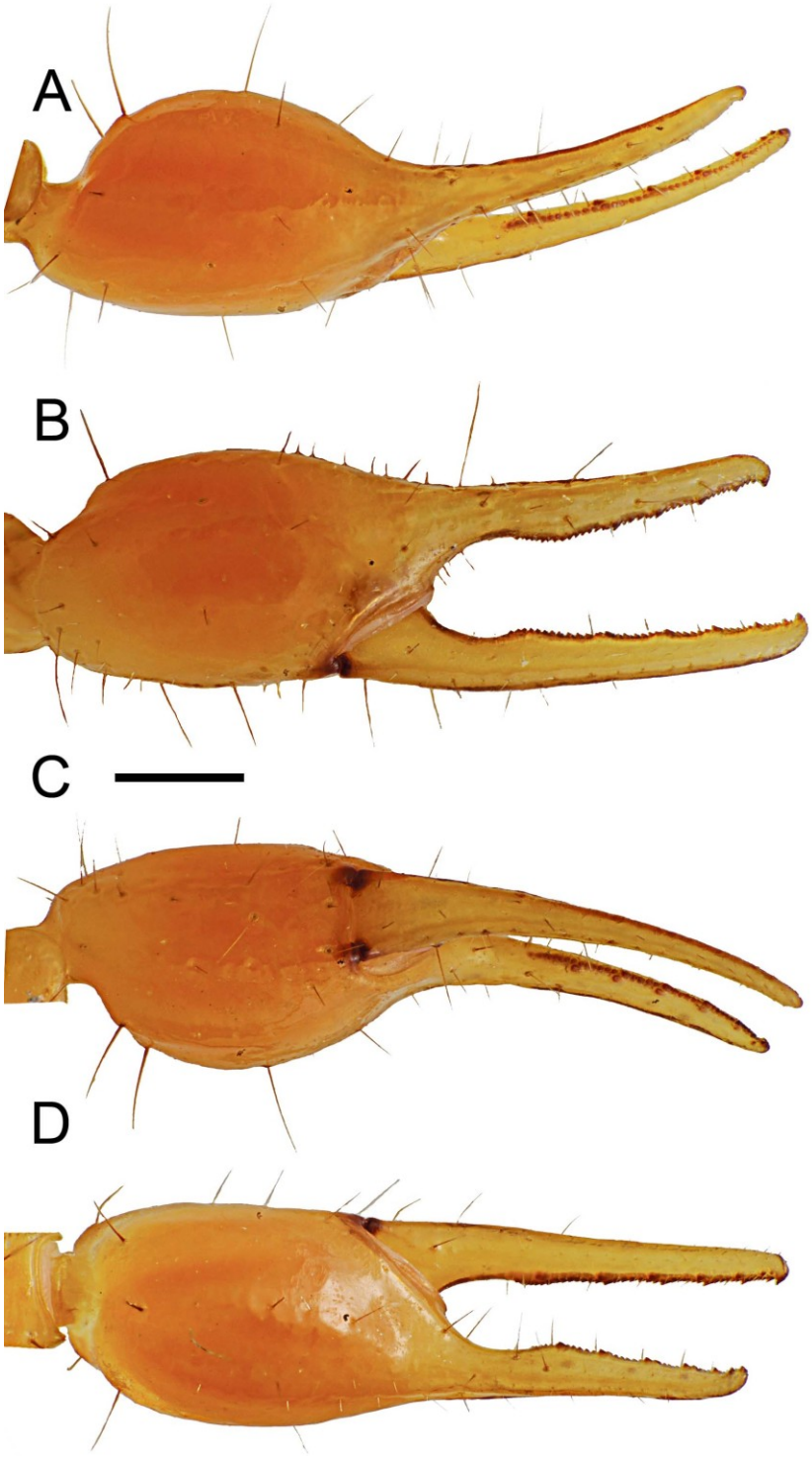


Figure 388. *Paravaejovis nigroguerreroensis*, **n. sp.**, paratype ♂ (AMNH), dextral pedipalp chela. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

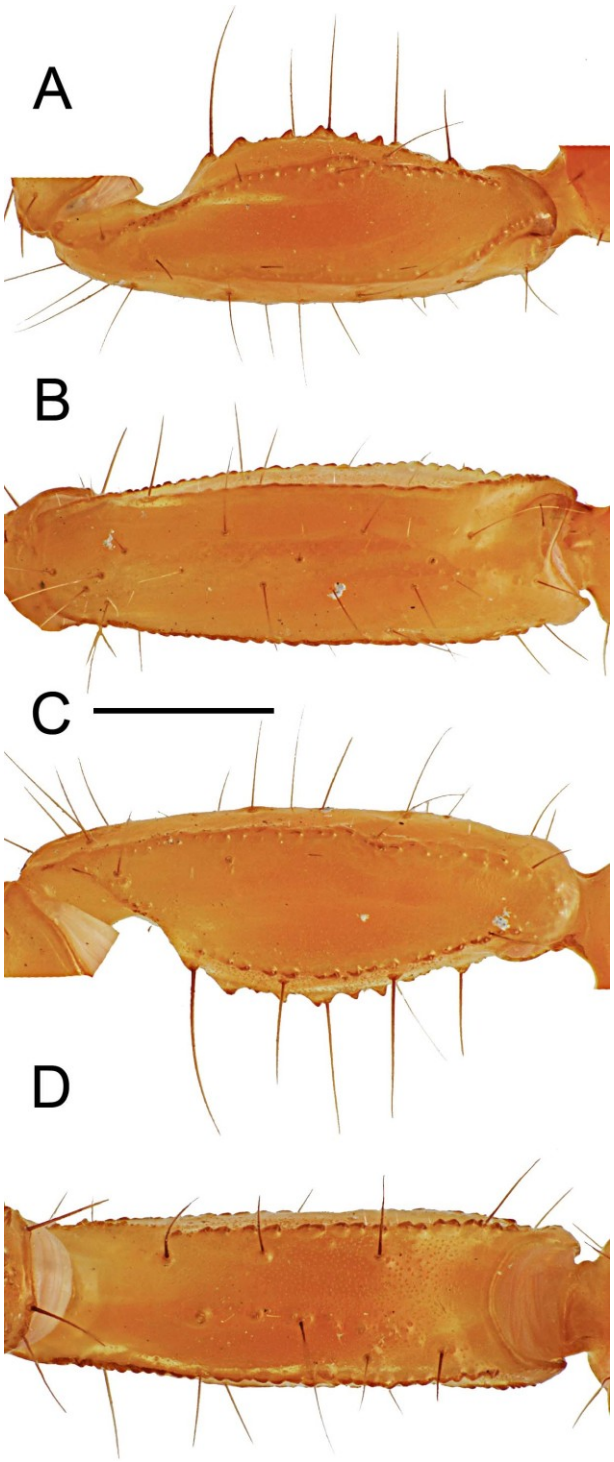


Figure 389. *Paravaejovis nigroguerreroensis*, **n. sp.**, paratype ♂ (AMNH), dextral pedipalp patella. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

Paravaejovis pumilis (Williams, 1970)

Figures 355, 390–392, 411A, 414C, 422A, 423A, 426B, 429A, 432D

Vejovis pumilis Williams, 1970c: 297–302, fig. 13, 14; 1970e: 181, 183.

Paruroctonus pumilis: Stahnke, 1974: 138.

Paravaejovis pumilis: Williams, 1980: 30, fig. 32–34, 54N; Francke and Soleglad, 1981: 236; Haradon, 1984b: 319; Kovařík, 1998: 143; Beutelspacher, 2000: 56, 63, 151; Sissom, 2000: 505; Sissom and Hendrixson, 2005a: 127, tab. 6.2; Soleglad and Fet, 2003a: 6, fig. 7; 2003b: 8, 41, 61, 67, 161, figs. 6, 78; McWest, 2009: 19, tab. 1, 21, figs. 15–19, 22, 34, 41, 100–1002, 113.

TYPE MATERIAL: **MEXICO: Baja California Sur:** Holotype ♂ (CAS, Type No. 10425), 43.1 km W El Crucero [Ciudad Constitución], 26.vii.1968, S.C. Williams, M.A. Cazier. J. Bigelow, and M. Bentzien. Paratypes: Allotype ♀, 240 ex. (CAS), same data as holotype; 6 ex. (CAS), San Raymundo area south to near La Paz.

DIAGNOSIS: *P. pumilis* is closely related to *P. nigroguerreroensis*, **n. sp.**, *P. voluptatis*, **n. sp.**, *P. hoffmanni*, and *P. diazi* (see *P. nigroguerreroensi*, **n. sp.**, for details). Among these species *P. pumilis* is more closely related to *P. voluptatis*, **n. sp.** These two species may be differentiated from the other species in the genus by having trichobothria *V* and *Eb* merge and undistinguishable arranged in rows of between 13 and 17 trichobothria, instead of having regular counts of $V_{1–4}$ and $Eb_{1–3}$. These species also have trichobothria *ib* and *it* at base of fixed finger, proximal to associated macroseta of RD7, instead of having trichobothria *ib* and *it* on proximal third to median third of fixed finger, at or close to RD6 or between RD6 and RD5. *P. voluptatis*, **n. sp.** and *P. pumilis* further differ by having distal margin of carapace convex, instead of having

a sublinear margin. *P. pumilis* is smaller than *P. voluptatis*, **n. sp.** with total length to less than 27 mm in the former and 30 mm in the latter. *P. pumilis* has pedipalp chelae elongated, patella and femur considerably less expanded laterally than *P. voluptatis*, **n. sp.** *P. pumilis* has ventral submedian carinae of metasomal segments I–IV densely and finely serrated, whereas *P. voluptatis*, **n. sp.** has these carinae in metasomal segments I–III obsolete and IV weakly finely granular in distal third. Furthermore, the intercarinal surface between ventral lateral carinae in metasomal segments I–III is matte and gently rounded, but in *P. voluptatis*, **n. sp.** is smooth and flat. *P. pumilis* also has ventral surface of metasomal segment V densely granular with minute and moderate granules and *P. voluptatis*, **n. sp.** has densely covered with granules of different size from fine to enlarged conical granules. Furthermore *P. pumilis* has ventral median carinae of metasomal segment V complete and irregularly granular and costate, but *P. voluptatis*, **n. sp.** has this carinae expressed on proximal half by large conical moniliform granules that become irregular medially and disperse in the second half. *P. pumilis* has lateral inframedian carina of metasomal segments I–III well defined, but *P. voluptatis*, **n. sp.** has these carinae weakly developed with scattered fine granulation.

DESCRIPTION: This redescription supplements Williams' (1970c) original description and is based on the material deposited in the collections mentioned below.

Color and infuscation Base color uniformly yellow straw. Carapace, tergites, and retrolateral margin of femur and patella with vestigial dusky markings. Median and lateral eyes intensely infuscate. Chelae yellowish with finger reddish. Pectines pale whitish. Aculeus reddish to brownish. Telson reddish

Carapace: Carapace 1.70 times longer than posterior width. Frontal lobes strongly curved laterally, such that lateral eyes completely face the anterolateral surface. Anterior margin

strongly convex, lacking medial notch and three pairs of minor macrosetae. Carapace matte, densely cover by minute granules. Median ocular tubercle moderately rised and broad. Superciliary carinae weak and matte, as high as median eyes. Position of median ocular tubercle on anterior half of carapace. Three pairs of lateral eyes, first anterior pair slightly larger than second pair and third pairs half the size of first pair. Median eyes approximately two times the size of first anterior pair. Anteromedian sulci moderate with a weak anterior depression; posteromedian, posterolateral and anterolateral moderate; posterior transverse vestigial to weak.

Sternum and coxal region: Sternum pentagonal subequilateral with three pairs of setae, one distal, one median pairs and one pair on the lobes, surface matte, median notch deep. Coxal region with scatter matte in and in ♂, in ♀ smooth. Anterior margin of coxa II smooth, subbasally two oblique slit-like structures, adjacent to a weak protuberance with a macroseta on top. Proximal margin of coxal endite II with a deep depression each, proximal median edge finely granular. Coxa IV 2.40 times longer than coxa II.

Chelicerae: Dorsal surface smooth, subdistal margin of manus with one macrosetae; distal margin with costate. Serrula vestigial on ventral distal half of movable finger, tines numbering 1–2.

Pedipalps: Trichobothrial pattern Type C, orthobothriotaxic. Chela wider than patella, patella wider than femur. Femur: All intercarinal surfaces densely matted. Dorsal prolateral complete, with conical and fine granules; dorsal retrolateral complete, with irregular conical and fine granules; ventral prolateral complete with conical and fine granules; retrolateral dorsosubmedian obsolete expressed by three major macrosetae positioned on distal half; retrolateral ventral and ventral retrosubmedian obsolete; ventral prolateral vestigial expressed by a short row of proximal crenatoserrate granules; vestigial expressed by proximal row of

crenatoserrate granules; prolateral ventrosubmedian obsolete, expressed by a proximal spiniform tubercle and a median tubercle with a macroseta on base; prolateral obsolete vestigial expressed by three proximal spiniform tubercles with a macroseta and a subbasal tubercle with a with a macroseta on base.

Patella: All intercarinal surface matte. Dorsal prolateral and dorsal retrolateral complete irregularly and finely granular; ventral prolateral complete with fine irregular conical granules; ventral retrosubmedian complete with minute granules; retrolateral dorsosubmedian and retrolateral median obsolete; ventral median obsolete, expressed by a proximal low costa with two or three minute granules; prolateral median on a vaulted projection, protruding strongly medially, expressed by a proximal tubercle and a row of fine scatter subserrate elongate granules becoming weaker distally forming a weak row of fine granules gently slanting towards subdistal end of dorsal prolateral carinae ending at trichobothrium *i*, proximal and distal granules with a macroseta on top; prolateral ventral obsolete expressed by two major macrosetae adjacent to ventral prolateral carinae.

Chela: Manus smooth and incrassate to moderate. Intercarinal surface smooth to finely matte. All carinae obsolete. Trichobothrium *Db* expressed as a macrosetae positioned on dorsal retrolateral carina, subbasal on chelae; *Dt* positioned at mid manus.

Fingers: Fixed finger, PD = 5, MD rows = 5, RD = 5, proximal RD positioned by proximal half. All RD subpaired with corresponding PD. Movable finger, PD = 7, MD rows = 6, distal row bearing one minute granule, RD = 6, proximal RD positioned by proximal half. All RD subpaired with corresponding PD. Trichobothria *ib* and *it* positioned basal on fixed finger, positioned at PD7, PD7 lacking granule. Fingers with moderate to strong scallop, proximal notch of fixed finger moderate and median lobe weak, proximal notch and median lobe of movable

finger weak, gap created when fingers closed strong, fingers fit unevenly in ♂, in ♀ fingers lacking scallop, gap created when fingers closed weak, fingers fit unevenly.

Legs: Basitarsi and Telotarsi I–IV compressed dorso-ventrally such that each segment forms a paddle-like structure, more notable in I and II. Basitarsus I prolateral ventral carinae expressed on distal half by a scatter row of spinules, in II expressed on distal half by a regular row of spinules, in III and IV absent; retrolateral ventral in I vestigial expressed on distal third and two or three scatter spinules in proximal and median aspect, in II complete, in III and IV absent; prolateral ventral I–III vestigial expressed by distal spinules, in IV absent; retrolateral median rows in I–IV obsolete expressed as few terminal spinules. Telotarsi I–IV with one pair of ventrodistal spinules. Setae: Prolateral ventral, 2:4:4:3; retrolateral ventral, 2:4:5:5; retrolateral dorsal, 2:3:4:2; dorsal, 4:4:4:3; retrolateral dorsal and dorsal series in I and III arranged in one row of elongated macrosetae being dorsal median slightly offset and expressed as a macrosetae, in IV arranged in two independent rows. Macrosetae on prolateral and distal dorsal aspect enlarged, ungues and dactyl relatively elongate. Retrolateral dorsal series in I, II and IV with macrosetae restricted to distal and proximal aspect, median aspect devoid of macrosetae

Tergites: Pretergites and postergites densely matte. Dorsal median and ventral submedian carinae in tergites I–VI obsolete expressed by a weak costa on distal half. Tergite VII intercarinal surface densely matte; dorsal median carina vestigial expressed on proximal half of the postergite as a weak costate; dorsal submedian vestigial expressed as a low short pair of proximal short oblique tubercles; dorsal lateral and lateral supramedian finely; lateral supramedian curving towards the proximal end of lateral inframedian carinae, intercarinal surface between these carinae cover with dense and fine enlarged granules.

Genital operculum: Male genital operculum: wider than long, with three pairs of macrosetae. Sclerites free on longitudinal edge moving independently but unable to open more than 45°. Genital papillae protruding posteriorly. Female genital operculum: Wider than long, with three macrosetae. Sclerites fuse longitudinal.

Sternites: Sternites III–VII acarinated matte in ♂, in ♀ finely punctuated, smooth and lustrous. Sternite V and VII lacking distal median glandular spot. Sternite VII with ventral lateral carinae vestigial, expressed by a weak costa minutely granular and two pairs of macrosetae; other carinae obsolete expressed by macrosetae. Spiracle elongated, slit-like, approximately two times longer than wide.

Pectines: Basal piece with median notch deep, with three pairs of macrosetae. Marginal lamella consist of three sclerites, medial lamella proximally fuse distally progressively forming a conspicuous rows of 10 beads in ♂, in ♀ medial lamella fuse expressed only proximally. Fulcra with 5–8 beads, in ♂ beads reduced in half the size of median lamella beads. Pectinal tooth numbering 12–16 in ♂, in ♀ 7–9. Pectines relatively short, with median sclerite of marginal lamella at the level of distal margin of coxa IV in ♂, in ♀ total length of marginal lamella shorter than distal margin of coxa IV. First proximal pectine attached at the level of proximal margin of the proximal sclerite of medial lamella in ♂, in ♀ proximal pectine attached to proximal third of the proximal sclerite of medial lamella.

Hemispermatophore: Lamina 1.40 longer than trunk. Dorsal through margin long, narrow, curving proximally, and removed from ventral trough. Hemimating plug developed from the inner lobe, distal barb margin with 10 elongated spinules. Primary and secondary hook positioned on the apex of lateral margin extension of the lamina (flange), hooks almost completely fused, forming a vestigial notch. Median lobe ental terminus moderate and rounded.

Basal plate of inner lobe removed from ventral trough. Spine of inner lobe moderate, secondary spine on ventromedian aspect of neck absent. Neck relatively short (0.5 times longer than basal plate). Measurements, lamina, 2.10; trunk, 1.50; dorsal trough/laminar hooks, 0.78; ventral trough/laminar hook, 0.42; neck, 0.18; basal plate, 0.36.

Metasoma: Intercarinal surfaces densely matte. Carinae: Dorsal lateral carinae in I–IV finely and irregularly crenatoserrate; lateral median in I–IV finely and irregularly crenatoserrate, terminus a curving ventrally as a short row of few minute granules; except lateral median in IV distal terminus weakly expanded laterally forming a triangular projection; dorsal lateral in V with proximal strongly crenatoserrate granules, becoming moderate and irregularly serrate, ending on at a smooth tubercle. Lateral inframedian in I complete finely crenatoserrated; in II partial with scatter finely crenatoserrated, becoming weaker proximally, present on distal half, in III partial finely crenatoserrated, becoming weaker proximally, present on distal third; in IV absent, in V partial with a proximal serrate tubercle followed by a costa that weakens distally, present in proximal half; ventral lateral in I–V finely crenatoserrate, ventral submedian in I–II smooth and finely costate, in III proximal half smooth and costate and distal half finely crenatoserrate in IV and ventral median in V finely crenatoserrate. Setae: In ♀, dorsal lateral, 0:1:2:2:6; lateral median, 1:1:3:3; lateral inframedian, 2:0:0:0:3; ventral lateral, 2:2:2:3:7; ventral submedian, 2:3:3:4:1; ventral sublateral, 2. All macrosetae in ♂ minor

Telson: Telson vesicle elongated in ♂, in ♀ globose and with few scatter broad crenulations. Ventral surface with 6–7 major macrosetae in ♀, in ♂ all macrosetae minor. Ventral median carinae with subaculear tubercle obsolete. Microserration on laterobasal aculeus numbering 3–6.

DISTRIBUTION: *Paravaejovis pumilis* is endemic to the Magdalena Plains in Baja California Sur, Mexico.

ECOLOGY: *Paravaejovis pumilis* is a psammophilous species, inhabiting a particular kind of desert community of thorn-scrub and columnar cacti. This community is exposed to the Pacific Ocean humidity winds, which produce abundant fog. This condition allows a large community of epiphytic plants. *P. pumilis* digs galleries under sparse vegetation cover and sometimes in open areas, preferring fine sedimentary soils. At El Cayuco Fish Camp, was collected in abundance, being the dominant species. This particular collection event yielded 90 ♂ individuals and only four ♀. This marked activity by males may coincide with the mating period. The bias to mature male surface activity suggest that females spend most of their lives inside their burrow. These observations confirm the reports of Williams (1970c, 1980).

REMARKS: Williams, (1970c) described *Vejovis pumilis* and subsequently created the genus *Paravaejovis* to place this monotypic species (Williams, 1980). Haradon (1984b) carried out a revision of the genus *Paruroctonus* based on morphology. He concluded that *Paravaejovis pumilis* may be related to one of the groups of that genus, although he did not take any taxonomic action. Haradon's assessment was accepted by succeeding revisions (Sissom, 2000, Soleglad and Fet, 2003, 2008). Here I present a topology in which this species nest within the Syntropinae, instead with paruroctonoids.

MATERIAL EXAMINED: **MEXICO: Baja California Sur:** *Municipio de Comondú*: Ciudad Constitución, 32 km SW, 24°55'17"N 111°58'5.5"W, 26 m, 11.vii.2004, O. Francke, W.E. Savary, E. González, and A. Valdez, collected at night with UV light, 2 ♂ (AMNH [LP 3137]); Ciudad Constitución, 32 km W, 24°55.2828'N 111°58.08'W, 26 m, 11.vii.2004, A. Valdez, E. González, O. Francke, and W.E. Savary, sand dunes, collected at night with UV light, 2 ♂, 1 ♀

(AMNH [ARA3175]), 2 ♂ (IBUNAM [ARA2418]); Ciudad Constitución, 43 km W, 24°51.7662'N 112°3.8328'W, 7 m, 11.vii.2004, A. Valdez, E. González, O. Francke, and W.E. Savary, sand dunes, collected at night with UV light, 1 ♀ (AMNH [ARA3174]); El Cayuco Fish Camp, sand dunes, 24°34.6656'N 111°40.6326'W, 6 m, 11.vii.2005, W.E. Savary, E. González, L. Prendini, and R. Mercurio, sand dunes, collected at night with UV light, 35 ♂, 2 ♀ (AMNH [ARA3173]), 19 ♂ (CAS [ARA1820]), 35 ♂, 2 ♀ (IBUNAM [ARA2417]) 1 ♂, 1 subad., (AMNH [LP 4740]); S of El Cayuco "Fish Camp", 24°34.672'N 111°40.645'W, 23 m, 24.v.2004, R. Mercurio, M. Nishiguchi et al., collected at night with UV light, 1 ♀ (AMNH [LP 3476]).

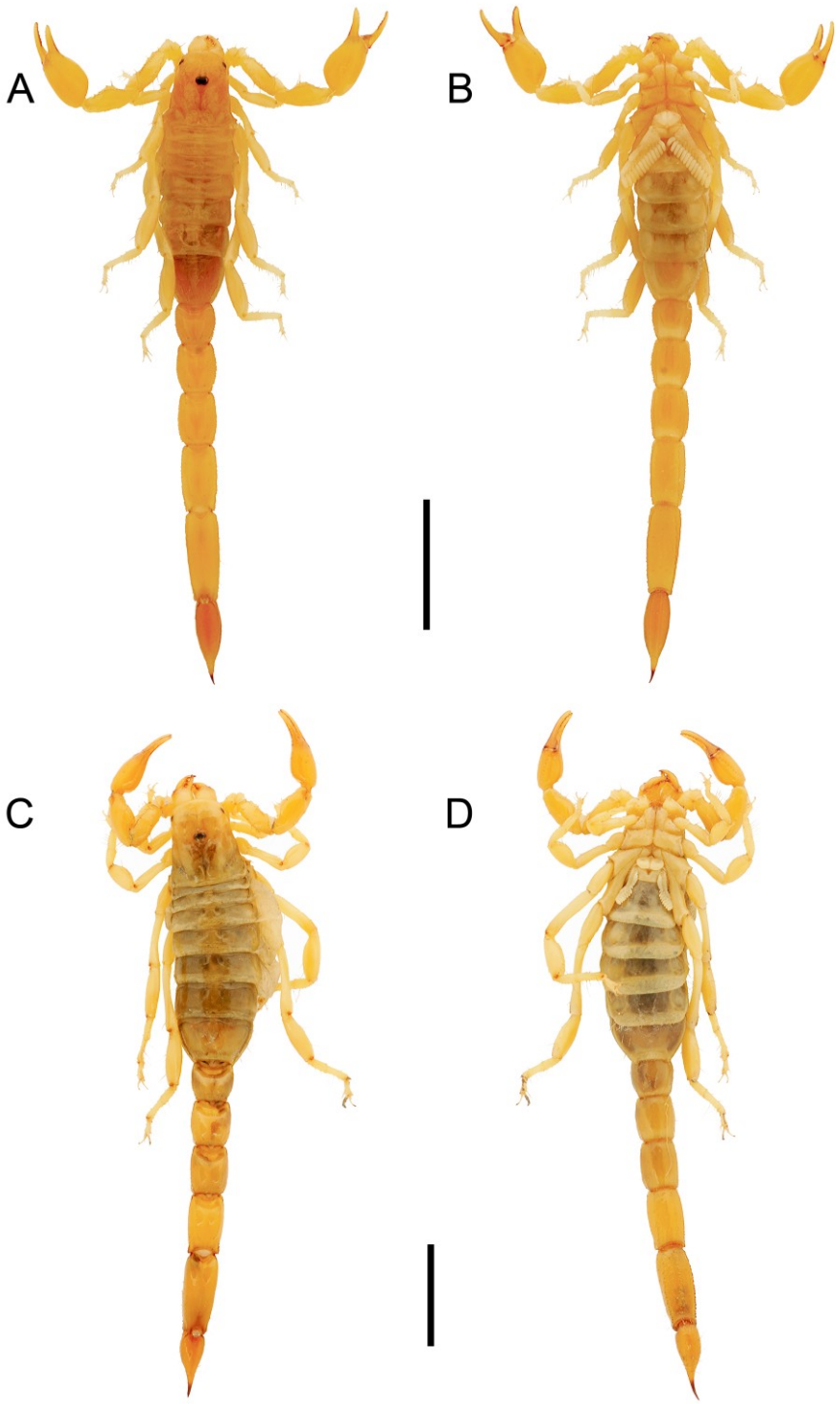


Figure 390. *Paravaejovis pumilis* (Williams, 1970), habitus. **A**, **B**. ♂ (AMNH). **C**, **D**. ♀ (AMNH). **A**, **C**. Dorsal aspect. **B**, **D**. Ventral aspect. Scale bars = 5 mm.

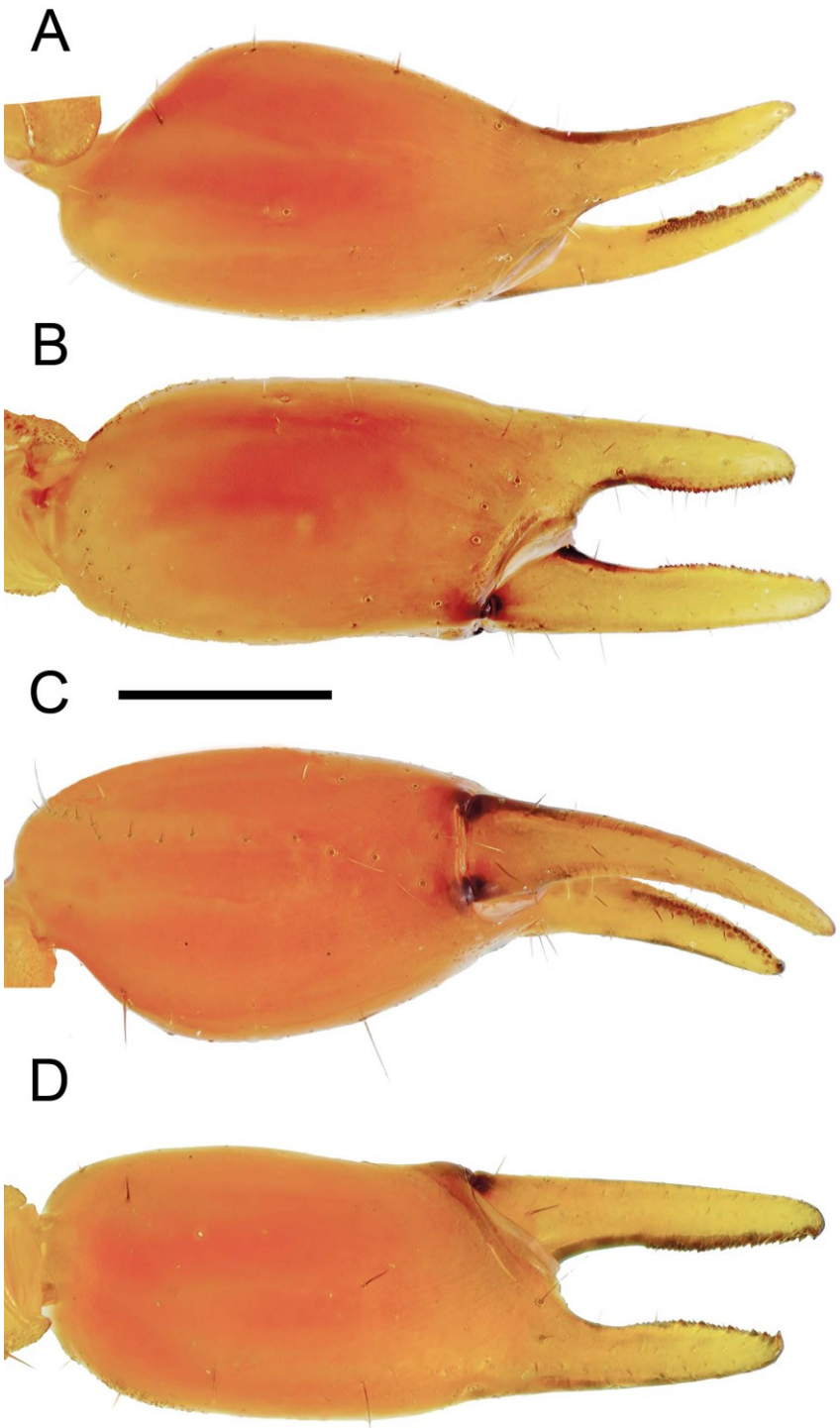


Figure 391. *Paravaejovis pumilis* (Williams, 1970), ♂ (AMNH), dextral pedipalp chela. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

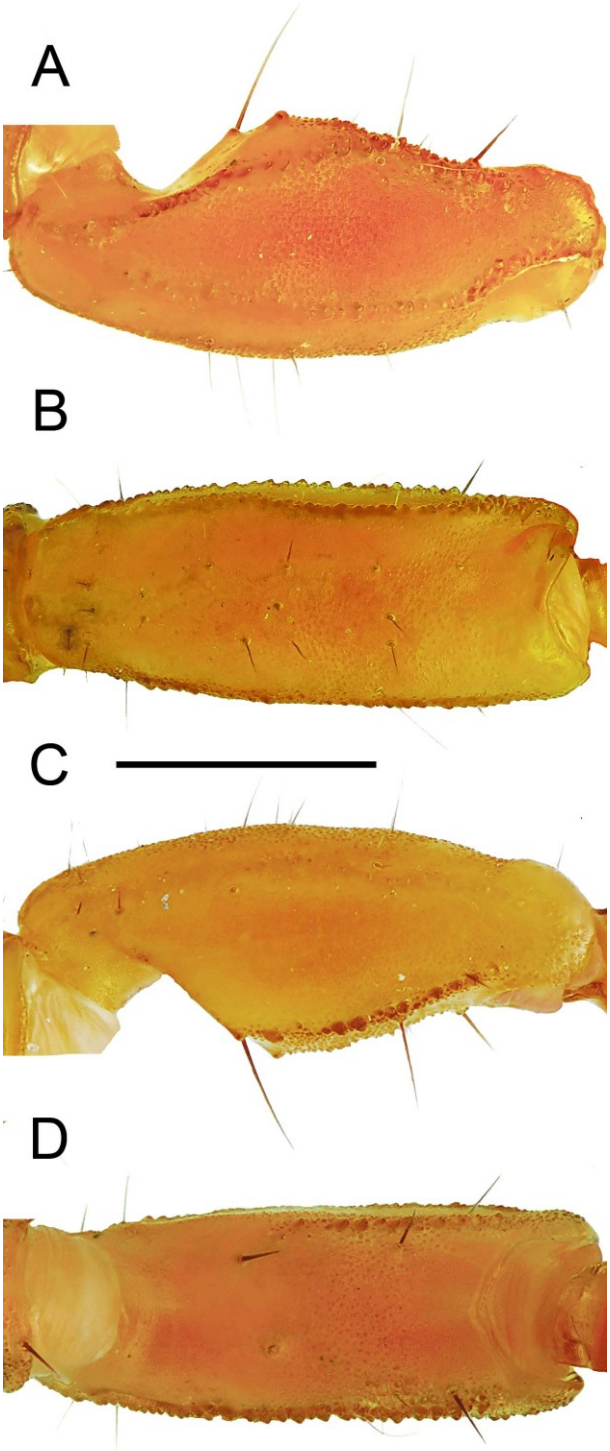


Figure 392. *Paravaejovis pumilis* (Williams, 1970), ♂ (AMNH), dextral pedipalp patella. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

Paravaejovis puritanus (Gertsch, 1958)

Figures 350, 393–395, 411B, 416D, 422B, 423B, 426C, 429B, 433A

Vejovis puritanus Gertsch, 1958: 11–13; Soleglad, 1973b: 359, tab. 4.

Vejovis terradomus Williams, 1970a: 403–407, figs. 5, 6 (synonymized by Williams, 1980: 67); Soleglad, 1973b: 359, tab. 4.

Vaejovis terradomus: Díaz-Nájera, 1975: 7, 17; Sissom, 2000: 535.

Vaejovis puritanus: Williams, 1976: 2; 1980: 54, 67–69, figs. 53N, 54M, 70, 71; 1986: 355; Kovařík, 1998: 148; Beutelspacher, 2000: 106, 137, 138, 154, map 87; Sissom, 2000: 535; Soleglad and Fet, 2003b: 9, 151, fig. B-1, 152, fig. B-2, 61, 161; Sissom and Hendrixson, 2005b: 128, tab. 6.2; Glushkov et al., 2006: 294; McWest, 2009: 20, tab. 1, 55, 59, fig. 164–168, 61, 118; Jiménez-Jiménez and Palacios-Cardiel, 2010: 128, tab. 6.2.

Vaejovis puritanus "form" *terradomus*: Beutelspacher, 2000: 106, 154, map 87.

Vaejovis "*terradomus* race": Mcwest, 2009: 20, tab. 1, 60, figs. 164–168, 118.

Hoffmannius puritanus: Soleglad and Fet, 2008: 4, 31, 33, fig. 52, 39, fig. 80, 50, tab. 3, 56, fig. 149, 68, 69, 73, 91.

TYPE MATERIAL: *Vejovis puritanus*: **MEXICO: Baja California:** Holotype ♂ (AMNH), Santo Tomas, 8.vii.1953, W.J. and J.W. Gertsch. Paratypes: **U.S.A.: California:** *San Diego Co.*: 1 ♀ (AMNH), Jacumba, 10.viii.1955, W.J. Gertsch.

Vejovis terradomus: **MEXICO: Baja California Sur:** Holotype ♂ (CAS, Type No. 10428), 1.6 km SW Rancho Canipole, 15.v.1969, S.C. Williams. Paratypes: 6 ♂, 3♀ (CAS), same data as holotype.

DIAGNOSIS: *Paravaejovis puritanus* is closely related to *P. schwenkmeyeri*, with which from a monophyletic group. This monophyletic group in turn, is sister to *P. cochimi*, **n. sp.**, *P. gravicaudus* and *P. spinigerus*. The scheme of relation found in the phylogenetic analysis is as follow: ((*P. puritanus* + *P. schwenkmeyeri*) (*P. spinigerus* (*P. cochimi* + *P. gravicaudus*))). *P. puritanus* may be separated from *P. schwenkmeyeri* by having carapace, pedipalps, tergites, prolateral surface of legs, and metasoma infuscate with dusky markings and base color brownish to orange, instead of having immaculate surfaces and base color pale yellow straw. Whereas *P. puritanus* has proximal notch and median lobe of pedipalp fixed finger moderate to weak, strong, *P. schwenkmeyeri* has these moderate to strong. *P. puritanus* further differs by having pedipalp fixed finger longer than manus and in contrast *P. schwenkmeyeri* has fixed finger and manus approximately with the same length. *P. puritanus* exhibits prolateral median carinae of pedipalp patella strong with large conical granules, but *P. schwenkmeyeri* exhibits this carinae finely crenulated. In that segment, *P. puritanus* also has dorsal retrolateral strongly crenulated and *P. schwenkmeyeri* has those carinae finely crenulated. *P. puritanus* has ventral lateral carinae in segments I–IV crenulated and ventral surface of metasomal segment V moderately granulated, but *P. schwenkmeyeri* has those carinae costate and smooth, and ventral surface of segment V weakly granulated. *P. puritanus* also has ventral surface of telson moderately crenulated, and *P. schwenkmeyeri* has this surface smooth.

DESCRIPTION: This redescription supplements Gertsch's (1958) original description, it is based on the material deposited in the collections mentioned in material examined.

Color and infuscation: Base color yellow straw to orange-brown. Carapace, tergites, legs, dorsal and retrolateral surface of pedipalp femur and patella infuscate with dusky markings. Carinae of pedipalp chelae outlined with infuscation. Median and lateral ocular tubercles

intensely infuscate. Genital operculum and pectines pale yellowish to whitish. Carinae of metasomal segments I-IV and ventral lateral and ventral median carinae in V weakly and finely infuscate. Aculeus base reddish, median and distal dark brownish.

Carapace: Carapace 1.16 times longer than posterior width. Anterior margin sublinear, with vestigial to moderate medial notch and three pairs of major macrosetae and occasionally with one intersperse minor macrosetae. Carapace shagreened, densely cover by minute granules and scattered moderate granules. Median ocular tubercle moderately raised. Superciliary carinae moderate and weakly crenular, higher than median eyes. Position of median ocular tubercle on anterior half of carapace. Three pairs of lateral eyes, first anterior pair slightly larger than second pair and third pairs slightly half the size of first pair. Median eyes approximately two times the size of first lateral frontal pair. Anteromedian sulci deep with an anterior shallow depression; posteromedian moderate on proximal half, medially broad, and deep distally; anterolateral moderate, posterolateral deep, posterior transverse vestigial to weak.

Sternum and coxal region: Sternum pentagonal subequilateral with three pairs of setae, one distal, one median pairs and one pair on the lobes, surface matte, median notch deep. Coxal region with scatter matte spots in ♂, in ♀ weakly matte, predominantly smooth. Anterior margin of coxa II with few scatter minute granules, subbasally three oblique slit-like structures, adjacent to a moderate, scattered granular protuberance. Proximal margin of coxal endite II with a deep elongate depression each, median edge finely granular. Coxa IV 2.21 times longer than coxa II.

Chelicerae: Dorsal surface smooth, subdistal margin of manus with one macrosetae; distal margin with costate. Serrula present on ventral distal half of movable finger, tines numbering 12–14.

Pedipalps: Trichobothrial pattern Type C, orthobothriotaxic. Chela wider than patella, patella wider than femur. Femur: All intercarinal surfaces matted. Dorsal prolateral, dorsal retrolateral, and ventral prolateral complete moderately granular with conical rounded granules; retrolateral dorsosubmedian complete, expressed by four macrosetae and a few fine subserrate granules; retrolateral ventral vestigial expressed by row of scatter enlarge granules; ventral prolateral vestigial expressed by enlarge serrate granules; ventral retrosubmedian vestigial expressed by few scatter proximal crenatoserrate granules; prolateral ventrosubmedian complete, expressed by a three proximal enlarged spiniform tubercles followed by a row of scatter enlarge and moderate conical tubercles, subbasal and subdistal ones with a macroseta on top, the row gently slanting towards dorsal prolateral carinae; prolateral ventral vestigial expressed by two proximal enlarged tubercles with a macroseta on top followed by two enlarged conical tubercles with a macroseta on base and a distal macrosetae.

Patella: All intercarinal surface matte. Dorsal prolateral, dorsal retrolateral, ventral prolateral, and ventral retrosubmedian complete moderately crenatoserrate; retrolateral dorsosubmedian and retrolateral median vestigial, expressed by a band of infuscation and macrosetae; ventral median vestigial, expressed by a strong proximal row of irregular granules; prolateral median on a vaulted projection, protruding moderately medially, complete by a strong crenatoserrate granules with one proximal, one median and one distal macrosetae on top, the row of macrosetae gently slanting towards subdistal end of dorsal prolateral carinae; prolateral ventral obsolete expressed by four to five major macrosetae adjacent to ventral prolateral carinae.

Chela: Manus smooth and elongate in sexes Dorsal prolateral, dorsal median, dorsal retrolateral, ventral prolateral, ventral median, prolateral median, ventral retrolateral and

prolateral median obsolete, with vestigial costate in ♂, in ♀ absent. All other carinae obsolete. Trichobothrium *Db* positioned on dorsal retrolateral carina, subbasal on chelae; *Dt* positioned at mid manus.

Fingers: Fixed finger, PD = 6, MD rows = 5, RD = 5, proximal RD positioned by proximal half. All RD subpaired with corresponding PD. Movable finger, PD = 7, MD rows = 6, distal row bearing one minute granule, RD = 6, proximal RD positioned by mid finger. All RD subpaired with corresponding PD. Trichobothria *ib* and *it* positioned subbasal on fixed finger, adjacent to PD6 in both sexes. Distal retrolateral denticles in both fingers moderately enlarged claw-like. Fingers with moderate scallop in ♂, proximal notch and medina lobe of fixed finger moderate, proximal notch and median lobe of movable finger weak, gap created when fingers closed strong, fingers fit unevenly, in ♀ fingers lacking scalloping, gap created when fingers closed absent.

Legs: Basitarsi I–II prolateral ventral, retrolateral ventral, and retrolateral dorsal carinae with complete rows of spinules; prolateral ventral in III and IV; retrolateral ventral in III complete, in IV absent; retrolateral dorsal in III and IV expressed as a row of spinules on distal third, spinules proximally becoming spiniform minute granules; retrolateral median rows in I–IV vestigial expressed as few terminal spinules. Telotarsi I–IV with two pairs of ventrodistal spinules in I–IV. Setae: Prolateral ventral 3:4:5:5; retrolateral ventral 3:7:8:9, intersperse minor and major macrosetae in IV; retrolateral dorsal 2:3:3:4; dorsal 4:4:4:4; retrolateral dorsal and dorsal series arranged in two independent rows in ♂, in ♀ retrolateral dorsal and dorsal series arranged in one sublinear row, being dorsal median offset, macrosetae slightly more elongate.

Tergites: Pretergites and postergites dorsal submedian intercarinal surface matte, other surfaces shagreened; dorsal submedian and dorsal median carinae in tergites I–VI moderate

vestigial, expressed by few distal moderate granules on distal half. Tergite VII dorsal lateral intercarinal surface matte with few scatter moderate granules; dorsal median carina weakly costate with few moderate granules, expressed on proximal half of the postergite; dorsal submedian vestigial expressed as a low short pair of proximal row of two or three granules; dorsal lateral and lateral supramedian comparatively stronger and complete, distal extreme with an enlarged subserrate granules; dorsal lateral carinae projecting and curving with scattered granules laterally approximating to lateral supramedian proximal margin, creating a semi horseshoe of strong and subserrated granules.

Genital operculum: Male genital operculum: wider than long, with three pairs of macrosetae. Sclerites free on longitudinal edge moving independently but unable to open more than 45°. Genital papillae protruding posteriorly. Female genital operculum: Wider than long, with three macrosetae. Sclerites fuse longitudinal.

Sternites: Sternites I–VII acarinated matte laterally and smooth medially in ♂, in ♀ finely punctuated, and lustrous. Distomedian glandular spot in IV vestigial, expressed by a narrow whitish band, in V with distal median glandular spot weak not protruding from adjacent surfaces but strongly contrasting with darker base color, in ♂, in ♀ obsolete in both segments. Sternite VII with ventral lateral carinae moderate finely crenatoserrate with two macrosetae; other carinae obsolete expressed by macrosetae. Distomedian glandular spot vestigial ♂, weakly protruding from adjacent surface, in ♀ vestigial weaker than V. Spiracle elongated, slit-like, approximately two times longer than wide.

Pectines: Basal piece with median notch deep, with three pairs of macrosetae. Marginal lamella consist of three sclerites, medial lamella proximally fuse distally progressively forming a conspicuous rows with 10–13 beads. Fulcra with 16–18 in ♂, in ♀ 13–16 beads. Pectinal tooth

numbering 17–19 in ♂, in ♀ 14–17. Pectines relatively short, with median sclerite of marginal lamella at the level of distal margin of coxa IV in ♂, in ♀ total length of marginal lamella shorter than distal margin of coxa IV.

Hemispermatophore: Lamina 1.50 longer than trunk. Dorsal through margin long, narrow, curving proximally, and removed from ventral trough. Hemimating plug developed from the inner lobe, distal barb margin with 12 elongated spinules. Primary and secondary hook positioned on the apex of lateral margin extension of the lamina (flange). Both hooks rounded low, separated slightly, forming a shallow notch. Median lobe ental terminus moderate and rounded. Basal plate of inner lobe removed from ventral trough. Spine of inner lobe relatively long and strongly sclerotized, secondary spine on ventromedian aspect of neck absent. Neck relatively short (0.38 times longer than basal plate). Measurements, lamina, 3.60; trunk, 2.40; dorsal trough/laminar hooks, 1.08; ventral trough/laminar hook, 0.54; neck, 0.30; basal plate, 0.78.

Metasoma: Intercarinal surfaces matte, dorsal intercarinal surface of segments I–III with scatter median moderate granules. Carinae: Dorsal lateral and lateral median carinae in I–IV strongly crenatoserrated terminating in moderate enlarge spinoid granules pointing backwards; except lateral median in IV distal terminus moderately expanded laterally forming a triangular projection; dorsal lateral in V strong and serrated proximally, becoming stronger medially with a field of granules becoming moniliform, ending on at low tubercle. Lateral inframedian in I complete moderately crenatoserrated; in II partial moderately crenatoserrated, becoming weaker proximally, present on distal third; in III partial with strong crenatoserrate granules, becoming weaker proximally, present on distal fourth; in IV absent, in V partial with a moderate row o0f crenatoserrate granules, becoming weaker and irregular distally, present in proximal half; ventral

lateral in I–IV finely crenatoserrate and smooth, ventral submedian in I–IV moderately costate; ventral lateral and ventral median moderately crenatoserrate. Setae: in ♀dorsal lateral carinae, 1:2:3:4:8; lateral median; 1:2:3:4; lateral inframedian, 2:1:1:0:4, ventral lateral, 2:3:3:4:10, ventral submedian, 3:3:3:4:2, ventral sublateral, 2, in ♂ all macrosetae reduced to microsetae or absent.

Telson: Dorsal surface smooth, ventral and lateral carinae strongly and irregularly crenular weakening distally disappearing at the base of the aculeus, in ♂, in ♀ crenulation weaker and expresses on proximal half. Ventral surface with 4–5 macrosetae in each carina. Ventral median carinae with moderate to weak subaculear tubercle, Microserration on laterobasal aculeus numbering 7–9.

DISTRIBUTION: *Paravaejovis puritanus* is endemic to the coast line of northern Baja California, Mexico and southwestern California, U.S.A. This coast is isolated from main land by Sierra de Juarez and Sierra de San Pedro Martir in Baja California. To the north the Transverse Ranges forms a barrier and to the south the Vizcaino desert limits is distribution.

ECOLOGY: *Paravaejovis puritanus* lives in subtropical costal hilly scrublands of mentioned strip of cost line. This species was collected in both secondary vegetation and grasslands. The altitudinal range was from 45 to 478 m. It seems to be lapidicolous, with certain facultative digging features, as females of this species have well-developed setal combs. The type of soil where it was collected consisted of sandy to fine loamy, moderatly compacted.

REMARKS: Williams described two species related to *P. puritanus*, *Vejovis terradomus* (1970a) and *Vejovis shcwenkmeyeri* (1970c). The same author revised the scorpion fauna of Baja California Peninsula ten year later, where he synonymized these last two under *P. puritanus* and recognized them as races. I included type specimens of these ‘races’ in my analyses *P. puritanus*

and *P. schwenkmeyeri* resulted valid species, supported by genetic and morphological evidences. However, *P. terradomus* did not stand as a valid species, and thus the synonymy with *P. puritanus* accepted.

MATERIAL EXAMINED: **MEXICO: Baja California:** *Municipio de Ensenada*: Bahía San Luis Gonzaga, 1.6 km N, [31°51'9.32"N 116°36'44.44"W], 14.vi.1968, S.C. Williams and M. Cazier, 20 ex. (CAS); El Rosario, 16 km E, [30°4.23483'N 115°45.49333'W], 5.v.1961, W.J. Gertsch and V. Roth, 1 ♂ (AMNH); Punta Banda, between El Rincon and La Bufadora, ca. 1 km SE of Pico Banda off BCN 23, 31°44'N 116°43.025'W, 139 m, 1.vii.2005, E. González, W.E. Savary, L. Prendini, and R. Mercurio, collected at night with UV light, 1 ♂ (AMNH [LP 5093]); Route 1, marker km 21, 30°20.469'N 115°49.019'W, 45 m, 2.vii.2005, E. González, R. Mercurio, L. Prendini, and W.E. Savary, collected at night with UV light, 1 ♀, 1 juv. (AMNH [LP 4447]), 1 ♂, 1 ♀ (AMNH); San Telmo de Arriba, [30°46.400'N 115°56.366'W], 3.v.1961, W.J. Gertsch and V. Roth, 2 ♀ (AMNH); Santo Tomas, 14.5 km, [31°34.87317'N 116°30.598833'W], 137 m, 11.vii.1969, S.C. Williams and V.F. Lee, 1 ♂, 1 ♀ (AMNH). **U.S.A.: California:** *Orange Co.*: Irvine Ranch Conservancy Preserve, former USGS pitfall trap sites, 33°41'53.06"N 117°40'55.90"W, 230 m, 2.viii.2008, Z.J. Valois, W.E. Savary, and Irvine Conservancy Team, formerly coastal scrub, fires within the past few years have destroyed the native flora and allowed feral mustard grass to completely overtake and choke the area, 1 ♂ (AMNH [LP 8917]). *Riverside Co.*: Riveraside, [33°56.88333'N 117°23.7666'W], 20.x.1975, 1 ♂ (AMNH). *San Diego Co.*: San Diego Wild Animal Park, USGS pitfall trap sites, 33°06'5.72"N 116°58'21.47"W, 327 m, 30.vii.2008, Z.J. Valois, W.E. Savary, J.P. Montagne, and T. Matsuda, coastal scrub foothills, 1 subad. ♀ (AMNH [LP 8900]); Mission Trails Regional Park, trail between Big Rock Road and Cowles Mountain, 32°49.285'N 117°01.314'W, 240 m,

29.viii.2005, L. Prendini and R. Mercurio, collected at night with UV light, 2 subad. ♀ (AMNH [LP 5019]); Nate Harrison Grade, Palomar Mountains, [33°21.80900'N 116°50.18366667'W], 478 m, 11.ix.1971, B. Banta, 23 ex. (CAS); Santee, [32°50.22367'N 116°58.37166667'W], 18.ix.1970, M. Soleglad, 1 ♂, 1 ♀ (AMNH); San Diego Wild Animal Park, 30.vii.2008, 33°05'58.29"N 116°58'25.40"W, 280 m, 1 (AMNH), 234 m, 1 (AMNH), 248 m, 1 (AMNH), 196 m, 1 (AMNH), 249 m, 2 ♂ (AMNH), Z.J. Valois, W.E. Savary, J.P. Montagne, and T. Matsuda.

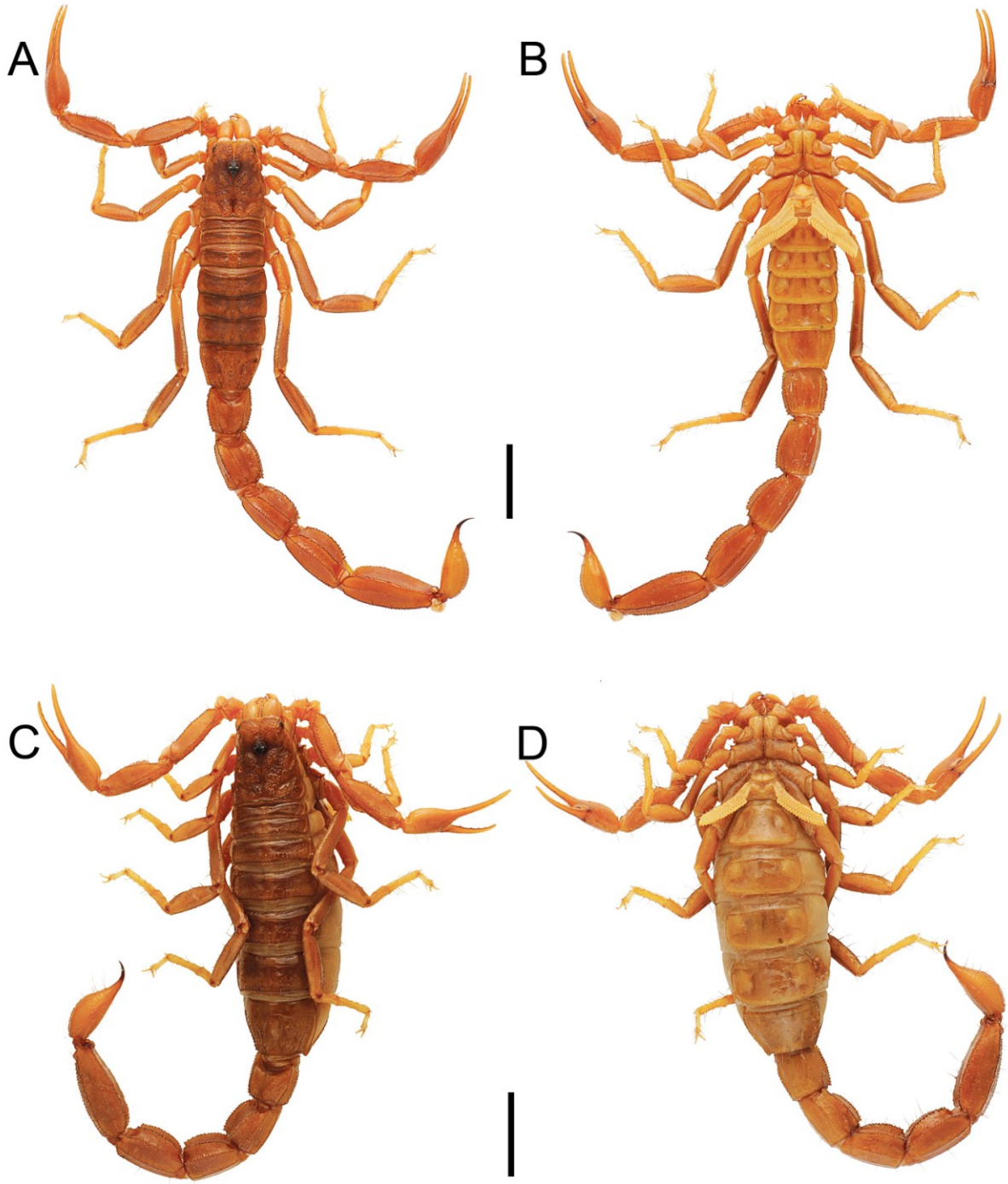


Figure 393. *Paravaejovis puritanus* (Gertsch, 1958), habitus. **A**, **B**. ♂ (AMNH). **C**, **D**. ♀ (AMNH). **A**, **C**. Dorsal aspect. **B**, **D**. Ventral aspect. Scale bars = 5 mm.

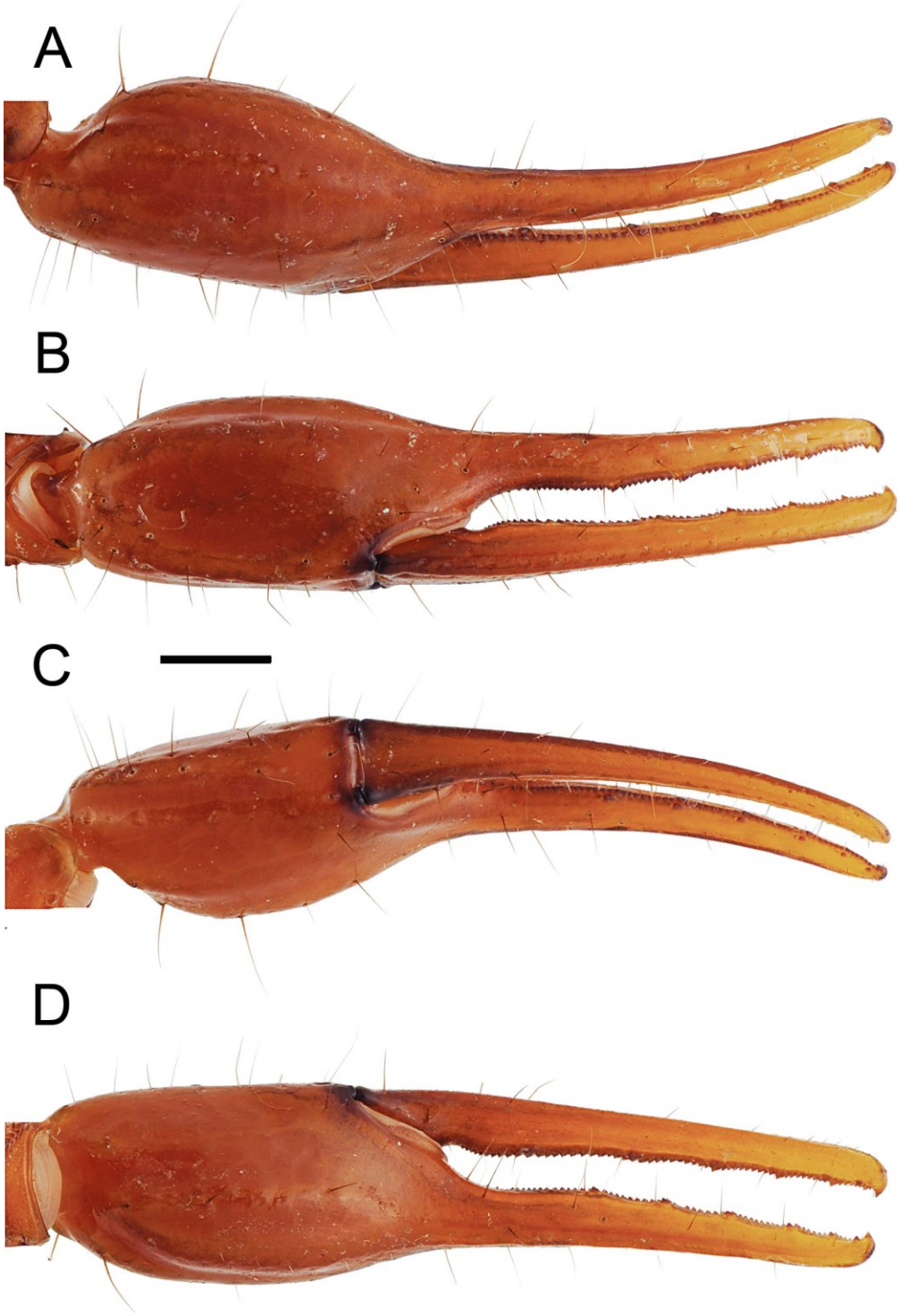


Figure 394. *Paravaejovis puritanus* (Gertsch, 1958), ♂ (AMNH), dextral pedipalp chela. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

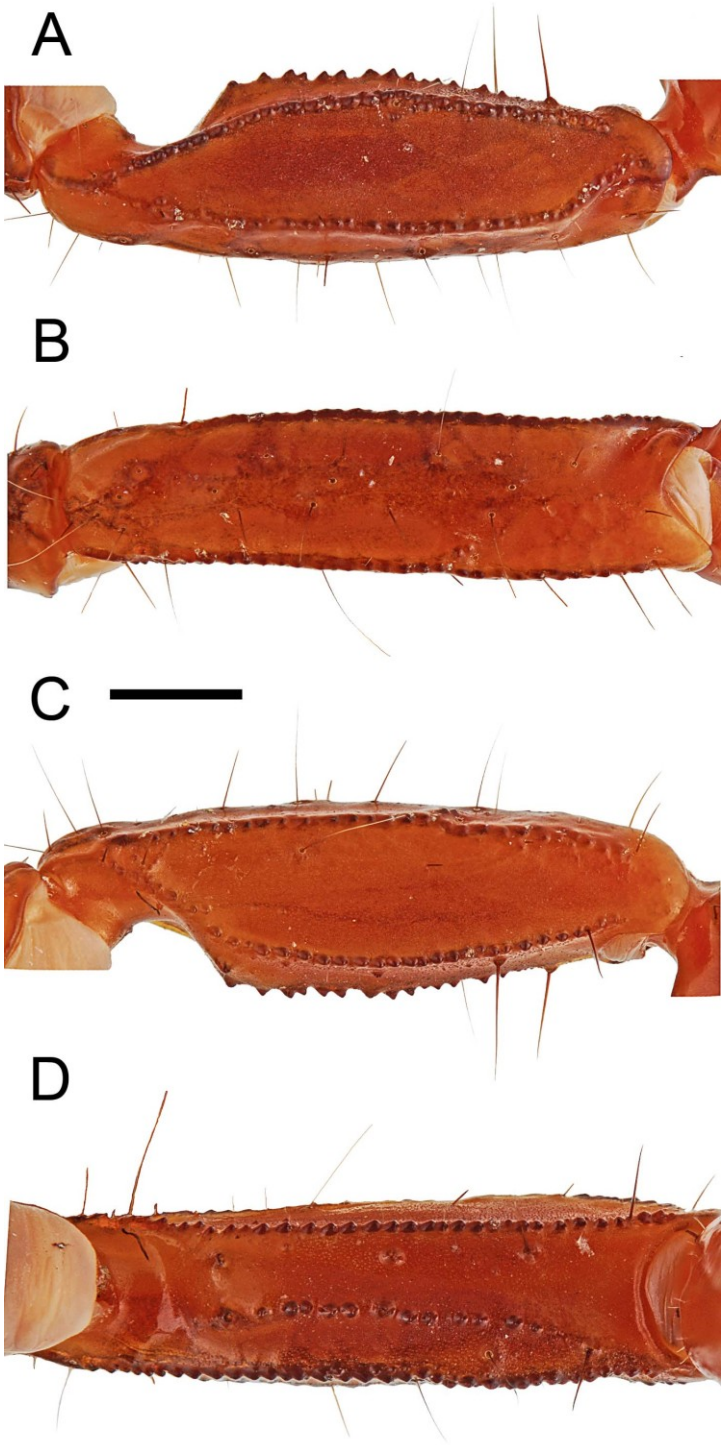


Figure 395. *Paravaejovis puritanus* (Gertsch, 1958), ♂ (AMNH), dextral pedipalp patella. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

Paravaejovis schwenkmeyeri (Williams, 1970)

Figures 355, 396–398, 411C, 413C, 422C, 423C, 426D, 429C, 433B

Vejovis schwenkmeyeri Williams, 1970a: 302–307, 313, figs. 16, 17.

Vejovis schwenkmeyeri: Soleglad, 1973b: 359, tab. 4.

Vaejovis schwenkmeyeri: Williams, 1980: 67; Díaz-Nájera, 1975: 7, 10; Sissom, 2000: 535.

Vaejovis puritanus "form" *schwenkmeyeri*: Beutelspacher, 2000: 106, 154, map 87.

TYPE MATERIAL: **MEXICO: Baja California Norte:** Holotype ♂ (CAS, Type No. 10426), Bahia de los Angeles, 19.vi.1968, S.C. Williams and M.A. Cazier. Paratypes: 75 ♂, 79 ♀ (CAS, including allotype ♀), same data as holotype.

DIAGNOSIS: *Paravaejovis schwenkmeyeri* is closely related to *P. puritanus*, with which from a monophyletic group (see *P. puritanus* for details). *P. schwenkmeyeri* may be separated from *P. puritanus* by having base color pale yellow straw, and carapace, pedipalps, tergites, prolateral surface of legs, and metasoma immaculate, instead of having base color brownish to orange and these surfaces infuscate with dusky markings. Whereas *P. schwenkmeyeri* has proximal notch and median lobe of pedipalp fixed finger moderate to strong, *P. puritanus* has these moderate to weak. *P. schwenkmeyeri* further differs by having pedipalp fixed finger and manus approximately with the same length, in contrast *P. puritanus* has fixed finger longer than manus. *P. schwenkmeyeri* exhibits prolateral median carinae of pedipalp patella finely crenulated, but *P. puritanus* exhibits this carinae strong with large conical granules. In that segment, *P. schwenkmeyeri* also has dorsal retrolateral finely crenulated, but those carinae are strongly crenulated in *P. puritanus*. *P. schwenkmeyeri* has ventral lateral carinae in segments I–IV costate and smooth and ventral surface of metasomal segment V weakly granulated, instead

of having ventral lateral carinae in segments I–IV crenulated to moderately granulated and ventral surface of segment V moderately crenulated.

DESCRIPTION: This redescription supplements Williams' (1970a) original description and is based on the material deposited in the collections mentioned below.

Color and infuscation: Base color pale yellow straw. Carapace, tergites, and legs with vestigial dusky markings. Fingers reddish. Genital operculum and pectines pale yellowish to whitish. Aculeus base reddish, median and distal dark brownish.

Carapace: Carapace 1.15 times longer than posterior width. Anterior margin linear, lacking medial notch and with three pairs of major macrosetae and occasionally with one intersperse minor macrosetae. Carapace shagreened, densely cover by minute granules and scattered moderate granules. Median ocular tubercle moderately raised. Superciliary carinae moderate and weakly crenular, as height as median eyes. Position of median ocular tubercle on anterior half of carapace. Three pairs of lateral eyes, first two pair same size and third pair smaller than first two pair. Median eyes approximately two times the size of first lateral frontal pair. Anteromedian sulci deep with an anterior shallow depression; posteromedian moderate on proximal half, medially broad, and deep distally; anterolateral moderate, posterolateral deep, posterior transverse vestigial to weak.

Sternum and coxal region: Sternum pentagonal equilateral with three pairs of setae, one distal, one median pairs and one pair on the lobes, surface matte, median notch deep. Coxal region with scatter matte spots in ♂, in ♀ smooth. Anterior margin of coxa II with few scatter minute granules, subbasally three oblique slit-like structures, adjacent to a moderate, scattered granular protuberance. Proximal margin of coxal endite II with a deep elongate depression each, median edge finely granular. Coxa IV 2.25 times longer than coxa II.

Chelicerae: Dorsal surface smooth, subdistal margin of manus with one macrosetae; distal margin with costate. Serrula present on ventral distal half of movable finger, tines numbering 12

Pedipalps: Trichobothrial pattern Type C, orthobothriotaxic. Chela wider than patella, patella wider than femur. Femur: All intercarinal surfaces matted. Dorsal prolateral, dorsal retrolateral, and ventral prolateral complete moderately granular with conical rounded granules; retrolateral dorsosubmedian complete, expressed by four macrosetae and a few scatter fine subserrate granules; retrolateral ventral vestigial expressed by row of scatter moderate granules; ventral prolateral vestigial expressed by enlarge serrate granules; ventral retrosubmedian vestigial expressed by few scatter proximal crenatoserrate granules; prolateral ventrosubmedian vestigial, expressed by two proximal enlarged spiniform tubercles followed two moderate conical tubercles with a macroseta on top and few intersperse scatter moderate granules; prolateral ventral vestigial expressed by two proximal enlarged tubercles with a macroseta on top followed by two low conical tubercles with a macroseta on base.

Patella: All intercarinal surface matte. Dorsal prolateral and ventral prolateral finely crenulate; dorsal retrolateral with vestigial crenulation, predominantly smooth, ventral retrosubmedian complete weakly crenular; retrolateral dorsosubmedian and retrolateral median vestigial, expressed by a vestigial broad costa; ventral median vestigial, expressed by a strong proximal row of irregular granules; prolateral median on a vaulted projection, protruding moderately medially, complete expressed by three or four moderate conical granules ending by trichobothrium *d*, followed by a fine row of minute crenulation gently slanting towards subdistal end of dorsal prolateral carinae, proximal, median, and distal moderate granules with a macroseta

on top; prolateral ventral obsolete expressed by three to four major macrosetae and occasionally one intersperse minor macroseta, adjacent to ventral prolateral carinae.

Chela: Manus smooth and elongate in sexes (manus 1.45 times longer than fixed finger). Dorsal prolateral, dorsal median, dorsal retrolateral, ventral prolateral, ventral median, prolateral median, ventral retrolateral and prolateral median obsolete, with vestigial costate in ♂, in ♀ absent. All other carinae obsolete. Trichobothrium *Db* positioned on dorsal retrolateral carina, subbasal on chelae; *Dt* positioned at mid manus.

Fingers: Fixed finger, PD = 6, MD rows = 5, RD = 5, proximal RD positioned by proximal half. All RD subpaired with corresponding PD. Movable finger, PD = 7, MD rows = 6, distal row bearing one minute granule, RD = 6, proximal RD positioned by mid finger. All RD subpaired with corresponding PD. Trichobothria *ib* and *it* positioned subbasal on fixed finger, adjacent to PD6 in both sexes. Distal retrolateral denticles in both fingers moderately enlarged claw-like. Fingers with moderate scallop in ♂, proximal notch and medina lobe of fixed finger moderate, proximal notch and median lobe of movable finger moderate, gap created when fingers closed strong, fingers fit unevenly, in ♀ fingers lacking scalloping, gap created when fingers closed absent.

Legs: Basitarsi I–II prolateral ventral, retrolateral ventral carinae with complete rows of spinules; prolateral ventral in III and IV absent; retrolateral ventral in III complete, in IV absent; retrolateral dorsal in I vestigial expressed by a row of spinules on distal third, in II complete with proximal third with spinules becoming scatter; in III, partial expressed by a row of spinules becoming scatter and turning into spiniform granules; in IV absent; retrolateral median rows in I–IV vestigial expressed as few terminal spinules. Telotarsi I–IV with two to three pairs of ventrodistal spinules in I–IV. Setae: Prolateral ventral 3:4:5:5; retrolateral ventral 3:6:8:8,

intersperse minor and major macrosetae in III; retrolateral dorsal 2:3:4:3; dorsal 4:4:5:5; retrolateral dorsal and dorsal series arranged in two independent rows in ♂, in ♀ retrolateral dorsal and dorsal series arranged in one sublinear row in II and III, being dorsal median offset. Macrosetae slightly more elongate.

Tergites: Pretergites and postergites dorsal submedian intercarinal surface matte, other surfaces shagreened; dorsal submedian and dorsal median carinae in tergites I–VI moderate vestigial, expressed on distal half by few moderate granules. Tergite VII dorsal lateral intercarinal surface matte with few scatter moderate granules; dorsal median carina weakly costate with few moderate granules, expressed on proximal half of the postergite; dorsal submedian vestigial expressed as a low short pair of proximal short row of granules; dorsal lateral and lateral supramedian comparatively stronger and complete with elongate subserrate granules; dorsal lateral carinae projecting weakly and curving with scattered granules laterally approximating to lateral supramedian proximal margin, creating a semi horseshoe of moderate and subserrated granules.

Genital operculum: Male genital operculum: wider than long, with three pairs of macrosetae. Sclerites free on longitudinal edge moving independently but unable to open more than 45°. Genital papillae protruding posteriorly. Female genital operculum: Wider than long, with three macrosetae. Sclerites fuse longitudinal.

Sternites: Sternites I–VII acarinated finely punctuated, and lustrous in both sexes. Distomedian glandular spot in V weak not protruding from adjacent surfaces and moderately contrasting with slightly darker base color, in ♂, in ♀ obsolete. Distomedian glandular spot in VII obsolete in both sexes. Sternite VII with ventral lateral carinae vestigial weakly and finely

crenatoserrate with two macrosetae; other carinae obsolete expressed by macrosetae. Spiracle elongated, slit-like, approximately two times longer than wide.

Pectines: Basal piece with median notch deep, with three pairs of macrosetae. Marginal lamella consist of three sclerites, medial lamella proximally fuse distally progressively forming a conspicuous rows with 10–11 beads. Fulcra with 16–18 in ♂, in ♀ 13–16 beads. Pectinal tooth numbering 17–19 in ♂, in ♀ 14–17. Pectines relatively short, with second sclerite of marginal lamella at the level of distal margin of coxa IV in ♂, in ♀ total length of marginal lamella slightly longer than distal margin of coxa IV.

Hemispermatophore: Lamina 1.86 longer than trunk. Dorsal through margin long, narrow, curving proximally, and removed from ventral trough. Hemimating plug developed from the inner lobe, distal barb margin with 12 elongated spinules. Primary and secondary hook positioned on the apex of lateral margin extension of the lamina (flange). Both hooks vestigial rounded, slightly separated, forming a vestigial notch. Median lobe ental terminus moderate and rounded. Basal plate of inner lobe removed from ventral trough. Spine of inner lobe relatively long and strongly sclerotized, secondary spine on ventromedian aspect of neck absent. Neck relatively short (0.42 times longer than basal plate). Measurements, lamina, 3.90; trunk, 2.10; dorsal trough/laminar hooks, 1.08; ventral trough/laminar hook, 0.54; neck, 0.30; basal plate, 0.72.

Metasoma: Intercarinal surfaces matte. Carinae: Dorsal lateral and lateral median carinae in I–IV strongly crenatoserrated terminating in moderate enlarge spinoid granules pointing backwards; except lateral median in IV distal terminus moderately expanded laterally forming a triangular projection; dorsal lateral in V strong and serrated proximally, becoming granular medially with a field of granules becoming moniliform distally, ending on at low tubercle.

Lateral inframedian in I complete moderately crenatoserrated; in II partial moderately crenatoserrated, becoming weaker proximally, present on distal third; in III partial with moderate crenatoserrate granules, becoming weaker proximally, present on distal fourth; in IV absent, in V partial with a moderate row of crenatoserrate granules, becoming weaker distally, present in proximal half; ventral lateral in I–IV proximal half smooth and distal half finely crenatoserrate, ventral submedian in I obsolete, in II–IV weakly costate and smooth; ventral lateral and ventral median strongly crenatoserrate. Setae: Dorsal lateral, 0:1:1:2:5; lateral median, 0:1:1:2; lateral inframedian, 2:0:0:0:2, ventral lateral, 2:2:2:2:6, ventral submedian, 3:3:3:3:2, ventral sublateral, 2.

Telson: Dorsal surface smooth, ventral and lateral carinae moderate and irregularly crenulations weakening distally disappearing at the base of the aculeus, in ♂, in ♀ crenulation weaker and expresses on proximal half. Ventral surface with 6–7 macrosetae in each carina. Ventral median carinae with moderate to weak subaculear tubercle. Microserration on laterobasal aculeus numbering 7–9.

DISTRIBUTION: *Paravaejovis schwenkmeyeri* is widely distributed in the Peninsula of Baja California, from the southern limits of the costal Upper California Gulf to the southern limit of Baja California Sur in the Los Cabos area and has also been recorded from Coronados Island, Mexico.

ECOLOGY: *Paravaejovis schwenkmeyeri* was collected in predominantly sandy soils, although a few specimens were collected on rocky soils. It can be found in volcanic soils or sedimentary soils moderately packed to loose sandy soils and is frequently observed in sand dunes. It seems it is not adapted to any particular vegetation. Most of the specimens were collected from sea level to 635 m altitude. However, I collected two specimens at 1179 m

altitude. Morphologically and genetically there is little difference among the samples from the whole range of distribution. However there are two well-defined clades within the cluster of samples, one representing more and less the Vizcaino Desert and the other the rest of the distributional range. Nevertheless, there are not enough morphological features to diagnose different species.

The locality at Los Cabos seems far from the distribution area. It is interesting to note that the area in between has been thoroughly sampled and never yielded specimens of this species. *P. schwenkmeyeri* is a semi-psammophilous species, constructing burrows in riverbanks and moderately packed sandy soils; although males are not strongly armed to dig in sand, females present longer and tougher setal combs.

REMARKS: *Paravaejovis schwenkmeyeri* is reinstated as valid species here. There are characters that separate it from *P. puritanus*, with which it was synonymized by Williams (1980). Molecular and morphological evidence support this conclusion.

MATERIAL EXAMINED: **MEXICO: Baja California Sur:** Isla Coronados, SW end, [26°7'8.94"N 111°16'32.02"W], 25.v.1970, S.C. Williams and V.F. Lee, 1 (AMNH). *Municipio de Mulegé*: Bahía Tortugas, 10 km NE, 27°45.2160'N 114°50.6016'W, 17 m, 5.vii.2008, H. Montaño and E. González, desert, collected at night with UV light, 1 ♀ (AMNH [ARA2893]); Bahía Tortugas, 10 km NW, 27°45.389'N 114°57.103'W, 110 m, 7.vii.2008, H. Montaño, and E. González, arroyo sand banks on cutting edges, collected at night with UV light, 1 juv. (AMNH [LP 8788]), 1 ♂, 1 ♀, 1 subad. ♂, 1 subad. ♀ (AMNH [ARA2881]), 2 ♂, 1 ♀ (IBUNAM [ARA2270]); Guerrero Negro, 1.7 km, road to Estero of San José, [27°56.09667'N 113°54.3850'W], 29.xii.1978, D. Weisman, R. Love, and V.F. Lee, 1 ex. (CAS); Guerrero Negro, 11 km SE, W side Route 1, 27°54.916'N 113°55.333'W, 18 m, 4.vii.2005, L. Prendini and R. Mercurio,

collected at night with UV light, 2 juv. (AMNH [LP 4443]); Microwave station "El Abulón", 141 m, 27°17'29.4"N 113°1'55.2"W, E. González, O. Francke, W.E. Savary, and A. Valdez, 14.vii.2004, collected at night with UV light, 4 ♀, 1 juv. (AMNH), 1 ♀, 2 juv. (AMNH [ARA1453]), 2 subad. ♀ (CAS [ARA1551]), 1 ♂, 1 ♀, 1 subad. ♀, 1 juv. (IBUNAM [ARA2108]), 1 ♂, 1 ♀, 8 juv. (AMNH), 1 ♀, 1 juv. (AMNH [LP 3173]), 27°17.483'N 113°01.916'W, W.E. Savary, and E. González, 12.vii.2005, collected at night with UV light, 1 juv. (AMNH [LP 4419]), 1 ♂ (AMNH [ARA1447]); Mulegé, 1 km S, 0 m, 18.vii.2004, 26°53'4.8"N 111°56'33.1"W, E. González, O. Francke, W.E. Savary, and A. Valdez, collected at night with UV light, 1 ex. (AMNH), 1 juv. (AMNH [LP 3175]), 26°53.0664'N 111°56.55'W, A. Valdez, E. González, O. Francke, and W.E. Savary, desert, on ground, collected at night with UV light, 1 subad. ♀ (IBUNAM [ARA2112]); Road Punta Abreojos, marker km 6, 17.vii.2004, 27°17'23.6"N 113°9'28.1"W, 103 m, E. González, O. Francke, W.E. Savary, and A. Valdez, collected at night with UV light, 2 ♂, 5 juv. (AMNH), 1 ♂ (AMNH [ARA1452]), 1 ♂ (IBUNAM [ARA2107]), 1 juv. (AMNH [LP 3170]); Route 1, 7 km SW turnoff to Punta Abreojos, 27°17.0496'N 113°9.8658'W, 76 m, 5.vii.2005, W.E. Savary, E. González, L. Prendini, and R. Mercurio, desert, on ground, collected at night with UV light, 2 ♂, 1 ♀ (IBUNAM [ARA2110]), 1 subad. ♂ (AMNH [LP 4437]); San Angel Dunes, 25 m, 14.vii.2004, 27°14'05"N 113°13'46.5"W, O. Francke, W.E. Savary, E. González, and A. Valdez, collected at night with UV light, 2 ♂, 5 juv. (AMNH [LP 3177]), 27°14.0832'N 113°13.7664'W, A. Valdez, E. González, O. Francke, and W.E. Savary, desert, on ground, collected at night with UV light, 3 ♀, 1 juv. (AMNH [ARA1448]); San Ignacio Mission, 27 km E, [27°16.533'N 112°53.366'W], 25.i.1965, V. Roth, 1 ♂ (AMNH); San Ignacio, 28 km E on Route 1, 27°23.730'N 112°39.540'W, 303 m, 8.vii.2005, L. Prendini and R. Mercurio, collected at night with UV light,

1 ♂ (AMNH [LP 4428]), desert, on ground, collected at night with UV light, 1 ♂ (AMNH [ARA1455]); San Ignacio, 3 km S on road to La Laguna, 27°16.533'N 112°53.366'W, 167 m, 12.vii.2005, E. González, W.E. Savary, L. Prendini, and R. Mercurio, collected at night with UV light, 1 ♀ (AMNH [LP 4422]); San Ignacio, 30 km E on Route 1, 27°24.361'N 112°38.281'W, 324 m, 8.vii.2005, R. Mercurio and L. Prendini, collected at night with UV light, 1 ♂, 1 juv. (AMNH [LP 4426]), desert, on ground, collected at night with UV light, 1 ♀ (IBUNAM [ARA2109]); San Ignacio, 4.8 km NW, [27°16.533'N 112°53.366'W], 22.ii.1966, V. Roth, 1 ♂, 1 ♀, 1 subad. ♂ (AMNH); San Miguel, 346 m, 16.vii.2004, 27°33'5.3"N 114°33'52"W, E. González, O. Francke, W.E. Savary, and A. Valdez, collected at night with UV light, 1 ♂, 2 ♀, 8 juv. (AMNH), 27°33.0828'N 114°33.8664'W, 1 ♀, 3 juv. (AMNH [ARA1442]), 2 juv. (CAS [ARA1156]), 1 ♂, 1 ♀, 2 juv. (IBUNAM [ARA2336]), 27°56'5.8"N 113°54'23.1"W, 25 m, 1 ♀, 1 juv. (AMNH [LP 3176]); San Francisco de la Sierra, 27°35'6.8"N 113°03'44.8"W, 1179 m, 17.vii.2004, O. Francke, W.E. Savary, E. González, and A. Valdez, collected at night with UV light, 1 juv. (AMNH [LP 3178]); Sierra del Placer, 21 km to junction Bahía Tortugas and Bahía Asunción, 98 km E of Vizcaino towards Bahía Tortugas, 28.vi.2008, 27°28.9278'N 114°17.0928'W, 262 m, desert, collected at night with UV light, 1 ♂, 1 ♀ (AMNH [ARA2851]), 1 ♂, 1 ♀ (IBUNAM [ARA2240]), 270 m, stabilized sand dunes, compacted sand dunes and rocky spots, scrub vegetation, collected at night with UV light, 1 juv. (AMNH [LP 8817]), H. Montaño and E. González; Vizcaino desert, 20 km W, 42 m, 16.vii.2004, 27°34'26.1"N 113°32'32.7"W, E. González, O. Francke, W.E. Savary, and A. Valdez, collected at night with UV light, 1 ♂, 2 juv. (AMNH), 27°34.4328'N 113°32.5332'W, W.E. Savary, O. Francke, A. Valdez, and E. González, desert, on ground, collected at night with UV light, 1 ♂, 1 subad. ♂ (AMNH [ARA1451]), 1 subad. ♂ (IBUNAM [ARA2106]), 1 ♀ (AMNH [LP 5097]). **Baja**

California: *Municipio de Ensenada*: Bahía de los Angeles, 30.5 km SE, [28°57'N 113°33'W], 15.i.1965, V. Roth, in arroyo, 1 ♀ (AMNH); Calamajué, 4 km along gravel road, from junction with Route 1, 29°15.116'N 114°08.366'W, 623 m, 13.vii.2005, R. Mercurio and L. Prendini, collected at night with UV light, 1 juv. (AMNH [LP 4441]); Cataviña, 1–2 km S, Hotel Desert Inn (former Hotel la Pinta), Blue Palm Canyon, 29°43.664'N 114°43.114'W, 556 m, 2.vii.2008, H. Montaño and E. González, arroyo with running water, thorny vegetation, sand banks, boulders and stones, collected at night with UV light, 1 subad. ♀, 1 juv. (AMNH [LP 8816]), desert, collected at night with UV light, 1 ♀ (AMNH [ARA2894]); Cataviña, 5 km N, Hotel Desert Inn (former Hotel la Pinta), Blue Palm Canyon, 29°45'2.72"N 114°44'35.31"W, 550 m, 4.vii.2008, H. Montaño and E. González, arroyo with running water, thorny vegetation, sand banks, boulders and stones, collected at night with UV light, 1 ♂ (AMNH [LP 8807]); Catavina, Hotel El Presidente, [29°45'2.72"N 114°44'35.31"W], 26.x.1978, G.J. Mallik, 1 ex. (CAS); Cataviña, NW of El Descanso, 29°46.6866'N 114°46.4406'W, 635 m, 18.v.2004, collected at night with UV light, 4 ♂, 1 subad. ♀, 1 subad. ♂ (AMNH [ARA3131]), 29°46.687'N 114°46.441'W, collected at night with UV light, 1 ♂, 2 ♀, 1 juv. (AMNH [LP 3479]), R. Mercurio, M. Nishiguchi et al.; El Marmol, 37 km S, at palm oasis, San Luis Ranch, [30°0.0040'N 114°45.88416667'W], 12.i.1965, V. Roth, 1 ♀ (AMNH); Gonzaga Bay, 9.7 km N, [29°47.56667'N 114°24.1166'W], 30 m, 14.vi.1968, S.C. Williams and M. Cazier, 1 ♂, 2 ♀ (AMNH); Miller's Landing, end of tidial flat, [28°29'59.79"N 113°59'59.82"W], 21.ii.1968, J. Bigelow, 1 ♂, 1 ♀ (AMNH); Misión de San Francisco de San Borja de Adac, 28°44.604'N 113°45.224'W, 437 m, 30.vi.2008, H. Montaño and E. González, desert, collected at night with UV light, 3 ♂, 3 ♀, 1 juv. (AMNH [ARA2883]), 4 ♂, 2 ♀, 2 juv. (IBUNAM [ARA2269]), thorn and scrub with cacti, stones and boulders, collected at night with UV light, 1 subad. ♀ (AMNH

[LP 8813]); Misión de San Francisco de San Borja de Adac, 5 km W, 28°44.558'N 113°47.935'W, 380 m, 30.vi.2008, H. Montaño and E. González, desert, collected at night with UV light, 5 ♂, 3 ♀, 4 juv. (AMNH [ARA2878]), 5 ♂, 3 ♀, 4 juv. (IBUNAM [ARA2266]), thorn and scrub with cacti, stones and boulders, collected at night with UV light, 1 subad. ♀ (AMNH [LP 8798]); Misión San Borja, 28°44.607'N 113°45.233'W, 433 m, 13.vii.2005, E. González and W.E. Savary, collected at night with UV light, 1 ♀, 2 juv. (AMNH [LP 4413]); Misión San Luis Gonzaga, [24°54'29.76"N 111°17'29.89"W], 14.ii.1966, V. Roth, (AMNH); Misión San Luis Gonzaga, 8 km W, [24°54'29.76"N 111°17'29.89"W], 14.ii.1966, V. Roth, 1 ♂, 3 ♀ (AMNH); Pinturas Montevideo, near San Borja, [28°0.74345'N 113°45.2328'W], 14.iii.1999, R. Aalbui, 1 ♂ (CAS); Puerto Alcatraz, 29°9.9702'N 113°36.9'W, 8.v.2009, W. López-Forment, 1 ♂, 2 ♀♀ (IBUNAM); Punta Bufeo, 4 km S turnoff, from road to San Felipe, 28 m, 14.vii.2005, 29°51.433'N 114°26.50'W, E. González, W.E. Savary, L. Prendini, and R. Mercurio, collected at night with UV light, 1 ♀ (AMNH [LP 4429]), 1 (AMNH), 31° 1'49.97"N 114°51'33.66"W, 1 ♂, 1 ♀ (AMNH [ARA1456]); Punta Calamajue, abandoned fishing village, 1.vi.2008, 29°41.1186'N 114°9.77'W, 5 m, desert, collected at night with UV light, 1 ♀, 1 juv. (AMNH [ARA2889]), 1 ♂, 1 ♀ (IBUNAM [ARA2268]), 29°41.119'N 114°09.774'W, 5.4 m, 1.vii.2008, sand dunes and rocky slopes, collected at night with UV light, 1 ♂ (AMNH [LP 8821]), H. Montaño and E. González; Punta Prieta, 37 km N, off Route 1, 29°15.116'N 114°10.10'W, 588 m, 13.vii.2005, L. Prendini and R. Mercurio, collected at night with UV light, 1 ♂, 1 ♀, 1 juv. (AMNH [LP 4451]), desert, on ground, collected at night with UV light, 2 ♂, 1 ♀ (AMNH [ARA1454]), 3 ♂ (IBUNAM [ARA2108]); road to Calamajue, 4 km, from junction with Route 1, 29°15.1158'N 114°8.3658'W, 623 m, 13.vii.2005, R. Mercurio and L. Prendini, desert, on ground, collected at

night with UV light, 2 ♂ (IBUNAM [ARA2111]); San José, Meling Ranch, [29°31'55.20"N 114°42'11.13"W], 1–4.v.1961, W.J. Gertsch and V. Roth, 1 ♂, 2 subad. ♂ (AMNH).

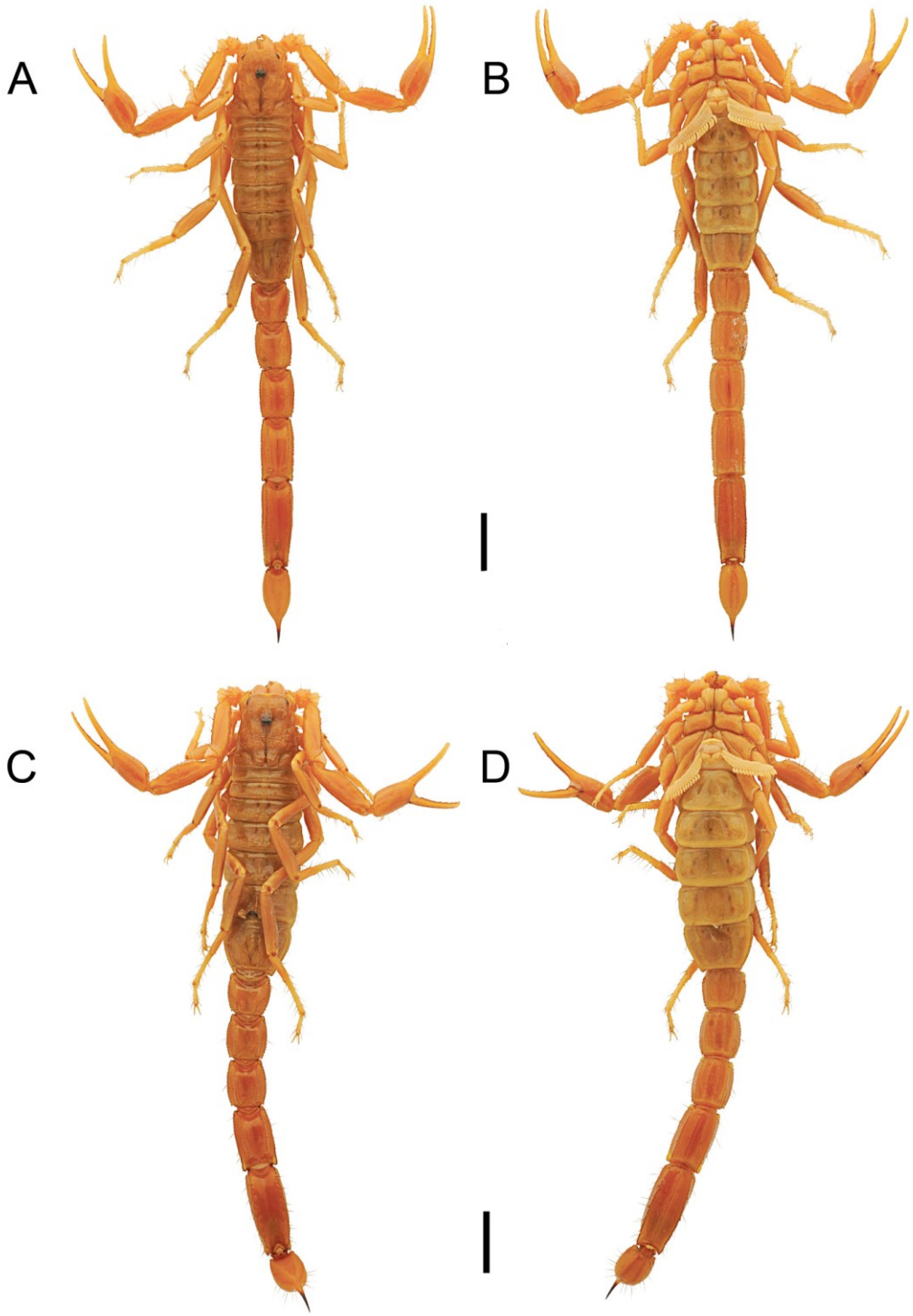


Figure 396. *Paravaejovis schwenkmeyeri* (Williams, 1970), habitus. **A**, **B**. ♂ (AMNH). **C**, **D**. ♀ (AMNH). **A**, **C**. Dorsal aspect. **B**, **D**. Ventral aspect. Scale bars = 5 mm.

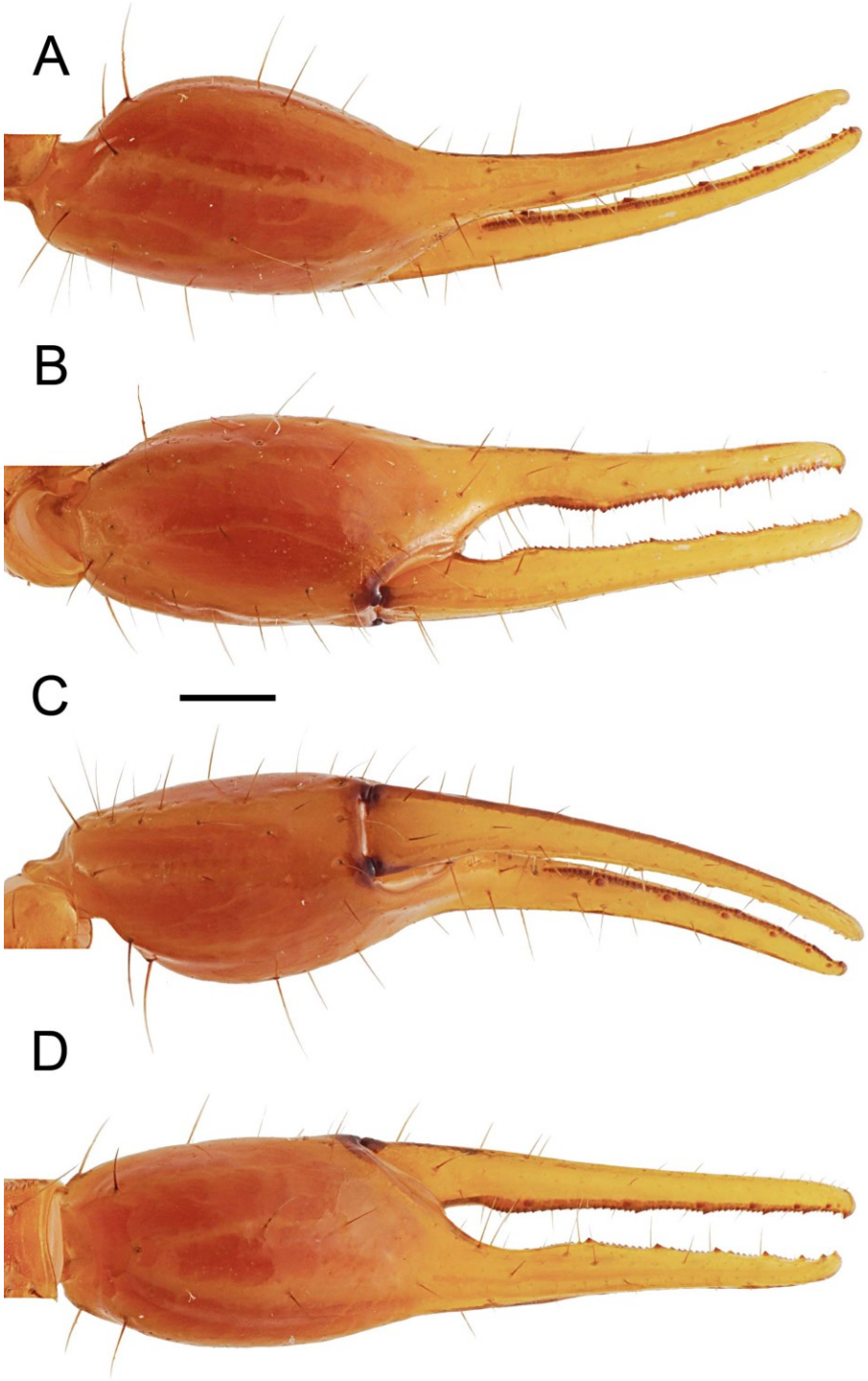


Figure 397. *Paravaejovis schwenkmeyeri* (Williams, 1970), **n. comb.**, ♂ (AMNH), dextral pedipalp chela. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

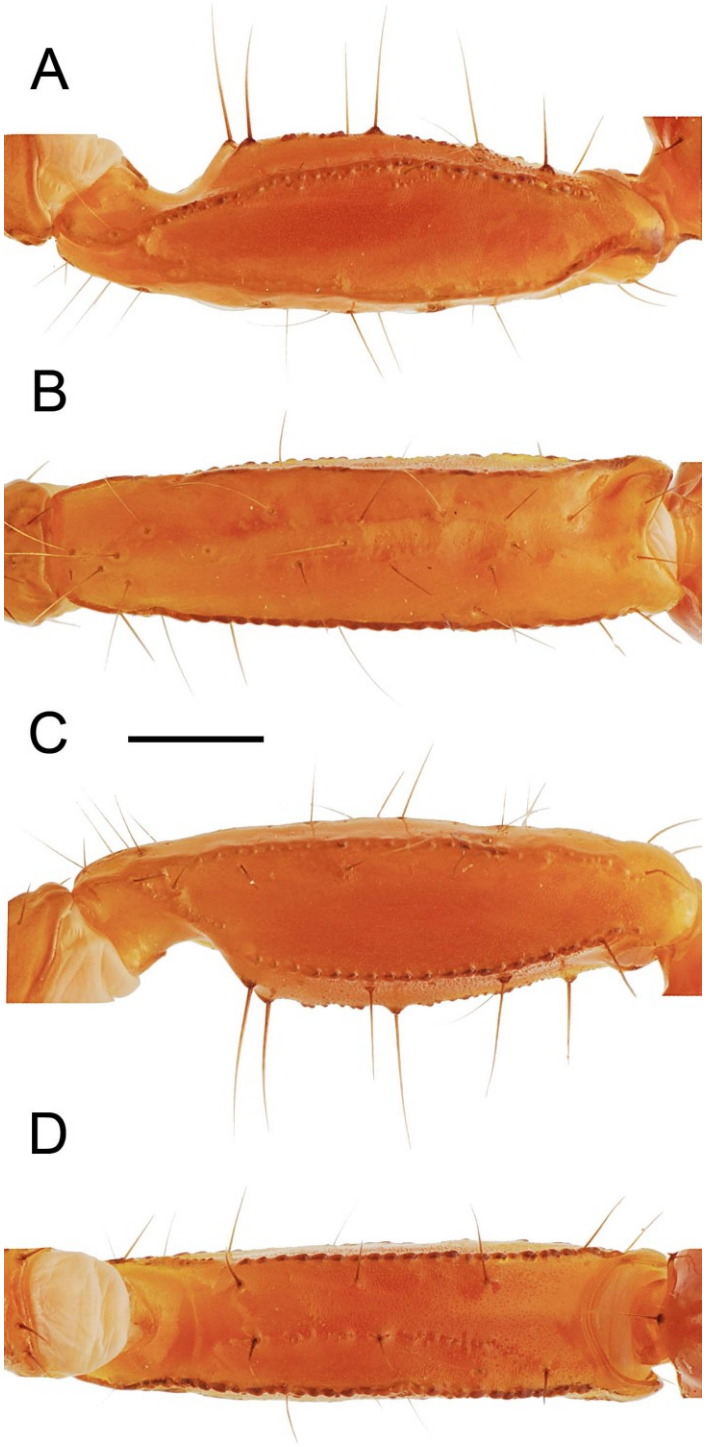


Figure 398. *Paravaejovis schwenkmeyeri* (Williams, 1970), ♂ (AMNH), dextral pedipalp patella. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

Paravaejovis spinigerus (Wood, 1863)

Figures 353, 399–401, 411D, 413D, 422D, 423D, 426E, 429D, 433C

Buthus spinigerus Wood, 1863a: 110; 1863b: 370.

Vejovis spiniger (incorrect subsequent spelling): Marx, 1890: 91.

Vejovis spinigerus: Kraepelin, 1894: 203 (in part); 1899: 185, 187 (in part); Banks, 1900: 425; 1901: 588; 1910: 187; Pavlovsky, 1924: 80; 1925: 151; Ewing, 1928: 13; Hoffmann, 1931: 349–353; Gertsch, 1958: 7; Bücherl, 1964: 61; Williams, 1968: 16; 1969: 3–18; 1970b: 326; Bücherl, 1971: 329.

Vaejovis spinigerus: Borelli, 1915: 7; Werner, 1934: 282; Stahnke, 1974: 135; Vachon, 1974: fig. 138, 163–165 (*spinigenus*; erratum); Williams, 1976: 2; 1980: 55, 69, 70, fig. 55D, 66, 72; Cokendolpher and Peek, 1991: 98; Sissom, 1991a: 216–219, fig. 1–4; Yahia and Sissom, 1996: 86; Sissom, 1997: 13; Kovařík, 1998: 148; Sissom and Jackman, 1997: 151; Beutelspacher, 2000: 110, 137, 141, 146, map 91; Sissom, 2000: 535, 536; Hendrixson, 2001: 49; Wolf and Harzsch, 2002: 203, 204, 206, 207, fig. 2; Soleglad and Fet, 2003b: 9, 150, fig. B-1, 59, tab. 2; Brown, 2004: 199, fig. 6; Sissom and Hendrixson, 2005a: 128, tab. 6.2; Soleglad and Fet, 2005: 5; Aguiar et al., 2008: 464, 466; Francke, 2008: 99, 102; Francke and Prendini, 2008: 8; Volschenk et al., 2008: 653, 655, tab. 1, 659; Wolf, 2008: 68, 69; Barron and Weidlich, 2009: 400, 401; McWest, 2009: 10, fig. 5, 20, tab. 1, 55, 56, 61, fig. 169–173, 62, 118; Warbug, 2010: 1739, tab. 1, 1746.

Vejovis spinigerus spinigerus: Hoffmann, 1931: 349–351.

Vaejovis spinigerus sonorensis: Hoffmann, 1931: 349–351; Díaz-Nájera, 1975: 7, 31; Vázquez and Zaragoza, 1979: 583; Beutelspacher, 2000: 110, 146, 154, map 91.

Vaejovis spinigerus spinigerus: Díaz-Nájera, 1975: 7, 10.

Vaejovis gravicaudus: Williams, 1980: 63 (misidentification, Isla Tiburon record only).

TYPE MATERIAL: *Buthus spinigerus* Wood: **U.S.A.:** Lectotype (designated by Cokendolpher and Peek, 1991) ♂ (USNM, S–9, Jar 3), "Texas" [not examined].

Vejovis spinigerus sonorensis Hoffmann: **MEXICO: Sonora:** Holotype: ♀ (AMNH), Bacerac.

DIAGNOSIS: *Paravaejovis spinigerus* is closely related to *P. cochimi* and *P. gravicaudus*, with which forms a monophyletic group (see *P. puritanus* for details). *P. spinigerus* may be separated from these species by having intense and broad dusky markings on carapace and tergites, and by having ventral lateral and ventral submedian carinae of metasomal segments I–IV and ventral median of V outlined with intense and broad infuscation, instead of having smaller markings and diffuse outline on metasomal carinae. *P. spinigerus* has seven retrolateral granules and seven rows of median granules on pedipalp movable fingers, instead of having six retrolateral granules and six rows of median denticles. Furthermore, *P. spinigerus* has the distal end of ventral median carinae of metasomal segment V bifurcated on distal half, whereas *P. cochimi* and *P. gravicaudus* have these carinae weakly bifurcated with two or three distal paired granules.

DESCRIPTION: This redescription supplements Sissom's (1991b) diagnosis and account for discussion of character variation and its relation with closely related species. It is based on the material deposited in the collections mentioned in material examined.

Color and infuscation: Base color yellow straw to orange brown. Carapace and tergites with intense dusky markings. Distal and proximal margin of carapace outlined by infuscation. Median and lateral ocular tubercles intensely infuscate. Pedipalp femur and patella, and legs with

scatter diffuse dusky markings. Retrolateral dorsosubmedian and retrolateral median carinae of pedipalp patella outlined by an intensely band of infuscation. Genital operculum and pectines pale yellowish to whitish. Ventral median and ventral submedian of metasomal segments II–IV and ventral median carinae in V outlined by intense but fine infuscation, in I infuscation diffuse. Aculeus base reddish, median and distal dark brownish. Ventral surface of telson with crenulations infuscate and ventral submedian carinae outlined by reddish to brownish dark bands, weakly infuscate.

Carapace: Carapace 1.07 times longer than posterior width. Anterior margin sublinear, with vestigial medial notch and three pairs of major macrosetae, occasionally with one or two intersperse minor macrosetae. Carapace shagreened, densely cover by minute granules and scattered enlarge and few moderate granules. Frontal lobes strongly curved laterally, such that lateral eyes face the frontal lateral side. Median ocular tubercle strongly protruding from adjacent surfaces and broad. Superciliary carinae strong and smooth medially, distal and proximal extremes with weak crenulations, higher than median eyes. Position of median ocular tubercle on anterior half of carapace. Three pairs of lateral eyes, first anterior pair slightly larger than second pair and third pair slightly half the size of first pair. Median eyes approximately two times the size of first lateral frontal pair. Anteromedian sulci deep with an anterior depression extending laterally to lateral eyes; posteromedian deep on proximal half, medially broad and distally deep; anterolateral deep producing a exacerbation of distal lobes; posterolateral deep, posterior transverse vestigial.

Sternum and coxal region: Sternum pentagonal subequilateral with three pairs of setae, one distal, one median pairs and one pair on the lobes, surface matte, median notch deep. Coxal region with scatter matte spots in ♂, in ♀ smooth. Anterior margin of coxa II entirely cover with

scatter moderate and minute granules, subbasally with three oblique slit-like structures, adjacent to a moderate, scattered, finely granular protuberance; proximal margin of coxal endite II with a deep elongated depression each, median edge finely granular. Coxa IV 2.20 times longer than coxa II.

Chelicerae: Dorsal surface smooth, subdistal margin of manus with three macrosetae; distal margin costate, base of fixed finger with vestigial minute crenulations. Serrula present on ventral distal half of movable finger, tines numbering 12–14.

Pedipalps: Trichobothrial pattern Type C, orthobothriotaxic. Chela wider than patella, patella wider than femur. Femur: All intercarinal surfaces matted. Dorsal prolateral and dorsal retrolateral complete with scatter moderate granules; ventral prolateral strongly granular with conical enlarged granules; retrolateral dorsosubmedian obsolete expressed by five macrosetae reducing in size distally; retrolateral ventral obsolete expressed by row of moderate serrate scatter granules; ventral prolateral vestigial expressed by a row of continuous enlarge crenatoserrate granules; ventral retrosubmedian, vestigial expressed by a row of scatter enlarge crenatoserrate granules; prolateral ventrosubmedian vestigial, expressed by a proximal enlarged spiniform tubercle followed by two enlarged conical granules with a macroseta on top; prolateral ventral vestigial expressed by two pairs of proximal enlarged tubercles, larger one with a macroseta on top followed by two enlarged conical tubercles with a macroseta on base.

Patella: All intercarinal surface matte. Dorsal prolateral and ventral prolateral complete strong with enlarge subserrate granules; dorsal retrolateral and ventral retrosubmedian complete moderately crenulated; retrolateral dorsosubmedian and retrolateral median obsolete; ventral median vestigial, expressed by a moderate proximal row of irregular fine granules; prolateral median on a vaulted projection protruding strongly medially, expressed by a proximal tubercle

and a row of three or four scattered and coarse crenatoserrate granules ending by trichobothrium *d*, proximal, median and distal granules with a macroseta on top, followed by a fine scatter row of minute granules that gently slants towards subdistal end of dorsal prolateral carinae; prolateral ventral obsolete expressed by three major macrosetae, occasionally with a intersperse minor macrosetae, adjacent to ventral prolateral carinae.

Chela: Manus smooth and moderate to incrassate in both sexes. Dorsal prolateral, dorsal median, dorsal retrolateral, ventral retrolateral, prolateral median, ventral median, and ventral retrolateral vestigial with a weak costa, all other carinae obsolete. Trichobothrium *Db* positioned on dorsal retrolateral carina, subbasal on chelae; *Dt* positioned at mid manus.

Fingers: Fixed finger, PD = 6, MD rows = 6, RD = 6, proximal RD positioned by proximal third. All RD subpaired with corresponding PD. Movable finger, PD = 6–7, MD rows = 6–7, distal row bearing one minute granule, RD = 7, proximal RD positioned by proximal third. All RD subpaired with corresponding PD. Trichobothria *ib* and *it* positioned subbasal on fixed finger, *ib* positioned between PD6 and PD7, adjacent to PD6, PD7 lacking granule; *it* at the level of PD6. Fingers with vestigial scallop in ♂, proximal notch and medina lobe of fixed and movable finger vestigial, gap created when fingers closed weak, fingers fit unevenly, in ♀ fingers lacking scalloping, gap created when fingers closed obsolete.

Legs: Basitarsi I–II prolateral ventral and retrolateral ventral carinae with complete rows of spinules; prolateral ventral in III and IV absent; prolateral ventral carinae in III complete, expressed as a row of scatter spinules on distal two thirds, proximal spinules becoming into spiniform granules, in IV absent; retrolateral median rows in I–IV vestigial expressed as few terminal spinules. Telotarsi I–IV with two pairs of ventrodistal spinules in I–IV. Setae: Prolateral ventral, 4:5:5:5, distal three in I–IV stout; retrolateral ventral, 5:8:9:7; retrolateral dorsal, 2:3:4:4;

dorsal, 3:4:4:3; retrolateral dorsal and dorsal series arranged in two independent rows in ♂, in ♀ macrosetae visibly more elongate and with one or two intersperse accessory minor macroseta and intersperse minor and major macrosetae in retrolateral ventral, retrolateral dorsal and retrolateral ventral

Tergites: Pretergites matte, postergites mostly matte, except the infuscate ventral submedian band with scatter moderate granules. Dorsal median and ventral submedian carinae in tergites I–VI vestigial expressed on distal half by two or three moderate granules. Tergite VII dorsal lateral intercarinal surface matte, other intercarinal surface shagreened with few scattered moderate granules and dense minute granules; dorsal median carina moderate costate with few moderate granules, expressed on proximal half of the postergite; dorsal submedian vestigial expressed two or three oblique row of granules; dorsal lateral and lateral supramedian comparatively stronger and complete, distal extreme with an enlarged subserrate granules; dorsal lateral carinae projecting and curving with scattered granules laterally approximating to lateral supramedian proximal margin, creating a semi horse show of strong and subserrated granules.

Genital operculum: Male genital operculum: wider than long, with three pairs of macrosetae. Sclerites free on longitudinal edge moving independently but unable to open more than 45°. Genital papillae protruding posteriorly. Female genital operculum: Wider than long, with three macrosetae. Sclerites fuse longitudinal.

Sternites: Sternites I–VII acarinated smooth, finely punctuated, and lustrous. Sternite V with distal median glandular spot obsolete in both sexes. Sternite VII with ventral lateral carinae vestigial, weakly costate with two pairs of macrosetae; other carinae obsolete expressed by macrosetae. Distomedian glandular spot obsolete in both sexes. Spiracle elongated, slit-like, approximately four times longer than wide.

Pectines: Basal piece with median notch deep, with five pairs of macrosetae. Marginal lamella consist of three sclerites, medial lamella proximally fuse distally progressively forming two conspicuous rows of beads, a proximal with 3 smaller beads and a median with 16–20 beads. Fulcra with 24–26 in ♂, in ♀ 20–22 beads. Pectinal tooth numbering 25–27 in ♂, in ♀21–23. Pectines relatively long, second sclerite of marginal lamella at the level of distal edge of coxa IV in ♂, in ♀ mid distal sclerite at the level of distal edge of coxa IV.

Hemispermatophore: Lamina 1.89 longer than trunk. Dorsal through margin long, narrow, curving proximally, and removed from ventral trough. Hemimating plug developed from the inner lobe, distal barb margin with 9 elongated spinules. Primary and secondary hook positioned on the apex of lateral margin extension of the lamina (flange). Both hooks rounded low, separated slightly, forming a shallow notch. Median lobe ental terminus moderate and rounded. Basal plate of inner lobe removed from ventral trough. Spine of inner lobe moderate, secondary spine on ventromedian aspect of neck absent. Neck moderate (0.69 times longer than basal plate). Measurements, lamina, 4.32; trunk, 2.28; dorsal trough/laminar hooks, 1.20; ventral trough/laminar hook, 0.78; neck, 0.54; basal plate, 0.78.

Metasoma: Intercarinal surfaces weakly matte to smooth, ventral intercarinal surface of segments V shagreened with scatter moderate conical and minute granules. Carinae: Dorsal lateral and lateral median carinae in I–IV strongly crenatoserrated terminating in sharp and elongated spiniform granules pointing backwards; except lateral median in IV distal terminus strongly expanded laterally forming a triangular projection; dorsal lateral in V strong and serrated proximally, becoming weaker and crenular, medially with a field of moderate crenulation turning moniliform distally. Lateral inframedian in I complete finely crenatoserrated; in II and III incomplete moderately crenatoserrated, becoming weaker proximally, present on

distal third; in IV absent, in V vestigial with one or two proximal tubercles and a fine irregular row of minute crenulations, expressed on proximal half; ventral lateral in I–IV proximal half smooth and distal half finely crenatoserrate; ventral submedian in I–IV obsolete; ventral lateral and ventral median strongly crenatoserrate. Setae: In ♀, dorsal lateral, 0:1:2:2:5; lateral median, 0:1:2:3; lateral inframedian, 2:1:1:0:4; ventral lateral, 3:3:3:5:13, setae in and V positioned in both sides of carinae; ventral submedian, 3:3:3:4:2; ventral sublateral, 2. One to two accessory major macrosetae in ventral submedian intercarinal surfaces in segments I–IV.

Telson: Dorsal surface smooth, ventral surface with scatter moderate crenulation. Ventral surface hirsute with 4–5 macrosetae in each carina. Ventral median carinae with subaculear tubercle vestigial. Microserration on laterobasal aculeus numbering 5.

DISTRIBUTION: *Paravaejovis spinigerus* is the most widely distributed scorpion in the Sonoran Desert, including the states of Baja California, Chihuahua, Sinaloa and Sonora, Mexico; and Arizona and New Mexico, U.S.A.

ECOLOGY: *Paravaejovis spinigerus* is a rather plastic species. It has been recorded in most of the kinds of vegetation present in the Sonoran Desert from columnar cacti landscapes, juniper forest, grasslands, chaparral, oak-pine forest, scrublands, inland sand dunes, costal sand dunes and even tropical deciduous forest. It can be found in all kinds of soils, from fine textured to rocky, sandy, loamy and with all degrees of compaction. At low and high altitudes, from sea level to 2012 m.

REMARKS: Sissom (2000) recorded this species from California, U.S.A. Sissom also mentioned that aside from the type series, *Vaejovis spinigerus* has never been found in Texas. The seemily spurious type locality, as in other cases, may be result of mislabeling.

Paravaejovis spinigerus was one of the most thoroughly sampled species in this analysis. The results of the phylogeny reveal no phylogeographic structure. It seems that local adaptations to dark substrate in volcanic habitats and pale forms with traces of pigmentation from sand dunes are all part of the same lineage. Morphologically, besides color, granulation and total size variation, commonly observed in most species of the subfamily, there is no correlation with the topology retrieved. Such plasticity to exploit all sorts of available habitats may be related to the wide distribution of this species. *P. spinigerus* is the counterpart of *C. crassimanus*, which has been able of pass throughout the Cochise Filter Barrier (Pyron and Burbrink, 2010) in the opposite direction, from the Sonoran to the Chihuahuan Desert.

MATERIAL EXAMINED: **MEXICO: Chihuahua:** *Municipio de Batopilas*: Batopilas, military control post, 27°3.5016'N 107°43.0536'W, 652 m, 2.viii.2005, O. Francke, K. McWest, H Montaño, J. Ballesteros, and L. Jarvis, collected at night with UV light, 1 ♂, 1 ♀ (AMNH [ARA 2570]), rock rolling by day, 1 ♂ (AMNH [LP 5282]). *Municipio de Chínipas*: Milpillas, [27°12'N 108°38'W], 1.ii, V. Roth, 4 ex. (AMNH). *Municipio de Janos*: Hwy MEX 2 km, 75 between Casas Grandes and Agua Prieta, 31°19.067'N 108°43.331'W, 1723 m, 26.vi.2006, P. Berea and E. González, rock rolling by day, 3 juv. (AMNH [LP 6317]); Hwy MEX 75 marker km 2, between Casas Grandes and Agua Prieta, 31°19.0668'N 108°43.3308'W, 1723 m, 26.vi.2006, E. González and P. Berea, collected at night with UV light, 1 subad. ♀ (AMNH [ARA 2520]), 3 subad. ♂, 1 juv. (IBUNAM [ARA 2392]), rock turning, 3 subad. ♂, (AMNH [ARA 2520]), 1 ♀, 3 subad. ♂, 2 subad. ♀, 1 juv. (IBUNAM [ARA 2388]), semidesert, on ground, collected at night with UV light, 3 subad. ♂, 1 subad. ♀ (AMNH [ARA 2521]), 1 ♂, 1 ♀, 1 juv. (AMNH [ARA 2520]); km 73 new road, between Casa Grande and Agua Prieta, 31°19.0668'N 108°43.3308'W, 26.vi.2006, P. Berea, 1 ♂ (AMNH); Los Timbres Ranch, W of

Hwy 2 N of Janos, 31°11'26.51"N 108°42'20.50"W, 1613 m, 26.iv.2005, Schwartz, Weirauch and Cervantes, 1 ex. (AMNH). **Sinaloa:** *Municipio de Badiguarato*: El Varejonal, 25°5.54400'N 107°24.51466667'W, 18.viii.2002, P. Berea, 3 ex. (AMNH), 6 ex. (AMNH). *Municipio de Choix*: Choix, 26°43.300'N 108°19.6500'W, P. Berea, 16.viii.2002, 1 ex. (AMNH), 17.viii, 1 juv. (IBUNAM). *Municipio de Culiacán*: Culiacán, 8 km SW, [24°48'N 107°23'W], 26.xi.1939, Bogert and H.E. Volkes, 1 ex. (AMNH); Presa Sanalona, 24°48.85200'N 107°9.083833'W, 18.viii.2002, P. Berea, 1 ♂ (AMNH). *Municipio de El Fuerte*: El Fuerte, 26°25.133'N 108°37.1666'W, P. Berea, 13.viii.2002, 3 ex. (AMNH), W. López-Forment, 16.xii.2006, 1 ♀ (IBUNAM), 8.i.2007, 1 ♂ (IBUNAM). *Municipio de Mazatlán*: Mazatlán, 21 km E, [23°14'29"N 106°24'35"W], 20.viii.1950, R. Zwifel, 1 ex. (AMNH). **Sonora:** Naranjo Ranch, [27°13'N 108°45'W], 7.ii, V. Roth, 1 ex. (AMNH); Los Baños Ranch, [31°30'N 110°40'W], 9.v.1966, V. Roth, 3 ex. (AMNH). *Municipio de Agua Prieta*: Pulpito Mountains, 113 km SE Agua Prieta, [31°19.5500'N 109°32.933'W], 27.vi.1972, G. Dingerkus, 1 ex. (AMNH); Cajon Bonita, 61 km E Agua Prieta, [31°19.5500'N 109°32.933'W], 6.viii.1975, V. Roth, 2 ex. (AMNH). *Municipio de Ahome*: Los Muchis, [25°47.00983'N 108°59.6245'W], 9.viii.1964, 1 ex. (AMNH). *Municipio de Alamos*: Alamos, [27°1.6500'N 108°56.4'W], C.M. Bogert, 1942, 1 ex. (AMNH), P. Berea, 12.vii.2006, 1 ex. (AMNH), 16.viii.2004, 1 ♂ (AMNH); Alamos, 12.9 km W, 23.viii.1965, W.J. Gertsch and R. Hastings, 5 ex. (AMNH); Alamos, 16 km W, 19.vii.1954, W.J. Gertsch, 1 ex. (AMNH), 3 ex. (AMNH); near Alamos, 7.viii.1956, V. Roth and W.J. Gertsch, 1 ex. (AMNH); Río Cochujaquí, E of Alamos, 14.i.1968, V. Roth, 3 ex. (AMNH); Río Cochujaquí, near Alamos, 1.ii, T. Walker, 1 ex. (AMNH); Cerro Colorado, W of Sonoyta, [26°45.92967'N 108°49.33033'W], 14.ii.1960, V. Roth, 1 ex. (AMNH); Sierra de Alamos, [27°2.92717'N 109°5.019'W], 15.i.1968, V. Roth, 7 ex. (AMNH), i, V. Roth, 2 ex. (AMNH), V. Roth, 3 ex.

(AMNH). *Municipio de Bacanora*: Bacanora, 10 km S on dirty road to El Encinal, 28°33.6318'N 109°22.1808'W, 682 m, 24.vi.2006, E. González and P. Berea, collected at night with UV light, 2 subad. ♂ (IBUNAM [ARA 2391]), tropical deciduous forest, under rock, 2 subad. ♂, 1 juv. (AMNH [ARA 2529]); Bacanora, 5 km SW, 28°57.860'N 109°23.760'W, 494 m, 23.vi.2006, E. González and P. Berea, rock rolling by day, 1 juv. (AMNH [LP 6302]); Hwy MEX 16 near Tonichi, 28°34.733'N 109°40.992'W, 711 m, 30.vi.2006, E. González and P. Berea, collected at night with UV light, 1 subad. ♀ (AMNH [LP 6327]). *Municipio de Benjamín Hill*: Benjamín Hill, [30°10'N 111°6'W], 4.xi.1989, L. Cervantes and R. Medina, 1 ♀ (IBUNAM). *Municipio de Cananea*: Cananea, [30°59'N 110°16'W], 23.ix.1985, A. Hoffmann, 1 ♀ (IBUNAM); Sierra de Los Ajos, [30°58.002'N 110°1.98'W], 1.vi.1971, V. Roth and Halstead, 5 (AMNH). *Municipio de Cumpas*: Cumpas, 18 km S, [29°59.833'N 109°46.633'W], 3.x.1963, V. Roth and N. Bucknal, 1 (AMNH); Ejido Alvaro Obregón, La Escondida Ranch, 30°16.473'N 109°50.070'W, 937 m, 27.vi.2006, E. González and P. Berea, collected at night with UV light, 1 subad. ♀, 1 juv. (AMNH [LP 6314]), rock turning, 3 ♀ (AMNH [ARA 2522]), 2 ♂, 3 ♀, 16 subad. ♂, 11 subad. ♀ (IBUNAM [ARA 2382]), thorn forest, on ground, collected at night with UV light, 2 ♂, 16 subad. ♂, 11 subad. ♀ (AMNH [ARA 2522]). *Municipio de Fronteras*: Magallanes, 31°05'N 109°55'W, 1.vi.1971, V. Roth and Halstead, 4 (AMNH). *Municipio de Guaymas*: Guaymas microwave antenna, 27°56.6238'N 110°54.1026'W, 389 m, 29.vi.2006, E. González and P. Berea, collected at night with UV light, 1 ♂, 2 ♀, 1 subad. ♀ (IBUNAM [ARA 2386]), desert, on ground, collected at night with UV light, 2 ♂, 3 ♀, 2 subad. ♀ (AMNH [ARA 2518]); Guaymas, [27°56.00'N 110°54.00'W], 14.iv.1921, 1 ex. (AMNH), R. Neveln, 30.xii.1967, 6 (AMNH), M. Collar, 25.iii.1976, 1 ♀ (IBUNAM); Guaymas, San Carlos Bay, [27°57'N 111°1'W], 6.iv.1969, Pape and Belze, 1 ex. (AMNH); Microwave antenna at Guaymas, 27°56.624'N 110°54.103'W,

389 m, 29.vi.2006, E. González and P. Berea, collected at night with UV light, 1 juv. (AMNH [LP 6324]); San Carlos, 5 km NW, [27°57.91150'N 111°2.70233'W], 13.x.1972, W. López-Forment, 1 subad. ♂ (IBUNAM); San Pedro Bay, [27°55.10'N 110°53.933'W], 3.iv.1953, 2 ex. (AMNH). *Municipio de Hermosillo*: Baviacora, 4.8 km W, Banks of Río Sonora, [29°42'N 110°9'W], 18.viii.1958, B.A. Branson, 1 ex. (AMNH); Hermosillo, 45 km E, [29°5.933'N 110°57.25'W], 20.ix.1960, R. Zwifel et al., 2 ex. (AMNH); Hermosillo, 47 km E, on road to Sahnaripa, Sierra San Juan de Dios, 482 m, 25.x.1975, J.J. Landye, 1 ex. (AMNH); Hermosillo, 51 km E, 20.viii.1960, R. Zwifel and Stal, 1 ex. (AMNH); Isla Tiburón, S end, [28°48'20.29"N 112°16'54.02"W], M. García and V. Melendez, 14.xi.1989, 1 ♂ (IBUNAM), F. Arias and L. Cervantes, 9.ii.1990, 1 ♂ (IBUNAM); North end Isla Tiburón, [29°10'35.65"N 112°24'8.16"W], 9.ii.1990, F. Arias and L. Cervantes, 1 ♂, 1 juv. (IBUNAM); Nuevo Kino Bay, [28°55.249'N 112°02.572'W], P. Berea, 4.v.2004, 1 ♂ (AMNH), v.2004, 1 ex. (AMNH); Nuevo Kino Bay, 16 km NW on dirty road, 2.vii.2006, 28°55.249'N 112°02.572'W, 116 m, collected at night with UV light, 1 juv. (AMNH [LP 6331]), 35 m, 1 ♀ (IBUNAM [ARA 2390]), E. González, Nuevo Kino Bay, 5 km NW, 28°53.4150'N 112°2.01'W, 30 m, E. González and P. Berea, 2.vii.2006, desert, on ground, collected at night with UV light, 2 ♀ (AMNH [ARA 2540]), 28.vi.2006, 3 ♀, 1 subad. ♂, 1 subad. ♀ (IBUNAM [ARA 2385]), 1 ♂, 3 ♀, 1 subad. ♀ (AMNH [ARA 2524]), collected at night with UV light, 1 ♂ (AMNH [LP 6321]); Santa Rosa Ranch, [28°20.06350'N 111°27.136'W], P. Berea, 14.viii.2004, 1 ♂, 1 ♀ (AMNH), 4.viii.2004, 7 (AMNH). *Municipio de Huatabampo*: Huatabampito costal sand dunes, 26°41.8176'N 109°36.3576'W, 0 m, E. González and J.L. Castelo, 22.ix.2009, under death cacti, collected during daylight, stabilized sand dunes with scattered vegetation, 1 ♀ (AMNH [LP 9970]), 26°41.8662'N 109°36.33'W, 24.viii.2009, sand dunes, on ground, collected at night with UV light, 3 ♂, 4 ♀, 4 subad. ♂, 9 subad. ♀, 5 juv.

(AMNH [ARA 3149]), 3 ♂, 4 ♀, 4 subad. ♂, 9 subad. ♀, 4 juv. (IBUNAM [ARA 2398]). *Municipio de Imuris*: Imuris, 28 km ENE, [30°47'N 110°52'W], 1.viii.1960, R. Zwifel, 1 ex. (AMNH); Imuris, 17.vii.1954, W.J. Gertsch, 1 ex. (AMNH). *Municipio de Navojoa*: E of Navojoa, [27°2.4'N 109°11.4'W], 17.v.1963, W.J. Gertsch and W. Ivie, 2 ex. (AMNH); Microwave Cerro Prieto, 15 km E of Navojoa, 27°4.9830'N 109°17.4498'W, 375 m, 23.viii.2009, E. González and J.L. Castelo, tropical deciduous forest, on ground, collected at night with UV light, 2 juv. (AMNH [ARA 3151]); Microwaves Cerro Prieto, ca. 15 km E of Navojoa, 27°4.9368'N 109°17.4348'W, 375 m, 23.ix.2009, E. González and J.L. Castelo, collected at night with UV light, volcanic outcrop with deciduous tropical forest, 2 juv. (AMNH [LP 9969]); Navojoa, 32 km S, [27°4.87800'N 109°26.766'W], 12.ix.1976, J. and W. Ivie, 1 ex. (AMNH); Navojoa, 80.5 km S, 24.viii.1965, W.J. Gertsch and R. Hastings, 2 ex. (AMNH); Navojoa, 9.7 km E, 2.vii.1964, W.J. Gertsch and J. Woods, 1 ex. (AMNH); on the road to Tehuelibampo, dirty road from Tesia between Rancherias and Camoa, 27°12.9984'N 109°17.6382'W, 105 m, 24.viii.2009, E. González and J.L. Castelo, turning rocks during daylight, 1 subad. ♂, (AMNH [LP 9967]). *Municipio de Plutarco Elías Calles*: Los Vidrios, 6.4 km SW, E of Sonoyta, [31°51.6833'N 112°51.26666667'W], 11.ii.1960, V. Roth, 1 ex. (AMNH). *Municipio de Puerto Peñasco*: Sonoyta, [29°18'N 109°27'W], 457 m, G.M. Bradt, 2.iv.1949, 1 ex. (AMNH), 3.iv.1949, 1 ex. (AMNH); Sonoyta, 16 km S, [32°6.1746'N 113°47.1048'W], 5.iv.1949, G.M. Bradt, 1 ex. (AMNH); Sonoyta, 40 km W, 28.xii.1960, V. Roth, 2 ex. (AMNH); Sonoyta, 56 km W, 28.xii.1960, V. Roth, 1 ex. (AMNH); SW Cerro Colorado, Pinacate Mountains, [31°46.20'N 113°29.4'W], 12.ii.1960, V. Roth, 1 ex. (AMNH); SW Sonoyta, bottom of Crater Elegante, 28.xi.1959, V. Roth and Peterson, 1 ex. (AMNH); SW Sonoyta, Cerro Colorado, 28.xi.1959, V. Roth, 1 ex. (AMNH). *Municipio de San Miguel de Horcasitas*: Cueva

Higuera, 12.9 km SE, San Miguel de Horcasitas, [29°18'N 110°27'W], 4.x.1966, V. Roth, 1 ex. (AMNH); San Miguel de Horcasitas, 4.x.1966, V. Roth, 1 ex. (AMNH). *Municipio de Soyopa*: dirty road between El Encinal and Tonichi, 645 m, 28°33.2388'N 109°21.64'W, E. González and P. Berea, 1.vii.2006, rock rolling by day, 2 ♀, 4 subad. ♂, 1 subad. ♀, 1 juv. (IBUNAM [ARA 2384]), tropical deciduous forest, on ground, collected at night with UV light, 3 ♀, 4 subad. ♂, 1 subad. ♀, 2 juv. (AMNH [ARA 2525]), 24.vi.2006, 1 ♂, 1 subad. ♀, 1 subad. ♂ (AMNH [ARA 2531]); Plutarco Elias Calles Dam, Ejido El Novillo, 28°58.827'N 109°30. 160'W, 258 m, 22.vi.2006, P. Berea and E. González, 1 subad. ♀, 2 juv. (AMNH [LP 6300]); Plutarco Elias Calles Dam, Ejido el Novillo, by the curtain, 28°58.8270'N 109°30.1596'W, 258 m, 22.vi.2006, E. González and P. Berea, rock rolling by day, 1 ♂, 4 ♀, 2 subad. ♂, 2 juv. (IBUNAM [ARA 2380]), tropical deciduous forest, under rock, 2 ♂, 5 ♀, 1 subad. ♂, 1 subad. ♀, 1 juv. (AMNH [ARA 2527]); Sierra El Encinal: 9 km from crossroad in Hwy MEX 16 to El Encinal, 28°35.412'N 109°27.148'W, 380 m, 24.vi.2006, E. González and P. Berea, collected at night with UV light, road cut wall, 2 subad. ♀ (AMNH [LP 6310]), 7 subad. ♂, 2 subad. ♀, 1 juv. (IBUNAM [ARA 2387]), tropical deciduous forest, on ground, collected at night with UV light, 7 subad. ♂, 3 subad. ♀, 1 juv. (AMNH [ARA 2519]); dirt road between Tonichi and El Encinal, 28°33.628'N 109°20.590'W, 1007 m, 24.vi.2006, P. Berea and E. González, collected at night with UV light, 1 juv. (AMNH [LP 6307]); S of El Encinal on dirty road between Tonichi and El Encinal, 28°33.6276'N 109°20.5896'W, 1007 m, 24.vi.2006, E. González and P. Berea, collected at night with UV light, 1 ♀, 1 subad. ♂ (IBUNAM [ARA 2389]), 1 subad. ♀ (IBUNAM [ARA 2393]), transitional forest, on ground, collected at night with UV light, 1 ♀, 1 subad. ♂, 1 subad. ♀ (AMNH [ARA 2530]). *Municipio de Yecora*: between Tepoca and Agua Blanca, 28°28'2.2"N 109°19'12.1"W, 870 m, 24.vi.2006, P. Berea, 3 ex. (AMNH); La Palma Agujerada Ranch,

between Tepoca and Guizamopa, Route SON 117, 28°28.722'N 109°10.298'W, 847 m, 23.vi.2006, E. González and P. Berea, collected at night with UV light, 1 subad. ♂, 1 subad. ♀, 2 juv. (AMNH [LP 6303]), rock rolling by day, 2 ♀, 6 subad. ♂, 4 subad. ♀, 3 juv. (IBUNAM [ARA 2383]), tropical deciduous forest, on ground, collected at night with UV light, 3 ♀, 6 subad. ♂, 4 subad. ♀, 2 juv. (AMNH [ARA 2528]). **U.S.A.: Arizona:** *Cochise Co.*: AMNH Research Station, [31°37.8240'N 109°7.93'W], 18.vi.1958, W.H. and M.K. McAlister, 1 ex. (AMNH); Apache, 21 km S, 6.ix.1972, T. Walker, J.A. Brubaker, and F.J. Moore, 3 ♂, 1 ♀, 2 subad. ♀ (OSAL), 2 ♂, 1 ♀ (OSAL); Apache, 8 km NW, 10.v.1961, W.J. Gertsch, 1 ex. (AMNH); Carr Canyon, [31°27.4080'N 110°14.37'W], 11.ix.1972, J.A. Brubaker and F.J. Moore, 1 ♀ (OSAL); Dos Cabezas, [32°10.5'N 109°36.78'W], 21.x.1970, V. Roth, 1 ♂ (IBUNAM); Draggon Mountains, [31°53'N 109°59'W], 2.viii.1976, J. Hubbard, G. Mont, and M. Cazier, 20 ex. (AMNH); Draggon Mountains, Cochise Stronghold, camp area, 1585 m, 15.vii.1970, M. Cazier and Bigelow, 4 ex. (AMNH); Douglas, [31°20.67'N 109°32.718'W], 21.viii.1969, G. Dingerkus, 1 ex. (AMNH); Douglas, 29 km E, iv.1965, B. and C. Durden, 2 juv. (AMNH); Douglas, 29 km E, Astin Spring, 30.iii.1966, B. Vogel, 1 (AMNH); E of Douglas on AZ 80, 31°32'13.5"N 109°17'23.8"W, 1395 m, 12.x.2007, K. McWest, 1 juv. (AMNH [LP 7829]); Foothills of Pinaleno Mountains, 7.4 km from junction of Hwy 191 on Hwy 366, 32°41'33.9"N 109°45'13.3"W, 1132 m, 25.vii.2007, J. Huff, collected at night with UV light, on sand, 1 ♀ (AMNH [LP 7012]); Guadalupe Canyon, 45 km E, Douglas, [31°20.3650'N 109°5.546166'W], 9.vi.1972, G. Dingerkus, 1 ex. (AMNH); Guadalupe, 8.x.1969, B. Locatis, 1 ex. (AMNH); Painted Canyon Ranch, W of Portal, [31°54'38.89"N 109°8'32.00"W], M. Cazier, 20.vi.1954, 1 ex. (AMNH), W.J. Gertsch, 4.vii.1954, 1 ex. (AMNH); Route 70, Coolidge Dam, [33°10.48117'N 110°31.671833'W], 7.ix.1939, D. Mulaik, 1 ex. (AMNH); Sierra Vista, 4.8 km

S, Hwy 92, [31°32'44"N 110°16'35"W], 1433 m, 5.vii.1969, M. Cazier et al., 1 ex. (AMNH); Cave Creek Canyon, [31°53'15.65"N 109°12'25.84"W], 22.viii.1956, A.F. Archer, 1 ex. (AMNH); Turkey Creek, 3.2 km S, Portal Road, Chivicolwy Mountains, [33°58.50233'N 111°6.792166'W], 1798 m, 22.vii.1979, M. Cazier et al., 1 ex. (AMNH); Whetstone, AZ 82, 3.2 km W junction AZ 90, 31°41.5165'N 110°23.0652'W, 1381 m, 26.vii.2008, K. McWest and H.M. Burrell, collected at night with UV light, 1 ♀ (AMNH [LP 8862]); Coronado National Forest, Cochise Stronghold, W of Sunsites, 32 km S of I–10, [31°53'N 109°59'W], 1524 m, 19.viii.2004, K.M. Pickett, from under log, 1 ♂ (AMNH [LP 3231]); Coronado National Forest, Portal, 26.vii.1968, D.G. Marqua, 1 ex. (AMNH); Portal, [31°54'38.89"N 109°8'32.00"W], W.J. Gertsch and A.J. Woods, 15.vii.1964, 1 ♀ (IBUNAM), W.J. Gertsch and A.J. Woods, 16.vii.1964, 2 ex. (AMNH), R. Hastings, 24.viii.1964, 2 ex. (AMNH), W.J. Gertsch, 16.vi.1964, 8 ex. (AMNH), 1965, 1 ex. (AMNH), vi.1965, 1 ex. (AMNH), 1.vii.1965, 10 ex. (AMNH), 2.viii.1965, 1 ex. (AMNH), 8.ix.1965, 1 ex. (AMNH), 14.vii.1966, 1 ex. (AMNH), viii.1966, 1 ex. (AMNH), 2.xi.1971, 1 ex. (AMNH), B. and C. Durden, 7.iv.1965, 1 ex. (AMNH), B. Vogel, 3.iv.1966, 1 ex. (AMNH), G. Dingerkus, 10.viii.1969, 1 ex. (AMNH), 12.vi.1972, 1 ex. (AMNH), 20.vi.1972, 1 ex. (AMNH), J.A. Brubaker and F.J. Moore, 9.ix.1972, 1 ♂ (OSAL); Portal, 3.2 km E, 24.viii.1976, W.J. Gertsch, 2 ex. (AMNH); Portal, 2 km N, 16.iv.1961, M. Cazier, W.J. Gertsch, and Kirwood, 1 ex. (AMNH); Portal, 3.2 km N, J. Cole, 10.vii.1960, 1 ex. (AMNH), W.J. Gertsch, 26.vi.1965, 3 ex. (AMNH); Portal, 12.9 km N, 15.v.1956, M. Statham, 1 ex. (AMNH); Portal, 4.8 km W, 3.vi.1973, M. Cazier, 1 ex. (AMNH); Portal, 4.8 km W, Cave Creek, 23.vii.1969, Bigelow, 13 (AMNH); Portal, 8 km W, E. Ordway, viii, 2 ex. (AMNH), W.J. Gertsch, 6.vii.1955, 3 ex. (AMNH), 15.vii.1955, 2 ex. (AMNH), C. and M. Cazier, 2.vii.1956, 10 (AMNH), E. Ordway, 4.vii.1956, 1 ex. (AMNH), J. Rosen and R. Schramel, 22.iv.1961, 1 ex.

(AMNH), G. Dingerkus, 5.vi.1962, 1 ex. (AMNH); Portal, 10 km W, Cave Creck Canyon, O. Francke, 14.vi.1973, 2 ex. (AMNH). Chiricahua Mountains: [31°55.7940'N 109°22.93'W], D.J. Knull, 3.viii.1956, 1 ♂ (OSAL), J. Cole, 20.vii.1960, 1 ex. (AMNH), J.C. Cooke, viii.1972, 1 ex. (AMNH); 8 km W Portal, 1646 m, 16.vi.1972, G. Dingerkus, 1 ex. (AMNH); Gaileyville, 24.vi.1972, G. Dingerkus, 1 ex. (AMNH); Cave Creek Ranch, 3.2 km S Portal, [31°55.78867'N 109°22.93716667'W], 1463 m, 28.viii.1969, E.G. Linsley, 2 ex. (AMNH); Paradise area, [31°56'15.01"N 109°12'58.05"W], 22.viii.1964, R. and M. Hastings, 1 ex. (AMNH); Paradise, 0.8 km N, 20.vii.1973, O. Francke, 2 ex. (AMNH); Paradise, 6.4 km N, 19.vi.1973, O. Francke, 1 ex. (AMNH); Sunny Flat Picnic area, Cave Creeck, [31°53'32.04"N 109°10'23.35"W], 28.vi.1960, R. Zwifel, 1 ex. (AMNH); Risco Ranch, Portal, vii.1953, C.M. Bogert, 1 ex. (AMNH). Peloncillo Mountains: Cottonwood Creek, [32°24'11.27"N 109°8'42.22"W], 1432 m, 14.vii.1960, R. Zwifel, 1 ex. (AMNH), 1 ex. (AMNH); Cottonwood, 6.4 km SW, Creek Pass, 8.vi.1973, O. Francke, 1 ex. (AMNH), 1 ex. (AMNH). Huachuca Mountains: Sunnyside Canyon, 31°26.828'N 110°24.084'W, 1830 m, 22.vii.2007, M. Rubio, under rock, 1 ♀ (AMNH [LP 7267]); Lower Carr Canyon [31°24'N 110°18'W], 21.vii.1955, W.J. Gertsch, 1 ex. (AMNH); Montezuma Pass, 0.8 km E on road cut, Coronado National Memorial, [31°20.93676'N 110°13.4571'W], 2012 m, 4.vii.1969, M. Cazier et al., 1 ex. (AMNH); Montezuma Pass, 0.8 km W, Coronado National Memorial, 1890 m, 4.vii.1969, M. Cazier et al., 1 ex. (AMNH); Montezuma Pass, 8 km, 7.ix.1950, W.J. Gertsch, 1 ex. (AMNH); Montezuma Pass, road cut, 3.2 km E of Pass Parking Area, [31°24'N 110°18'W], 1829 m, 6.iv.1969, M. Cazier et al., 9 ex. (AMNH). Southwestern Research Station: [31°53'15.65"N 109°12'25.84"W], 8.vii.1971, F.J. Moore, 1 ♂, 1 ♀ (OSAL); 1.6 km SW, 14.viii.1964, Hastings, 1 ex. (AMNH); 8 km W Portal, 5.viii.1955, W.J. Gertsch, 5 ex. (AMNH). *Coconino Co.*: Haulpai Hiltop, 1.6 km S, Grand

Canyon, Coconino Plateau, [35°50'N 112°30'W], 6.vi.1964, M. Cazier and Bigelow, 4 ex. (AMNH); Sedona, 2.5 km N, [34°51.600'N 111°47.35'W], 10.ix.1968, M. Cazier, 2 ex. (AMNH). *Cruz Co.*: Nogales, [31°21.233'N 110°56.35'W], 4.iii.1921, 1 ex. (AMNH). *Gila Co.*: Payson rodeo grounds, W off SR-87A, 34°13'6.28"N 111°20'14.77"W, 10.vi.2000, 1 ex. (AMNH), 1523 m, 6.x.2007, 1 juv. (AMNH [LP 7694]), Z.J. Valois; Roosvelt Lake, 4 km NE, Sierra Aneha, [33°40'18"N 111°9'40"W], 1524 m, 12.x.1920, L. Burroughs, 1 ex. (AMNH); Seneca, 3.2 km S of Salt Canyon, [33°45.402'N 110°30.774'W], 12.v.1972, O. Francke, 2 ex. (AMNH); SR-87A, W side, 6.x.2007, 33°57'18.09"N 111°24'35.17"W, 1058 m, 1 ♀ (AMNH [LP 7692]), 33°57'35.51"N 111°24'0.48"W, 998 m, 1 juv. (AMNH [LP 7693]), Z.J. Valois. *Graham Co.*: Galiuro Mountains, Harrison Creek, 32°34'20.42"N 110°13'5.73"W, 1470 m, 24.vii.2008, H.M. Burrell and K. McWest, 1 ♂ (AMNH [LP 8863]); road to Bonita (Hwy 266) off of Hwy 191, 32°34'14.7"N 109°43'06.9"W, 1280 m, 25.vii.2007, J. Huff, 1 ♂ (AMNH [LP 7013]), 1 ex. (AMNH); Stockton Pass Camp, 12.9 km E Bonita, Pinaleno Mountains, [32°42.0833'N 109°52.3'W], 25.vii.1970, M. Cazier et al., 17 ex. (AMNH). *Maricopa Co.*: Agua Caliente, 5.i.1940, D. Mulaik, 1 ex. (AMNH); Buckeye Hills Recreation Area, [33°17.039'N 112°38.754'W], 302 m, 24.viii.2000, J. Bigelow, 2 ♂ (AMNH [LP 1811]); Canyon Lake, [33°32.113'N 111°25.394'W], 27.iii.1966, R. Beaudry, 1 ex. (AMNH); Canyon Lake, 3.2 km SW, 15.ix.1968, J. Bigelow, 1 ex. (AMNH); Fort McDowell, 16 km NE, Río Verde Ranger, [33°38.20'N 111°40.4666'W], 21.iii.1930, J.R. Chamberlin, 3 ex. (AMNH); Lichfield Park, Indian Sc. Road, 0.8 km N, 0.8 km W Dysart Road, [33°29.60'N 112°21.5'W], 5.ii.1970, L. Fuller, 1 ex. (AMNH); Litchfield Park, 26.xii.1940, D. Mulaik, 3 ex. (AMNH); Painted Rock Reservoir, [33°4'0.21"N 113°0'23.63"W], M. Cazier, 27.iv.1970, 11ex. (AMNH), J. Congdon, 28.ix.1973, 1 ex. (AMNH); Phoenix, [33°26.89200'N 112°4.428'W], 24.iv.1964, R. Beaudry, 1

ex. (AMNH); Sant Jones, 6.4 km SE, Gila River, [32°43.1833'N 114°33.31666'W], 20.v.1972, O. Francke, 5 ex. (AMNH); Scotsdale Airport, 3.2 km N, [33°37.36667'N 111°54.633'W], 8.v.1969, Genestout, 1 ex. (AMNH); Sunflower: [33°52'48.4"N 111°28'30.0"W], Bigelow, 3.v.1969, 1 ex. (AMNH), E. Minch and A. Zuirgzdins, 16.x.1976, 4 ex. (AMNH); along border of Tonto National Forest where road dead-ends, 33°52'48.4"N 111°28'30.0"W, 1059 m, 26.vii.2007, J. Huff, under rocks, 2 juv. (AMNH [LP 7014]); Sycamore Creek Road, 33°55'26.07"N 111°27'25.67"W, 1361 m, 6.x.2007, Z.J. Valois, 1 juv. (AMNH [LP 7691]); turnoff to Bushnell Tanks, 33°52'08.8"N 111°27'54.4"W, 1057 m, 6.iv.2007, J. Huff and L. Prendini, 20 ex. (AMNH); 1 juv. (AMNH [LP 7161]). Superstition Mountains, 8.9 km NNW Apache junction, [33°28'9.67"N 111°28'40.62"W], 8.v.1972, F.W. Wagner, 1 ex. (AMNH); Sycamore Creek, 29 km S of Sunflower, [34°4.718862'N 111°42.308724'W], 8.v.1972, O. Francke et al., 1 ex. (AMNH); Sycamore Creek, Dos 'S' Ranch, 20.iii.1930, 2 (AMNH); Tempe, Salt River, [33°25.76667'N 111°56.5833'W], 28.iv.1973, F.W. Wagner, 1 ex. (AMNH); Tonto National Forest, Mount Ord, Mazatzal Mountains, 6.ix.2007, 33°55'09.1"N 111°26'50.8"W, 1436 m, 1 juv. (AMNH [LP 7172]), 1 ♀ (IBUNAM), 33°55'12.1"N 111°26'00.3"W, 1542 m, 1 juv. (AMNH [LP 7169]), 1 ♂ (IBUNAM), L. Prendini and J. Huff. *Mohave Co.*: Black Mountains: on Route 66, 35°02'03.42"N 114°16'59.56"W, 8.x.2007, R.C. West, rocky slopes under rocks, 2 juv. (AMNH [LP 7687]); Oatman, 5 km E on Route 66, [35°1.5833'N 114°23.01666'W], 3.iv.2003, R.C. West, 1 ♀ (AMNH [LP 2447]); 5.6 km E Oatman, Route 66, [34°59.255'N 114°25.723'W], 731 m, 2.iv.2004, R.C. West, under rocks, 1 ♀ (AMNH [LP 2969]); E side of Sitgreaves Pass on Oatman Hwy, 35°02.427'N 114°21.429'W, 1015 m, 12.viii.2007, W.D. Sissom, T. Anton, and G. Casper, 1 juv. (AMNH [LP 7827]), 1 ex. (AMNH); loop road on W side of Union Pass, W of Kingman, 35°12.970'N 114°24.456'W, 993 m,

11.viii.2007, W.D. Sissom, T. Anton, and G. Casper, 2 juv. (AMNH [LP 7828]), (AMNH [LP 7830]), 4 ex. (AMNH); W side of Sitgreaves Pass, 1.8 km E of Gold Road on Oatman Hwy, 35°02.590'N 114°21.972'W, 12.viii.2007, W.D. Sissom, T. Anton, and G. Casper, 2 ex. (AMNH); W side of Sitgreaves Pass, 2.9 km W Gold Road on Oatman Hwy, 35°02.678'N 114°23.200'W, 832 m, 12.viii.2007, W.D. Sissom, T. Anton, and G. Casper, 1 juv. (AMNH [LP 7825]); W side of Sitgreaves Pass, just E of Gold Road on Oatman Hwy, 35°02.773'N 114°22.948'W, 856 m, 12.viii.2007, W.D. Sissom, T. Anton, and G. Casper, 1 juv. (AMNH [LP 7826]), 5 ex. (AMNH). Desert Basin, NE Red Lake, Hualapai Valley, Grand Wash Cliffs, [35°16.83417'N 114°1.366'W], 16.v.1969, M. Cazier et al., 3 ex. (AMNH); Kingman on Hualapai Road, 11.2 km SE, [35°12.50'N 114°1.55'W], 19.vi.1971, J.L. Bigelow, 1 (AMNH); Wickenburg, 34°11'22.93"N 113°03'13.75"W, 10.x.200 ex. 7, R.C. West, 1 juv. (AMNH [LP 7688]); Wickenburg, 57 km N, 30.viii.1965, K. Hom, 1 ex. (AMNH); Wikieup, 8.5 km S, [34°42.14050'N 113°36.04933'W], 6.iv.1969, M. Cazier, 1 ex. (AMNH); Yucca, 28 km SE, [34°52.333'N 114°8.9666'W], 29.v.1969, M. Cazier et al., 17 ex. (AMNH). *Navajo Co.*: WSW of Cibecue, 12 km, [34° 2'35.86"N 110°29'16.16"W], 1633 m, 20.vi.1967, M. Nickerson, 1 ex. (AMNH). *Pima Co.*: Ajo Mountains, [32°21.10350'N 112°52.526'W], 457 m, 11.x.1935, 1 ex. (AMNH); Arizona, 16 km NW, [32°45.35367'N 111°40.2575'W], 26.viii.1950, M. Cazier, 1 ex. (AMNH); Baboquivari Mountains, Brown Canyon, [32°24.250'N 111°57.95'W], V. Roth, 19.vii.1959, 1 ex. (AMNH), W.J. Gertsch, 22.iv.1961, 3 ex. (AMNH); Carney Spring, 1.6 km E Peralta Road Superstition Mountains 12.9 km SW Apache Jet, [33°28.68333'N 111°14.333'W], 24.iv.1972, O. Francke, 15 ex. (AMNH); Carney Spring, 6.4 km E Peralta Road Superstition Mountains 12.9 km SW Apache Jet, 20.iii.1978, O. Francke, 8 ex. (AMNH); Casa Grande, [32°53.150'N 111°44.633'W], 30.v.1975, R. Smith, 2 ex. (AMNH); Darby Well,

[32°20.236866'N 112°51.042546'W], 20.ii.1958, V. Roth, 1 (AMNH); near Saquaro, National Mountains, [32°15'N 110°30'W], 13.x.1978, L. Prendini and J. Huff, 1 ♂ (IBUNAM); Organ Pipe Cactus National Monument, [32°2.5020'N 112°52.52'W], 12.v.1973, F.J. Moore and R.L. Berry, 1 ♂, 1 subad. ♂, 5 subad. ♀ (OSAL); Organ Pipe Cactus National Monument, Baquito Springs, 25.iii.1964, D.C. Lowrie, 1 ex. (AMNH); Organ Pipe National Mountains, Headquarters, 0.8 km S, 488 m, 26.viii.1973, M. Kolner and R. Garrison, 1 ex. (AMNH); Quitobaquito, 20.xii.1954, K.W. Haller, 1 ex. (AMNH); Quitobaquito Spring, 3.2 km, Rincon Spring Organ Pipe National Mountains, 4.iv.1970, M. Cazier, 2 ex. (AMNH); Saguaro National Mountains, [32°15'N 110°30'W], 915 m, 20.ii.1960, V. Roth, 1 ex. (AMNH); San Vicente, 14.5 km E, [32°0.72'N 111°38.22'W], 10.vi.1952, A. Emerson, 1 ex. (AMNH); Sells, 32 km E, [31°54.7200'N 111°52.87'W], 12.v.1973, F.J. Moore and R.L. Berry, 1 ♂, 1 subad. ♂, 1 subad. ♀ (OSAL). Santa Catalina Mountains: [32°26.580'N 110°47.28'W], 8.v.1969, 4 ex. (AMNH); Coronado National Forest, [32°25.8180'N 110°42.32'W], 10.v.1973, F.J. Moore and R.L. Berry, 1 ♀, 2 subad. ♂, 8 subad. ♀ (OSAL); Molino Basin Camp, [32°26.580'N 110°47.28'W], 1430 m, 21.viii.1973, M. Kolner and R. Garrison, 1 ex. (AMNH); Molino Basin, Upper Campground, 1350 m, 29.iii.1975, E. Minch, 7 ex. (AMNH); Sabino Canyon, [32°19'N 110°49'W], D. Cottam, 1938, 1 ex. (AMNH), M. Cazier, 10.viii.1950, 1 ex. (AMNH). Tucson, [32°13.3020'N 110°55.59'W], P. Steckler, vii.1934, 14 ex. (AMNH), vii.1935, 1 ex. (AMNH), F.J. Moore, 9.ix.1970, 1 ♂, 1 subad. ♂ (OSAL), Upper Sabino Canyon, near Tucson, 1964, W.J. Gertsch, 1 ex. (AMNH). Tucson Mountains, Verde Camp, [32°13.50'N 111°7'W], 9.iv.1970, M. Cazier, 1 (ex. AMNH); Tucson Mountains, Tucson Park, [32°13.8060'N 111°5.85'W], F.J. Moore, 10.vii.1971, 1 subad. ♀ (OSAL), F.J. Moore and R.L. Berry, 8.v.1973, 1 ♂, 4 ♀, 3 subad. ♂, 19 subad. ♀ (OSAL); Vail, 15400 E Collassal Cave Road, 32°02.080'N 110°39.914'W, 1007 m,

20.vi.2006, J. Cowles, B. Savary, W.E. Savary, and R. Mercurio, 1 ex. (AMNH), collected at night with UV light, 1 juv. (AMNH [LP 5869]); Vail, 4.6 km ESE, on heading of 106°, property of W.P. Savary and J. Cowles, 32°02'12.7"N 110°39'52.2"W, 1006 m, 1.viii.1996, W.E. Savary et al., 1 ♀ (AMNH [LP 4398]). *Santa Cruz Co.*: Atascosa Mountains, 14.ix.2007, 31°24.574'N 111°09.435'W 1456 m, 1 ex. (AMNH), 31°24.702'N 111°09.543'W 1402 m, 1 ex. (AMNH), 31°25.316'N 111°09.830'W 1329 m, 1 ex. (AMNH), 31°25.582'N 111°10.185'W 1300 m, collected at night with UV light, 2 juv. (AMNH [LP 7135]), 1 ♂ (IBUNAM), 31°25.705'N 111°10.406'W 1280 m, 1 ex. (AMNH), 31°25.885'N 111°11.142'W 1388 m, 1 ex. (AMNH), M. Rubio; Coronado National Forest, Santa Rita Mountains, Gardner Canyon, Gardner Canyon Road, 31°43.070'N 110°46.582'W 1638 m, 19.vi.2006, R. Mercurio and W.E. Savary, collected at night with UV light, 1 juv. (AMNH [LP 5868]); Los Baños Ranch, 31°30'N 110°40'W 9.v.1966, V. Roth, 1 ex. (AMNH); Madera Canyon, 31°43.550'N 110°52.8166'W W.A. McDonald, 21.viii.1954, 1 ex. (AMNH), S.C. Williams, 22.viii.1966, 1 ex. (AMNH); Patagonia, 31°32.50'N 110°45.2'W 17.ix.1952, B. Malkin, 1 ex. (AMNH); Patagonia, 3.2 km SW, at Sonoita Crekk, 1219 m, 22.viii.1973, M. Kolner and R. Garrison, 1 ex. (AMNH); Patagonia, 3.2 km W, Sonoita Creek Park, 18.viii.1972, O. Francke, 6 ex. (AMNH); Peña Blanca Lake near Nogales, 31°24.01667'N 111°5.2666'W 11.ix.1963, W.J. Gertsch, 1 ex. (AMNH); near Peña Blanca Lake, 31°24'19.48"N 111°5'12.87"W 1219 m, 25.vii.2008, H.M. Burrell and K.J. McWest, 1 ♀ (AMNH [LP 8865]); Ruby, 31°27.66667'N 111°14.25'W 1280 m, 2.iv.1964, M. Kolner, 1 ex. (AMNH); Ruby, 6.4 km SE, 5.ix.1950, W.J. Gertsch, 1 ex. (AMNH); Santa Rita Mountains, Coronado National Forest, Gardner Canyon, 19.vi.2006, 31°42.663'N 110°47.837'W, 3 ex. (AMNH); Santa Rita Mountains, Madera Canyon, 31°43.550'N 110°52.8166'W 24.vii.1953 G.M. Bradt, 1 ex. (AMNH); Sycomoro Canyon, 34°26.50'N 111°47.4166'W 21.vi.1969, M.

Cazier et al., 10 ex. (AMNH). *Tucson Co.*: [32°13.30'N 110°55.5833'W], 10.iii.1946, J.W. Green, 1 ex. (AMNH). *Yavapai Co.*: Alamo Road, N side, 34°10'4.43"N 113°01'56.57"W, 867 m, 10.v.2008, Z.J. Valois and B. Hendrixson, found in flat open Sonora desert-grassland, 1 juv. (AMNH [LP 8515]); Base of cliff N of Picnic area Montezuma Well, [34°36.78333'N 111°50.4'W], 25.iv.1969, J. Rinne, 1 ex. (AMNH); Bradshaw Mountains, Black Canyon, Horsethief Basin Recreation Area, Black Canyon Creek, 16.vi.2006, 34°11.526'N 112°09.740'W, 756 m, R. Mercurio and W.E. Savary, 1 ex. (AMNH), 758 m, R. Mercurio, W.E. Savary, and ATS group, collected at night with UV light, 1 juv. (AMNH [LP 5867]); Camp Verde, 9.7 km SE, [34°34'N 111°51.3666'W], 11.ix.1962, V. Roth, 1 ex. (AMNH); Childs, 3.2 km W, along Verde River, [34°20.98333'N 111°41.95'W], 8.v.1970, M. Cazier, 2 ex. (AMNH); Congress, [34°8.76667'N 112°50.8'W], 24.vii.1948, C. and P. Vauris, 2 ex. (AMNH); Kaibab National Forest, Ash Fork, 10 km S on Hwy 89 from intersection with I-40, at boat ramp 3262, 35°04'56.5"N 112°24'19.9"W, 1544 m, 8.ix.2007, L. Prendini and J. Huff, 1 juv. (AMNH [LP 7176]); Kaibab National Forest, Ash Fork, 17 km S on Hwy 89 from intersection with I-40, at boat ramp 3262, 33°04'56.5"N 112°24'19.9"W, 1544 m, 9.ix.2007, L. Prendini and J. Huff, 1 ♂ (IBUNAM); McGuireville, E Beaver Creek Road, 34°38'24.86"N 111°48'32.17"W, 1015 m, 10.x.2007, 1 ex. (AMNH), 1016 m, 7.x.2007, rocky hillside, grasses and mesquite trees, 1 juv. (AMNH [LP 7695]), Z.J. Valois; Perkinsville, Perkinsville Road (FR 318) at Verde River, 34°53'44.43"N 112°12'25.40"W, 1164 m, 14.vi.2007, H.M. Burrell, M.N. McWest, and K. McWest, N side of river near bridge, under rocks in mesquite grove, 1 ex. (AMNH [LP 7268]); Prescott, [34°34.10'N 112°27.6833'W], 4.vii.1969, B. Chilton, 4 ex. (AMNH); Prescott, 84 km S, on Hwy 89, ix.1939, D. Mulaik, 3 ex. (AMNH); Sedona, [34°51'44.01"N 111°45'30.90"W], 12.iv.1969, M. Paremann, 1 ex. (AMNH); Verde Hot Springs, [34°20.93148'N

111°41.90232'W], 2.ix.1951, G.M. Bradt, 1 ex. (AMNH); Verde River, 1.6 km W Childs, [33°32.80'N 111°39.75'W], 12.vii.1969, A. Hulse, 8 ex. (AMNH); Yarnell, [34°13.350'N 112°44.983'W], 3.ix.1961, V. Roth, 18 ex. (CAS); *Yuma Co.*: Alamo Lake State Park, [34°13.933'N 113°36.1666'W], 13.iii.1976, M. Cazier et al., 1 ex. (AMNH); Alamo Lake State Park, Granitic Canyon, Bill Williams River, vi.1970, M. Cazier et al., 2 ex. (AMNH); Colorado River, 18 km S Cibola on Cibola Lake, [33°14.25583'N 114°40.31933'W], 3.iv.1979, M. Cazier et al., 14 ex. (AMNH); Crater Mountains, 32 km NW Ajo, [34°34.02983'N 112°3.438833'W], 26.ix.1970, R. Rice, 10 ex. (AMNH); Fortuna Mine, [32°33.10311'N 114°19.84656'W], 7.ii.1960, V. Roth, 1 ex. (AMNH); Hoodoo Well, [33°20.535426'N 113°51.295896'W], V. Roth, 1 ex. (AMNH); Horse Tanks, [33°12.66882'N 114°12.346476'W], 19.ii.1960, D. Muse, 2 ex. (AMNH); Martinez Lake, [32°58'50.50"N 114°28'47.12"W], 3.iv.1960, V. Roth, 1 ex. (AMNH); Palm Canyon, [33°21.636'N 114°5.9118'W], V. Roth, 17.ix.1956, 1 ex. (AMNH), 10.v.1958, 1 ex. (AMNH); Tule Mountains, [32°11.15367'N 113°47.6288333'W], 30.ix.1956, V. Roth, 1 ex. (AMNH). **New Mexico:** *Hidalgo Co.*: Animas, vii.1963, J. Woods, 1 ex. (AMNH); Animas Peak, [31°34.1700'N 108°47.322'W], 22.vii.1963, V. Roth, 1 ex. (AMNH); Animas Peak, N side, 24.viii.1964, R. Zwifel, 1 ex. (AMNH); Animas, 4.8 km E, 3.vii.1968, D.O. Marqua, 1 ex. (AMNH); Beacon Hill, Antelope Pass, NM 9, 8.2 km E junction NM 80, 31°56.2141'N 108°57.2324'W, 1305 m, 27.vii.2008, K. McWest and H.M. Burrell, collected at night with UV light, 1 ♀ (AMNH [LP 8992]), 1 ex. (AMNH); Guadalupe Mountains, [31°25.7700'N 109°2.652'W], J. Szerly, 1 ex. (AMNH); Indian Creek, Animas Mountains, [31°34.1700'N 108°47.322'W], 1829 m, 23.ix.1972, Hasbrouck, 1 ex. (AMNH); T28 S, R21 W, Sec 11 near Rodeo, [31°50.21667'N 109°1.9'W], 10.x.1964, W. Shear, 1 ex. (AMNH); W end of Antelope Pass at base of Beacon Hill along NM 9, 5 m E junction NM 80, 31°56'13.7"N 108°57'15.0"W,

1303 m, 12.x.2007, K. McWest, on road near shoulder stripe, 1 juv. (AMNH [LP 7824]). Peloncillo Mountains: [32°05'43.1"N 108°58'13.7"W], 14.vii.1960, 1 ex. (AMNH), 1494 m, R. Zwifel, 1.viii.1972, 1 ex. (AMNH); Clanton Draw, [31°52.50'N 108°55.368'W], 1676 m, 14.viii.1972, R. Zwifel, 2 ex. (AMNH); Cottonwood Creek, 61 km N Douglas, 8.vi.1973, O. Francke, 4 ex. (AMNH); Geronimo Pass, Coronado National Forest, 1755 m, 13.ix.2002, 31°30.885'N 109°01.510'W, oak-pine scrub on rocky hills, collected at night with UV light and during the day by turning stones, 1 ♂ (AMNH [LP 2131]), 7 juv. (AMNH [LP 2137B]), 1 ex. (AMNH [LP 2138B]), 31°30.8850'N 109°1.5096'W, collected at night with UV light, 1 ♂, 6 ♀, 3 subad. ♂, 4 subad. ♀ (AMNH [ARA3125]), L. Prendini, L. Esposito, and Y. Rodriguez; Granite Gap, [32°05'43.1"N 108°58'13.7"W], M.A. Cazier, 14.viii.1976, 1 subad. ♂ (IBUNAM), L. Prendini and J. Huff, 1367 m, 4.ix.2007, 1 juv. (AMNH [LP 7102]), 1 subad. ♀ (IBUNAM); Granite Gap, NM Hwy 80, 32°05'19.3"N 108°58'24.7"W, 1365 m, 11.x.2007, K. McWest, 1 juv. (AMNH [LP 7823]), 32°5.2840'N 118°58.4051'W, 1374 m, 27.viii.2008, K. McWest and H.M. Burrell, 2 juv. (AMNH [LP 8866]); Granite Gap on Hwy 80, N of Rodeo, 32°05'34.2"N 108°58'12.1"W, 1367 m, 22.vii.2007, J. Huff, 2 ex. (AMNH), collected at night with UV light, 1 juv. (AMNH [LP 7015]); Granite Gap, 14.5 km S of I-10 along NM State Rout 80, [32°5.3240'N 108°58.3948'W], S.J. Burchfield and B.R. Tomberlin, 1.iv.2004, 4 ♀ (AMNH [ARA3124]), S.J. Burchfield, iv.2004, 2 ♀, 1 juv. (AMNH [LP 3049]), 1 ♀ (AMNH [LP 3050]), 1 ♀ (AMNH [LP 3110]), 1 ♀ (AMNH [LP 3075]); Granite Gap Ghost Town, 18.5 km S Road Forks, 32°04.974'N 108°58.962'W, 13.ix.2002, L. Prendini, L. Esposito, and Y. Rodriguez, Chihuahua desert scrub, under stones, 1 ♂, 3 ♀ (AMNH [LP 2142B]); Rodeo, 12 km N, [31°50.21667'N 109°1.9'W], 9.vii.1960, J. Cole, 1 ex. (AMNH); Rodeo, 12.9 km SE, M. Statham, 30.vi.1955, 1 ex. (AMNH),

J.O. Hood, 14.vii.1955, 1 ex. (AMNH); Skeleton Canyon, [31°35.400'N 109°2.16666'W], V. Roth, 17.iv.1966, 1 ex. (AMNH), F.J. Moore and R.L. Berry, 7.v.1973, 2 ♀, 2 subad. ♂ (OSAL).

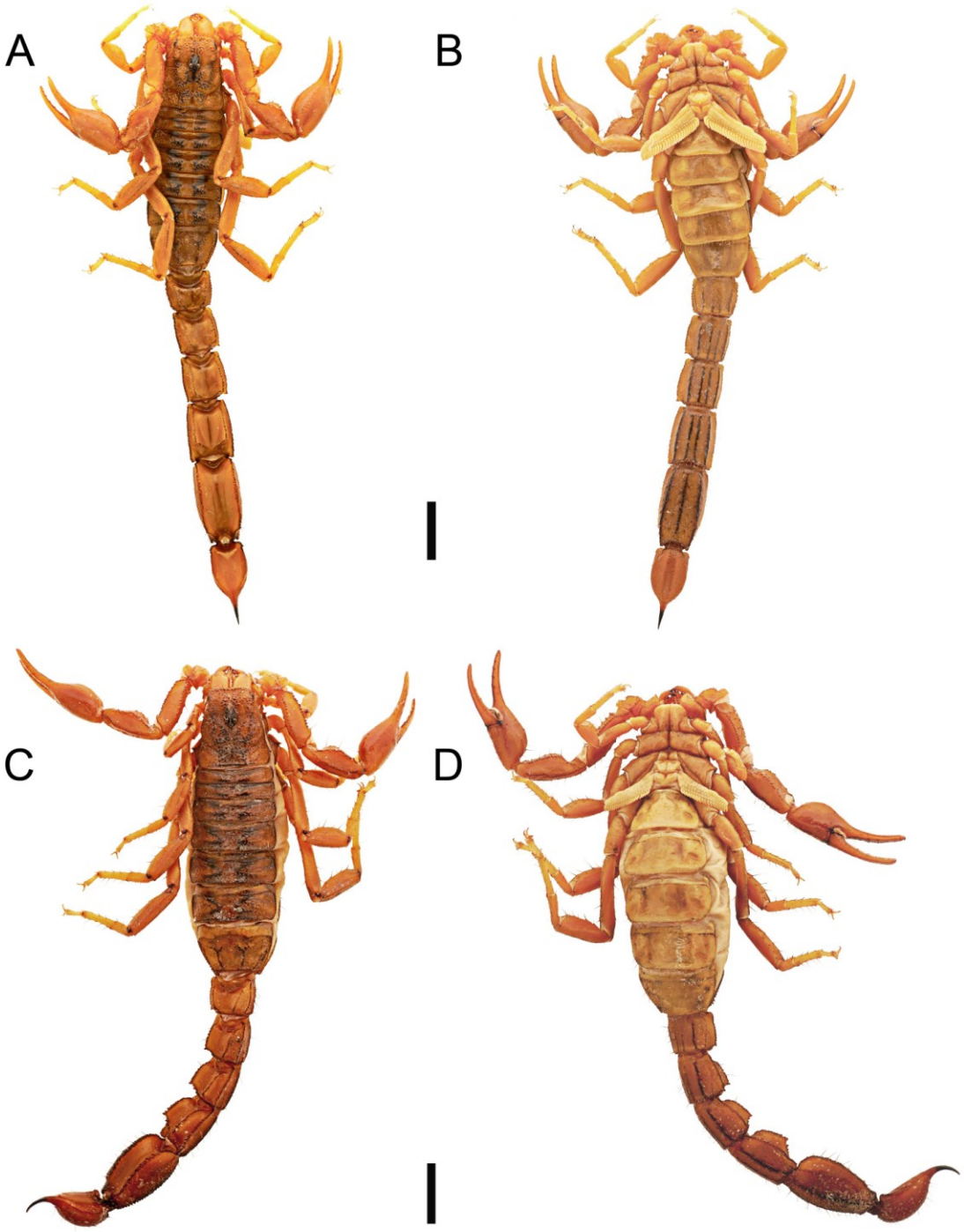


Figure 399. *Paravaejovis spinigerus* (Wood, 1863), habitus. **A**, **B**. ♂ (AMNH). **C**, **D**. ♀ (AMNH). **A**, **C**. Dorsal aspect. **B**, **D**. Ventral aspect. Scale bars = 5 mm.

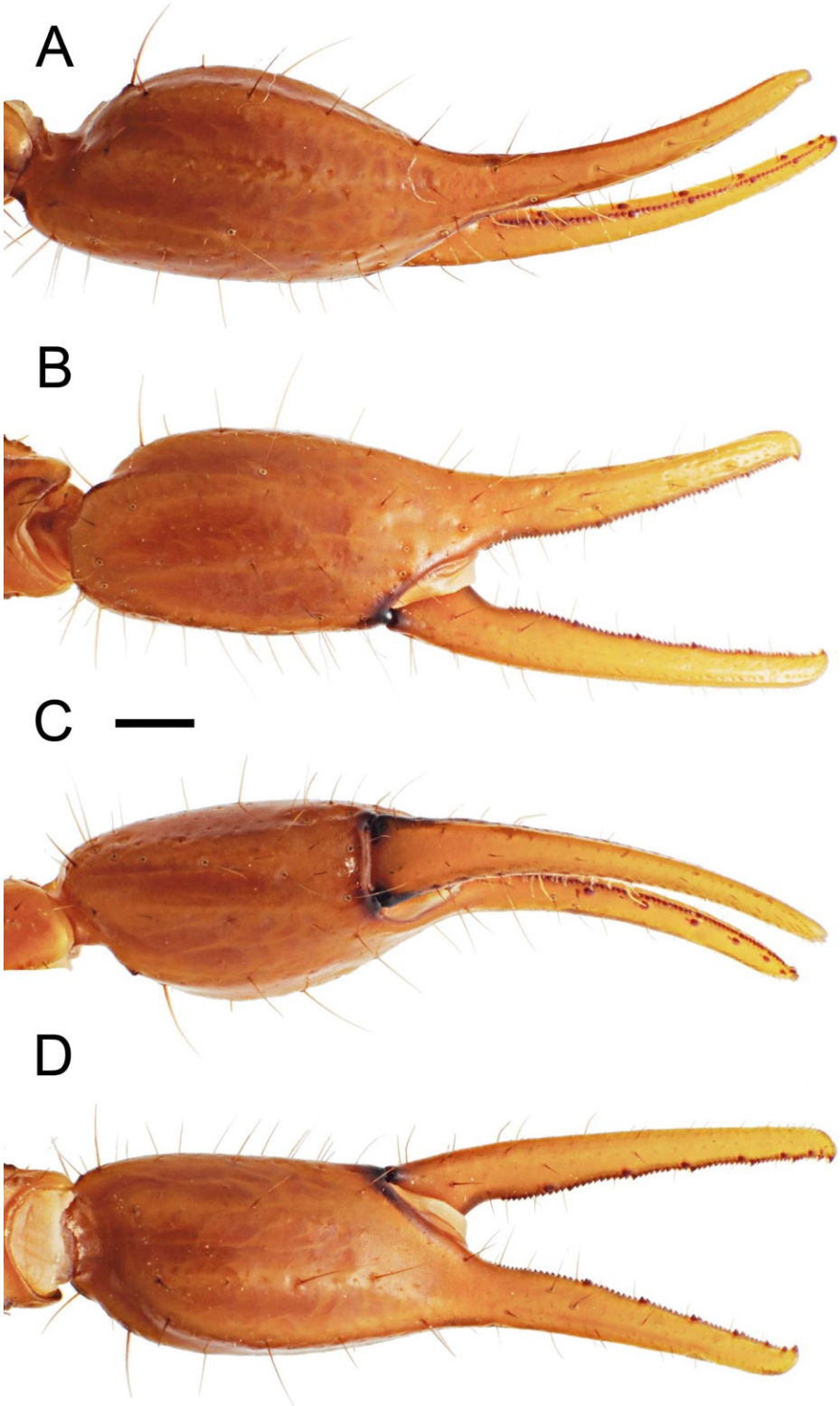


Figure 400. *Paravaejovis spinigerus* (Wood, 1863), ♂ (AMNH), dextral pedipalp chela. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

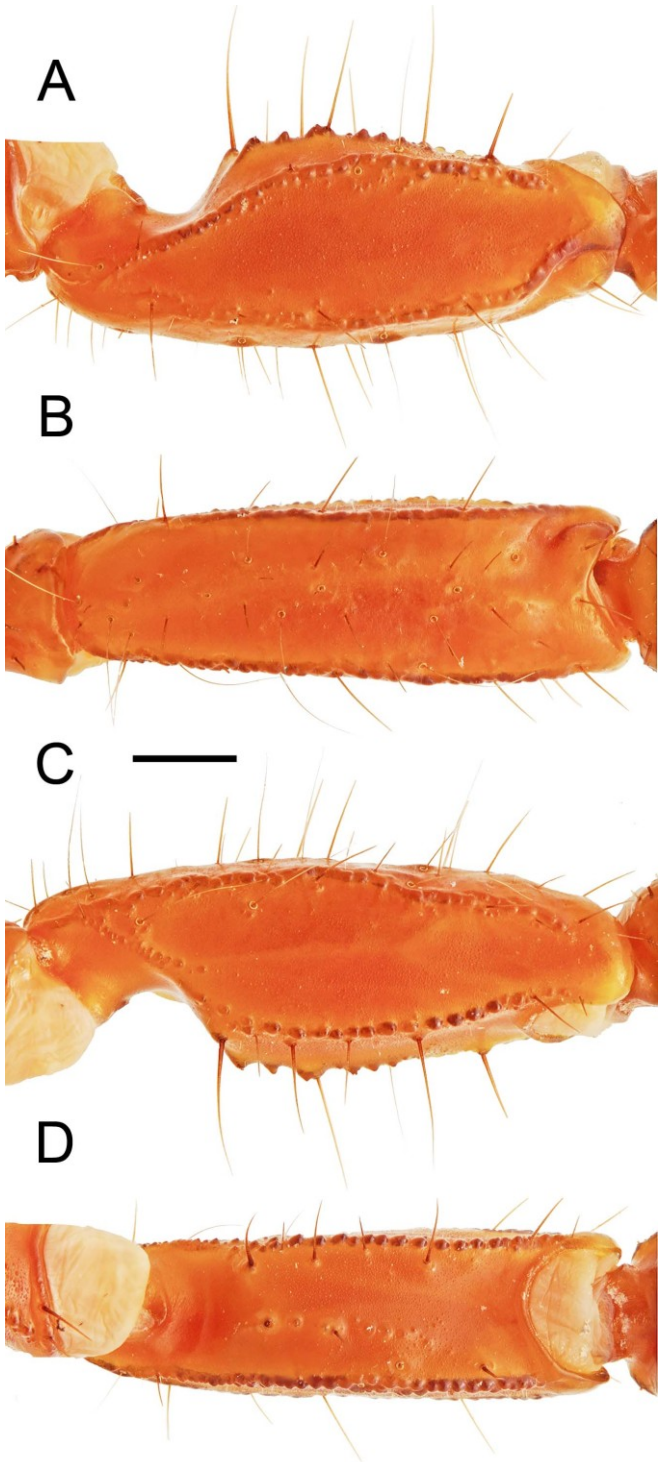


Figure 401. *Paravaejovis spinigerus* (Wood, 1863), ♂ (AMNH), dextral pedipalp patella. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

Paravaejovis voluptatis, **n. sp.**

Figures 354, 402–404, 412, 414D, 422E, 423E, 424C, 429E, 433D; Table 17

TYPE MATERIAL: **MEXICO: Baja California Sur:** *Municipio de Mulegé*: Holotype ♂ (IBUNAM), Sierra del Placer, 21 km to junction Bahía Tortugas and Bahía Asunción, 98 km E of Vizcaino towards Bahía Tortugas, 27°28.9278'N 114°17.0928'W 262 m, 28.vi.2008, H. Montaño and E. González, sand dunes, on ground, collected at night with UV light.

ETYMOLOGY: The species name *voluptatis* is an adjective in Latin that means pleasure and refers to the type locality in Pleasure Sierra (Sierra del Placer), in Baja California Sur, Mexico.

DIAGNOSIS: *Paravaejovis voluptatis*, **n. sp.** is closely related to *P. nigroguerreroensis*, **n. sp.**, *P. pumilis*, *P. hoffmanni*, and *P. diazi* (see *P. nigroguerreroensi* for details). Among these species *P. voluptatis*, **n. sp.** is more closely related to *P. pumilis*. These two species may be differentiated from the other species in the genus by having trichobothria *V* and *Eb* merge and undistinguishable arranged in rows of between 13 and 17 trichobothria, instead of having regular counts of series $V_{1–4}$ and $Eb_{1–3}$. These species also have trichobothria *ib* and *it* at base of fixed finger, proximal to associated macroseta of RD7, instead of having trichobothria *ib* and *it* on proximal third to median third of fixed finger, at or close to RD6 or between RD6 and RD5. *P. voluptatis*, **n. sp.** and *P. pumilis* further differ from other species by having distal margin of carapace convex, instead of having sublinear margin. *P. voluptatis*, **n. sp.** is larger than *P. pumilis* with total length to 30 mm in the former and less than 27 mm in the latter. Furthermore *P. voluptatis*, **n. sp.** has pedipalp chelae noticeable incrassate, patella and femur considerably more expanded laterally than *P. pumilis*. *P. voluptatis*, **n. sp.** has ventral submedian carinae in

metasomal segments I–III obsolete and IV weakly finely granular in distal third, whereas *P. pumilis* has these carinae densely and finely serrated. Furthermore, the intercarinal surface between ventral lateral carinae in metasomal segments I–III, is smooth and flat in *P. voluptatis*, **n. sp.** but in *P. pumilis* are matte and gently rounded. *P. voluptatis*, **n. sp.** also has ventral surface of metasomal segment V densely covered with granules of different size from fine to enlarged conical granules and *P. pumilis* has dense granulation of minute and moderate granules. *P. voluptatis*, **n. sp.** also has ventral median carinae of metasomal segment V expressed on proximal half by large conical granules moniliform that become irregular medially and loss order in the second half, whereas *P. pumilis* has a complete irregular costate carinae. *P. voluptatis*, **n. sp.** has lateral inframedian carina of metasomal segments I–III weakly developed with scattered fine granulation, *P. pumilis* has well defined carinae in these segments.

DESCRIPTION: The following description is based on the holotype male.

Color and infuscation: Base color uniformly yellow straw. Median and lateral ocular tubercle intensely infuscate. Chelae yellowish with finger reddish. Pectines pale whitish. Aculeus reddish to brownish. Telson reddish

Carapace: Carapace 1.08 times longer than posterior width. Frontal lobes strongly curved laterally, such that lateral eyes face the frontal lateral side. Anterior margin moderately convex, lacking medial notch and with three pairs of minor macrosetae. Carapace matte, densely cover by minute granules. Median ocular tubercle weakly raised and broad. Superciliary carinae weak and smooth, lower than median eyes. Position of median ocular tubercle on anterior half of carapace. Three pairs of lateral eyes, two anterior pairs same size and third pair slightly less than half the size of first two pair. Median eyes approximately two times the size of first anterior pair.

Anteromedian sulci moderate with a weak anterior shallow depression; posteromedian deep and narrow, anterolateral weak, posterolateral moderate; posterior transverse vestigial.

Sternum and coxal region: Sternum pentagonal proximal lateral extension elongate with three pairs of setae, one distal, one median pairs and one pair on the lobes, surface matte, median notch deep. Coxal region with scatter spots of matte surface. Anterior margin of coxa II smooth to weakly finely granular, subbasally three oblique slit-like structures, adjacent to a vestigial protuberance finely granular with a macroseta on base. Proximal margin of coxal endite II with a deep elongate depression each, proximal median edge finely granular. Coxa IV 2.24 times longer than coxa II.

Chelicerae: Dorsal surface matte, subdistal margin of manus with one macrosetae; distal margin with costate, base of fixed finger with a pair of vestigial crenulations, slightly reddish. Serrula vestigial on ventral distal half of movable finger, tines numbering 5.

Pedipalps: Trichobothrial pattern Type C, orthobothriotaxic. Chela wider than patella, patella wider than femur. Femur: All intercarinal surfaces densely shagreened with densely minute granules and moderate scatter granules except retrolateral surface smooth. Dorsal prolateral complete and strong with conical granules; dorsal retrolateral and ventral prolateral complete and strong, with irregular conical granules; retrolateral dorsosubmedian obsolete expressed by three minor macrosetae positioned on distal half; retrolateral ventral obsolete, ventral retrosubmedian vestigial expressed by a field of crenatoserrate granules on proximal third; ventral prolateral vestigial expressed by a short row of proximal crenatoserrate granules; prolateral ventrosubmedian obsolete, expressed by a proximal spiniform tubercle and a median tubercle with a macroseta on base, with few additional small intersperse granules; prolateral

obsolete vestigial expressed by two proximal spiniform tubercles with a macroseta and a subbasal tubercle with a with a macroseta on base.

Patella: All intercarinal surface matte, except retrolateral surface. Dorsal prolateral irregular with enlarge, moderate and minute conical granules; dorsal retrolateral partial proximal half obsolete and distal half moderately costate ending with a short row of granules; ventral prolateral complete and strong with moderate irregular conical granules; ventral retrosubmedian complete and weak with dense minute crenulations; retrolateral dorsosubmedian and retrolateral median obsolete; ventral median obsolete, expressed by a proximal row of minute granules; prolateral median on a vaulted projection, protruding strongly medially, expressed by a proximal tubercle and a row of scatter subserrate elongate granules, with macrosetae on top on proximal granule, gently slanting towards subdistal end of dorsal prolateral carinae ending at trichobothrium *i*, followed by a gap of smooth surface and a subdistal macrosetae with a macroseta on top; prolateral ventral obsolete expressed by two major macrosetae adjacent to ventral prolateral carinae.

Chela: Manus smooth proximally, dorsal, prolateral, distal retrolateral surfaces with scatter fine granulation, strongly incrassate, with prolateral surface strongly protruding (manus 2.00 times longer than fixed finger). All carinae obsolete. Trichobothrium *Db* expressed as a macrosetae positioned on dorsal retrolateral carina, subbasal on chelae; *Dt* positioned at mid manus.

Fingers: Fixed finger, PD = 5, MD rows = 5, RD = 5, proximal RD positioned by proximal half. All RD subpaired with corresponding PD. Movable finger, PD = 7, MD rows = 6, distal row bearing one minute granule, RD = 6, proximal RD positioned by proximal half. All RD subpaired with corresponding PD. Trichobothria *ib* and *it* positioned basal on fixed finger,

positioned at PD7, PD7 lacking granule. Fingers with moderate scallop, proximal notch of fixed finger moderate and median lobe weak, proximal notch and median lobe of movable finger obsolete, gap created when fingers closed moderate, fingers fit unevenly.

Legs: Basitarsi and Telotarsi I–IV compressed dorso-ventrally such that each segment forms a paddle-like structure, more notable in I and II. Basitarsus I prolateral ventral carinae partial expressed on distal half by a scatter row of spinules, in II complete regular row of spinules, in III and IV absent; retrolateral ventral in I and II complete regular row of spinules, in III partial expressed on distal half, IV absent; prolateral ventral I–II complete regular row of spinules, III vestigial expressed on distal third, in IV absent; retrolateral median rows in I–obsolete expressed as few terminal spinules, in IV absent. Telotarsi I–IV with one or two pairs of ventrodistal spinules in I–IV. Setae: Prolateral ventral, 2:3:3:3; retrolateral ventral, 2:4:5:5; retrolateral dorsal, 2:2:3:3; dorsal, 2:4:4:3; retrolateral dorsal and dorsal series in I and III arranged in one row of elongated macrosetae being dorsal median expressed as a macrosetae, in IV arranged in two independent rows. Macrosetae on prolateral and distal dorsal aspect enlarged, ungues and dactyl relatively elongate.

Tergites: Pretergites and postergites densely matte. Dorsal median and ventral submedian carinae in tergites I–IV absent, in V–VII obsolete expressed by a weak costa on distal half. Tergite VII dorsal median carina vestigial expressed on proximal half of the postergite as a weak costate; dorsal submedian absent; dorsal lateral and lateral supramedian obsolete expressed by a row of fine granules; lateral supramedian curving towards the proximal end of lateral inframedian carinae, intercarinal surface between these carinae cover with dense minute granule and moderate conical granules.

Genital operculum: Male genital operculum: wider than long, with two pairs of macrosetae. Sclerites free on longitudinal edge moving independently but unable to open more than 45°. Genital papillae protruding posteriorly. Female genital operculum: Wider than long, with three macrosetae. Sclerites fuse longitudinal.

Sternites: Sternites III–VII acarinated, medially finely punctuated, laterally and lustrous. Sternite V and VII lacking distal median glandular spot. Sternite VII with all carinae obsolete, expressed by pairs of macrosetae. Spiracle elongated, slit-like, approximately two times longer than wide.

Pectines: Basal piece with median notch deep, with three pairs of macrosetae. Marginal lamella consist of three sclerites, medial lamella proximally fuse distally progressively forming a conspicuous rows of 8 beads. Fulcra with 15 beads. Pectinal teeth count 16. Pectines relatively short, with median sclerite of marginal lamella at the level of distal margin of coxa IV. First proximal pectine attached at the level of proximal margin of the proximal sclerite of medial lamella.

Hemispermatophore: Lamina 1.72 longer than trunk. Dorsal through margin moderate, wide distally, curving and tapering proximally, and removed from ventral trough. Hemimating plug not completely developed, could not see inner lobe and distal barb margin. Primary and secondary hook positioned on the apex of lateral margin extension of the lamina (flange). Hooks fused in to a short hook. Median lobe ental terminus moderate and rounded. Measurements, lamina, 2.58; trunk, 1.50; dorsal trough/laminar hooks, 1.44; ventral trough/laminar hook, 0.60.

Metasoma: Intercarinal surfaces densely shagreened in metasomal segments I–V with dense minute and scatter moderate granules, except ventral intercarinal surface smooth in I–IV. Ventral distal intercarinal surface of IV matte Prolateral and ventral intercarinal surface of

metasomal segment V with dense minute, moderate and enlarge subserrate granules. Metasoma 1.4 times longer than mesosoma. Metasomal segments I–III wider than long. Carinae: Dorsal lateral carinae in I–IV finely and irregularly crenatoserrate; lateral median in I–IV finely and irregularly crenatoserrate, terminus weakly curving ventrally with two or three granules; except lateral median in IV distal terminus moderately expanded laterally forming a triangular projection; dorsal lateral in V with proximal with three or four enlarge crenatoserrate granules, becoming finely serrate and medially to distally mixing with the fields of granules of the lateral intercarinal surface. Lateral inframedian in I complete irregularly and finely crenatoserrated, mixed with intercarinal granulation; in II partial with scatter finely crenatoserrated, present on distal half, in III partial finely crenatoserrated, present on distal third; in IV absent, in V partial with a proximal serrate tubercle followed by a row of scatter and fine granules, present in proximal half; ventral lateral in I–IV finely crenatoserrate, ventral submedian in I–III obsolete, in IV proximal half obsolete and distal half finely crenatoserrate; ventral median and ventral lateral in V strongly crenatoserrate. Setae: Dorsal lateral, 0:1:1:2:4; lateral median, 1:1:3:3; lateral inframedian, 1:0:0:0:3; ventral lateral, 2:2:2:3:7; ventral submedian, 2:3:3:3:1; ventral sublateral, 2. All macrosetae minor

Telson: Telson 2.25 times longer than wide. Metasomal segment V 1.2 times wider than telson. Vesicle 2.3 times longer than aculeus. Telson vesicle globose with dense broad crenulations. Ventral surface with 6–7 major macrosetae all macrosetae minor. Ventral median carinae with subaculear tubercle obsolete. Microserration on laterobasal aculeus numbering 4.

DISTRIBUTION: *Paravaejovis voluptatis*, **n. sp.** seems to be endemic to the Sierra del Placer, in the western extreme of the Vizcaino Desert, Baja California Sur, Mexico.

ECOLOGY: *Paravaejovis voluptatis*, **n. sp.** is undoubtedly a psammophilous species judging by its morphological adaptations and the habitats where it was taken. The two known specimens were collected using ultraviolet detection at night, at an altitude of 262 m in the sand dunes of Sierra del Placer. The specimens were collected on a steppe dune, while they were walking around.

REMARKS: The discovery of *P. voluptatis*, **n. sp.** is important because it exhibits characters that further support the nested position of *P. pumilis* within the syntropines. Fet et al. (2006b) discovered that *Paravaejovis*, *Paruroctonus*, *Smeringurus*, and *Vejovoidus*, share the possession of a vestigial serrula. This character then was hypothesized to be a synapomorphy for the Smeringurinae by Soleglad and Fet (2008). The undeniable relationship between *P. voluptatis*, **n. sp.** and *P. pumilis*, the unique neotrichobothriotaxy exhibited by these two species, is strong evidence of their relationship and at the same time reenforces the link to the Syntropines because *P. voluptatis*, **n. sp.** has a conspicuous serrula with five well-develop tines. This character falsifies the placement of *P. pumilis* within the subfamily Smeringurinae. It is thus hypothesized than *P. pumilis* shows a secondary reduction of the serrula, instead of being derived from the Smeringurinae ancestor.

Paravaejovis voluptatis, **n. sp.** also creates an interesting biogeographic link between the Magdalena Plains and the Vizcaino Desert. It may be possible that the Magdalena Plains extended northward to the limit where the seaway opened through the Vizcaino Desert. Today, the orogeny of Sierra de la Giganta divides these two deserts.

MATERIAL EXAMINED: **MEXICO: Baja California Sur:** *Municipio de Mulegé*: Sierra del Placer, 21 km to junction Bahía Tortugas and Bahía Asunción, 98 km E of Vizcaino towards

Bahía Tortugas, 27°28.9278'N 114°17.0928'W 262 m, 28.vi.2008, H. Montaño and E. González, sand dunes, on ground, collected at night with UV light; 1 ♂ [AMNH (LP 8704)].

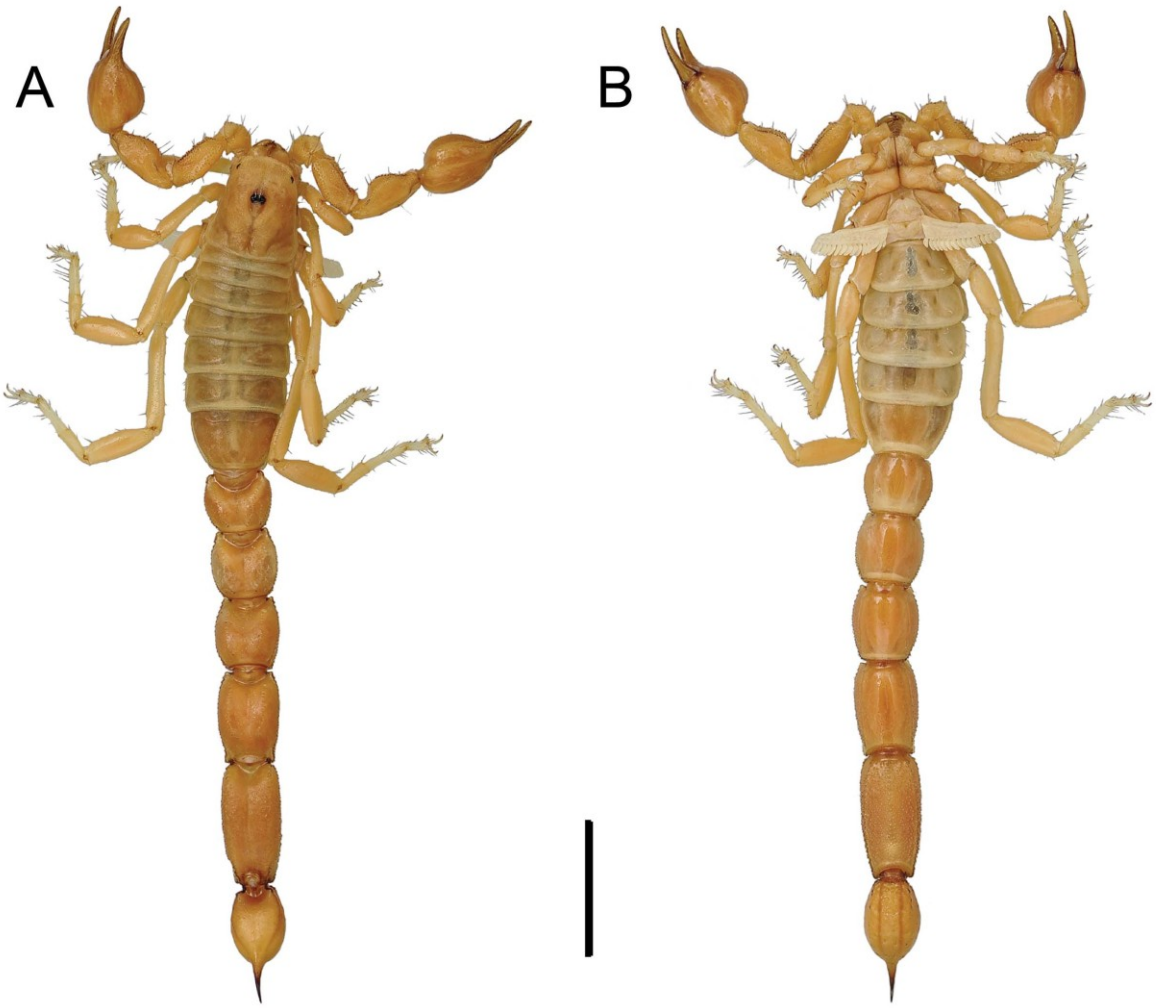


Figure 402. *Paravaejovis voluptatis*, **n. sp.**, holotype ♂ (IBUNAM), habitus. **A**. Dorsal aspect. **B**. Ventral aspect. Scale bar = 5 mm.

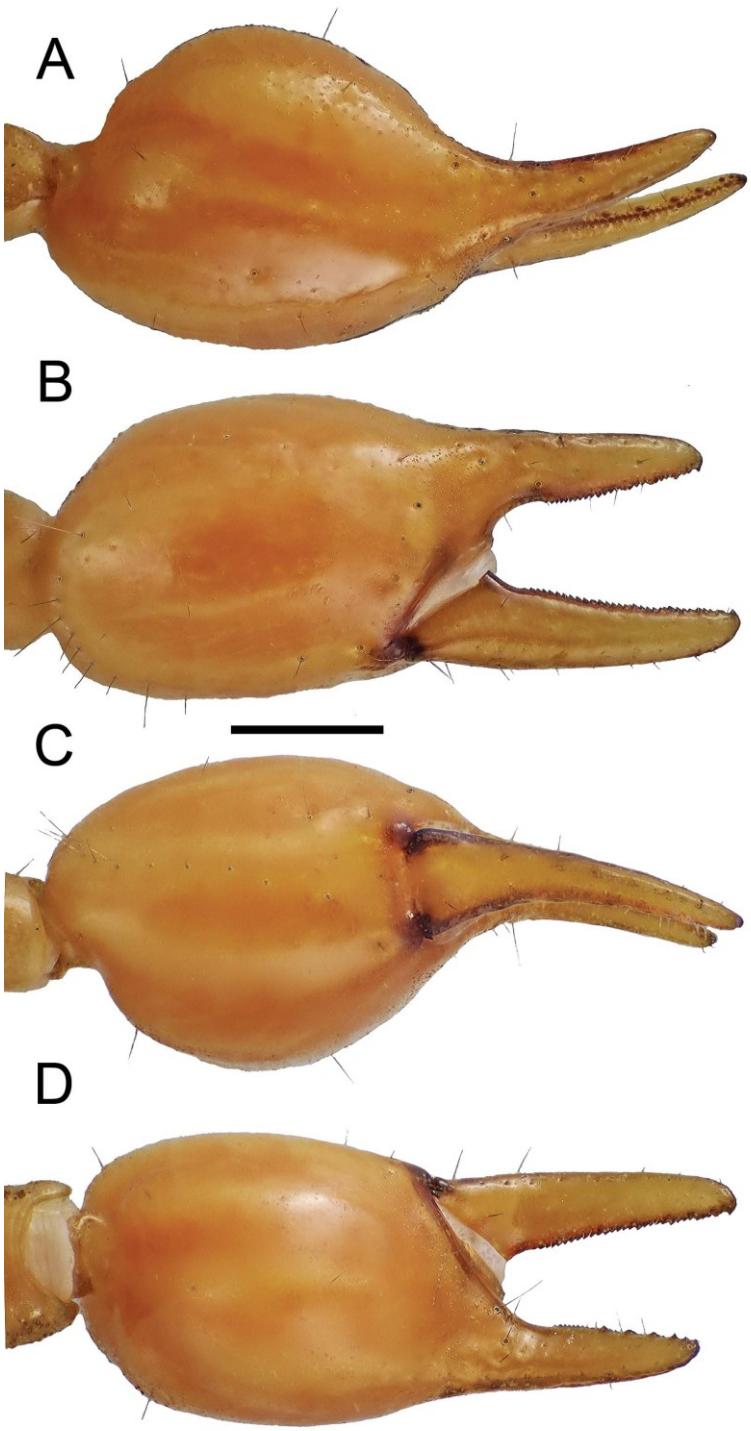


Figure 403. *Paravaejovis voluptatis*, **n. sp.**, holotype ♂ (IBUNAM), dextral pedipalp chela. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

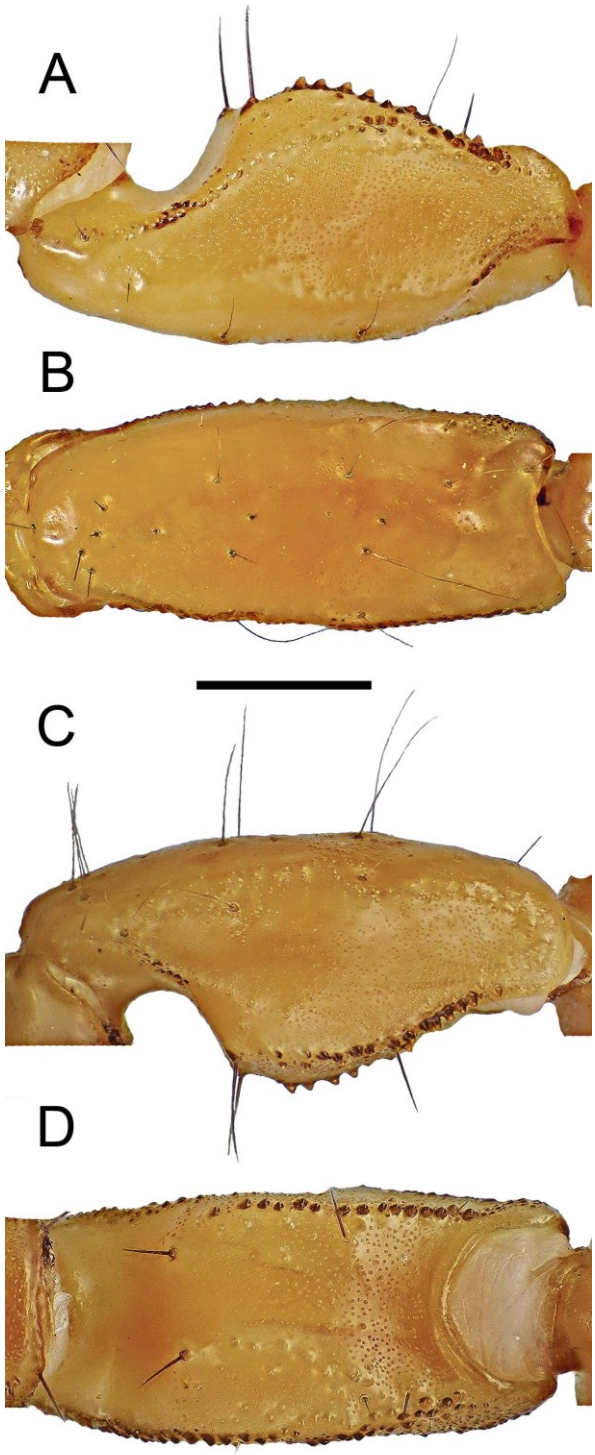


Figure 404. *Paravaejovis voluptatis*, **n. sp.**, holotype ♂ (IBUNAM), dextral pedipalp patella. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

Paravaejovis waeringi (Williams, 1970)

Figures 354, 362, 405–407, 408B, 414A, 422F, 423F, 424F, 429F, 433E; Tables 16

Vejovis waeringi Williams, 1970a: 397–400, 401, fig. 1, 2; Soleglad, 1973b: 359, tab. 4; Stahnke, 1974: 135.

Vaejovis waeringi: Díaz-Nájera, 1975: 7, 11; Williams, 1980: 55, 73, 74, fig. 53Q, 54K, 55C, 59, 76; Sissom, 1991a: 219; Kovařík, 1998: 148; Beutelspacher, 2000: 113, 137, 154, map 96; Sissom, 2000: 536, 37; Soleglad and Fet, 2003b: 9, 150, fig. B-1, 152, fig. B-2; Sissom and Hendrixson, 2005a: 128, tab. 6.2; McWest, 2009: 20, tab. 1, 55, 56, 63, figs. 185–189, 64, 65, 117.

Vaejovis confusus: Polis and Farley, 1979: 38; Polis and McCormick, 1986: 59, 61, 62, 64, 69, 71, fig. 2, 4–6 tab. 1–4, 6, 7, 9, 11; Polis and McCormick, 1986: 12, tab. 1; Polis, 1990: 7, tab. 1: Sissom, 1991b: 119, 220; Ross, 2009: 531–532.

Vaejovis flavus: Wolf, 2008: 68 (probable misidentification).

Hoffmannius waeringi: Soleglad and Fet, 2008: 4, 32, 33, fig. 51, 50, tab. 3, 62, fig. 183, 83, 82, 91.

TYPE MATERIAL: **MEXICO: Baja California:** Holotype ♂ (CAS, Type No. 10431), Oakie Landing, 43 km S Puertecitos, 12.vi.1968, S.C. Williams and M.A. Cazier. Paratypes: 179 ♂, 54 ♀ (CAS, including ♀ allotype), same data as holotype; 22 ♂, 7 ♀ (CAS), San Felipe; 15 ♂, 7♀ (CAS); Puertecitos, 2 ♀ (CAS), 4 mi W Rio Hardy Fishing Camp; 1 ♂, 1 ♂ (AMNH), Puertecitos, 44 km S, Oakies Landing, [30°21.033'N 114°38.333'W], 12.vi.1968, S.C. Williams and M. Cazier.

DIAGNOSIS: *Paravaejovis waeringi* is more closely related to *P. confusus*, *P. elucidatus*, **n. sp.**, *P. exploratus*, **n. sp.**, and *P. kino*, **n. sp.** with which forms a monophyletic group. These species may be distinguished from the other species in the genus by having elongated fingers such that trichobothria *ib–it* are in the medial third of the fixed finger, *ib* being at or close to PD6 and *it* between PD5 and PD6; carinae ventral submedian costate crenulated to finely granulated, setal combs on basitarsus I–III. *Paravaejovis waeringi* and *P. elucidatus* are similar in having relatively wide telson vesicle in males but differs from *P. elucidatus* and the other species by having the slenderest metasomal segment V in females. *Paravaejovis waeringi* is the species with the longest chelae among the mentioned species in females (table 16). Dorsal carinae of chelae: dorsal retrosubmedian accessory, dorsal media, dorsal prolateral, and prolateral median costate, moderate, and weakly crenular but predominantly smooth.

DESCRIPTION: This redescription supplements Williams' (1970a) original description and it is based on the material deposited in the collections mentioned in material examined.

Color and infuscation: Base color pale yellow straw. Median and lateral eyes intensely infuscate. Genital operculum and pectines pale yellowish to whitish. Aculeus base reddish, median and distal dark brownish.

Carapace: Carapace 1.13 times longer than posterior width. Anterior margin sublinear, with obsolete notch and with three pairs of minor macrosetae in ♂, in ♀ major macrosetae. Carapace shagreened, densely cover by minute and moderate granules. Median ocular tubercle moderately raised. Superciliary carinae moderate and moderately crenular, higher than median eyes. Position of median ocular tubercle on anterior half of carapace. Three pairs of lateral eyes, first two pairs same size and third pair smaller than first two pairs. Median eyes approximately three times the size of first lateral frontal pair. Anteromedian sulci deep with an anterior shallow

depression; posteromedian moderate on proximal half, medially broad, and deep distally; anterolateral moderate, posterolateral deep, posterior transverse vestigial to weak.

Sternum and coxal region: Sternum pentagonal equilateral with four pairs of setae, one distal, two median pairs and one pair on the lobes, surface matte, median notch deep. Coxal region matte in ♂, in ♀ smooth. Anterior margin of coxa II with few scatter minute granules, subbasally three oblique slit-like structures, adjacent to a moderate, scattered granular protuberance. Proximal margin of coxal endite II with a deep elongate depression each, median edge finely crenular. Coxa IV 2.41 times longer than coxa II.

Chelicerae: Dorsal surface smooth, subdistal margin of manus with one macrosetae; distal margin with costate and base of movable finger with vestigial crenulation. Serrula present on ventral distal half of movable finger, tines numbering 8

Pedipalps: Trichobothrial pattern Type C, orthobothriotaxic. Chela wider than patella, patella wider than femur. Femur: All intercarinal surfaces matted. Dorsal prolateral, dorsal retrolateral, and ventral prolateral complete strongly granular with conical rounded granules; retrolateral dorsosubmedian complete, expressed by three macrosetae and a row of crenatoserrate granules; retrolateral ventral vestigial expressed by row of scatter serrate granules; ventral prolateral vestigial expressed by a broad costae finely and irregularly crenatoserrate; ventral retrosubmedian vestigial expressed by few scatter proximal crenatoserrate granules; prolateral ventrosubmedian partial, expressed by two or three proximal enlarged spiniform tubercles followed by an irregular row of conical moderate and enlarged tubercles, subbasal and distal enlarged granules with a macroseta on top; prolateral ventral vestigial expressed by two proximal enlarged tubercles with a macroseta on top followed by three enlarged conical tubercles with a macroseta on base and few intersperse moderate conical granules.

Patella: All intercarinal surface matte. Dorsal prolateral and ventral prolateral moderately crenulate; dorsal retrolateral and ventral retrosubmedian vestigial, expressed by a moderate costae; retrolateral dorsosubmedian and retrolateral median vestigial, expressed by a vestigial irregular broad costa; ventral median vestigial, expressed by a strong proximal costa with irregular crenatoserrate granules; prolateral median on a vaulted projection, protruding moderately medially, complete expressed by row of moderate scatter conical granules ending by trichobothrium *i*, followed by gap of smooth surface, gently slanting towards subdistal end of dorsal prolateral carinae, proximal, median, and distal moderate granules with a minor macroseta on top in ♂, in ♀ major macrosetae; prolateral ventral obsolete expressed by three minor macrosetae on top in ♂, in ♀ major macrosetae, adjacent to ventral prolateral carinae.

Chela: Manus smooth and elongate in sexes (manus 1.45 times longer than fixed finger). Dorsal prolateral, dorsal median, prolateral median, moderately costate with fine minute granules; dorsal retrolateral, ventral prolateral, ventral median, ventral retrolateral, and dorsal submedian accessory weakly costate smooth in ♂, in ♀ absent. All other carinae obsolete. Trichobothrium *Db* positioned on dorsal retrolateral carina, subbasal on chelae; *Dt* positioned at mid manus.

Fingers: Fixed finger, PD = 6, MD rows = 6, RD = 6, proximal RD positioned by proximal half. All RD subpaired with corresponding PD. Movable finger, PD = 7, MD rows = 6, distal row bearing one minute granule, RD = 6, proximal RD positioned by mid finger. All RD subpaired with corresponding PD. Trichobothria *ib* and *it* positioned medially on fixed finger, *ib* positioned adjacent to PD6 and *it* between PD5 and PD6, adjacent to PD6 in ♂, in ♀ *ib* at the level and *it* between PD5 and PD6. Distal retrolateral denticles in both fingers moderately

enlarged claw-like. Fingers lacking scalloping, gap created when fingers closed strong, fingers fit unevenly in both sexes.

Legs: Basitarsi I–II prolateral ventral, retrolateral ventral carinae with complete rows of spinules; prolateral ventral in III and IV absent; retrolateral ventral in III complete, expressed by a scatter row of spinules, in IV absent; retrolateral dorsal in I–III complete expressed by a row of scatter spinules, in IV vestigial, expressed on distal third by a row of continues spinules; retrolateral median rows in I–IV vestigial expressed as few terminal spinules. Telotarsi I–IV with two pairs of ventrodistal spinules in I–IV. Setae: Prolateral ventral, 3:4:5:5; retrolateral ventral, 4:7:9:8, intersperse minor and major macrosetae in III; retrolateral dorsal, 3:3:3:3; dorsal, 4:4:4:4; retrolateral dorsal and dorsal series arranged in two independent rows, being dorsal median offset in I and IV in both sexes, retrolateral dorsal and dorsal series arranged in one sublinear row in II and III, All macrosetae in ♂ relatively shorter than in ♀.

Tergites: Pretergites and postergites dorsal submedian intercarinal surface matte, other surfaces shagreened; dorsal submedian and dorsal median carinae in tergites I–VI moderate, expressed on distal half by few moderate granules. Tergite VII intercarinal surface shagreened with dense minute granule and moderate scatter granules; dorsal median carina moderately costate with few enlarge rounded granules, expressed on proximal half of the postergite; dorsal submedian vestigial expressed as a pair of proximal short row of conical granules; dorsal lateral and lateral supramedian comparatively stronger and complete with elongate subserrate granules; dorsal lateral carinae projecting weakly and curving with scattered granules laterally approximating to lateral supramedian proximal margin, creating a semi horseshoe of moderate and subserrated granules.

Genital operculum: Male genital operculum: wider than long, with three pairs of macrosetae. Sclerites free on longitudinal edge moving independently but unable to open more than 45°. Genital papillae protruding posteriorly. Female genital operculum: Wider than long, with three macrosetae. Sclerites fuse longitudinal.

Sternites: Sternites I–VII acarinated matte in ♂, in ♀ finely punctuated, and lustrous. Distomedian glandular spot in V and VII weak not protruding from adjacent surfaces and weakly contrasting with slightly darker base color, in ♂, in ♀ obsolete. Sternite VII with ventral lateral carinae vestigial strong, finely crenatoserrate with two macrosetae; other carinae obsolete expressed by macrosetae, all macrosetae minor in ♂, in ♀ major. Spiracle elongated, slit-like, approximately two times longer than wide.

Pectines: Basal piece with median notch deep, with three pairs of macrosetae. Marginal lamella consist of three sclerites, medial lamella proximally fuse distally progressively forming a conspicuous rows with 6–10 beads. Fulcra with 14–17 in ♂, in ♀ 11–15 beads. Pectinal tooth numbering 15–18 in ♂, in ♀ 12–16. Pectines relatively short, with second sclerite of marginal lamella at the level of distal margin of coxa IV in ♂, in ♀ total length of marginal lamella slightly shorter than distal margin of coxa IV.

Hemispermatophore: Hemimating plug developed from the inner lobe, distal barb margin with 13 spinules. Dorsal through margin long, tapering distally but almost a broad as capsule proximally, curving proximally. Primary and secondary hook positioned on the apex of lateral margin extension of the lamina (flange), completely fused unable to distinguish them. The sole hook, sharp and strongly curved towards the dorsal trough. Lamina 1.38 longer than trunk. Median lobe ental terminus moderate and rounded. Basal plate of inner lobe removed from ventral trough, spine of inner lobe short. Neck shorter than basal plate (0.5). Measurements,

lamina, 3.33; trunk, 2.40; dorsal trough/laminar hooks, 1.00; ventral trough/laminar hook, 0.66; inner lobe (mating plug) neck, 0.33; basal plate, 0.66.

Metasoma: Intercarinal surfaces matte. Carinae: Dorsal lateral and lateral median carinae in I–IV strongly crenatoserrated terminating in moderate enlarge spinoid granules pointing backwards; except lateral median in IV distal terminus moderately expanded laterally forming a triangular projection; dorsal lateral in V strong and serrated proximally, becoming granular medially with a field of granules becoming moniliform distally, ending on at moderate tubercle. Lateral inframedian in I complete moderately crenatoserrated; in II partial moderately crenatoserrated, becoming weaker proximally, present on distal half; in III partial with moderate crenatoserrate granules, becoming weaker proximally, present on distal third; in IV absent, in V partial with a moderate row of crenatoserrate granules, becoming weaker distally, present in proximal half; ventral lateral in I–IV finely crenatoserrate, ventral submedian in I–III costate smooth to minutely crenatoserrate, in IV weakly costate and weakly crenatoserrate; ventral lateral and ventral median in V strongly crenatoserrate. Setae: Dorsal lateral, 0:1:1:3:5; lateral median, 0:2:2:4; lateral inframedian, 1:0:0:0:3; ventral lateral, 2:2:2:3:9; ventral submedian, 3:3:3:3:2; ventral sublateral, 2; in ♀ all macrosetae major in ♂ all macrosetae minor or reduced to microsetae,

Telson: Dorsal surface smooth, ventral and lateral carinae moderate and irregular, crenulations weakening distally disappearing at the base of the aculeus. Ventral surface with 5–6 macrosetae in each carina. Ventral median carinae with moderate to weak subaculear tubercle. Microserration on laterobasal aculeus numbering 4–7.

DISTRIBUTION: *Paravaejovis waeringi* is endemic to northeastern limit of the Sonoran Desert, includes the Altar Desert in Sonora, the delta of the Colorado River in Baja California, Mexico and the Colorado Desert in California and Arizona, U.S.A.

ECOLOGY: *Paravaejovis waeringi* is a psammophilous species, found commonly in sand dunes. This species constructs burrows in open and scarcely vegetated areas of creosote and similar scrublands. It prefers loose sandy soils at altitudes from sea level to 750 m. Polis and McCormick (1986) studied the patterns of resource use and age structure of an assemblage of five species of scorpions on the northern limit of the Colorado Desert. The authors reported *Vaejovis confusus* among the species, but it is likely that they in fact studied populations of *Paravaejovis waeringi*, judging by the location. They found that *P. waeringi* is one of the less common species on the surface and that its activity has two peaks, coinciding with the end of the peak of the largest scorpions in the community, *Smeringurus mesaensis* Stahnke and *Hadrurus arizonensis* Stahnke. They also concluded that *H. arizonensis* and *P. waeringi* overlap in their habitat but consume different prey.

REMARKS: Williams (1970a) described *Vejovis waeringi* and *Vejovis coloradensis* from the upper sandy deserts of the Gulf of Baja California and the Colorado Desert, correspondingly. Subsequently, Williams (1980) proposed the synonym of these species. The results of the phylogenetic analyses conducted here showed significant differences, it seems that the population in the Colorado Desert, may be different from the population in the Colorado Delta. However, the morphology of these populations cannot be satisfactorily separated. Thus, I accept the synonymy proposed by Williams.

MATERIAL EXAMINED: **MEXICO: Baja California:** *Municipio de Ensenada*: Puertecitos, [30°21.0333'N 114°38.333'W], 13.iii.1968, J. Pinter, 2 ♂ (CAS); Puertecitos, 15 m,

11.vi.1968, S.C. Williams and M. Cazier, 2 ♂, 1 ♀ (CAS); Puertecitos, 44 km S, 12.vi.1968, W.K. Fox, 1 ♂, 1 juv. (AMNH); Punta Bufeo, ca. 2 km S, 29°54.150'N 114°26.80'W, 2 m, 14.vii.2005, E. González, W.E. Savary, L. Prendini, and R. Mercurio, collected at night with UV light, 1 ♂ (AMNH [LP 4424]). *Municipio de Mexicali*: Guadalupe Canyon, 32°11.781'N 115°42.683'W, 62 m, 14.vii.2005, E. González and L. Prendini, burrow excavation by day, 1 juv. (AMNH [LP 4420]); NW Laguna Salada, S of Route 2, 32°34.51'N 115°44.60'W, 11 m, 16.v.2004, R. Mercurio, M. Nishiguchi et al., collected at night with UV light, 1 ♂, 1 ♀, 2 juv. (AMNH [LP 3478]); San Felipe, [31°1.6500'N 114°50.11666'W], 14.iv.1968, J. Pinter, 6 ex. (CAS); San Felipe, 11 km S, 30°57.3120'N 114°47.7336'W, 11 m, 15.vii.2005, E. González, W.E. Savary, L. Prendini, and R. Mercurio, sand dunes, on sand, collected at night with UV light, 1 ♀ (AMNH [ARA1498]), 1 ♀ (IBUNAM [ARA2064]); San Felipe, sand dunes, 11 km S, 30°57.312'N 114°47.734'W, 11 m, 15.vii.2005, E. González, W.E. Savary, L. Prendini, and R. Mercurio, collected at night with UV light, 1 ♀, 1 juv. (AMNH [LP 4431]). **Sonora:** *Municipio de Plutarco Elías Calles*: S end Sonoyta River near Gulf, [31°46.20'N 113°29.4'W], 26.xi.1959, V. Roth, 2 ♀♀ subad. (AMNH). *Municipio de Puerto Peñasco*: Reserva de la Biosfera and Parque Nacional El Pinacate: Microwave station Cerro Lava, past first gate on road to antennas, 32°2.0958'N 113°34.2558'W, 266 m, 28.vi.2005, R. Mercurio and E. González, desert, cliff slope, collected at night with UV light, 1 ♂ (AMNH [ARA1440]); Sonoyta, 48 km S, [32°6.1746'N 113°47.1048'W], 152 m, 31.iii.1949, G.M. Bradt, 1 ♀ (AMNH); Bahía Cholla, near Puerto Peñasco, [31°19'5.04"N 113°32'12.07"W], 0 m, 16.i.1971, S.C. Williams, 1 ♀ (IBUNAM); SW Sonoyta in bottom of Crater Elegante, [31°46.20'N 113°29.4'W], 28.xi.1959, 2 ♀ subad. (AMNH); Sonoyta, 95 km NW off Route 2, W microwave station Cerro Lava, 32°6.1746'N 113°47.1048'W, 273 m, 28.vi.2005, R. Mercurio and E. González, collected at night

with UV light, 1 ♂ (AMNH [ARA1439]); Sand dunes off road to Microondas Cerro Lava, 32°02.908'N 113°33.378'W, 230 m, 28.vi.2005, E. González and R. Mercurio, collected at night with UV light, 2 ♂ (AMNH [LP 4433]). *Municipio de San Luis Río Colorado*: Microwave station Cerro Prieto, 5 km NW, Reserva de la Biosfera and Parque Nacional El Pinacate, 32°14.0106'N 114°4.0368'W, 256 m, 27.vi.2005, R. Mercurio and E. González, desert, collected at night with UV light, 3 ♂, 1 ♀ (AMNH [ARA3019]); Route 2, between San Luis Río Colorado and Microondas El Desierto, S side behind llantera, 32°24.264'N 114°31.415'W, 64 m, 27.vi.2005, R. Mercurio and E. González, collected at night with UV light, 1 subad. ♂ (AMNH [LP 4439]). **U.S.A.: Arizona:** *Yuma Co.*: Muggins Mountains, [32°44.70283'N 114°12.19633'W], iv.1958, V. Roth, 1 juv. (AMNH); Palm Canyon, Kofa Mountains, [33°21.636'N 114°5.9118'W], 25.iv.1960, W.J. Gertsch, 1 ♂ (AMNH); Yuma, 32°40'30.40"N 114°35'51.05"W, 64 m, 1.iii.2008, 1 ♂, 1 juv. (AMNH [LP 8337]). **California:** *Imperial Co.*: Algodones Dunes, along Grays Wells Road, S of Interstate Hwy 8, W of Imperial Sand Dunes Recreation Area, 32°44.1756'N 114°53.43'W, 50 m, 31.viii.2005, R. Mercurio and L. Prendini, sand dunes, on sand, collected at night with UV light, 1 ♀ (AMNH [ARA1499]); Algodones Dunes, Route 80, [32°41.06667'N 114°46.1166'W], 3.vi.1970, M. Cazier et al., 1 ♂, 1 juv. (AMNH). *Riverside Co.*: Berdoo Canyon, off Dillon Road, 33°48'56.8"N 116°10'17.0"W, 303 m, 17.viii.2004, M. McCoy, W.E. Savary, R. Mercurio, and K. Bamba, 3 ♂ (AMNH [LP 3223]); Cottonwood Spring, 33°44.1840'N 115°48.58'W], 6.viii.1971, C.A. and W.E. Triplehorn, 1 subad. ♀ (OSAL); Desert Center, 36 km N/NE, on SR–177, Desert Center Road, 33°59'26.69"N 115°14'24.53"W, 300 m, 4.viii.2008, W.E. Savary and Z.J. Valois, 1 ♀(AMNH); Desert Center, 45 km NNE, on SR–62, Desert Center Rice Road, N side of road, 34°03'16.54"N 115°12'27.55"W, 445 m, 4.viii.2008, Z.J. Valois and W.E. Savary, flat, open, creosote scrub,

hard packed sand with small patches of loose windblown sand, 1 juv. (AMNH [LP 8869]); Indio, 1.5 km N, [33°43.20'N 116°13.9166'W], 13.x.1978, B. Anderson and R. Stewent, 1 ♂, 1 juv. (AMNH); Intersection of Dillon Road and Landfill Road, 33°44'06.3"N 116°09'53.5"W, 16 m, 12.ix.2007, L. Prendini and J. Huff, Mohave desert, sparse gravel plain, shrub-coppice dunes against hillside, very degraded, 1 juv. (AMNH [LP 7119]); Palm Springs, 12 km NW, S of 111, 2 km E of Snow Creek Road, 33°54'35.5"N 116°39'15.0"W, 345 m, 18.viii.2004, M. McCoy, W.E. Savary, R. Mercurio, and K. Bamba, 2 ♂ (AMNH [LP 3222]); Pinyon Wells, 33°53.7480'N 116°5.68'W], 16.v.1973, F.J. Moore and R.L. Berry, 1 ♀, 1 subad. ♀ (OSAL); San Bernardino Mountains, Berdoo Canyon Road, 8 km NE on Berdoo junction, 33°49'39.27"N 116°09'4.26"W, 509 m, 3.viii.2008, W.E. Savary and Z.J. Valois, 1 juv. (AMNH). *San Bernardino Co.*: Park Moabi Road, 10 km from intersection with I-40, 34°42'35.7"N 114°30'59.7"W, 231 m, 9.ix.2007, L. Prendini and J. Huff, collected at night with UV light, 2 ♂, 1 ♀, 1 subad. ♀, 1 juv. (AMNH [ARA3121]), 2 ♂, 1 subad. ♀, 2 juv. (IBUNAM [ARA2376]); Park Moabi Road, 9.7 km from intersection with I-40, 34°42'35.7"N 114°30'59.7"W, 231 m, 9.ix.2007, L. Prendini and J. Huff, steep rocky mountain slopes and in ravine, 1 juv. (AMNH [LP 7197]); Twentynine Palms, 63 km E on Hwy 62, 34°05'35.6"N 115°24'29.1"W, 510 m, 11.ix.2007, L. Prendini and J. Huff, Mohave desert, granite outcrops and low granitic hills on N side of Hwy, coarse, granitic sandy-loam soil, 2 juv. (AMNH [LP 7222]). *San Diego Co.*: Borrego Springs, [33°14.8333'N 116°22.31666667'W], 14.vii.1999, M.E. Soleglad, 1 ♀ (AMNH [LP 1688]); San Felipe Valley, N of SR-78, SR-2 junction, just W of W entry into Anza Borrego State Park, 33°05'55.28"N 116°28'16.10"W, 689 m, 1.viii.2008, Z.J. Valois and W.E. Savary, rocky, talus slopes to hard packed substrate flats, typical Colorado desert, 2 ♂♂, 1 ♀ (AMNH [LP 8905]); San Felipe Valley, N side of SR-78, just W of W entry into Anza Borrego State

Park, 33°06'1.93"N 116°27'34.38"W, 684 m, 1.viii.2008, W.E. Savary and Z.J. Valois, 4 ♂, 2 subad. ♀ (AMNH).

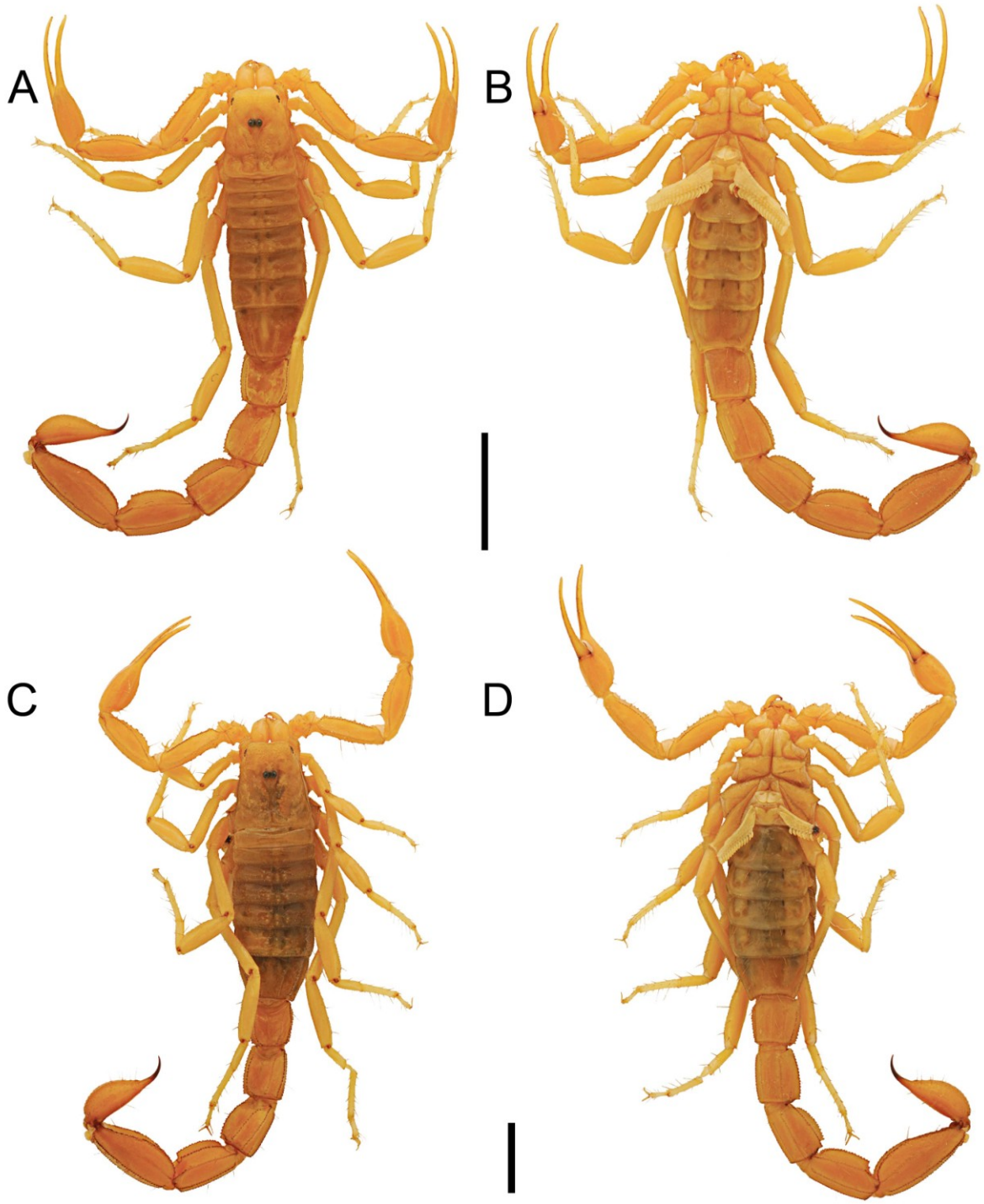


Figure 405. *Paravaejovis waeringi* (Williams, 1970), habitus. **A**, **B**. ♂ (AMNH). **C**, **D**. ♀ (AMNH). **A**, **C**. Dorsal aspect. **B**, **D**. Ventral aspect. Scale bars = 5 mm.

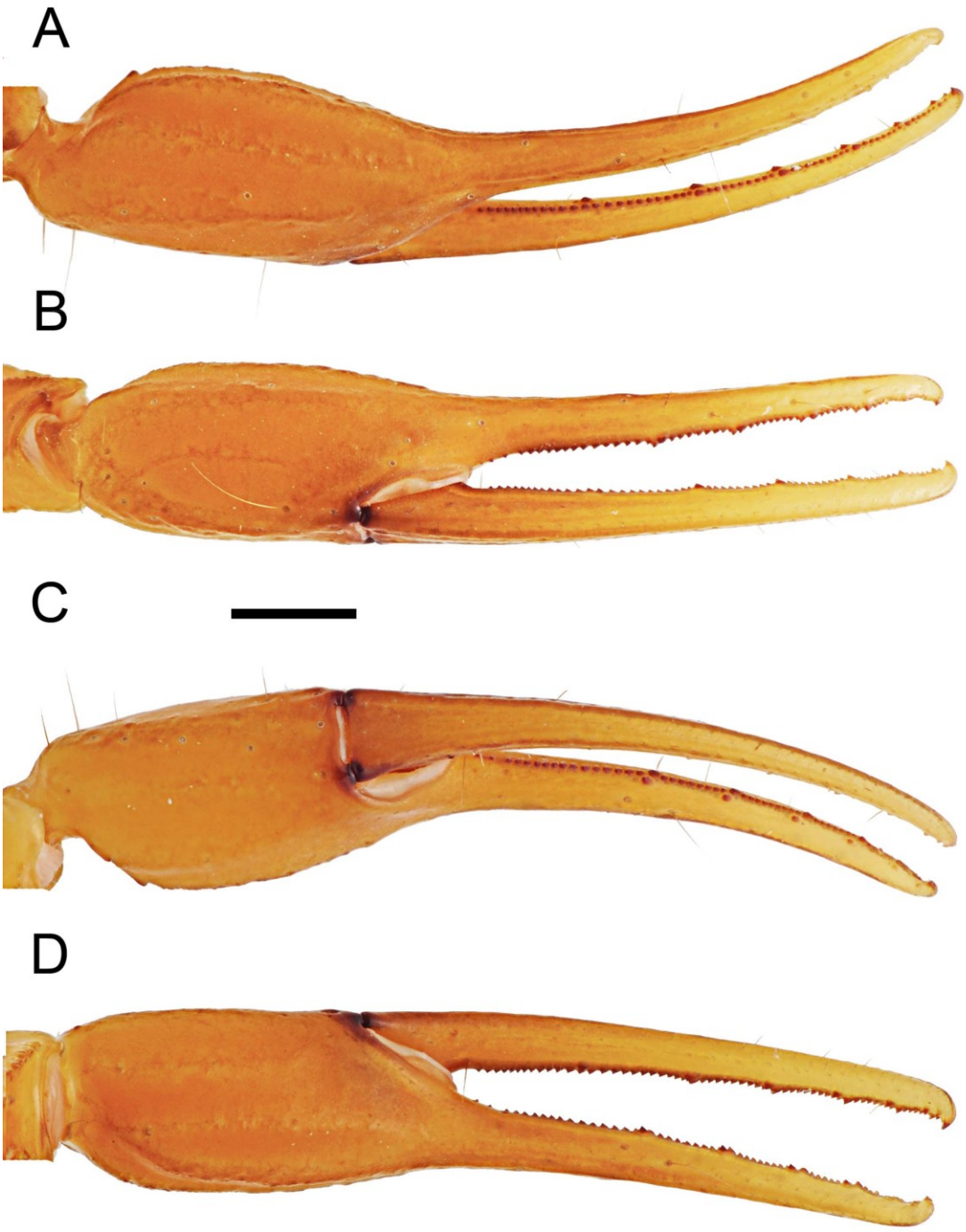


Figure 406. *Paravaejovis waeringi* (Williams, 1970), ♂ (AMNH), dextral pedipalp chela. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

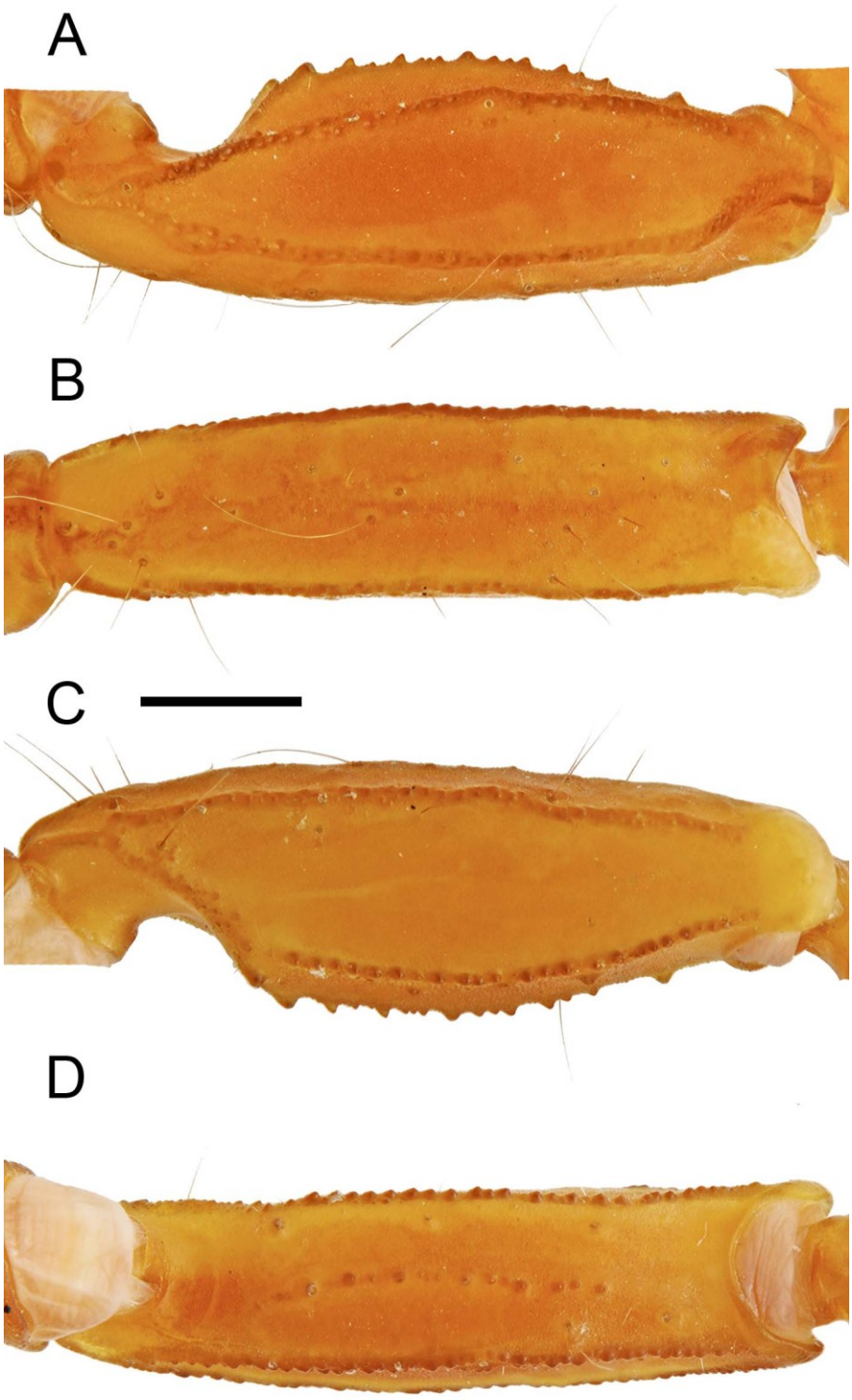


Figure 407. *Paravaejovis waeringi* (Williams, 1970), ♂ (AMNH), dextral pedipalp patella. **A**. Dorsal aspect. **B**. Retrolateral aspect. **C**. Ventral aspect. **D**. Prolateral aspect. Scale bar = 1 mm.

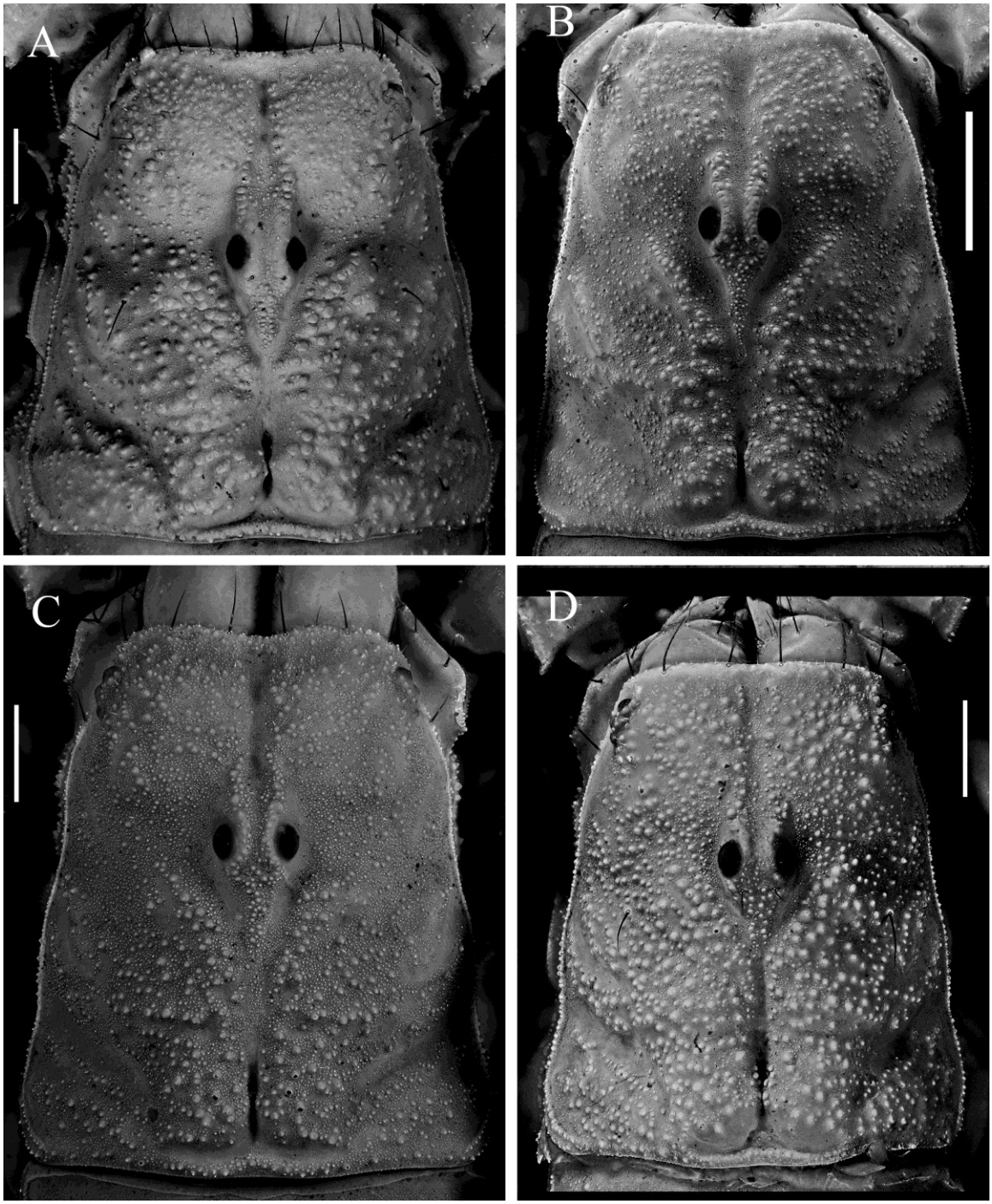


Figure 408. *Paravaejovis* Williams, 1980, carapace dorsal aspect. **A**. *Paravaejovis cochimi*, **n. sp.**, paratype ♂ (AMNH). **B**. *Paravaejovis waeringi* (Williams, 1970), ♂ (AMNH). **C**. *Paravaejovis confusus* (Stahnke, 1940), ♂ (AMNH). **D**. *Paravaejovis diazi* (Williams, 1970), paratype ♂ (AMNH). Scale bars = 1 mm.

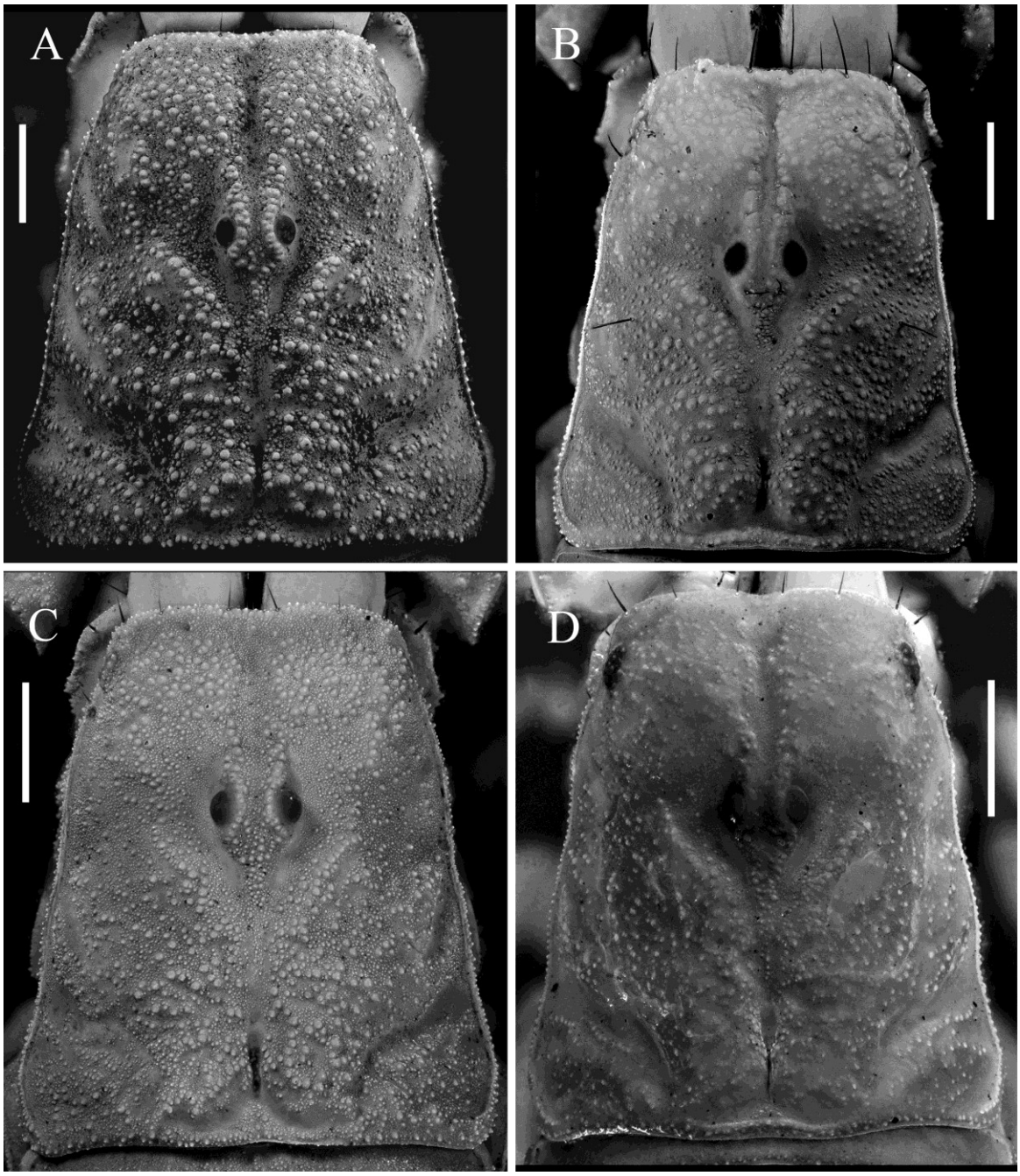


Figure 409. *Paravaejovis* Williams, 1980, carapace dorsal aspect. **A**. *Paravaejovis elucidatus*, **n. sp.**, paratype ♂ (AMNH). **B**. *Paravaejovis eusthenura* (Wood, 1863), ♂ (AMNH). **C**. *Paravaejovis exploratus,* **n. sp.**, paratype ♂ (AMNH). **D**. *Paravaejovis galbus* (Williams, 1970), holotype ♂ (CAS). Scale bars = 1 mm.

Figure 410. *Paravaejovis* Williams, 1980, carapace dorsal aspect. **A**. *Paravaejovis gravicaudus* (Williams, 1970), paratype ♂ (AMNH). **B**. *Paravaejovis nigroguerreroensis*, **n. sp.**, holotype ♂ (AMNH). **C**. *Paravaejovis hoffmanni* (Williams, 1970), paratype ♂ (AMNH). **D**. *Paravaejovis kino*, **n. sp.**, paratype ♂ (AMNH). Scale bars = 1 mm.

Figure 411. *Paravaejovis* Williams, 1980, carapace dorsal aspect. **A**. *Paravaejovis pumilis* (Williams, 1970), ♂ (AMNH). **B**. *Paravaejovis puritanus* (Gertsch, 1958), ♂ (AMNH). **C**. *Paravaejovis schwenkmeyeri* (Williams, 1970), ♂ (AMNH). **D**. *Paravaejovis spinigerus* (Wood, 1863), ♂ (AMNH). Scale bars = 1 mm.

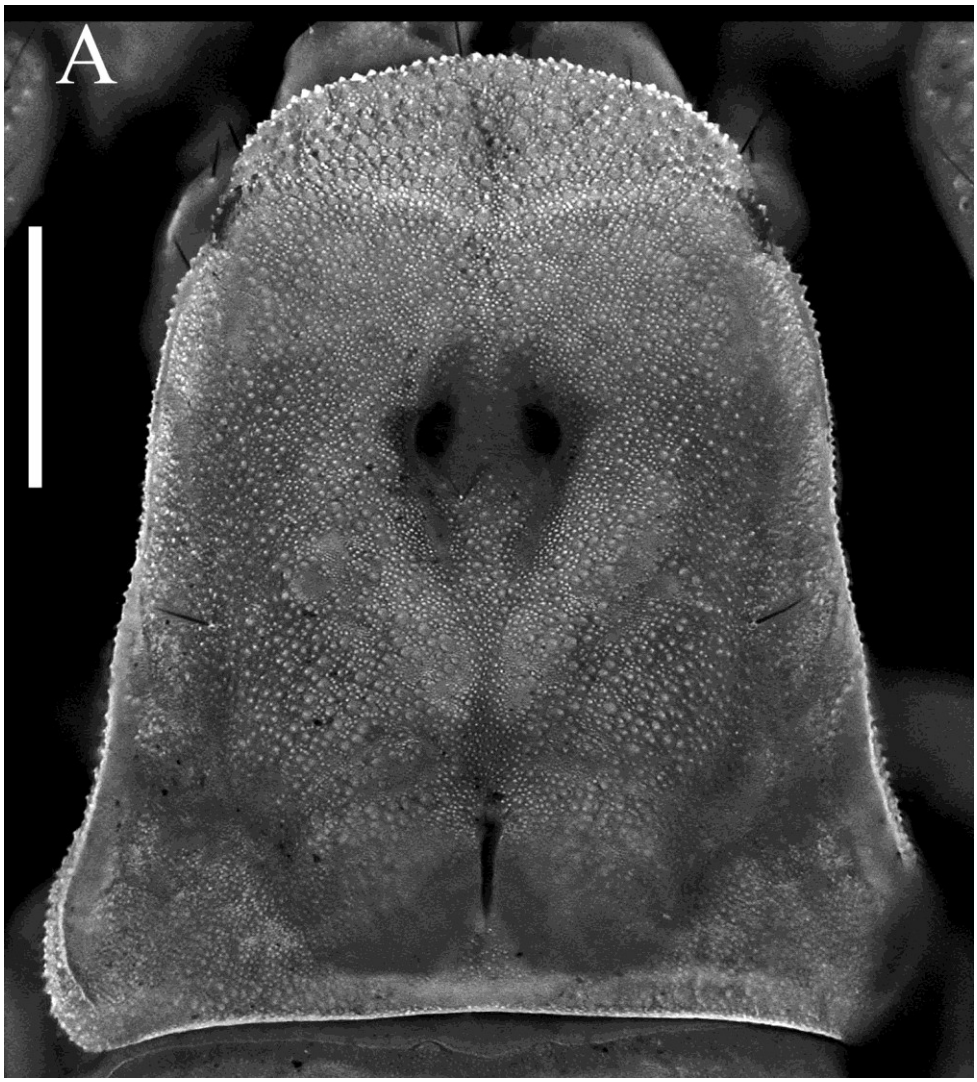


Figure 412. *Paravaejovis voluptatis*, **n. sp.**, paratype ♂ (AMNH), carapace dorsal aspect. Scale bars = 1 mm.

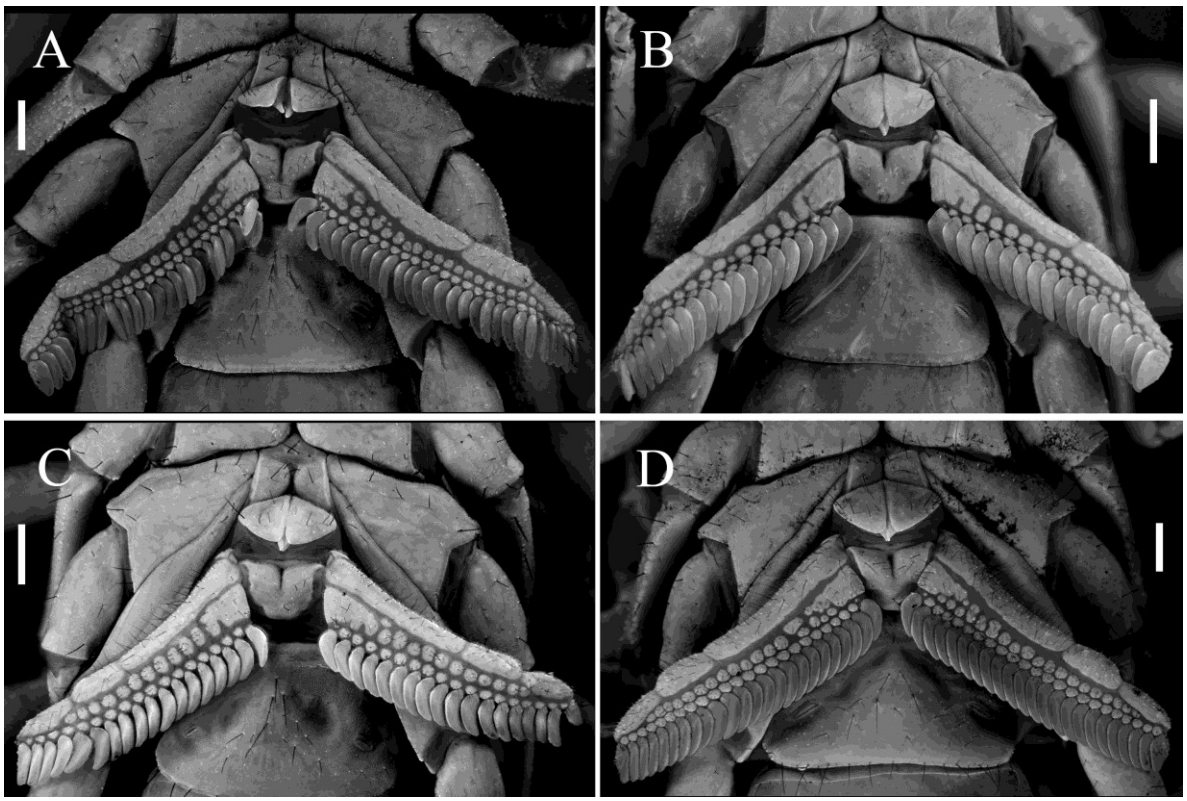


Figure 413. *Paravaejovis* Williams, 1980, sternum, genital operculum and pectines, ventral aspect. **A**. *Paravaejovis cochimi*, **n. sp.**, paratype ♂ (AMNH). **B**. *Paravaejovis confusus* (Stahnke, 1940), ♂ (AMNH). **C**. *Paravaejovis schwenkmeyeri* (Williams, 1970), ♂ (AMNH). **D**. *Paravaejovis spinigerus* (Wood, 1863), ♂ (AMNH). Scale bars = 1 mm.

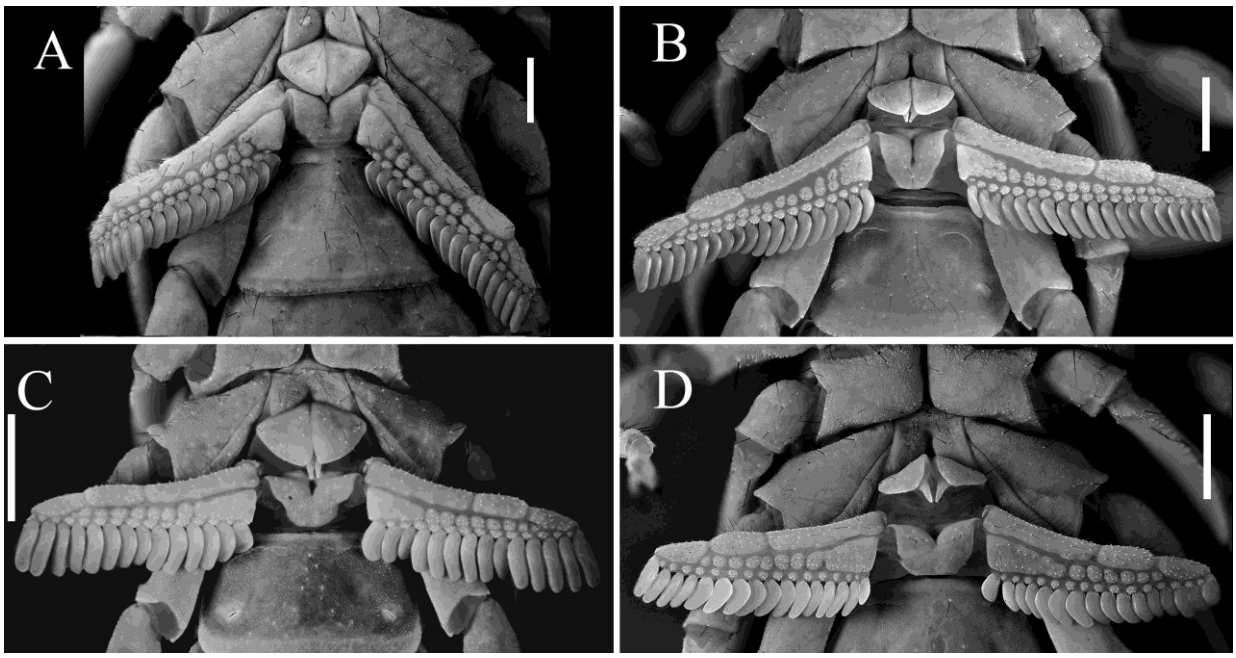


Figure 414. *Paravaejovis* Williams, 1980, sternum, genital operculum and pectines, ventral aspect. **A**. *Paravaejovis waeringi* (Williams, 1970), ♂ (AMNH). **B**. *Paravaejovis hoffmanni* (Williams, 1970), paratype ♂ (AMNH). **C**. *Paravaejovis pumilis* (Williams, 1970), ♂ (AMNH). **D**. *Paravaejovis voluptatis*, **n. sp.**, paratype ♂ (AMNH). Scale bars = 1 mm.

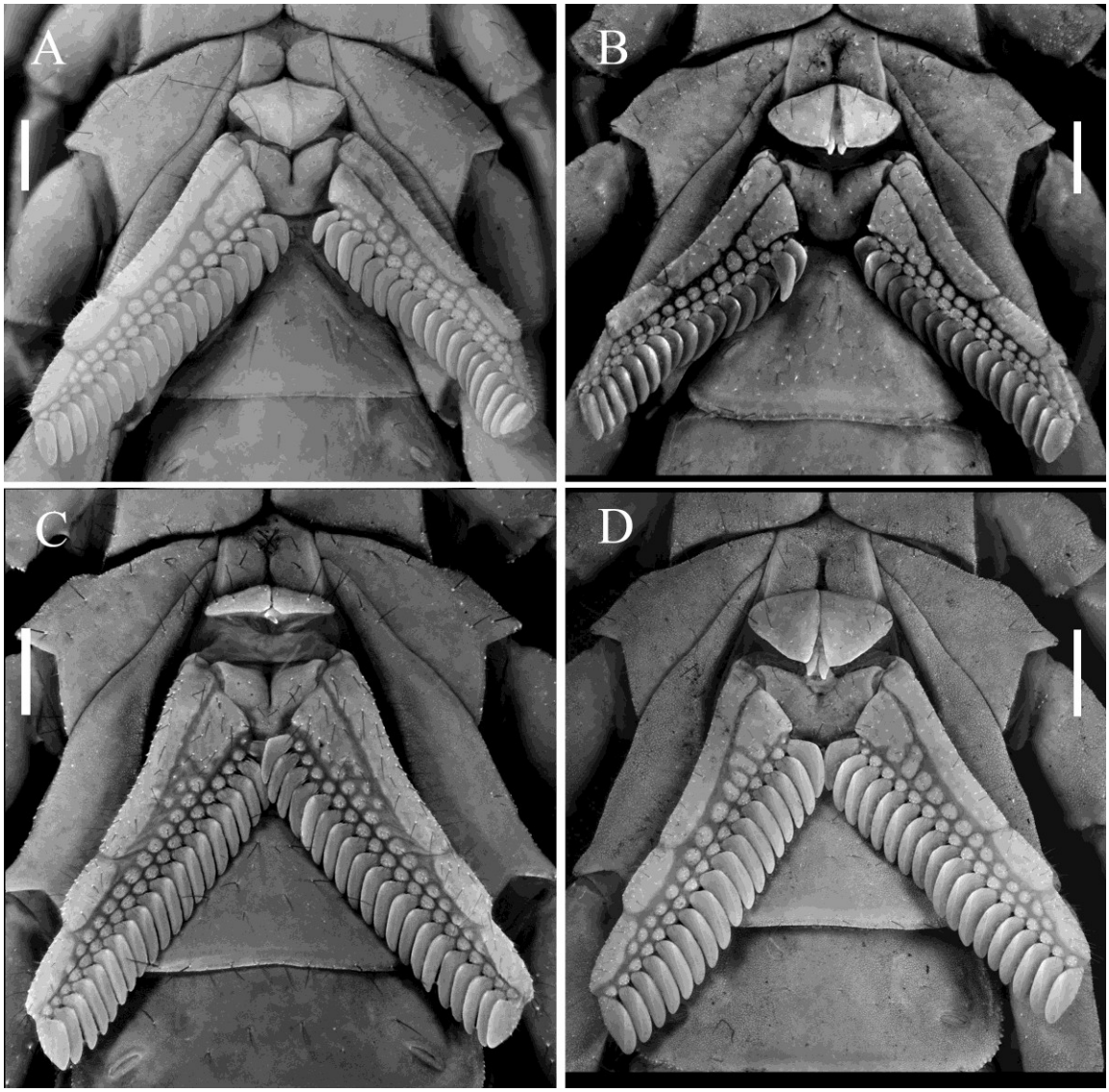


Figure 415. *Paravaejovis* Williams, 1980, sternum, genital operculum and pectines, ventral aspect. **A**. *Paravaejovis diazi* (Williams, 1970), paratype ♂ (AMNH). **B**. *Paravaejovis elucidatus*, **n. sp.**, paratype ♂ (AMNH). **C**. *Paravaejovis eusthenura* (Wood, 1863), ♂ (AMNH). **D**. *Paravaejovis exploratus,* **n. sp.**, paratype ♂ (AMNH). Scale bars = 1 mm.

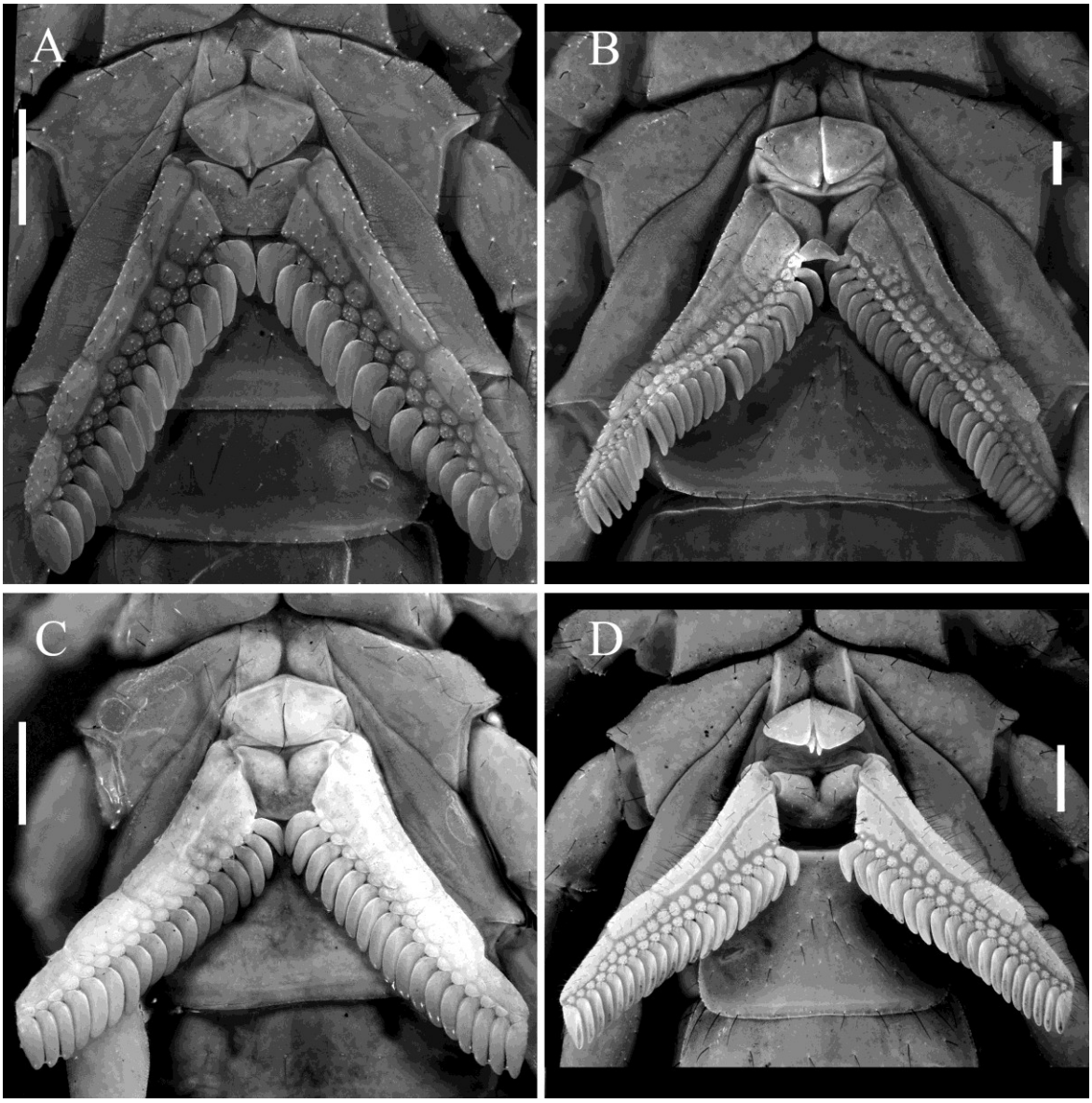


Figure 416. *Paravaejovis* Williams, 1980, sternum, genital operculum and pectines, ventral aspect. **A**. *Paravaejovis nigroguerreroensis*, **n. sp.**, paratype ♂ (AMNH). **B**. *Paravaejovis gravicaudus* (Williams, 1970), paratype ♂ (AMNH). **C**. *Paravaejovis galbus* (Williams, 1970), holotype ♂ (CAS). **D**. *Paravaejovis puritanus* (Gertsch, 1958), ♂ (AMNH). Scale bars = 1 mm.

Figure 417. *Paravaejovis kino*, **n. sp.**, paratype ♂ (AMNH) sternum, genital operculum and pectines, ventral aspect. Scale bars = 1 mm.

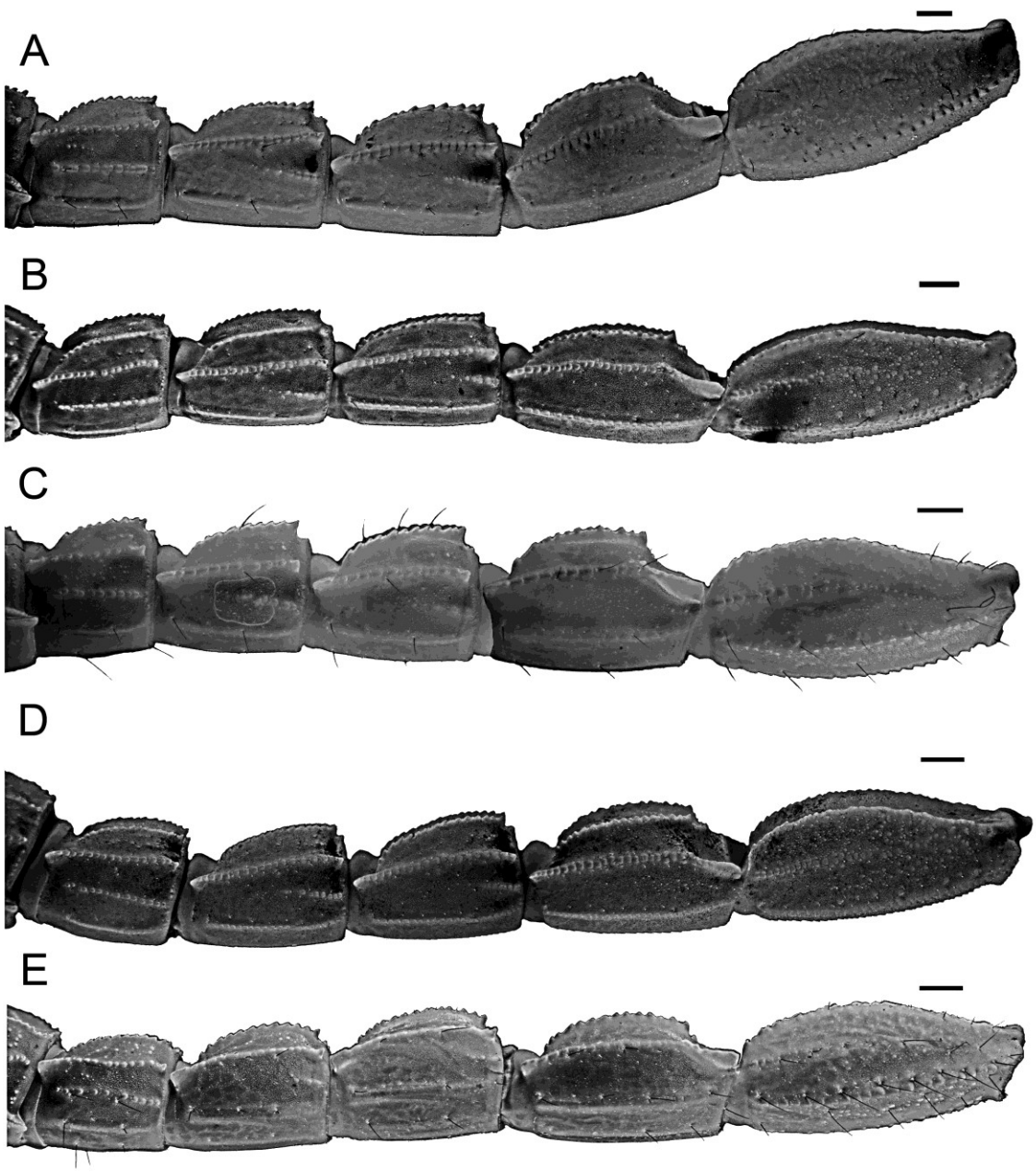


Figure 418. *Paravaejovis* Williams, 1980, metasomal segments I–V, lateral aspect. **A**. *Paravaejovis cochimi*, **n. sp.**, paratype ♂ (AMNH). **B**. *Paravaejovis confusus* (Stahnke, 1940), ♂ (AMNH). **C**. *Paravaejovis diazi* (Williams, 1970), paratype ♂ (AMNH). **D**. *Paravaejovis elucidatus*, **n. sp.**, paratype ♂ (AMNH). **E**. *Paravaejovis eusthenura* (Wood, 1863), ♂ (AMNH). Scale bars = 1 mm.

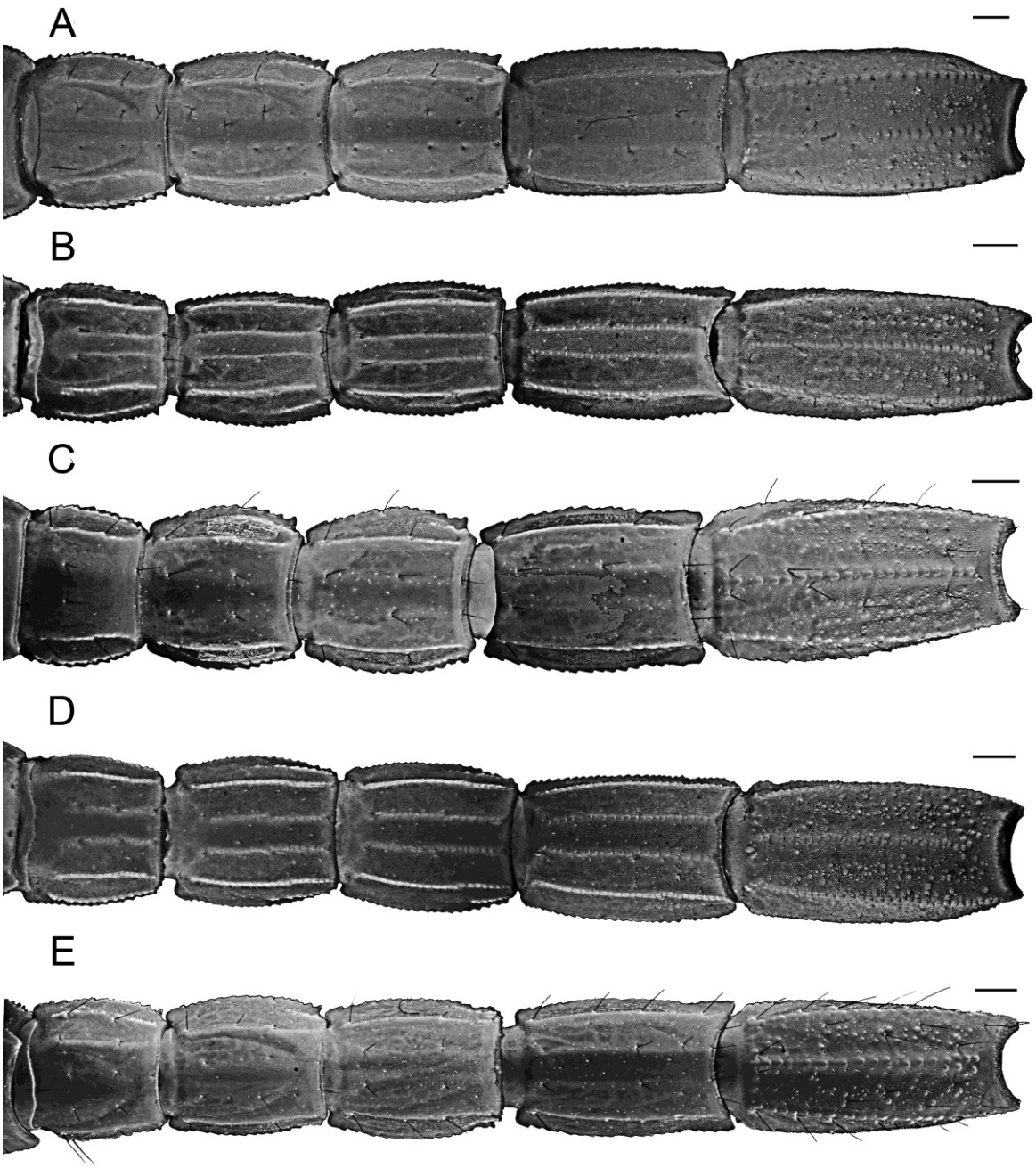


Figure 419. *Paravaejovis* Williams, 1980, metasomal segments I–V, ventral aspect. **A**. *Paravaejovis cochimi*, **n. sp.**, paratype ♂ (AMNH). **B**. *Paravaejovis confusus* (Stahnke, 1940), ♂ (AMNH). **C**. *Paravaejovis diazi* (Williams, 1970), paratype ♂ (AMNH). **D**. *Paravaejovis elucidatus*, **n. sp.**, paratype ♂ (AMNH). **E**. *Paravaejovis eusthenura* (Wood, 1863), ♂ (AMNH). Scale bars = 1 mm.

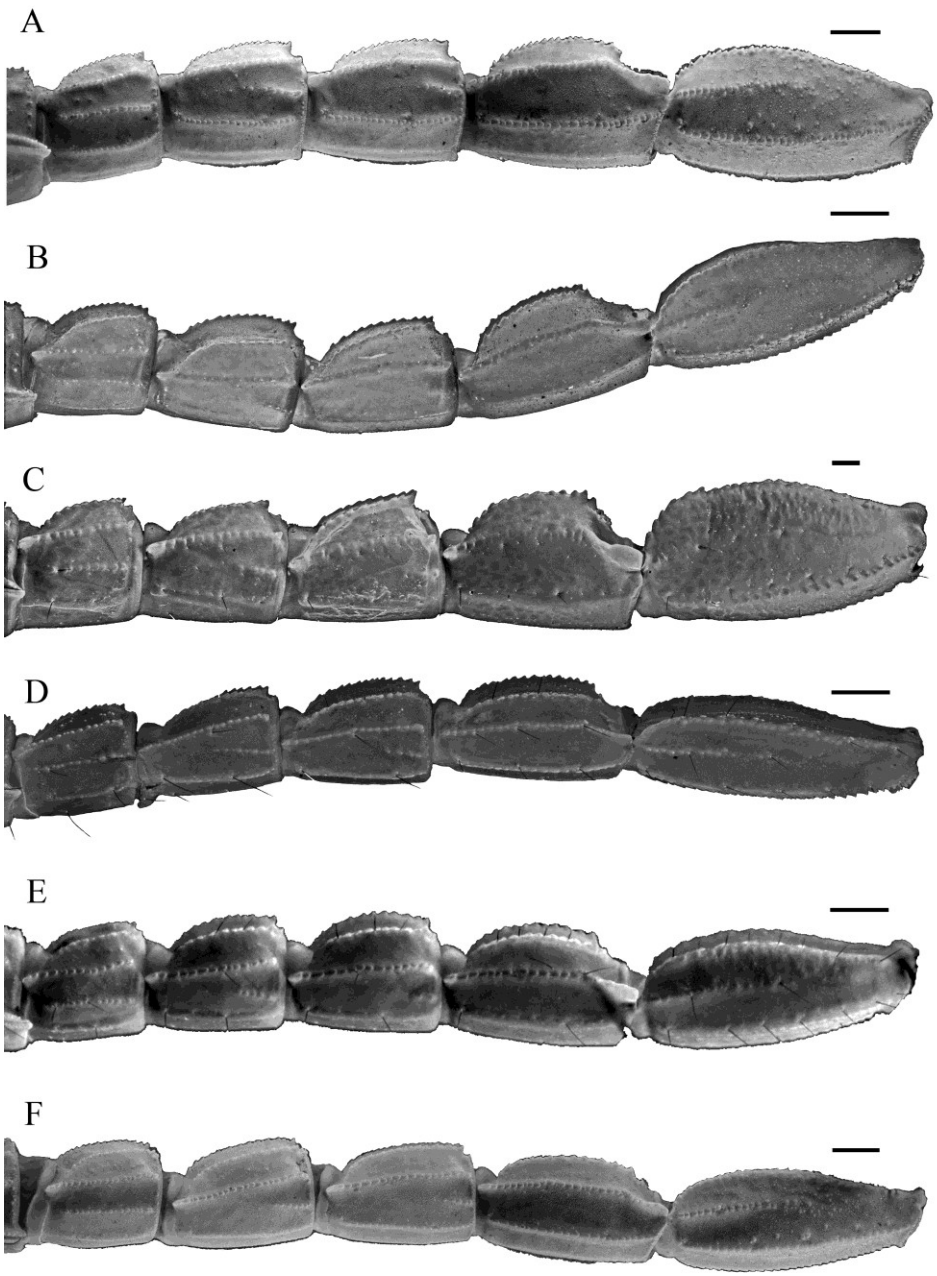


Figure 420. *Paravaejovis* Williams, 1980, metasomal segments I–V, lateral aspect. **A**. *Paravaejovis exploratus*, **n. sp.**, paratype ♂ (AMNH). **B**. *Paravaejovis galbus* (Williams, 1970), holotype ♂ (CAS). **C**. *Paravaejovis gravicaudus* (Williams, 1970), ♂ (AMNH). **D**. *Paravaejovis nigroguerreroensis*, **n. sp.**, holotype ♂ (AMNH). **E**. *Paravaejovis hoffmanni* (Williams, 1970), ♂ (AMNH). **F**. *Paravaejovis kino*, **n. sp.**, paratype ♂ (AMNH). Scale bars = 1 mm.

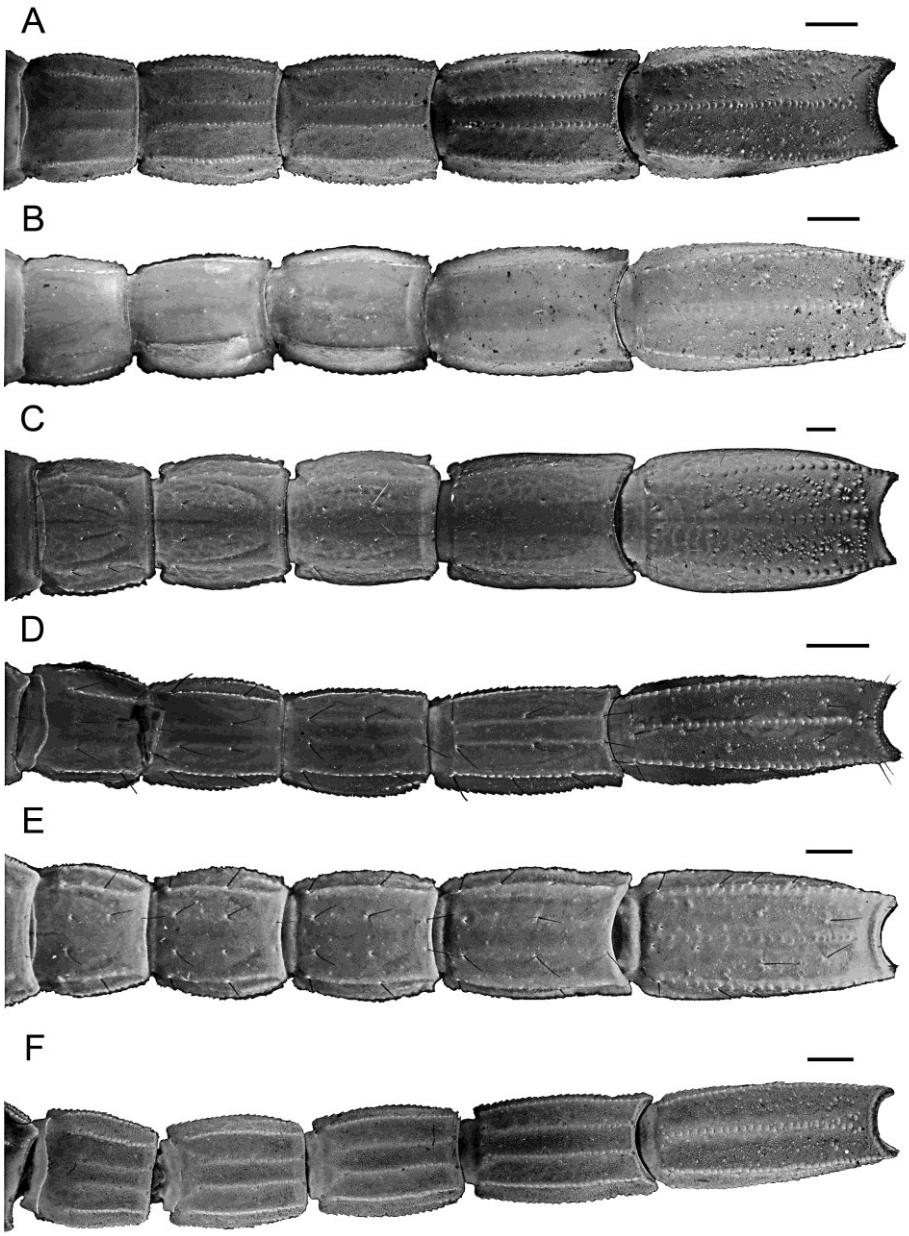


Figure 421. *Paravaejovis* Williams, 1980, metasomal segments I–V, ventral aspect. **A**. *Paravaejovis exploratus*, **n. sp.**, paratype ♂ (AMNH). **B**. *Paravaejovis galbus* (Williams, 1970), holotype ♂ (CAS). **C**. *Paravaejovis gravicaudus* (Williams, 1970), ♂ (AMNH). **D**. *Paravaejovis nigroguerreroensis*, **n. sp.**, holotype ♂ (AMNH). **E**. *Paravaejovis hoffmanni* (Williams, 1970), ♂ (AMNH). **F**. *Paravaejovis kino*, **n. sp.**, paratype ♂ (AMNH). Scale bars = 1 mm.

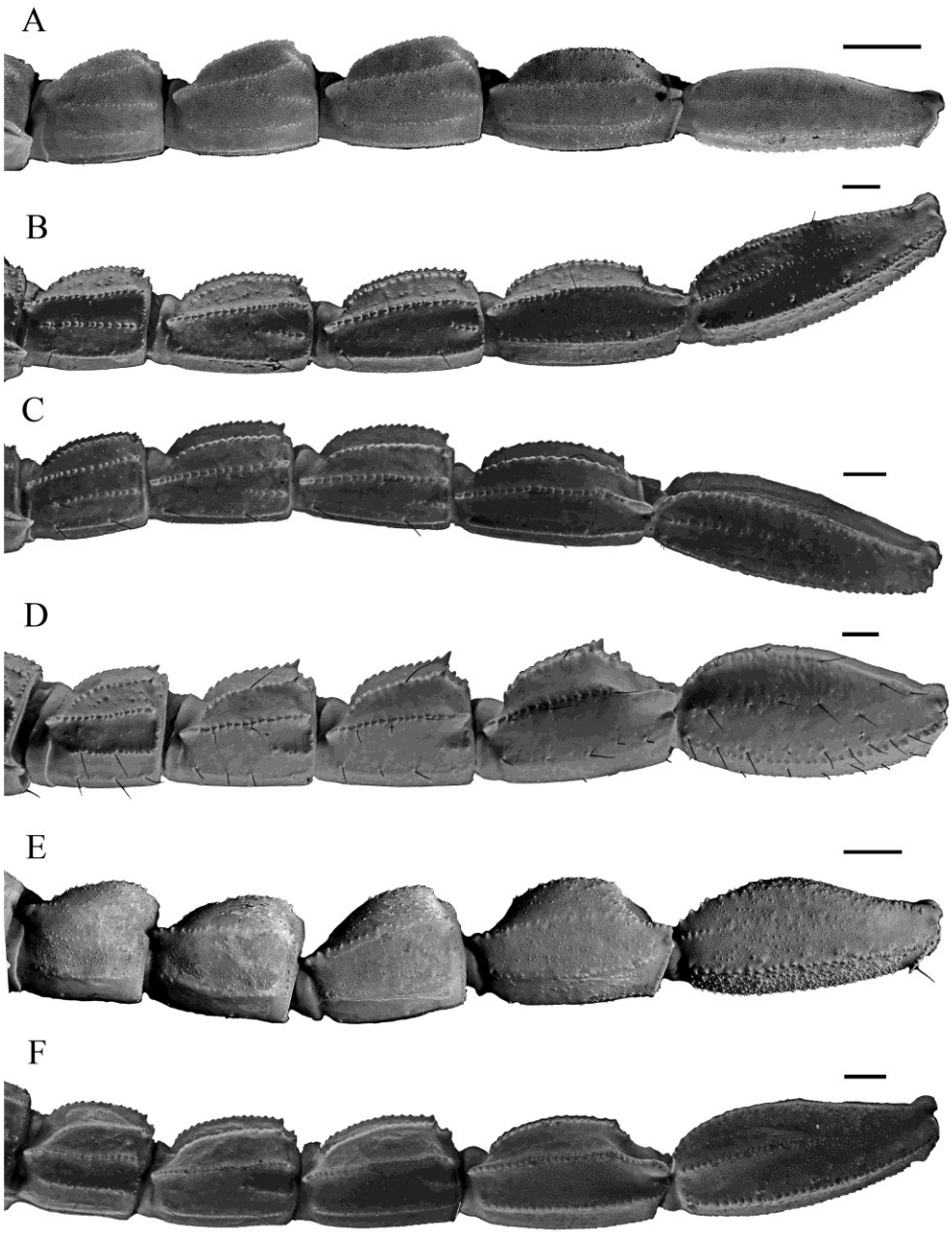


Figure 422. *Paravaejovis* Williams, 1980, metasomal segments I–V, lateral aspect. **A**. *Paravaejovis pumilis* (Williams, 1970), ♂ (AMNH). **B**. *Paravaejovis puritanus* (Gertsch, 1958), ♂ (AMNH). **C**. *Paravaejovis schwenkmeyeri* (Williams, 1970), ♂ (AMNH). **D**. *Paravaejovis spinigerus* (Wood, 1863), ♂ (AMNH). **E**. *Paravaejovis voluptatis*, **n. sp.**, holotype ♂ (AMNH). **F**. *Paravaejovis waeringi* (Williams, 1970), ♂ (AMNH). Scale bars = 1 mm.

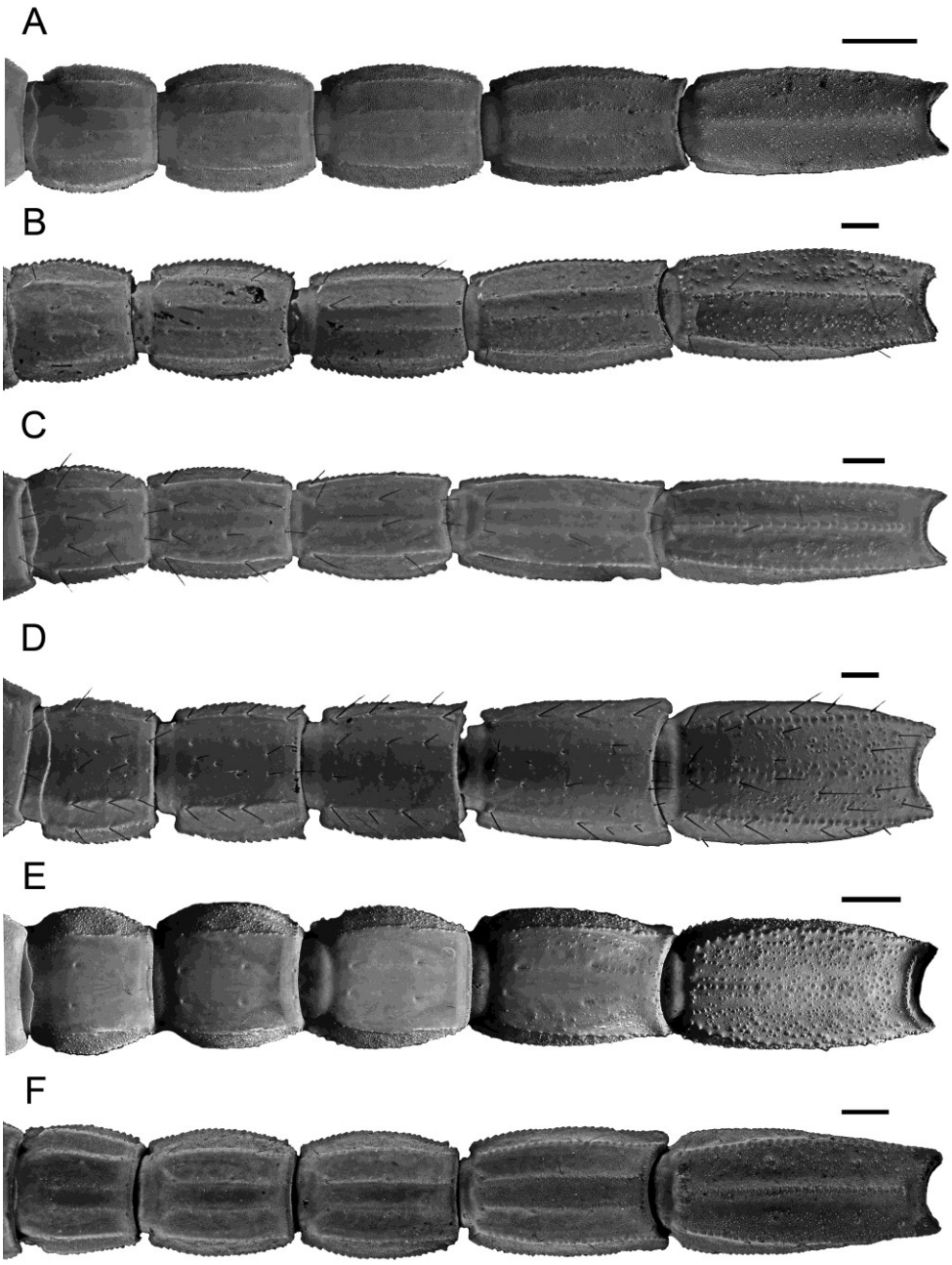


Figure 423. *Paravaejovis* Williams, 1980, metasomal segments I–V, lateral aspect. **A**. *Paravaejovis pumilis* (Williams, 1970), ♂ (AMNH). **B**. *Paravaejovis puritanus* (Gertsch, 1958), ♂ (AMNH). **C**. *Paravaejovis schwenkmeyeri* (Williams, 1970), ♂ (AMNH). **D**. *Paravaejovis spinigerus* (Wood, 1863), ♂ (AMNH). **E**. *Paravaejovis voluptatis*, **n. sp.**, holotype ♂ (AMNH). **F**. *Paravaejovis waeringi* (Williams, 1970), paratype ♂ (AMNH). Scale bars = 1 mm.

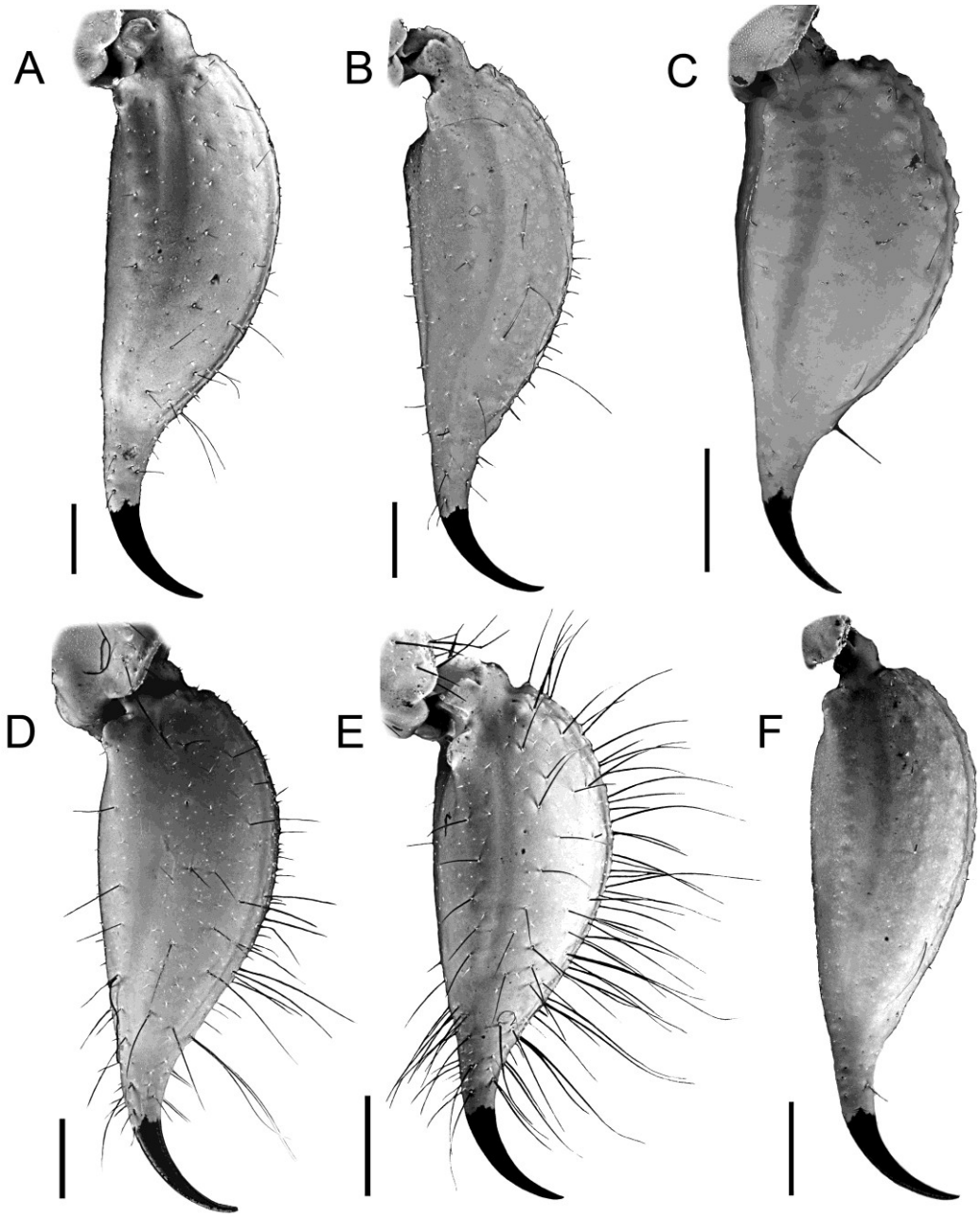


Figure 424. *Paravaejovis* Williams, 1980, telson, lateral aspect. **A**. *Paravaejovis cochimi*, **n. sp.**, paratype ♂ (AMNH). **B**. *Paravaejovis confusus* (Stahnke, 1940), ♂ (AMNH). **C**. *Paravaejovis voluptatis*, **n. sp.**, holotype ♂ (AMNH). **D**. *Paravaejovis diazi* (Williams, 1970), ♂ (AMNH). **E**. *Paravaejovis eusthenura* (Wood, 1863), ♂ (AMNH). **F**. *Paravaejovis waeringi* (Williams, 1970), ♂ (AMNH). Scale bars = 1 mm.

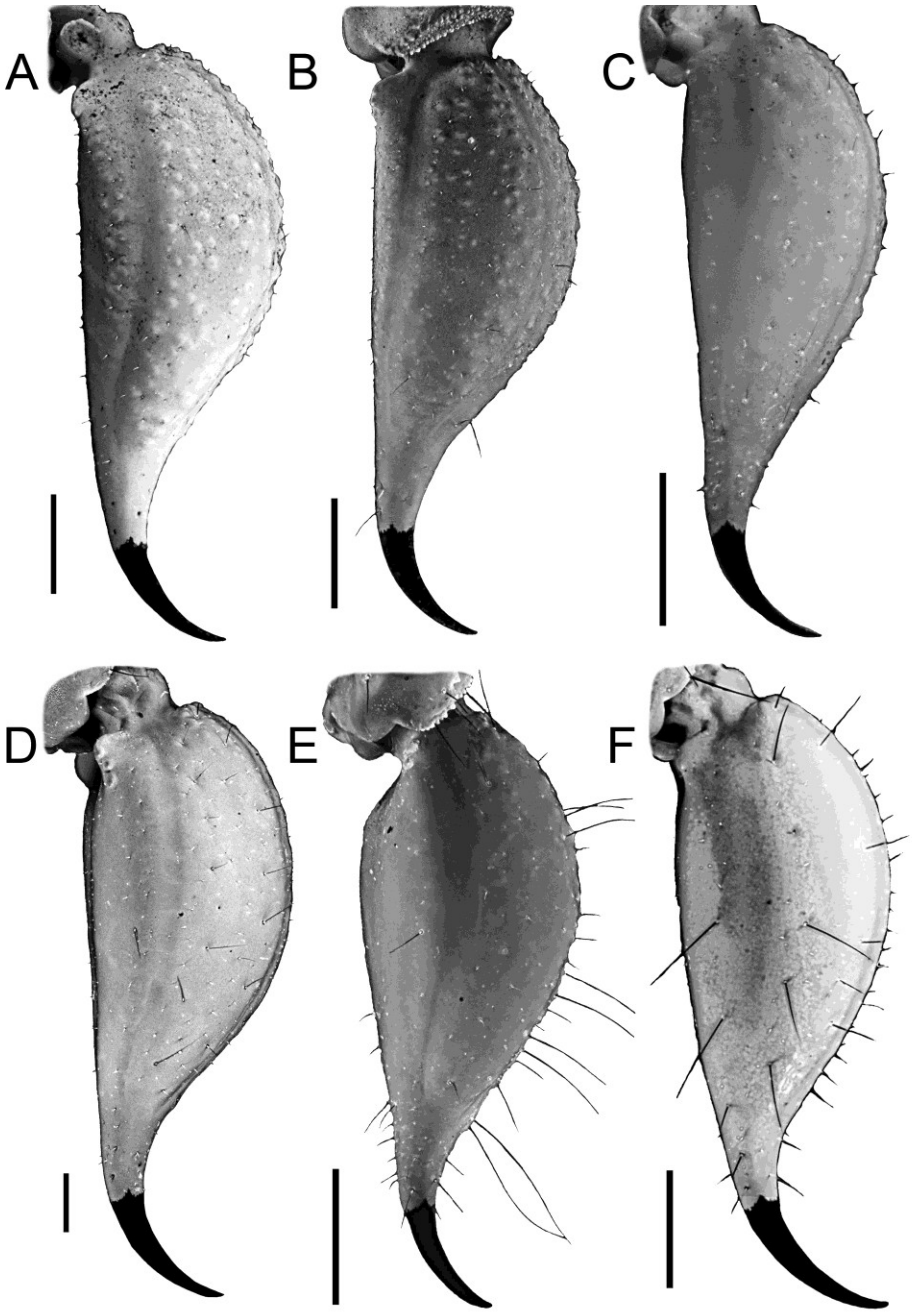


Figure 425. *Paravaejovis* Williams, 1980, telson, lateral aspect. **A**. *Paravaejovis elucidatus*, **n. sp.**, paratype ♂ (AMNH). **B**. *Paravaejovis exploratus*, **n. sp.**, paratype ♂ (AMNH). **C**. *Paravaejovis galbus* (Williams, 1970), holotype ♂ (CAS). **D**. *Paravaejovis gravicaudus* (Williams, 1970), ♂ (AMNH). **E**. *Paravaejovis nigroguerreroensis*, **n. sp.**, paratype ♂ (AMNH). **F**. *Paravaejovis hoffmanni* (Williams, 1970), paratype ♂ (AMNH). Scale bars = 1 mm.

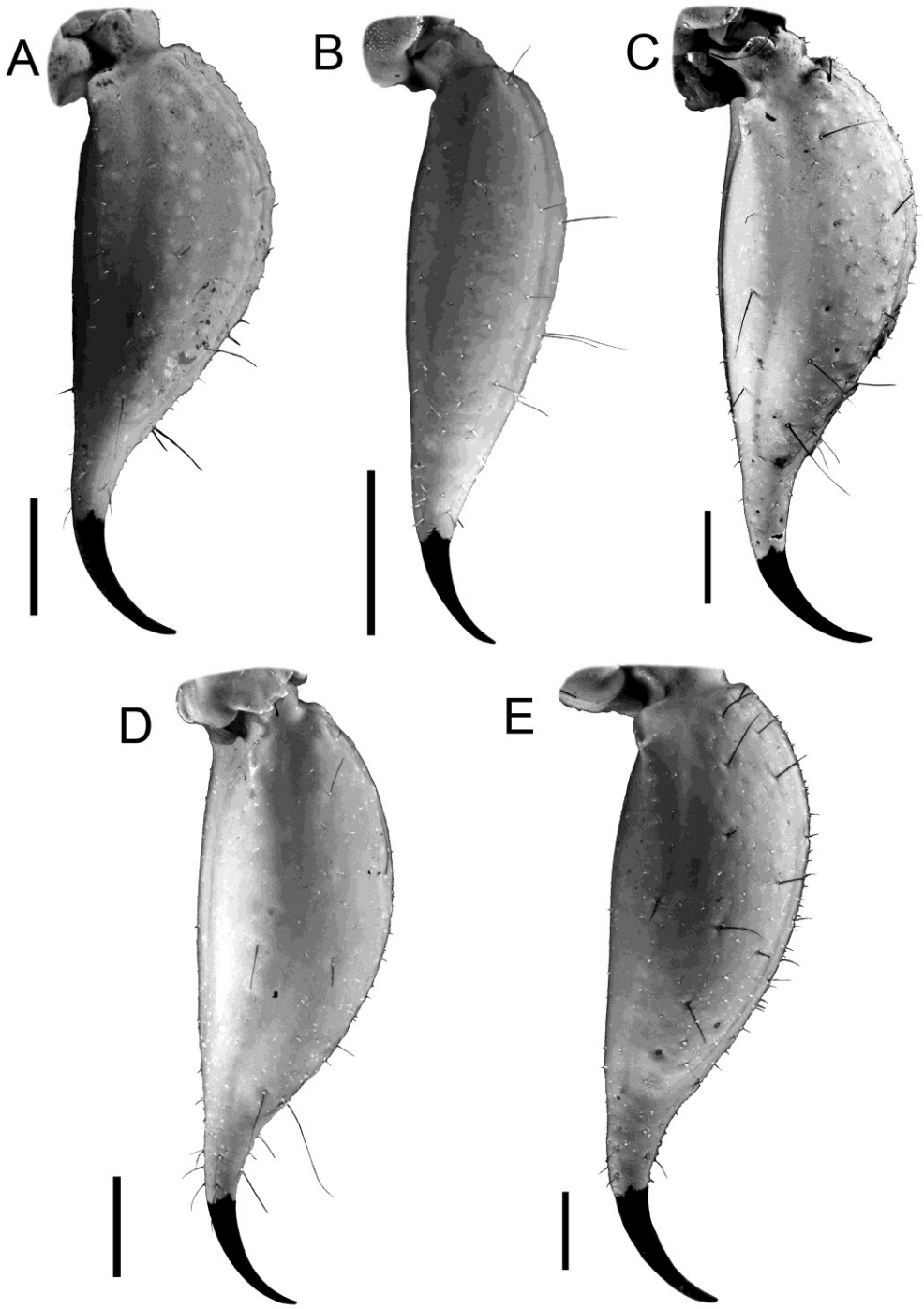


Figure 426. *Paravaejovis* Williams, 1980, telson, lateral aspect. **A**. *Paravaejovis kino*, **n. sp.**, paratype ♂ (AMNH). **B**. *Paravaejovis pumilis* (Williams, 1970), ♂ (AMNH). **C**. *Paravaejovis puritanus* (Gertsch, 1958), ♂ (AMNH). **D**. *Paravaejovis schwenkmeyeri* (Williams, 1970), ♂ (AMNH). **E**. *Paravaejovis spinigerus* (Wood, 1863), ♂ (AMNH). Scale bars = 1 mm.

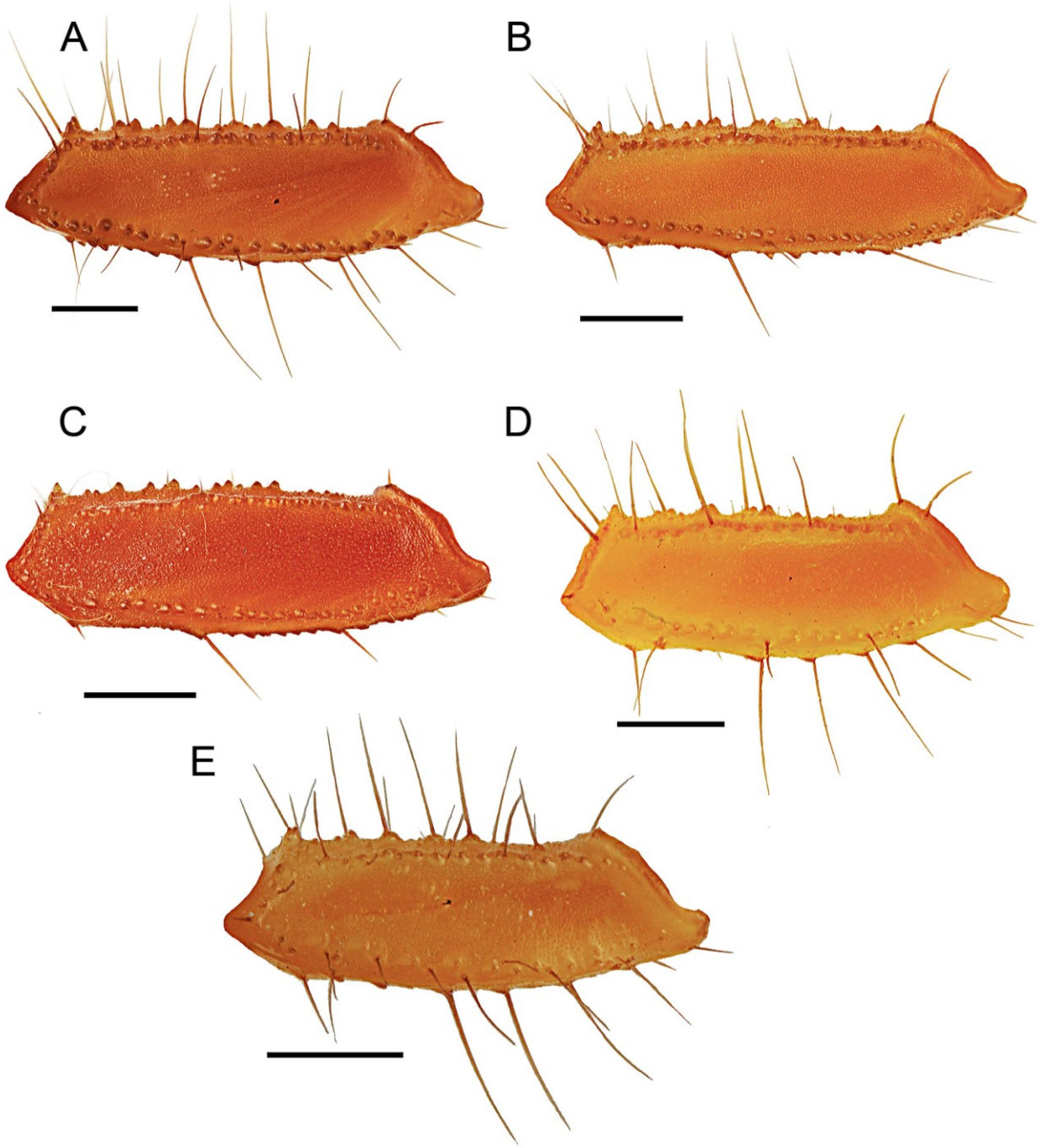


Figure 427. *Paravaejovis* Williams, 1980, dextral dorsal pedipalp femur. **A**. *Paravaejovis cochimi*, **n. sp.**, paratype ♂ (AMNH). **B**. *Paravaejovis confusus* (Stahnke, 1940), ♂ (AMNH). **C**. *Paravaejovis diazi* (Williams, 1970), paratype ♂ (AMNH). **D**. *Paravaejovis eusthenura* (Wood, 1863), ♂ (AMNH). **E**. *Paravaejovis elucidatus*, **n. sp.**, paratype ♂ (AMNH). Scale bars = 1 mm.

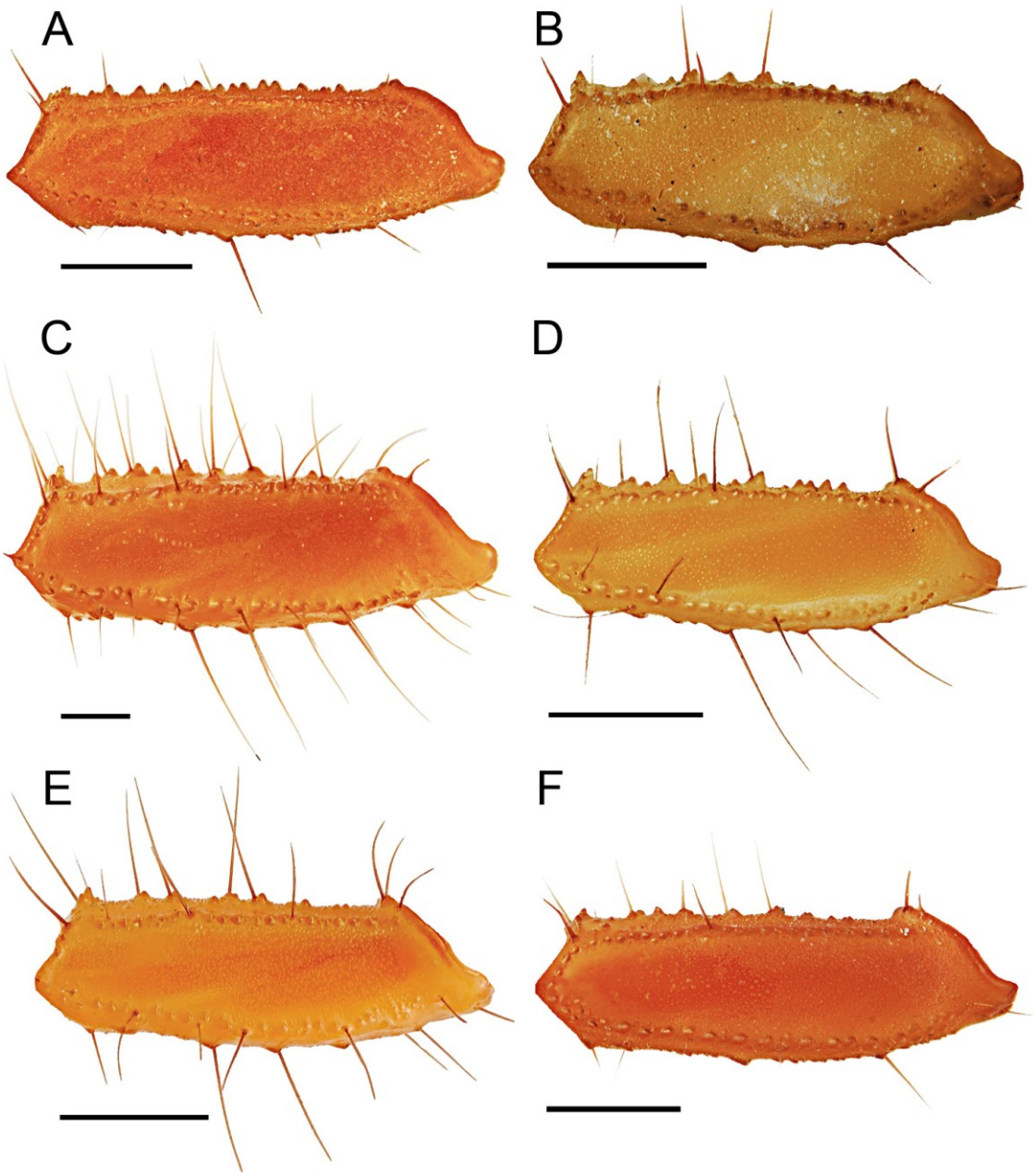


Figure 428. *Paravaejovis* Williams, 1980, dextral dorsal pedipalp femur. **A**. *Paravaejovis exploratus*, **n. sp.**, paratype ♂ (AMNH). **B**. *Paravaejovis galbus* (Williams, 1970), holotype ♂ (CAS). **C**. *Paravaejovis gravicaudus* (Williams, 1970), ♂ (AMNH). **D**. *Paravaejovis nigroguerreroensis*, **n. sp.**, paratype ♂ (AMNH). **E**. *Paravaejovis hoffmanni* (Williams, 1970), ♂ (AMNH). **F**. *Paravaejovis kino*, **n. sp.**, paratype ♂ (AMNH). Scale bars = 1 mm.

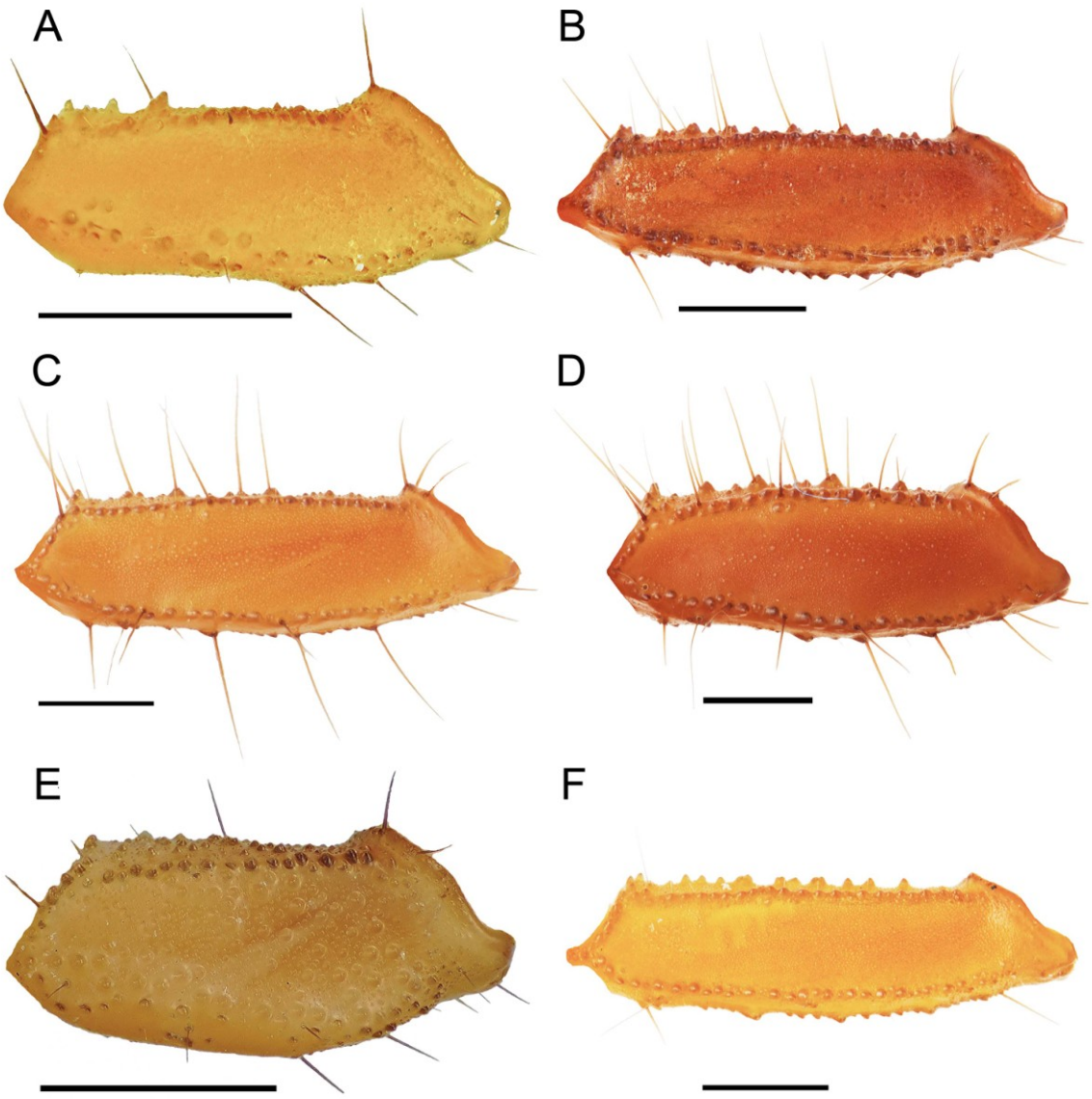


Figure 429. *Paravaejovis* Williams, 1980, dextral dorsal pedipalp femur. **A**. *Paravaejovis pumilis* (Williams, 1970), ♂ (AMNH). **B**. *Paravaejovis puritanus* (Gertsch, 1958), ♂ (AMNH). **C**. *Paravaejovis schwenkmeyeri* (Williams, 1970), ♂ (AMNH). **D**. *Paravaejovis spinigerus* (Wood, 1863), ♂ (AMNH). **E**. *Paravaejovis voluptatis*, **n. sp.**, holotype ♂ (AMNH). **F**. *Paravaejovis waeringi* (Williams, 1970), paratype ♂ (AMNH). Scale bars = 1 mm.

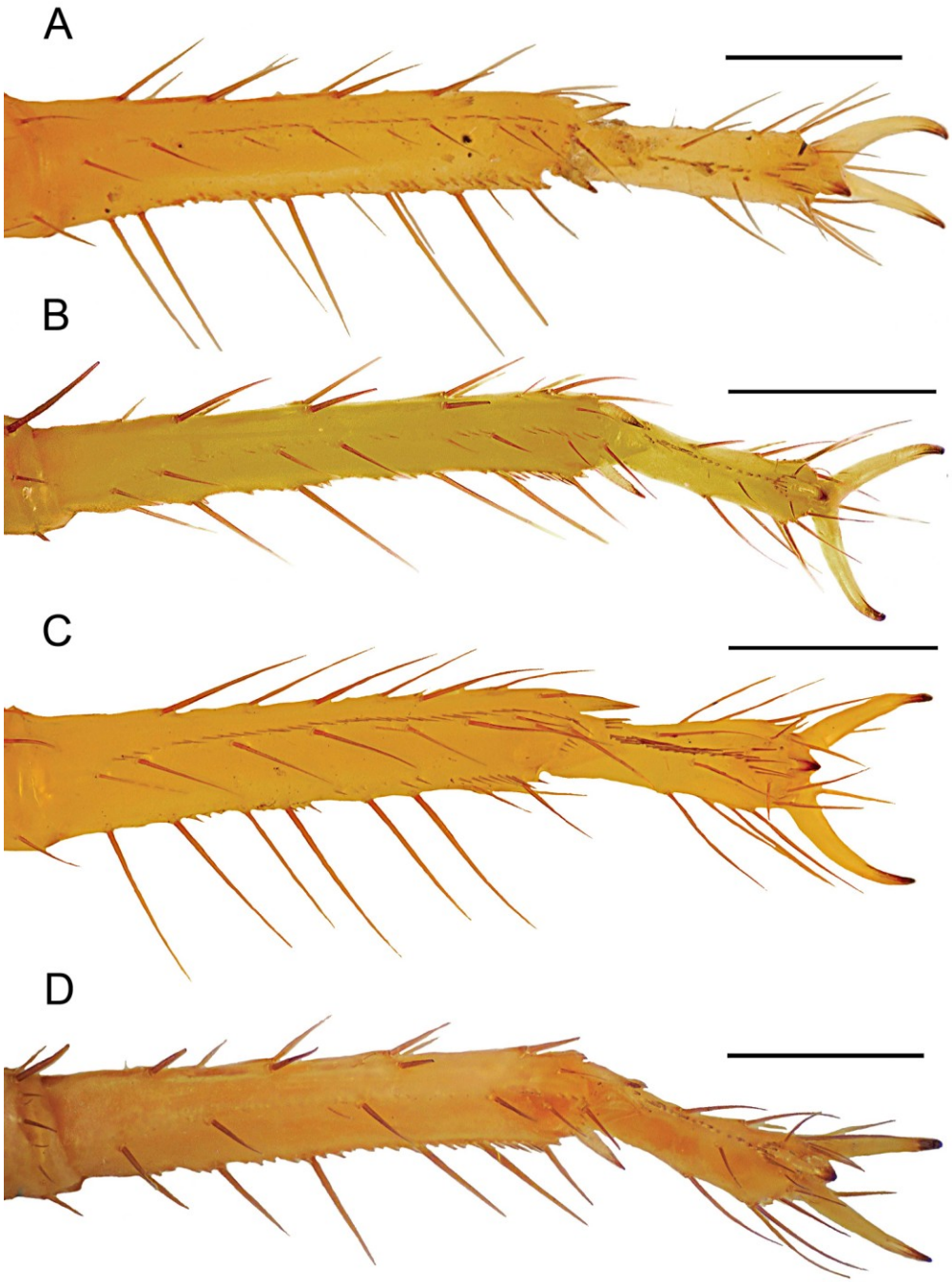


Figure 430. *Paravaejovis* Williams, 1980, dextral basitarsus and telotarsus III. **A**. *Paravaejovis cochimi*, **n. sp.**, paratype ♂ (AMNH). **B**. *Paravaejovis confusus* (Stahnke, 1940), ♂ (AMNH). **C**. *Paravaejovis diazi* (Williams, 1970), ♂ (AMNH). **D**. *Paravaejovis elucidatus*, **n. sp.**, paratype ♂ (AMNH). Scale bars = 1 mm.

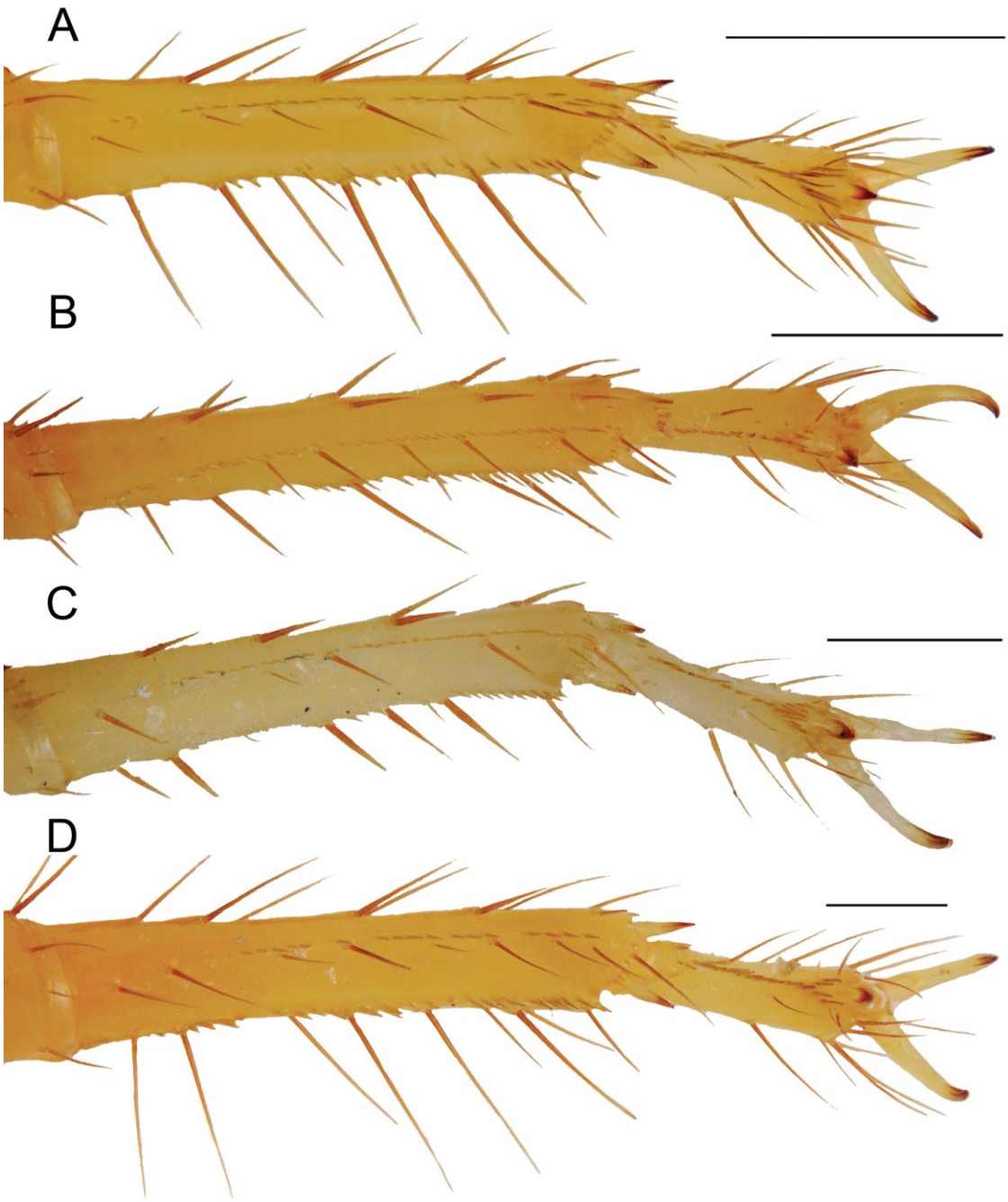


Figure 431. *Paravaejovis* Williams, 1980, dextral basitarsus and telotarsus III. **A**. *Paravaejovis eusthenura* (Wood, 1863), ♂ (AMNH). **B**. *Paravaejovis exploratus*, **n. sp.**, paratype ♂ (AMNH). **C**. *Paravaejovis galbus* (Williams, 1970), holotype ♂ (CAS). **D**. *Paravaejovis gravicaudus* (Williams, 1970), ♂ (AMNH). Scale bars = 1 mm.

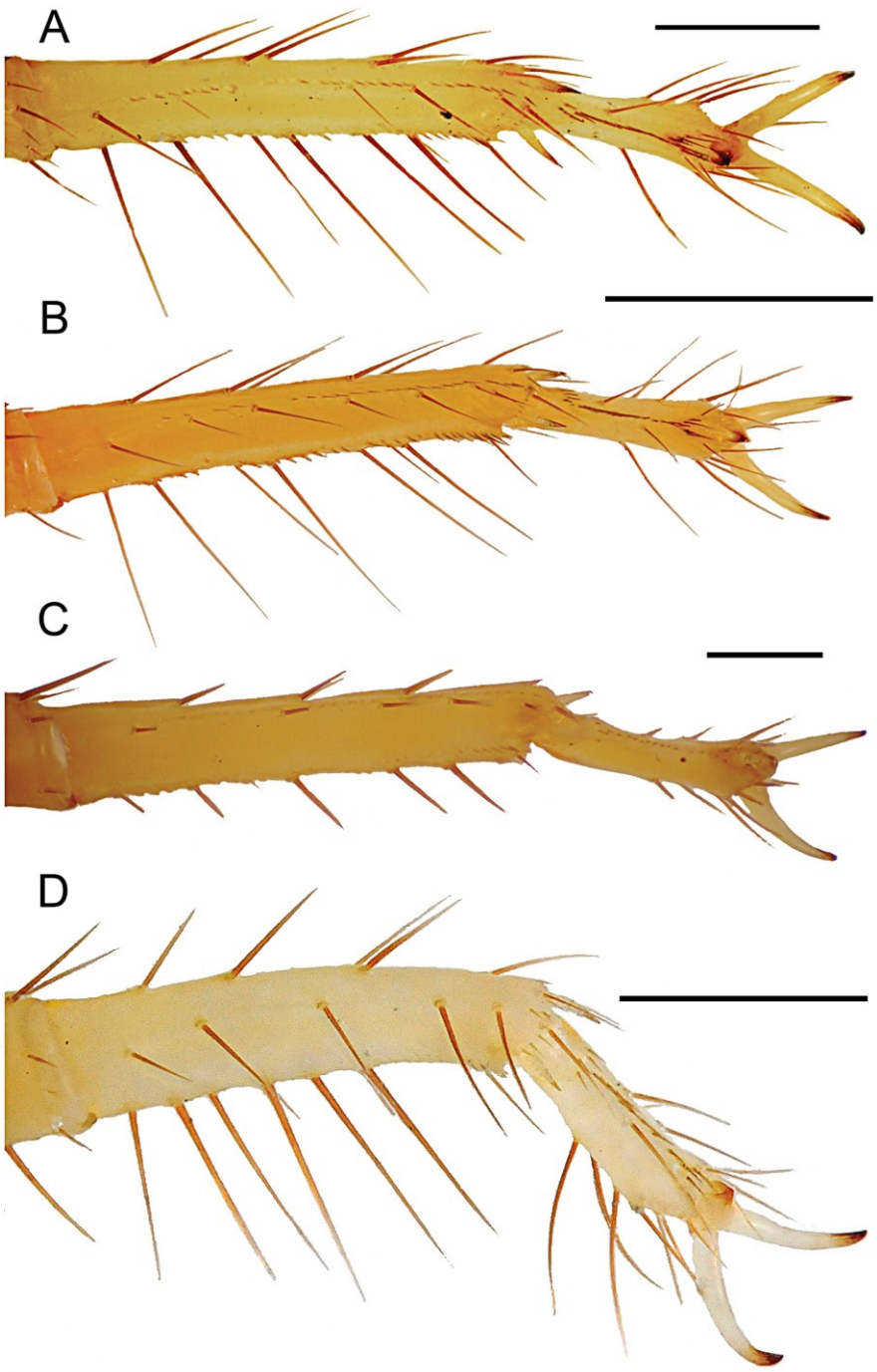


Figure 432. *Paravaejovis* Williams, 1980, dextral basitarsus and telotarsus III. **A**. *Paravaejovis nigroguerreroensis*, **n. sp.**, holotype ♂ (AMNH). **B**. *Paravaejovis hoffmanni* (Williams, 1970), ♂ (AMNH). **C**. *Paravaejovis kino*, **n. sp.**, paratype ♂ (AMNH). **D**. *Paravaejovis pumilis* (Williams, 1970), ♂ (AMNH). Scale bars = 1 mm.

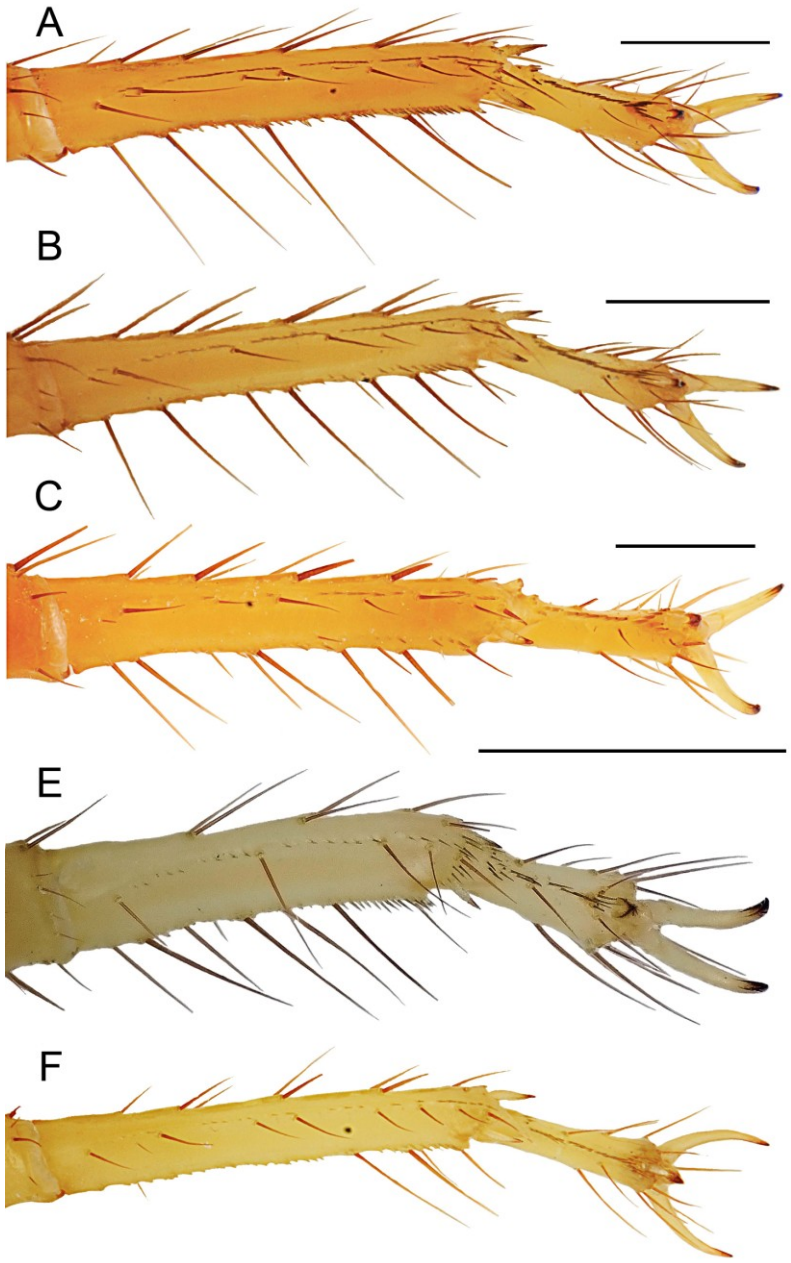


Figure 433. *Paravaejovis* Williams, 1980, dextral basitarsus and telotarsus III. **A**. *Paravaejovis puritanus* (Gertsch, 1958), ♂ (AMNH). **B**. *Paravaejovis schwenkmeyeri* (Williams, 1970), ♂ (AMNH). **C**. *Paravaejovis spinigerus* (Wood, 1863), ♂ (AMNH). **D**. *Paravaejovis voluptatis*, **n. sp.**, holotype ♂ (AMNH). **E**. *Paravaejovis waeringi* (Williams, 1970), ♂ (AMNH). Scale bars = 1 mm.

VOLUME IV

CHAPTER 4

PHYLOGENY OF THE SUBFAMILY SYNTROPINAE (VAEJOVIDAE: SCORPIONES) BASED ON COMPREHENSIVE TAXON SAMPLING

ABSTRACT

In this chapter the North American vaejovid scorpion subfamily Syntropinae is reanalyzed with comprehensive sampling, including all except two of the known species, and 26 species newly described in chapter 3, most of which are represented by samples from multiple populations. The topology of relationships for the genera of Syntropinae obtained in chapter 1 is generally congruent, with some rearrangements. Phylogenetic species based on the morphological diagnoses in chapter 3 were mostly recovered. The new analyses increased the direct support of the clades. The average Relative Bremer Support in the analysis of chapter 1 was 65; in this analysis the average is 87. The monophyly of the genera recovered in all the sensitivity analyses increased from 64% to 80%. The comprehensive taxon sample implemented here not only strengthens the monophyly of the genera recognized in chapter 1, but also resolved the position of *Konetontli*, which was placed basal to all Syntropinae. The implications of the topology for the diversification of Syntropinae are discussed on the basis of putative cryptic and actual geological events that help to explain the extant diversity of the group.

INTRODUCTION

North America harbors the world's greatest scorpion diversity and, within North America, the Baja California Peninsula holds the record for scorpion diversity. The number of species in Baja California is approximately 43 % of the species described from mainland Mexico (61 species, 46 of which are vaejovids). The density of species per unit area in Baja California is striking, with 13 species per km^2 reported near Loreto (Due and Polis, 1986). The high number of sympatric species in subtropical arid zones contrasts with most groups of vertebrates and invertebrates, where diversity is highest in the tropics (MacArthur, 1972; Polis, 1990). Although there have been several syntheses of scorpion diversity in North America (Pocock, 1902; Ewing, 1928; Hoffmann, 1931; Díaz-Nájera, 1964; Williams, 1980), the total number of species is far from completely known.

The subfamily Syntropinae as defined by González-Santillán and Prendini, in prep. is among the most diverse taxa of North American scorpions. Although several regional surveys have been conducted (i.e. Gertsch and Allred, 1965; Gertsch, 1958; Williams, 1968; Sissom, 1991b), the diversity of Syntropinae has never been completely assessed. Recent fieldwork produced numerous new distribution records for most of the described species and led to the discovery of several new forms. The current diversity of the Syntropinae encompasses 11 genera, and 80 species (chapter 3).

Both historical and ecological factors could explain the diversity and distribution of Syntropinae. North America and particularly Mexico, has a complex geological history. Tectonic dynamics including collisions, drifting and breakup of the continental plates along with periods of volcanic activity make the physiognomy of Mexico unique (Ortega-Gutiérrez and Guerrero-

García, 1982). The geological history has created a remarkable topography that played a role in the distribution and diversification of Syntropinae.

Edaphic features are known determinants of scorpion distribution (Lamoral, 1979; Bradley, 1986; Polis and McCormick, 1987; Koch, 1981; Prendini 2001). The subfamily contains stenotopic taxa, e.g. *Syntropis* and *Kuarapu* are lithophilous and most *Paravaejovis* and *Vizcaino* are psammophilous. The ecomorphotypes and specialized behavior may have restricted the distributions of these taxa to particular regions with appropriate substrata (Polis, 1990; Prendini, 2001). It has been suggested that stenotopic taxa tend to undergo rapid adaptative radiation (Vrba, 1980, 1983, 1984), which may explain the diversity of stenotopic species in places like Baja California and the Balsas Depression. The subfamily also contains eurytopic taxa, exhibiting less modified morphology and plastic behavioral features, capable of subsisting on a variety of substrata, e.g. *Mesomexovis*, *Thorellius*, *Konetontli*, and *Chihuahuanus*. Other biotic and abiotic factors may explain this diversity, for example altitudinal gradients, interaction between and among communities of scorpions, temperature and precipitation (Koch, 1981; Polis, 1990).

In this chapter I present a phylogenetic analysis of the Syntropinae with comprehensive sampling, including all except two of the known species, most of which are represented by samples from multiple populations. Based on the phylogenetic results, I suggest some biogeographical hypotheses elaborated on the basis of the evolutionary scenario proposed by Hafner and Riddle (1997), Hafner and Riddle (2005) and Riddle and Hafner (2006) for the warmer deserts of North America and Baja California Peninsula.

MATERIAL AND METHODS

Taxon sampling and terminals

The ingroup comprised all except two of the 80 species of Syntropinae, *Paravaejovis flavus* Banks, 1900 and *Paravaejovis galbus* Williams, 1970. Individuals representing multiple populations per species were included to represent the extent of the distribution range, including topotypes when possible. Sixteen exemplars representing eight genera and 15 species of Smeringurinae and Vaejovinae served as taxa outgroups, following González-Santillán and Prendini, in prep. Similarly the analyses were rooted on *Smeringurus grandis* (Williams, 1970). The total number of terminals including outgroup and ingroup was 462. Of these two terminals were not scored for discrete and continuous morphological characters and six had no molecular information. Twenty-two terminals were missing 12S and COI markers, 23 terminals missed 16S and 18S, and 25 terminals 28S.

Populations representing putative subspecies and species in synonymy were also included, to test taxonomic hypotheses. Traditionally, subspecies have been recognized on the basis of discontinuities in the geographical distribution of phenotypic traits (Mayr and Ashlock, 1991). Although the ICZN regulates the subspecies rank, use of this category remains contentious (Mayr, 1942, 1982; Wilson and Brown, 1953; Cracraft, 1983; Nixon and Wheeler, 1990; Burbrink et al., 2000; Brower, 2002; Phillimore and Owen, 2006). Both molecular and morphological studies have shown that subspecies often represent diagnosable species (Burbrink et al., 2000; Brower, 2002; Phillimore and Owen, 2006).

Morphological characters

The dataset of González-Santillán and Prendini, in prep., comprising 251 morphological characters including 61 legacy characters modified from matrices published by Lamoral (1980), Stockwell (1989), Prendini (2000), Fet et al. (2001), Soleglad and Sissom (2001), Soleglad and Fet (2003b), Prendini (2004), Francke and Prendini (2008) and Prendini et al. (2010), was used for analyses. Morphological terms follow the terminology of González-Santillán and Prendini, in prep.

Characters represented 17 character systems including 206 discrete characters and 45 continuous characters. Discrete characters were extrapolated to conspecific terminals by direct comparison to holotype, paratype or topotype specimens. Although occasional polymorphisms in some characters were omitted, time and effort were optimized. Quantitative characters scored by González-Santillán and Prendini, in prep. obviously could not be extrapolated, and were assigned "?" missing data to terminals for which these data had not been gathered.

Continuous characters were analyzed as such (Goloboff et al., 2006) and treated as additive or ordered (Wagner, 1961; Farris, 1970) following the standardization implemented by González-Santillán and Prendini, in prep., running a script in TNT written by P. Goloboff.

Sequencing of DNA markers

DNA was extracted using Qiagen Dneasy Tissue Kits. The fourth leg of the specimen was used for DNA extraction. Genetic markers were amplified with Eppendorff thermocyclers. The list of primers to amplify the genetic markers is provided in table 1. The PCR reaction was

conducted using PureTaq-Ready-To-Go PCR Beads (GE Healthcare), 1 μl of each direction primer, 2 μl of DNA template and 21 μl of DNA grade H_2O. The basic thermal profile used was: 94°C for 3:00 min, 94°C for 0:30 min, 55–42°C 0:30 min (depending on the locus), 72°C 0:45 min and ending at 72°C 7:00 min for 35–40 cycles.

PCR products were verified on a 1 % agarose-TBE electrophoresis gel stained with SYBR Safe. Amplified products were cleaned using Ampure Magnetic Beads (Beckman-Coulter) and re-suspended in 40 μl DNA-grade water by using a Beckman Coulter Biomek NX robot. Amplification products were sequenced in both directions. Each 8 μl sequencing reaction mixture included 1 μl of Big Dye, 1μl of Big Dye Terminating buffer, 1 μl of 3.2 pm primer and 5μl of gene amplification product. Samples were sequenced in a thermocycler Eppendorff Mastercycler cycling 35 times using the following thermal profile: 96°C for 0:15min, 50°C for 0:15min, 60°C for 4:00 min and hold at 4°C∞. Cycle-sequenced products were cleaned using CleanSeq magnetic beads, and the procedure performed on a Biomex NX robot. Products were re-suspended in EDTA and 33μl transferred to an Eppendorff plate to run on the Applied Biosystems, Inc. Prism 3730xl automated DNA sequencer.

Complementary strands of DNA were assembled into consensus sequences using Sequencher version 5 (Gene Codes Corporation, 2010). Primers were removed from the sequences, and the quality of each sequence was checked for mismatches among strands by direct observation of chromatographs. In the event of conflicting nucleotides from complementary strands, the entire fragment was discarded and re-sequenced.

Multiple alignment

Sequences were aligned using MAFFT version 6 (Katoh et al., 2005) with the strategy G-INS-I. All other settings were as recommended by Katoh et al. (2005), including the gap opening penalty set to 1.53 (default value) and the scoring matrix for nucleotide sequences 1/PAM κ=2. All alignments were conducted in the online version http://mafft.cbrc.jp/alignment/server/ (Katoh et al., 2002; Katoh et al., 2005; Katoh and Toh, 2008; Katoh et al., 2009) (appendix 5–9).

Alignments were analyzed with MEGA 5.05 to determine transition/transversion bias and the content of variable, constant and parsimony-informative sites.

Phylogenetic analyses

The molecular (concatenated genes) and morphological partitions (combined discrete and continuous) were analyzed separately and simultaneously to investigate phylogenetic signal. A preferred hypothesis was selected from among the simultaneous analyses, considering gaps as fifth state, under different strengths of *k*. Simultaneous analyses maximize explanatory power, convey several sources of independent characters and allow the emergence of secondary signals (Farris, 1983; 1986; Farris and Kluge, 1986; Nixon and Carpenter, 1996). Resampling values were used as an optimality criterion for selecting the most parsimonious tree from among the results of simultaneous analyses (Källersjö et al., 1999). All analyses were conducted using parsimony as the optimality criterion in TNT using the command **xmult = level 10** (Goloboff et al., 2003). Trees were prepared with Winclada 1.00.08 (Nixon 1999–2002).

Sensitivity analyses

The sensitivity of the data to different weighting regimes was explored under different values of concavity constant (*k*) (Goloboff, 1993; Prendini et al., 2003; Goloboff et al., 2008; Álvarez et al., 2009; Lopardo et al., 2010) as it has been demonstrated that weighting against homoplasy improves support values and the performance of phylogenetic analyses (Goloboff et al., 2008). Batch scripts for windows were written to perform searches using implied weights with the following *k* values: 3, 10, 15, 30, 60, 100 and 110. The stability of nodes to the *k* value is presented as majority rule consensus with cutoff 50 % (Nixon and Carpenter, 1996) as presented by Prendini (2000). Additionally, clades of interest recovered for each analysis, are presented as a 'Navajo rug' (Giribet, 2003), reporting the partitions or combination in which they were recovered (figure 434).

Resampling and nodal support

Resampling and node support were calculated with TNT. Jackknifing with 36 % probability of removal was conducted with 3000 pseudoreplicates. The highest average value of resampling among simultaneous analyses treating gaps as an additional state was used as an optimality criterion to select the preferred hypothesis. Jackknife values greater than or equal to 80 were considered high, between 79 and 63, medium (Farris et al., 1996) and less than 62, low.

Absolute and relative Bremer supports up to 100 extra steps were calculated (Bremer, 1994; Goloboff and Farris, 2001; Goloboff et al., 2003; Goloboff et al., 2008). Successive calculation of trees one step longer, retaining up to 1000 trees in memory every search, were

obtained with the command **sub hold 1000**; **bb=tbr fillonly** generating 100,000 trees. Whereas absolute support was calculated from this set of trees, relative support was calculated using only trees within absolute support (Goloboff and Farris, 2001). Because Bremer support is scaled from 0–100 in terms of the evidence contradicting and supporting the nodes (Goloboff and Farris, 2001), it is more comparable among different datasets, but still less so than resampling values. Values greater than 80 were considered high, between 80 and 51, medium, and less than 50, low. Informative characters were used to calculate the CI, RI and fit of each topology as well as the CI and RI of each character, to evaluate levels of homoplasy for the morphological partition per character system. Indices for trees and characters were calculated with scripts available online at (http://tnt.insectmuseum.org/index.php/Scripts).

RESULTS

Sequence Data

A total of 457 samples were processed and 2199 sequences generated. The 12S fragment was the most variable among the genetic markers, ranging from 332 to 335 base pairs in the outgroup and 228 to 336 in the ingroup (table 18). The 16S fragment varied from 480 to 486 in the outgroup and 480 to 483 in the ingroup, the variation in the outgroup being the greatest among the five fragments. As expected, the variation in 18S, 28S and COI was minimal. Five sequences were shorter and in four cases the first part of the COI gene failed to amplify.

Table 19 provides the results of the alignments. The mitochondrial genes contained over four times more information than the nuclear genes. However, the nuclear genes contained over twice the number of transitions to transversions compared to the mitochondrial, which contained almost the same number of transitions as transversions.

Table 18. Length variation among genetic markers. Outgroup (italics) and ingroup (bold).

	12S	**16S**	**18S**	**28S**	**COI**
	332/6	*480/1*	*1761/7*	*514/11*	*1078/16*
	333/4	*481/1*	*1762/1*	*516/5*	**790/1**
	334/2	*482/9*	*1763/8*	**512/1**	**834/1**
	335/4	*483/3*	**1761/130**	5**14/405**	**884/1**
	228/2	*484/1*		**515/22**	**819/1**
	329/73	*486/1*		**516/9**	**376/4**
	330/225	**480/5**			**933/1**
	331/102	**481/83**			**1059/1**
	332/27	**482/262**			**1078/431**
	333/7	**483/91**			
	334/1				
	335/2				
	336/1				
Total Samples	440	441	440	437	441

Table 19. Results of transition/transversion bias, variability, parsimony-informative and conserved sites of the genetic markers used for phylogenetic analyses. Calculations of the nucleotide bias were conducted using the maximum composite likelihood test under the Tamura-Nei (Tamura et al., 2004) model of substitutions with MEGA 5.05 (Tamura et al., 2011). Numbers in parentheses for the COI gene represent content of each nucleotide per codon position from first to third. Values for nucleotide composition are expressed as percentages.

	Nuclear		**Mitochondrial**			**Total**
	Ribosomal				**Protein-coding**	
Nucleotides	*18S*	*28S*	*12S*	*16S*	*COI*	
Length	1764	521	372	500	1078	4235
Variable	55	60	227	248	490	1080
Info (%)	36(2)	35(7)	187(50)	207(41)	435(40)	900(21)
Info+gaps (%)	38(2)	38(7)	207(56)	213(43)	435(40)	931(22)
Conserved	1708	458	130	244	588	3128
A	25.44	22.69	41.06	37.58	24.45(29.95)(29.20)(14.20)	38.05
C	27.59	32.03	13.61	14.96	21.70(16.18)(29.95)(18.97)	15.20
G	23.56	26.03	8.12	11.08	13.36(3.75)(12.83)(23.50)	10.06
T	23.42	19.25	37.21	36.38	40.49(50.13)(28.02)(43.33)	36.69
ts rate						
AG	11.45	16.11	6.66	10.13	22.82(17.32)(10.28)(44.56)	9.91
GA	10.55	11.41	20.08	25.44	25.71(32.06)(10.02)(33.35)	24.82
TC	26.13	24.14	6.28	6.51	4.16(2.07)(23.45)(4.45)	6.12
CT	25.97	17.86	28.75	21.38	12.62(7.76)(51.23)(8.20)	22.3
tv rate						
AC	3.05	3.97	1.55	2.03	2.32(0.39)(0.32)(1.11)	1.85
TA	3.29	3.46	7.85	6.87	4.24(3.11)(0.73)(0.67)	7.01
CG	3.57	4.88	2.60	2.73	3.77(1.68)(0.75)(0.90)	2.8
GT	3.03	2.93	7.11	6.65	7.03(5.21)(0.70)(2.05)	6.76
ts:tv	2.8	2.12	1.07	1.36	1.68(2.41)(15.76)(7.88)	1.31

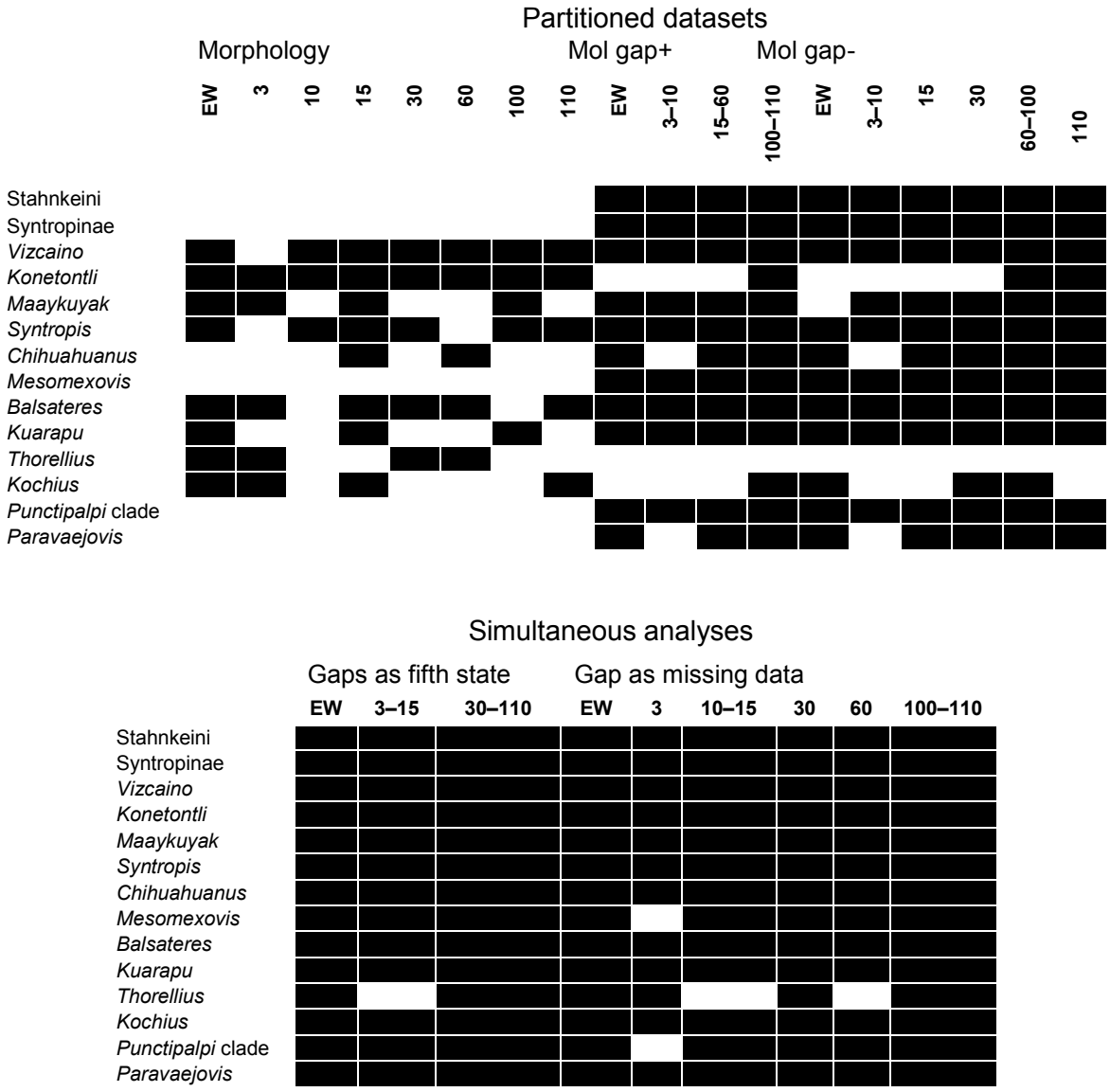


Figure 434. Nodal stability in separate (upper box) and simultaneous analyses (lower box), according to variation in weighting regime (equal weighting, EW, or implied weighting with a range of *k* values) and gap treatment (as a fifth state or missing). Selected clades correspond to the generic classification of González-Santillán and Prendini, in prep. The *punctipalpi* clade comprises *Kuarapu*, *Balsateres*, *Thorellius*, and *Kochius*.

The 12S and 16S gene alignments contained more indels, which increased the number of informative sites compared to the other genes. These genes also had the highest A/T content. CT was the most frequent transition, across all genes. COI contained the highest number of informative sites and also the highest amount of thymine among the markers (table 19).

Phylogenetic analyses

The morphological analyses resulted in 44 MPTs (table 20). The shortest trees were obtained with EW and IW under k = 60–100. The topology of the majority rule consensus differs slightly from that in chapter 1. Syntropinae and Stahnkeini were not retrieved as monophyletic under any k value. However, the following genera were consistently recovered: *Vizcaino*, *Konetontli*, *Maaykuyak*, *Kochius*, *Balsateres*, *Thorellius* and *Syntropis*.

The tree with best average jackknife value, obtained by analysis with IW under k = 110 (figure 435), had length = 2022.665, CI = 0.210, RI = 0.904 and fit = 141.32 (table 21). Although the relative positions of some genera differed, the same genera were recovered as monophyletic. Syntropinae and Stahnkeini were not monophyletic. The analysis with EW recovered more genera than those under IW with other values of k (figure 434). The most stable genera were *Vizcaino* and *Konetontli*. *Syntropis*, *Balsateres* and others were less stable, whereas *Mesomexovis*, the *punctipalpi* clade and *Paravaejovis* were never monophyletic.

The combined molecular analyses treating gaps as fifth state resulted in 26 MPTs, of which the shortest tree, obtained with EW, had length =18027, CI = 0.107, RI = 0.700 and fit = 603.61–603.67 (table 20, 21). The analyses with gaps were treated as missing data resulted in 30 MPTs, of which the shortest tree, again obtained with EW, also had length = 17800, CI = 0.103,

RI = 0.699 and fit = 591.51–592.36 (table 20). All genera were retrieved reciprocally monophyletic. The best average jackknife among analyses treating gaps as a fifth state (68.6) was obtained with EW and IW under k = 60–110. Compared to morphology, the analyses with molecules recovered more monophyletic clades. Stahnkeini and Syntropinae were monophyletic in all analyses, as were *Vizcaino*, *Syntropis*, *Mesomexovis*, *Kuarapu*, and the *punctipalpi* clade. The other genera were less frequently recovered, with *Balsateres* and *Thorellius* never recovered as monophyletic.

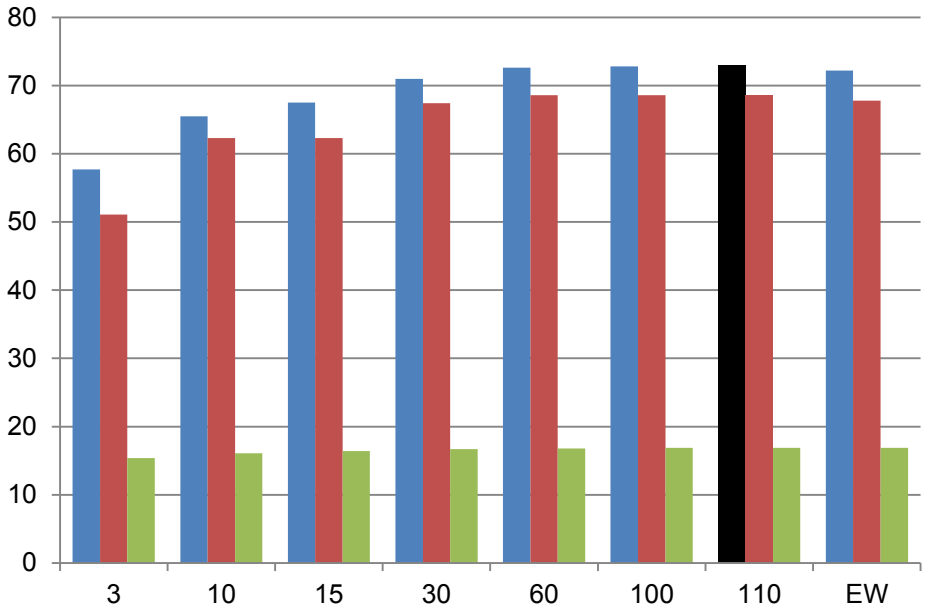


Figure 435. Average jackknife resampling expressed in gc values (group presence\contradicted) for simultaneous analyses of morphological and molecular data with gaps as a fifth state (blue bars), separate analyses of the combined molecules partition with gaps as a fifth state (red bars) and separate analyses of morphology (green bars). The preferred hypotheses for the separate analyses of the morphological and molecular partitions and the simultaneous analyses (black bar), recovered with IW under $k = 110$, had average jackknife resampling gc values of 16.9, 68.6 and 72.9, respectively

The simultaneous analyses with gaps treated as fifth state generated 52 MPTs, whereas those with gaps as missing data generated 38 MPTs. The best costs were, respectively, k = 100 with length 230146.308, CI = 0.115, RI = 0.744 and fit = 124.72 and k = 100 and 110 with length = 20140.308, CI = 0.115, RI = 0.744 and fit = 133.19 and 124.72. The clades of interest where recovered in all analyses, except for *Mesomexovis* and the *punctipalpi* clade, not recovered with gaps as missing data and IW under k = 3, and *Thorellius* with gaps as fifth state and IW under k = 3–15 and with gaps as missing data and IW under k =10, 15, and 60 (figure 434).

The preferred hypothesis for simultaneous analysis obtained with IW under k = 110, had average jackknife value of 72.9 (figure 436). The morphological and molecular partitions were complementary in terms of phylogenetic signal contribution (figure 434). *Konetontli*, *Balsateres*, *Kochius*, and *Thorellius* were retrieved less frequently in analyses of the molecular partition, and more frequently in analyses of the morphological partitions. An inverse pattern is evident for Stahnkeini, Syntropinae, *Mesomexovis*, the *punctipalpi* clade, and *Paravaejovis.* The monophyly of all clades was obtained in the analyses with EW and IW under k = 30–110.

Table 20. Most parsimonious trees (MPT), length (L), consistency index (CI), retention index (RI) and fit (F) obtained by partitioned and simultaneous analyses with equal weighting (EW) and implied weighting (IW) under different values of the concavity constant, *k*. Gaps were treated as a fifth state or as missing data. Values in bold correspond to the preferred hypothesis, with highest average jackknife values, for separate analyses of the morphological partition (16.9) and the combined molecules (68.6), and for the simultaneous analysis (72.9) with gaps treated as fifth state in each case.

Analysis	W, *k*	MPT	L	CI	RI	F
Morphology	3	10	2098.291	0.202	0.900	139.06
	10	9	2028.977	0.209	0.904	83.50
	15	2	2028.557	0.209	0.904	65.62
	30	8	2022.933	0.210	0.904	40.29
	60	4	2022.665	0.210	0.904	22.87
	100	4	2022.665	0.210	0.904	14.53
	110	**2**	**2022.665**	**0.210**	**0.904**	**13.32**
	EW	5	2022.665	0.210	0.904	141.32
Molecules +gaps	3	2	18722	0.103	0.687	596.78
	10	2	18311	0.105	0.695	421.12
	15	6	18172	0.106	0.697	358.49
	30	4	18114	0.106	0.698	256.36
	60	6	18067	0.107	0.699	168.76
	100	1	18043	0.107	0.700	117.56
	110	**2**	**18041**	**0.107**	**0.700**	**109.37**
	EW	3	18027	0.107	0.700	603.61–603.67
Molecules-gaps	3	2	18492	0.099	0.686	585.77
	10	3	18106	0.101	0.694	415.07
	15	6	17953	0.102	0.696	353.88
	30	2	17891	0.102	0.697	253.55
	60	2	17828	0.102	0.699	167.13
	100	2	17817	0.103	0.699	116.48
	110	2	17815	0.103	0.699	108.38
	EW	11	17800	0.103	0.699	591.51–592.36
Simultaneous+gaps	3	6	20960.683	0.112	0.735	741.68
	10	3	20561.187	0.114	0.741	510.30
	15	7	20509.526	0.115	0.742	429.50
	30	6	20451.994	0.115	0.743	301.01
	60	2	20404.512	0.115	0.743	194.70
	100	13	20146.308	0.112	0.744	133.19
	110	**3**	**20370.308**	**0.115**	**0.744**	**124.72**
	EW	12	20360.944	0.115	0.744	747.78–748.02
Simultaneous-gaps	3	3	20708.467	0.109	0.736	730.46
	10	2	20325.110	0.111	0.741	504.18
	15	4	20287.110	0.111	0.742	424.71
	30	3	20219.994	0.111	0.743	298.09
	60	1	20166.954	0.112	0.743	193.01
	100	3	20140.308	0.112	0.744	133.17
	110	3	20140.308	0.112	0.744	123.71
	EW	19	20131.9442	0.112	0.744	735.72–735.93

Table 21. Summary of resampling (jackknife, Jack), nodal support (relative Bremer Support, RBS), branch length (number of apomorphies) and nodal stability (percentage of times the node was recovered monophyletic) for selected nodes in the preferred hypothesis. Resampling values 1 corresponds to analyses conducted in chapter 1 (146 terminals, 4472 characters), number 2 to results of the expanded analysis (462 terminals, 4486 characters). Jackknifing in gc values for analysis 1 was conducted with 1000 replications, analysis 2 with 3000 replicates and both analyses with 36 % probability of removal. Relative Bremer support was calculated in analysis 1 with a subset of 65,000 trees used to calculate absolute Bremer support, and analysis 2 with a subset of 100,000 trees.

	Resampling and Support 1		**Resampling and Support 2**		**Apomorphies**	**Sensitivity analysis (%)**		
Clades	Jack	RBS	Jack	RBS	BL	Mor	Mol+	Mol-
Stahnkeini	100	76	98	42	28	0	100	100
Syntropinae	99	75	99	90	33	0	100	100
Vizcaino	100	89	100	89	66	88	100	100
Konetontli	83	38	82	80	17	100	20	63
Maaykuyak	96	54	79	90	34	50	100	88
Syntropis	100	89	100	95	90	75	100	100
Chihuahuanus	86	48	60	77	12	25	75	75
Mesomexovis	60	29	50	98	22	0	100	100
Kuarapu	-	-	-	-	114	63	100	100
Balsateres	100	100	100	92	81	75	0	0
Thorellius	96	85	68	97	16	50	0	0
Kochius	100	83	99	98	28	50	20	50
punctipalpi clade	38	46	39	94	19	0	100	100
Paravaejovis	65	31	81	92	11	0	75	80
Average	86	65	81	87				

Homoplasy content in the preferred hypothesis

Two hundred and forty-two of the 250 morphological characters were informative with an average CI = 0.29, RI = 0.60 and fit = 0.76 (table 22). The highest CI was obtained for the 18S data and the lowest for the COI data. The highest RI was obtained for the discrete morphological characters and the lowest for the continuous morphological characters. The highest fit was obtained for the COI data and the lowest fit for the 18S data. The discrete morphological characters had higher CI and RI but lower fit than the continuous morphological characters.

The partitions used to generate the preferred hypothesis in the simultaneous analysis varied little in terms of homoplasy (table 22). The average CI, RI and fit for the morphological characters was similar to but slightly greater than the average of the three indices for the molecular data, although the number of informative molecular characters was almost four times greater than the number of informative morphological characters (table 22).

Table 22. Average CI, RI and Fit obtained for morphological and molecular partitions used to obtain the preferred hypothesis. Abbreviations: MC, continuous morphological characters; MD, discrete morphological characters, CMor, combined morphological characters; CMol, combined molecular characters. Number in parentheses indicates the number of informative characters by partition.

Partitions	Indices		
	CI	RI	Fit
MC (45)	0.19	0.46	0.74
MD (197)	0.32	0.83	0.56
CMor (242)	**0.29**	**0.60**	**0.76**
12S (207)	0.35	0.60	0.55
16S (213)	0.30	0.64	0.60
COI (435)	0.17	0.56	0.75
18S (38)	0.54	0.74	0.30
28S (38)	0.35	0.65	0.55
CMol (931)	**0.26**	**0.60**	**0.65**

DISCUSSION

Effects of Comprehensive Taxon Sampling

This analysis presented here comprised three times as many terminal taxa as that presented in chapter 1, with an addition of 35 species, 20 of which were newly described in chapter 3. The effects of including these terminals were minimal on the topology, however. There was an increase in average RBS values for genera in figures 10, from 65 to 87, but a decrease in average resampling values from 86 to 81. The genera were more frequently recovered monophyletic in the sensitivity analyses. Inspection of the figure 4 in chapter 1 indicated that the genera were retrieved as monophyletic in 64% of all analyses, compared to the lower box in figure 434, where the genera were recovered in 80% of all analyses.

The preferred topology presented here (figure 436) recovered the monophyly of the genera recovered in chapter 1 (figure 10), however with slightly different relationships among them: (*Konetontli* (*Maaykuyak* (*Vizcaino Syntropis*))) (*Kuarapu* (*Balsateres* (*Thorellius* (*Kochius*)))) (*Mesomexovis*) (*Chihuahuanus Paravaejovis*)). Among the basal clades, the inclusion of five new species increased support for *Konetontli* and altered its relationship with *Maaykuyak*, with which it did not form a monophyletic group (figure 436), unlike the previous analysis (figure 10). However, the inclusion of additional species had no effect on the relationships of *Vizcaino*, *Syntropis*, the *punctipalpi* clade, or the three crown clades, *Mesomexovis*, *Chihuahuanus*, and *Paravaejovis*. The relationships recovered in figure 10 were preserved in all cases.

The inclusion of five new exemplars of *Konetontli* produced a generic topology with strong morphological signal. The genus was divided into two groups, each containing five species. The basal group bears granular ventral carinae on the metasomal segments, whereas the derived group bears smooth carinae. *Konetontli* was recovered in all morphological analyses in which *k* was varied, but to a lesser extent in the molecular analyses (figure 434).

Maaykuyak vittatus contains two clades, one comprising terminals from Los Cabos and two localities north of that locality and another representing samples from the Comondús and Loreto regions, all on the Baja California Peninsula. The grouping of these disjunct populations may be due to a paucity of samples but, no specimens were collected during intense collecting on both sides of the Sierra de la Giganta suggesting that disjunction is real. The disjunct distribution might be related to the hypothesis of a shallow trans-peninsular seaway at the Isthmus of La Paz during the early to middle Miocene, which isolated the Cape Region from the rest of the peninsula (Riddle et al., 2000; Carreño and Helenes, 2002; figure 437). On the other hand, there is little evidence of morphological or genetic structure between the two populations. The only variable trait among populations appears to be body size: northern populations are larger.

Limited structure was evident in the topology of *Maaykuyak waueri* despite the presence of an effective geographic barrier, the Rio Grande basin, which is responsible for a divergence in the co-distributed *Chihuahuanus coahuilae*. Why the two species are not similar structured genetically, in response to a common agent of vicariance, is unclear.

The relationship of *Kochius* maintained the structure obtained in chapter 1. The species of *Kochius* with pronounced scalloping on the pedipalp chela fingers, distributed from the southern ranges of the Sierra de la Giganta to Los Cabos of the Baja California Peninsula, and adjacent islands form a monophyletic group. This group is sister to a monophyletic group comprising the

species with straight chela fingers, i.e. *Kochius sonorae*, the only species of *Kochius* distributed across the Gulf of California, and the rest of the species distributed from the Baja California Peninsula to the Central Valley of California and Death Valley.

The relationships within *Mesomexovis* were unaffected by the addition of more terminals. Four major clades of *Mesomexovis* were recovered: the basal *M. atenango* clade; *M. occidentalis* and related species; *M. punctatus* and related species; *M. variegatus* and related species; and *M. nigropictus* and related species. Most species of clade comprising *M. variegatus* and related species are distributed on the northern side of the TMVB, whereas most species of the *punctatus* clade are distributed south of the TMVB.

The analyses presented confirmed the presence of cryptic species in this genus. Historically, *M. punctatus* and its two former subspecies, now recognized as valid species *M. variegatus* and *M. nigropictus*, were widely distributed. After revision (chapter 3), nine species are recognized with more restricted distributions. The clade including *M. punctatus* also includes four species distributed in the southern foothills of the TMVB (*M. fasciatus*, *M. ofeliae*, *M. tlayoli*, and *M. zaragozai*), with *M. punctatus* recorded only on the northern side of the TMVB. The clade including *M. nigropictus* also includes two species, *M. hesperus* and *M. tinctus*, distributed west and east of the distribution of *M. nigropictus.* The clade including *M. variegatus* also includes *M. mintoni*, *M. izazagai*, and *M. ponce*. Three of the species in this clade are endemic to sub-basins within the Balsas Depression and one (*M. mintoni*) to the Bajio region in central Mexico.

The relationships within *Chihuahuanus* were also unaffected by the addition of more terminals. *Chihuahuanus russelli* and *C. crassimanus*, previously included in *Kochius* (Soleglad and Fet, 2008) were placed basally, followed by the clade comprising four semi-psammophilous

species, *C. glabrimanus*, *C. globosus*, *C. kovariki*, and *C. panchovillai*. The third clade comprises the mesic species *C. bilineatus* and *C. coahuilae*. The terminals of *C. coahuilae* present a distinctive phylogeographic structure comprising two clades representing populations on either side of the Rio Grande or Rio Bravo (figure 437). The Rio Grande rises in the Rocky Mountains of southwest Colorado and flows south through New Mexico to southern Texas, turning southeast and emptyng into the Gulf of Mexico, bisecting the distribution of *C. coahuilae* in the Chihuahuan desert. Despite the genetic divergence between the two clades separated by the Rio Grande, the morphology is conserved, and the recognition of two separate species unjustified.

Relationships within *Paravaejovis* were sensitive to the addition of terminals, except for the *confusus* group, which remained basal in *Paravaejovis* as recovered previously (figure 10). Whereas the clade containing *P. pumilis* was recovered sister to the clade comprising *P. gravicaudus* and *P. spinigerus* in figure 10, in this result it was placed between the *confusus* clade and integrated by the *puritanus* clade and the clade *P. gravicaudus*-*P. spinigerus*.

Species of the *confusus* group are very distinctive morphologically. The hemispermatophore has an unusual curved laminar hook and the pedipalp chela fingers are elongated, with a characteristic arrangement of the trichobothria on the fixed finger. The *confusus* group is also among the most complex species groups within the subfamily. The broad distribution and conserved morphology makes species delimitation challenging. Five clades, corresponding to species recognized in chapter 3, where recovered in the analyses presented here. Species co-distributed in the vicinity of the Colorado River estuary are especially difficult to separate. Further sampling, molecular phylogeographic analysis and a detailed assessment of morphological variation are needed to assess whether there are four diagnosable species in this area.

Biogeographical implications

Species of subfamily Syntropinae are distributed throughout Mexico, except the Peninsula of Yucatan and the western U.S.A. The northernmost record is represented by *Paravaejovis* in the U.S. state of Oregon and the southernmost by *Mesomexovis* in the Isthmus of Tehuantepec, Mexico. Members of the subfamily occupy most arid and subtropical regions along the Pacific coast and to the east of the Sierra Madre Occidental, but the Sierra Madre Oriental represents a major barrier in the east, and Syntropinae do not reach the coast of the Gulf of Mexico (figures 12–15; table 7). The northeastern limit of distribution is one of the main tributaries of the Mississippi basin, the Red River.

The highest diversity of Syntropinae occurs in the Baja California peninsula (Williams, 1980) with five genera (two endemic) and 33 species. This diversity comprises the monotypic *Vizcaino*, all species of *Syntropis*, 99% of the species of *Paravaejovis* and *Kochius*, and one of two species of *Maaykuyak.* The southern part of the Trans-Mexican Volcanic Belt, including the Pacific coast and lowlands of the Balsas Depression is the second most diverse area for Syntropinae. This region harbors the monotypic *Balsateres* and *Kuarapu*, all species of *Thorellius*, 99% of the species of *Konetontli*, and 90% of the species of *Mesomexovis.* Compared to Baja California, this central region of Mexico has four endemic genera. The remaining diversity of Syntropinae occurs in the vast territory occupied by the Great Basin, Mojave, Sonoran and Chihuahuan deserts of North America, inhabited by *Chihuahuanus*, several species of *Paravaejovis*, and one species of *Maaykuyak*.

The distribution of 11 genera is mostly continuous, except for *Maaykuyak* and *Konetontli*, which are disjunct; the former is distributed in Baja California Sur and the Chihuahuan desert and the latter in the Baja California Peninsula and the Pacific coast of Mexico. This disjunct distribution can be explained by two major geological events: the development of the Sierra Madre Occidental (SMO) (ca. 34–27 million years ago) (Axelrod, 1979; Ortega-Gutiérrez and Guerrero-García, 1982) and the embayment of the Gulf of California, separating the Baja California Peninsula from the mainland (ca. 6 million years ago) (Gastil et al., 1983). The presence of *Maaykuyak* and *Konetontli* on the Baja California peninsula and mainland Mexico suggests that the distribution of these taxa predates the separation of the Peninsula and, in the case of *Maaykuyak*, the orogeny of the SMO. This distribution and the phylogenetically basal position of these genera (figures 10, 12, 15), suggest they are relictual.

The orogeny of the Trans-Mexican Volcanic Belt (TMVB) during the Miocene (5.3 million years ago) (Ortega-Gutiérrez and Guerrero-García, 1982; Ferrari et al., 2000; Ferrusquía-Villafranca and González-Guzmán, 2005) presented a formidable barrier for most fauna distributed with a north-south distribution on the continent, especially taxa with poor mobility such as scorpions (Polis, 1990; Prendini, 2001). Likewise, the development of the SMO caused vicariance between faunas with an east-west distribution. This subdivision of mainland Mexico into north-south and east-west regions, related to the isolation and formation of the deserts, subtropical, and tropical regions of the country, is responsible for the evolution of their fauna. These geographical barriers most likely promoted the divergence between *Mesomexovis*, *Chihuahuanus*, and *Paravaejovis* (figure 437). The distributions of these genera, with respect to the three barriers mentioned, indeed matches their phylogenetic relationships: (*Mesomexovis* (*Chihuahuanus Paravaejovis*)).

The embayment of the Gulf of California, separating the Baja California Peninsula from the mainland, is among the forces that caused the evolution of endemic fauna (e.g., the psammophilous *Vizcaino* and lithophilous *Syntropis*). Similarly, the Balsas depression was separated from tropical lowlands along the Gulf of Mexico by orogeny of the TMVB and SMO. The orogeny of the Sierra Madre del Sur in Oaxaca further closed the connection with southern Mexico. The development of taxa in the Balsas Depression resembles the Baja California Peninsula in that some taxa independently acquired similar adaptations and produced communities of endemic fauna (e.g., the psammophilous *Balsateres* and the lithophilous *Kuarapu*). The separation of the Baja California Peninsula also affected the clade comprising *Kochius*, *Balsateres*, *Kuarapu*, and *Thorellius* (figure 437). The four genera appear to have been continuously distributed from central Mexico to northern Mexico and the southwestern U.S.A., along the Pacific coastal side of the SMO. *Kochius* became isolated on the peninsula and diversified.

The phylogenetic relationships among genera and species presented in this chapter are consistent with several patterns observed in other plants and animal taxa (e.g., mammals, reptiles, amphibians, birds, cacti). Hypotheses concerning the formation of the core warm deserts of the southwestern of U.S.A. and northern Mexico proposed by Riddle and Hafner (2006) are supported by geological and climatic hypotheses, which explain biotic distributions in these areas. Riddle and Hafner (2006) propose that the recent biota of Baja California is the result of Pleistocene to Holocene climatic oscillations, concomitant with sea transgression at several points along the Baja California Peninsula and the Sea Gulf embayment. This modification of the landscape apparently contributed to the creation of several vicariance events in three phases: (1) the earliest widespread taxa were fragmented by transgression of sea in two or more population

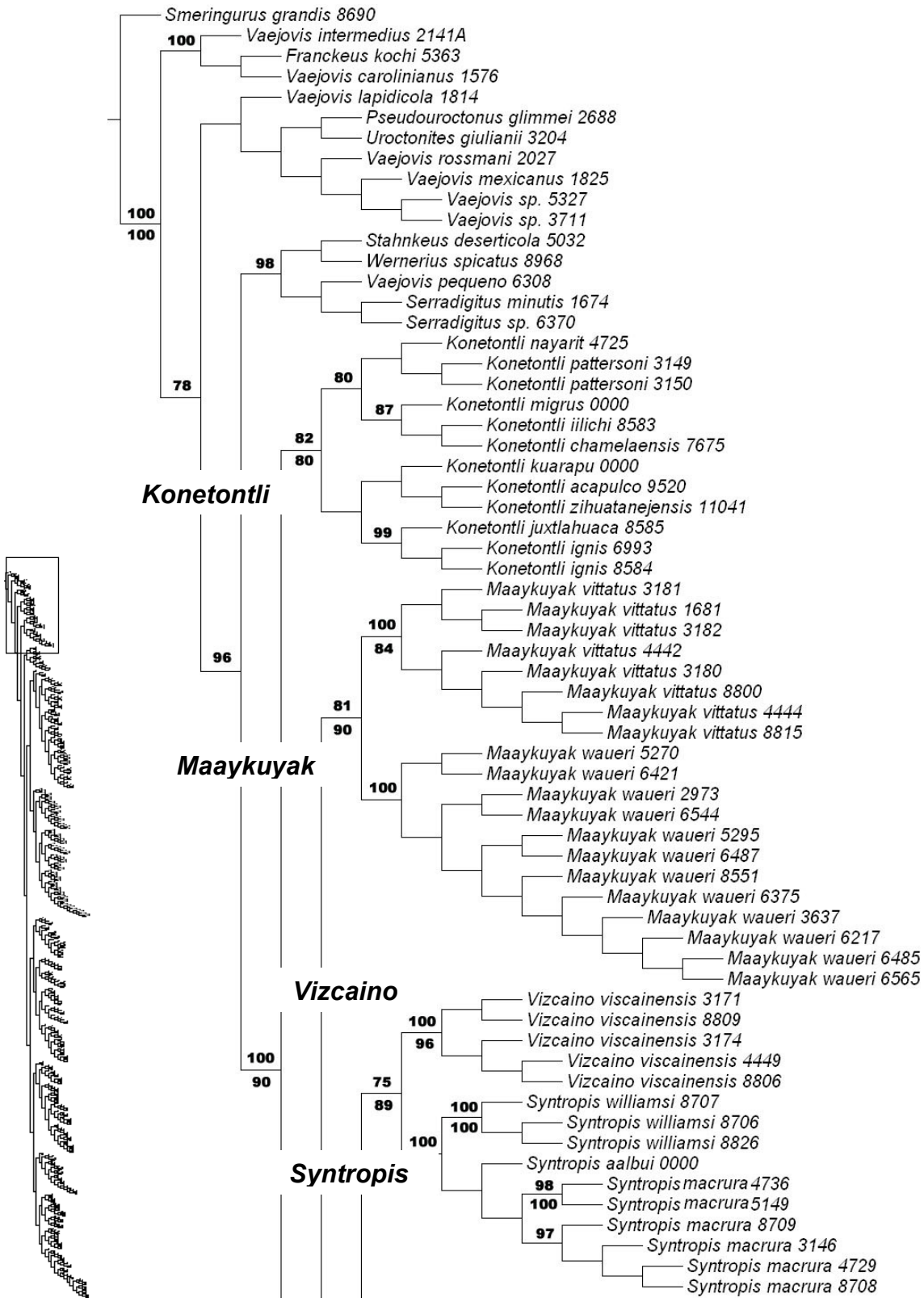
cores; (2) long isolation promoted *in situ* speciation; and (3) subsequent dispersal across former barriers by derived taxa promoted gene sorting, reproductive isolation, and morphological variation. The retreat of barriers, in this case flooded areas, created distributions in which the favorable habitat expands beyond the actual species distribution without any apparent reason, i.e. geographical barrier or ecological discontinuity.

Several of the hypothetical former vicariance barriers proposed by Riddle and Hafner (2006) fit the distribution of several syntropine taxa studied here. The hypotheses of seaways across the Vizcaino desert and at the Isthmus of La Paz predict that endemic taxa will be restricted to the south-central portion of the Peninsula and to the Cabos area. Figures 144 (*Kochius bruneus*); 147 (*Kochius villosus*); 350 (*Paravaejovis cochimi*); 351 (*Paravaejovis diazi*); 354 (*Paravaejovis gravicaudus*); 353 (*Paravaejovis hoffmanni*), indicate distributions of several taxa that coincide with area B in the shaded part of the map in figure 437. Similarly, area A of figure 437 coincides with figure 144 (*Kochius punctipalpi*) and 353 (*Paravaejovis eusthenura*). *Kochius* and *Paravaejovis* appear to have had similar biogeographical histories, both with a strong pulse of diversification in the Baja California Peninsula and similar ancestral distributions that were affected by the embayment of the Gulf of California, isolating fauna on both shores. These may have managed to remain sympatric because they use different habitats: whereas most *Kochius* are lapidicolous, most *Paravaejovis* are adapted to sandy deserts.

The coincidences observed between the maps of figure 437 and the maps of the following taxa are noteworthy: figure 306, (*Chihuahuanus glabrimanus* with letter K); 308 (*Chihuahuanus globosus* and *Chihuahuanus kovariki* with letter J); 309 (*Chihuahuanus bilineatus* also with letter K). *Chihuahuanus glabrimanus* and *C. bilineatus* are enclosed in the area delimited by the TMBV, SMO, Sierra Madre Oriental (SMOR) and the southern region of the basin of the Nazas

River. In contrast, *C. globosus* occupies the areas between the Nazas Basin and the Rio Grande Basin.

The correlation between the geological history and the process of diversification and actual distribution of the Syntropinae seem to be inextricably connected. Future directions will include quantitative analyses to test these biogeographic hypotheses.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Uroctonites giulianii 3204
Vaejovis rossmani 2027
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Vaejovis sp. 3711
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Vaejovis pequeno 6308
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Konetontli pattersoni 3149
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Konetontli juxtlahuaca 8585
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Maaykuyak waueri 6544
Maaykuyak waueri 5295
Maaykuyak waueri 6487
Maaykuyak waueri 8551
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Vizcaino viscainensis 3174
Vizcaino viscainensis 4449
Vizcaino viscainensis 8806
Syntropis williamsi 8707
Syntropis williamsi 8706
Syntropis williamsi 8826
Syntropis aalbui 0000
Syntropis macrura 4736
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Syntropis macrura 8709
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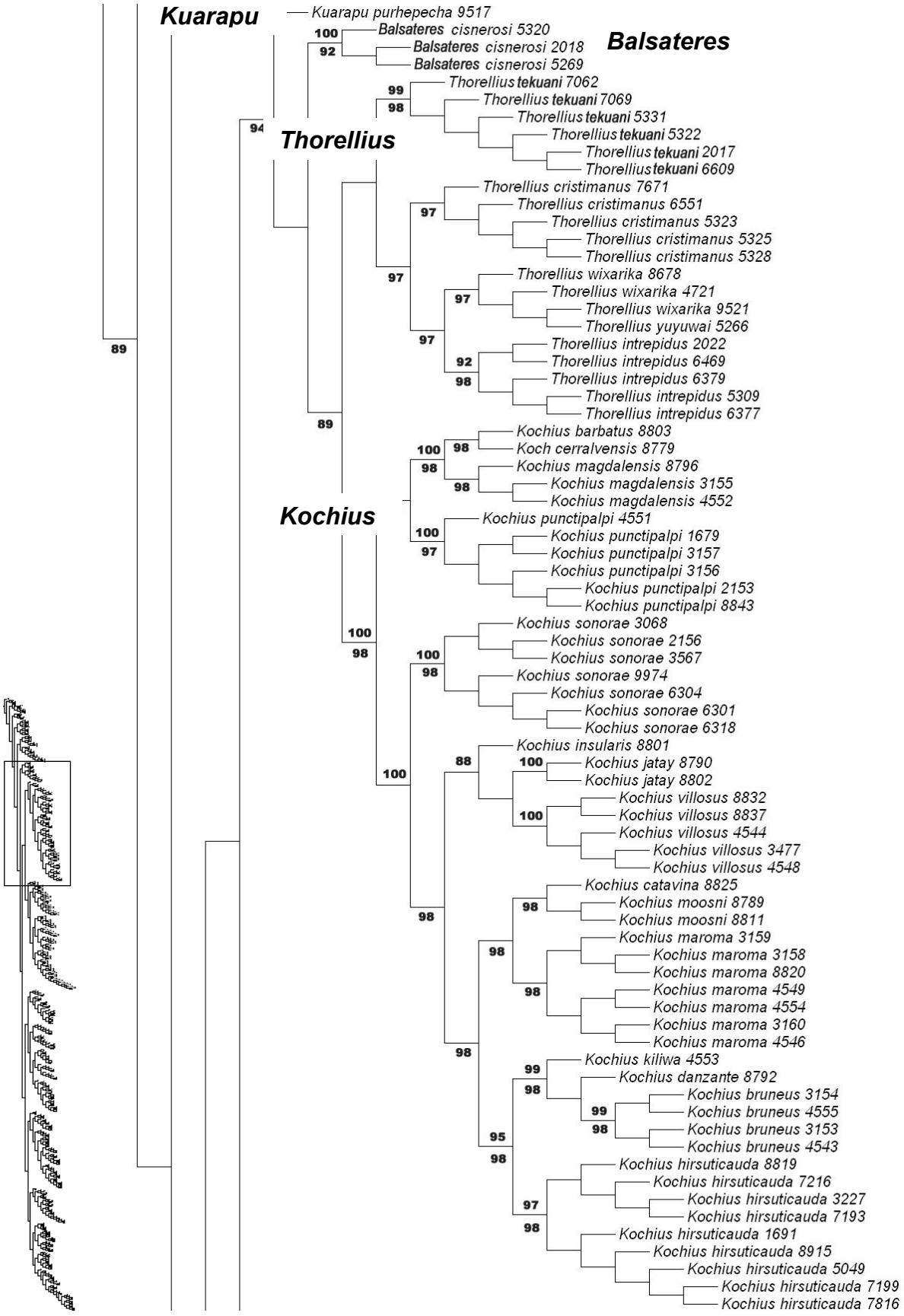
Vizcaino
Syntropis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Thorellius
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Thorellius tekuani 7069
Thorellius tekuani 5331
Thorellius tekuani 5322
Thorellius tekuani 2017
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Thorellius cristimanus 7671
Thorellius cristimanus 6551
Thorellius cristimanus 5323
Thorellius cristimanus 5325
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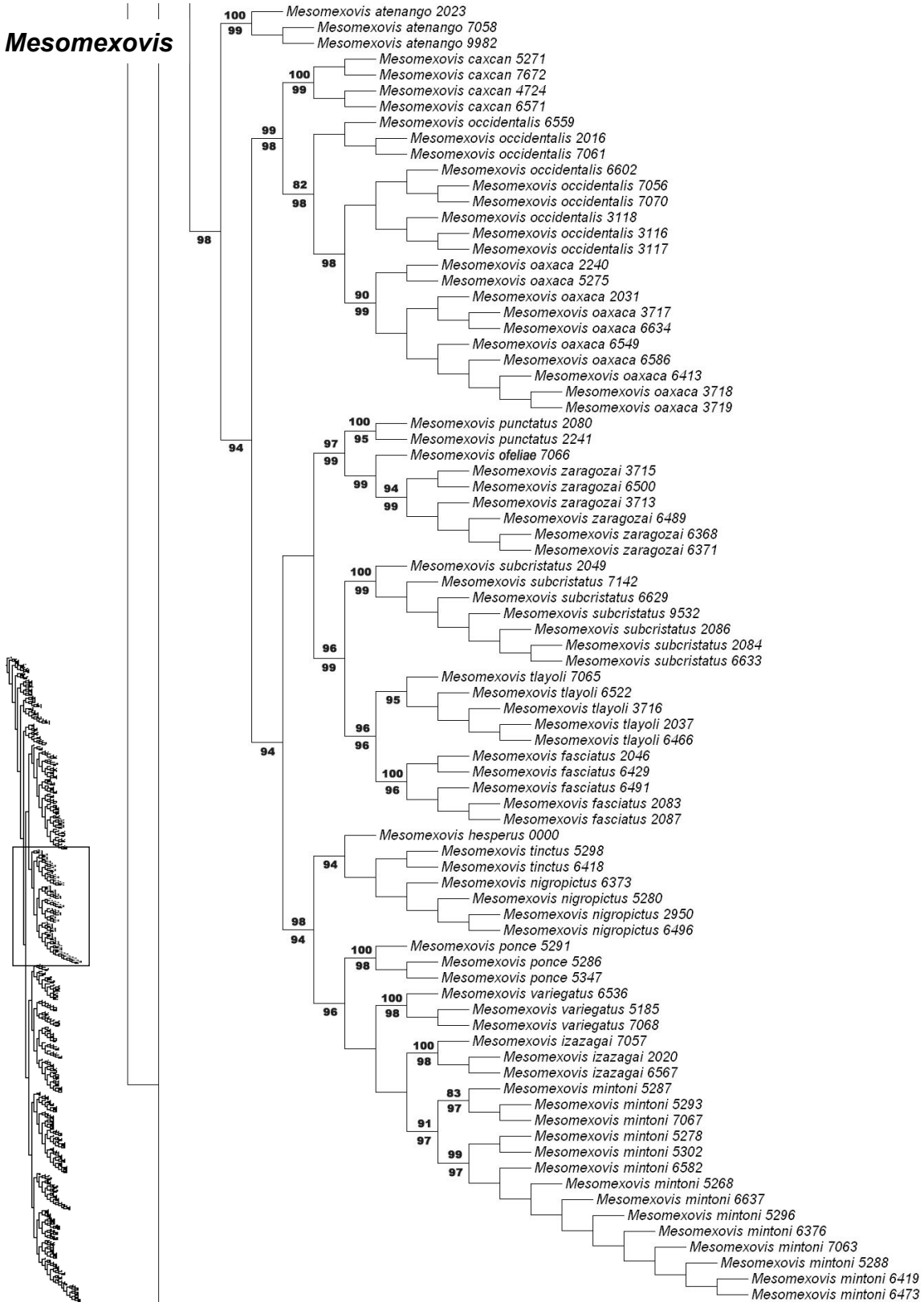
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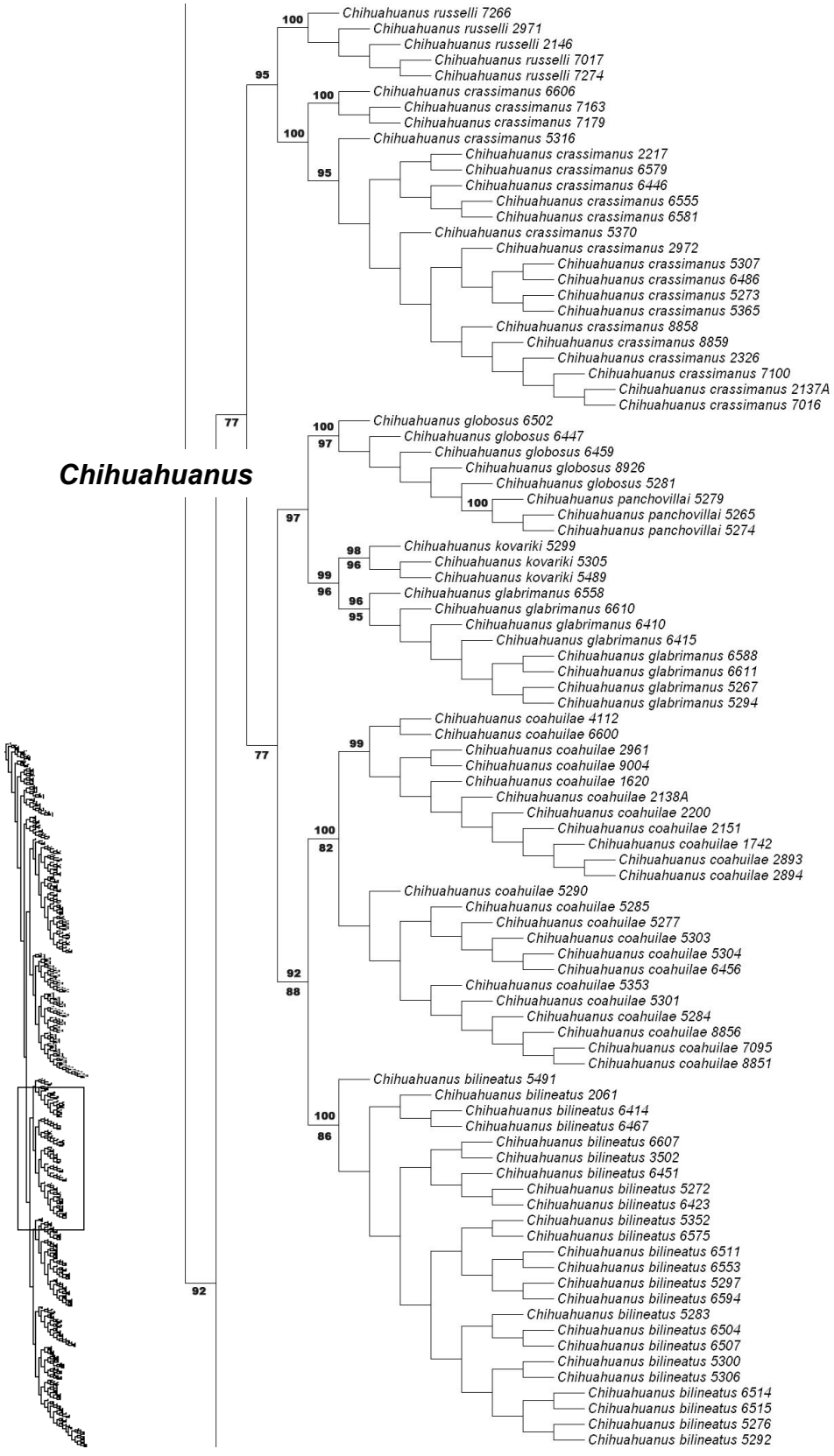
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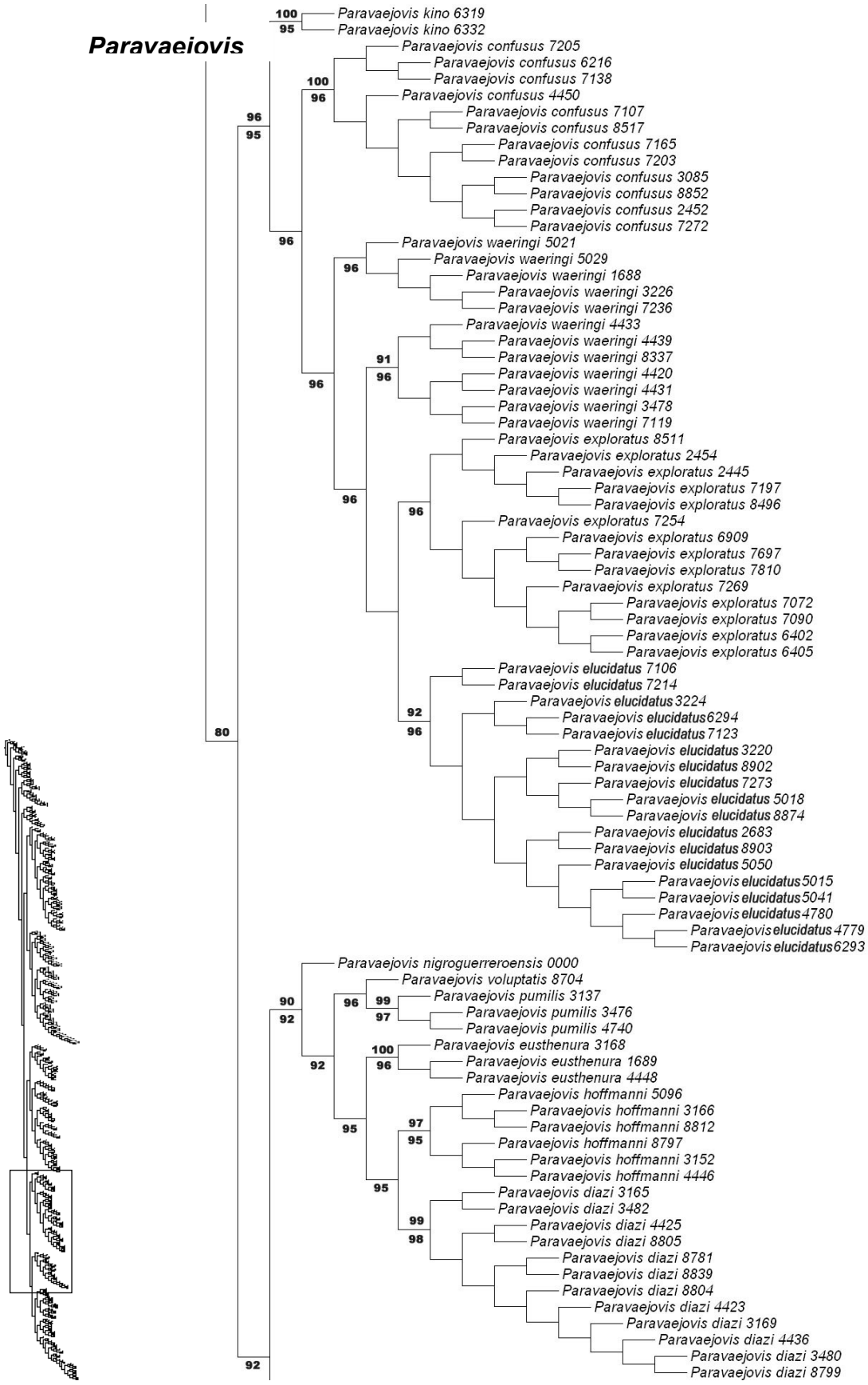
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Paravaejovis (continued)

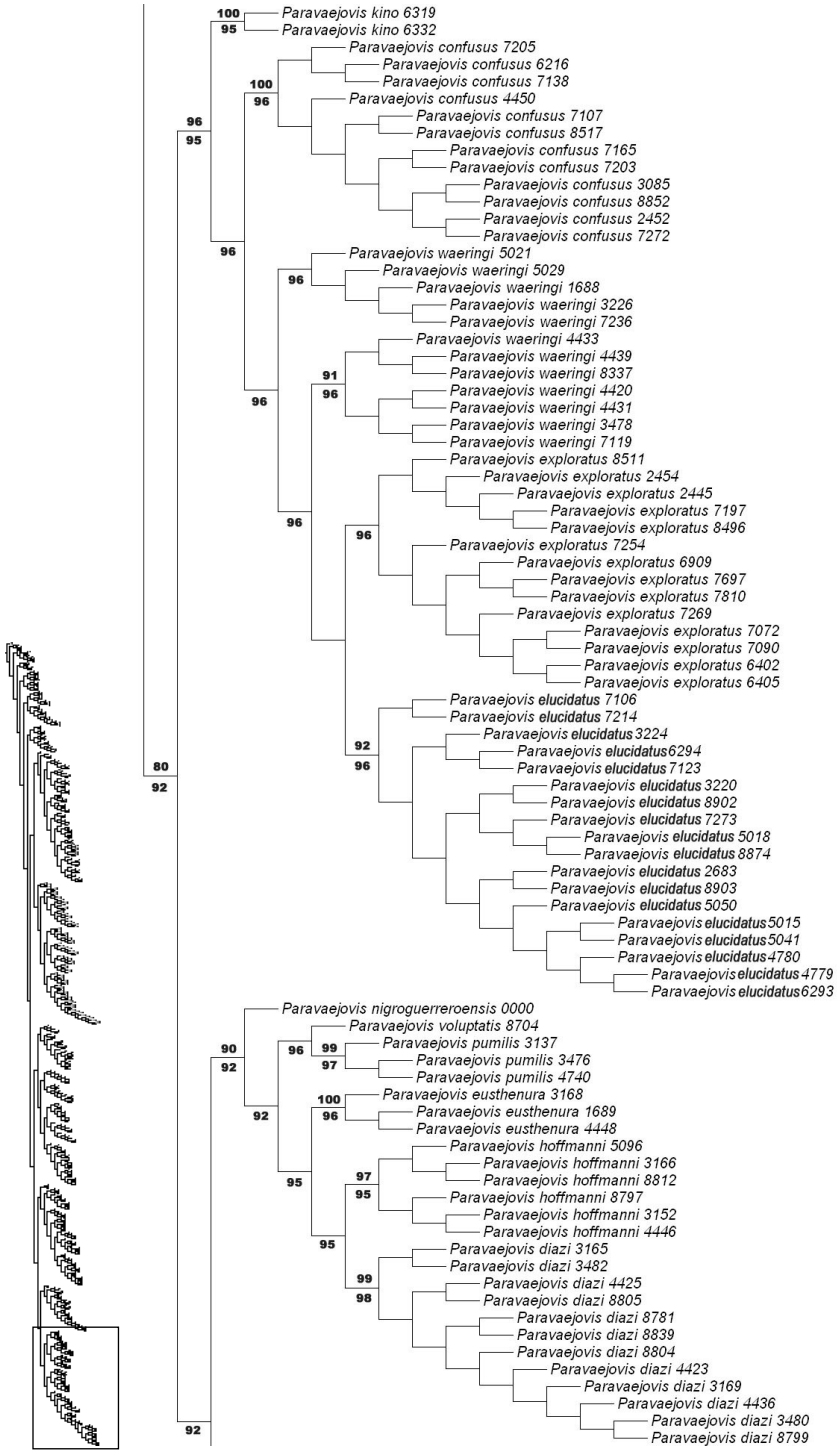


Figure 436. Preferred hypothesis, strict consensus of three most parsimonious trees resulting from simultaneous analysis of five gene markers, continuous and discrete morphological characters with IW under $k = 110$. Tree length 20370.308, CI 0.115, RI 0.744 and fit 124.72. Gaps were treated as an additional state, all discrete characters were unordered and all continuous ordered. Jackknife value was 72.9 (figure 435).

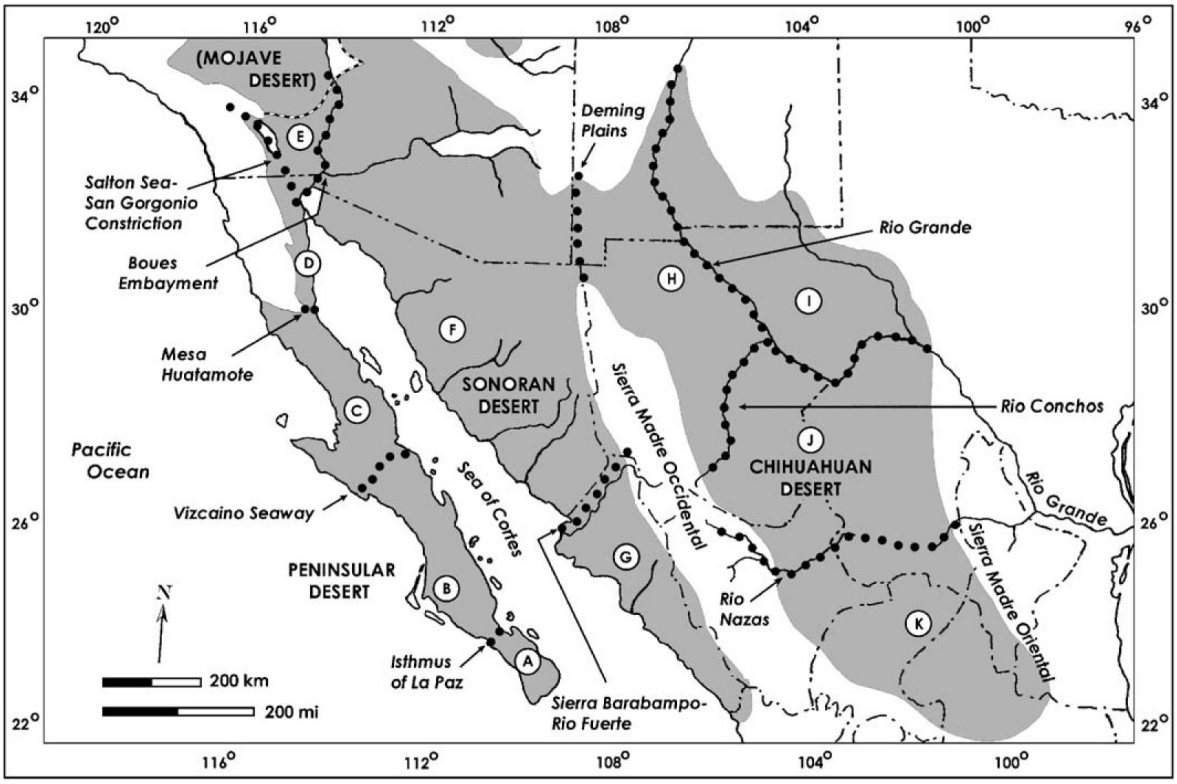


Figure 437. Map of western North America from Riddle and Hafner (2006) showing shaded areas as regional warm deserts delineated by Shreve (1942), Hafner and Riddle (1997), and Hafner and Riddle (2005) and rows of bead postulated historical distributional barriers.

SUMMARY AND SYNTHESIS

Aims and objectives

This dissertation focused on the systematics of the North American scorpion subfamily Syntropinae (Vaejovidae: Scorpiones) with emphasis on the generic and specific relationships. Prior this study, the monophyly of Syntropinae and its component genera had not been rigorously tested and the classification was unstable. There were two classifications of this subfamily and subordinate taxa in use: the mostly unpublished classification of Stockwell (1989, 1992), published with modifications by Soleglad and Fet (2003b, 2005, 2006, 2008), and the classification of Sissom (2000), presented in the Catalog of the Scorpions of the World. Sissom (2000) recognized nine genera whereas Soleglad and Fet (2003b, 2005, 2006, 2008) recognized one subfamily, two tribes, two subtribes and 16 genera. Although the classification of Stockwell was based on quantitative analyses, several flaws where identified in the analyses. None of the classifications presented thus far tested the monophyly of the genera of Syntropinae and there has been no attempt to revise the systematics of the species.

The objectives of this dissertation were to (1) analyze the generic relationships of the subfamily and test the monophyly of genera proposed in previous classifications using simultaneous analyses of new and published morphological characters as well as five genetic markers for the described species; (2) provide new diagnostic characters for the subfamily, redefine the genera and present new diagnoses, distribution maps and identification keys for all genera; (3) present a taxonomic revision of the species of the Syntropinae, including 24 new species, fully described and illustrated with high quality images and detailed distribution maps for the species in the subfamily, and keys for their determination; and (4) conduct a phylogenetic

analysis of all new and previously described species in the Syntropinae, with comprehensive phylogeographic sampling of populations, based on morphology and five genetic markers, to establish the relative positions of species within genera and test species concepts.

Chapter 1: Monophyly and generic limits of Syntropinae

The first set of analyses included all currently recognized (Soleglad and Fet, 2008) genera in the Syntropini as ingroup: *Hoffmannius* Soleglad and Fet, 2008; *Kochius* Soleglad and Fet, 2008; *Kuarapu* Francke and Ponce-Saavedra, 2010; *Syntropis* Kraepelin, 1900; *Thorellius* Soleglad and Fet, 2008; plus *Paravaejovis pumilis* and four Mexican species with a subaculear tubercle, putatively related to the Syntropinae. When available, between two and five specimens per species were included. The total ingroup terminals selected for the analyses were 138. Additionally, sixteen exemplars comprising 15 species and eight genera of Smeringurinae, Vaejovinae and Stahnkeini (*sensu* Soleglad and Fet, 2008) served as outgroup. Analyses were rooted on *Smeringurus grandis* (Williams, 1970) because preliminary results retrieved it basal to the Smeringurinae and basal to the family Vaejovidae. Additionally, rooting on *S. grandis* tested the monophyly of Smeringurinae and Paravaejovini and the position of *P. pumilis*.

A dataset for 251 morphological characters was developed, of which 206 were discrete characters that belonged to 17 character systems: (1) carination of pedipalp segments (30 characters); (2) ornamentation of pedipalp segments (17 characters); (3) carination of metasomal segments (20 characters); (4) ornamentation of metasomal segments (5 characters); (5) ornamentation of telson (characters); (6) hemispermatophore microstructure (14 characters); (7) genital opercula (2 characters); (8) ornamentation of tergite and sternite (9 characters); (9)

pectinal teeth (5 characters); (10) ornamentation of chelicerae (4 characters); (11) ornamentation of carapace (9 characters); (12) pedipalp chela finger lobes and notches (12 characters); (13) pedipalp chela finger dentition (8 characters); (14) pedipalp trichobothrial pattern (18 characters); (15) leg macrosetae patterns (14 characters); (16) leg spinule patterns (5 characters) and; (17) infuscation and color (25 characters). A further 45 continuous characters from setal counts on the pedipalp and metasomal carinae (appendices 3–5) were also coded. Of the 251 coded characters, a total of 61 legacy characters were modified from matrices published by Lamoral (1980), Stockwell (1989), Prendini (2000), Fet et al. (2001), Soleglad and Sissom (2001), Soleglad and Fet (2003b), Prendini (2004), Francke and Prendini (2008) and Prendini et al. (2010).

The dataset for the molecular partition included five loci: partial 28S rDNA (ca. 520 base-pairs) and partial 18S rDNA (1,763 base-pairs) from the nuclear genome and partial 16S rDNA (ca. 485 base-pairs), partial 12S rDNA (ca. 335 base-pairs) and partial Cytochrome Oxidase Subunit I, COI (ca. 1,078 base-pairs) from the mitochondrial genome. These five markers permitted the inference of phylogenetic relationships at family, genus, and species levels in the Syntropinae.

The morphological and combined molecular partitions were analyzed independently. The simultaneous analysis of all partitions generated the preferred phylogenetic hypothesis. Datasets were analyzed using parsimony as optimality criterion in TNT (Goloboff et al., 2003). Sensitivity of the data to different regimes of weighting against homoplasy was explored under different values of concavity constant k = 1–20 increasing one unit and k = 20–100 increasing 10 units for all analyses. Resampling and node support were calculated with TNT. Jackknifing with a removal probability of 36% and symmetric resampling with a removal probability of 33% with

1000 pseudoreplicates each were conducted. The highest resampling values served as the optimality criterion to select the most parsimonious tree among the results of simultaneous analyses with gaps considered as a fifth state. Absolute and relative Bremer support (ABS and RBS), up to 65 extra steps, was calculated. Partitioned Bremer support (PBS) (Baker and DeSalle, 1997) was calculated to assess the contribution of each partition to the total Bremer support. Informative characters were used to calculate CI, RI and fit for the preferred hypothesis as well as CI and RI for each character to evaluate the levels of homoplasy for the morphological partition in the preferred hypothesis.

Morphological and molecular analyses produced different topologies, the molecular partition having more resolution. The preferred hypothesis was a single most parsimonious tree resulting from simultaneous analysis of five genetic markers, continuous characters, and discrete morphological characters under IW, $k = 15$ with tree length 10884.593, CI 0.191, RI 0.627 and fit 289.77. Gaps were treated as an additional state, all discrete characters were unordered, and all continuous ordered. The highest average jackknife value was 80.9.

Partitioned Bremer support values showed that the morphological characters had lower contribution to support than the genetic markers, but the morphological characters impacted more clades. The partitioned Bremer support also revealed that the partitions included in this analysis carry largely incongruent signals, which is not rare in other groups of arthropods, for example spiders.

Among the major discoveries, the simultaneous analyses produced a phylogenetic hypothesis in which Stahnkeini and Syntropinae are reciprocally monophyletic. The analyses consistently recovered a new scheme of relationship for the Syntropinae that comprises the following monophyletic groups (figure 10) containing 11 diagnosable genera: ((*Maaykuyak*

Konetontli) (*Vizcaino Syntropis*) (*Kuarapu* (*Balsateres* (*Thorellius Kochius*))) (*Mesomexovis* (*Chihuahuanus* (*Paravaejovis*)))). The implications of this novel scheme are: The two tribes and corresponding subtribes created by Soleglad and Fet (2008) and their genus *Hoffmannius* are not supported. Of the two classifications in use, the *intrepidus* group=*Thorellius* and the *punctipalpi* group=*Kochius* where partially retrieved, with several species transferred to other genera. The only genus retrieved monophyletic was *Syntropis*. The placement of *Kuarapu* in the subfamily Syntropinae is justified. Furthermore, this new scheme also impacted the Smeringurinae and Paravaejovini, which are not monophyletic because *Paravaejovis* was retrieved inside Syntropinae.

The basal clades display disparate morphology. *Vizcaino* is psammophilous, found exclusively in sandy habitats (Williams, 1970b; 1980). *Syntropis* on the other hand is one of the better-known examples of lithophilous scorpions (Polis 1990; Lourenço and Sissom, 2000; Sissom, 2000), which prompted early researchers to place it sister to *Serradigitus*, another well-known lithophilous genus (Stahnke, 1974; Stockwell, 1989; 1992; Sissom, 2000; Soleglad and Fet, 2008). *Maaykuyak* and *Konetontli* have less modified morphology, except for the relative small body size and subaculear tubercle in the latter. These small scorpions occur in mesic climates and vegetated areas, compared to the arid, desolate areas inhabited by the other two genera. These four genera are relict members of an earlier radiation, of which most of the contemporary related taxa are extinct and have been replaced by a new recent diversification represented by the more diverse genera, *Thorellius*, *Kochius*, *Mesomexovis*, *Chihuahuanus* and *Paravaejovis*.

The following clade arranged in a pectinate group comprising *Kuarapu*, *Thorellius*, *Balsateres*, and *Kochius*, was referred to as the *punctipalpi* clade. This is yet another unexpected

outcome uniting morphologically disparate taxa. At one extreme *Kuarapu* presents a lithophilous ecomorphotype (Francke and Ponce-Saavedra, 2010). At the other extreme, *Thorellius* and *Kochius* appear to be less specialized morphologically, sheltering under rocks and other objects and not preferring particular substrate. *Balsateres* burrows in compacted sandy to loamy soils (Ponce-Saavedra and Sissom, 2004).

Three derived monophyletic groups are located terminally on the tree: *Mesomexovis*, *Chihuahuanus*, and *Paravaejovis*. These three genera have a very strong biogeographical signal; each is distributed in an area that has been recognized as biogeographical unit with particular physiography, geology, fauna and flora. *Mesomexovis* is distributed in the Pacific coast of Mexico and the slopes of the Trans-Mexican Volcanic Belt, *Chihuahuanus* is found exclusively in the Chihuahuan desert, and *Paravaejovis* ranges from the Baja California Peninsula to the Sonoran, Mohave, and Great basin deserts of the Unites States and Mexico.

Chapter 2: Generic revision of Syntropinae

The phylogenetic analyses allowed the redefinition of the subfamily Syntropinae and its component genera. The following taxonomic emendations were proposed. The tribe Paravaejovini Soleglad and Fet, 2008 and the subtribe Thorellina Soleglad and Fet, 2008 were synonymized with Syntropinae. Eleven genera were recognized, *Kochius* Soleglad and Fet, 2008; *Kuarapu* Francke and Ponce-Saavedra, 2010; *Paravaejovis* Williams, 1980; *Syntropis* Kraepelin, 1900, and *Thorellius* Soleglad and Fet, 2008. Six new genera were described: *Balsateres,* **n. gen.**, *Chihuahuanus*, **n. gen.**, *Konetontli,* **n. gen.**, *Maaykuyak,* **n. gen.**, *Mesomexovis*, **n. gen.**, and *Vizcaino*, **n. gen.** *Hoffmannius*, **syn. n.** was synonymized with *Paravaejovis* and 10 species were

transferred to the latter. Five species formerly placed in *Kochius*, and *Thorellius* were transferred to corresponding new genera and/or elevated to species rank: *Chihuahuanus cazieri* (Williams, 1968), **n. comb.**, *Chihuahuanus crassimanus* (Pocock, 1898), **n. comb.**, *Chihuahuanus russelli* (Williams, 1971), **n. comb.**, *Chihuahuanus kovariki* (Soleglad and Fet, 2008), **n. comb.**, and *Mesomexovis atenango* (Francke and González-Santillán, 2007), **n. comb.**, *Mesomexovis subcristatus* (Pocock, 1898), **n. comb.**, and *Mesomexovis occidentalis* (Hoffmann, 1931), **n. comb.** *Kochius barbatus* (Williams, 1971), **n. stat.**, *Kochius cerralvensis* (Williams, 1971), **n. stat.**, *Kochius villosus* (Williams, 1971), **n. stat.**, *Mesomexovis spadix* (Hoffmann, 1931), **n. comb.**, **n. stat.**, and *Mesomexovis variegatus* (Pocock, 1898), **n. comb.**, **n. stat**. *Paravaejovis schwenkmeyeri* (Williams, 1970), **n. comb.** was removed from synonymy. New diagnoses and detailed distribution maps were prepared for each genus along with a key to the identification of the genera.

Chapter 3: Species revision of Syntropinae

After resolving the monophyly and limits of the genera of Syntropinae, a revision of the species in the subfamily was conducted. Eighty valid species were recognized, all of which were fully described and illustrated with detailed distribution maps and images of diagnostic characters of the pedipalp chelae, patella, and femur, carapace, pectines and sternum, tarsi and basitarsi III, metasomal segments, telson and habitus of male and female. An identification key to the species of each genus was prepared.

An important discovery was the presence of cryptic species in several genera. For example, one formerly widespread species in central Mexico, *Vaejovis punctatus* (now

Mesomexovis punctatus) comprised nine species restricted to smaller areas: *M. ofeliae,* **n. sp.**, *M. zaragozai*, **n. sp.**, *M. tlayoli*, **n. sp.**, and *M. fasciatus*, **n. sp.** are distributed on the southern foothills of the TMVB, whereas *M. punctatus* is only recorded on the other side of the TMVB. The clade formerly comprising *M. nigropictus* included the species *M. hesperus*, **n. sp.**, and *M. tinctus*, **n. sp.**, distributed west and east of the distribution of *M. nigropictus.* Finally, within the *M. variegatus* clade were found *M. ponce*, **n. sp.**, *M. izazagai*, **n. sp.**, and *M. mintoni*, **n. sp.**, the first three being endemic to sub-basins within the Balsas Depression and the last to the Bajio region in central Mexico.

The following taxonomic emendations and additions were proposed in the revision. The number of species of the genus *Konetontli* González-Santillán and Prendini, in litt. was doubled, with descriptions of four new species: *Konetontli ignis,* **n. sp.**; *Konetontli ilitchi*, **n. sp.**; *Konetontli juxtlahuaca*, **n. sp.**; *Konetontli migrus*, **n. sp.**; and the removal from synonymy of *Konetontli zihuatanejensis* (Baldazo-Monsivais, 2003). Three new species were described in the genus *Thorellius* Soleglad and Fet, 2008: *Thorellius tekuani*, **n. sp.**; *Thorellius wixarika*, **n. sp.**; and *Thorellius yuyuawi*, **n. sp.** *Thorellius atrox* (Hoffmann, 1931) was synonymized with *Thorellius cristimanus* (Pocock, 1898). Six new species were described in the genus *Kochius* Soleglad and Fet, 2008: *Kochius catavina*, **n. sp.**; *Kochius danzante*, **n. sp.**; *Kochius jatay*, **n. sp.**; *Kochius kiliwa*, **n. sp.**; *Kochius maroma*, **n. sp.**; and *Kochius moosni*, **n. sp.** Six new species were described in the genus *Mesomexovis* González-Santillán and Prendini, in litt.: *Mesomexovis caxcan*, **n. sp.**; *Mesomexovis izazagai*, **n. sp.**; *Mesomexovis ofeliae*, **n. sp.**; *Mesomexovis tinctus*, **n. sp.**; *Mesomexovis tlayoli*, **n. sp.**; and *Mesomexovis zaragozai*, **n. sp.** *Mesomexovis nigropictus* (Pocock, 1898) was restored from synonymy and *M. spadix* (Hoffmann, 1931) synonymized. One new species was described in the genus *Chihuahuanus* González-Santillán and Prendini, in

litt.: *Chihuahuanus panchovillai* **n. sp.** *Chihuahuanus cazieri* (Williams, 1968) was synonymized with *C. crassimanus* (Pocock, 1898). Six new species were described in the genus *Paravaejovis* Williams, 1980: *Paravaejovis cochimi*, **n. sp.**, *Paravaejovis elucidatus*, **n. sp.**, *Paravaejovis exploratus,* **n. sp.**, *Paravaejovis kino*, **n. sp.**, *Paravaejovis nigroguerreroensis*, **n. sp.**, *Paravaejovis voluptatis* **n. sp.** The classification proposed in this revision is presented in table 23.

Chapter 4: All-Species phylogeny of Syntropinae

The final aspect of the research presented a phylogenetic analysis of Syntropinae with sampling expanded to include all except two species, most of which were sampled in multiple populations, testing species limits and assessing fine-scale biogeographical patterns.

Following the same scheme of analysis used previously, the dataset comprising 251 morphological characters belonging to 17 character systems including 206 discrete characters and 45 continuous characters, was used. Discrete characters were extrapolated to samples identified as the same species. Identification of species for each terminal was performed by direct comparison to holotype, paratype or topotype specimens. The quantitative nature of continuous characters may present larger variation and this could generate a stronger effect in the analyses. For this reasons it was decided to avoid the same treatment as discrete characters, hence only samples scored in chapter 1 were included and the rest were assigned "?" missing data. The genetic dataset included 457 terminals in total, expanding more than two times the samples used in chapter 1 (183). Sequences were aligned using MAFFT version 6 (Katoh et al., 2005). The molecular (concatenated genes) and the morphological partitions (combined discrete

and continuous) were analyzed independently to investigate the phylogenetic signal. The preferred hypothesis was selected among the simultaneous analyses considering gaps as fifth state, under different strengths of *k*. Resampling values served as optimality criterion to select the most parsimonious tree among the results of simultaneous analyses (Källersjö et al., 1999), which in turn was the preferred hypothesis. All analyses were conducted using parsimony as optimality criterion in TNT using the command **xmult = level 10** (Goloboff et al., 2003). Sensitivity of the data to different regimens of weighting against homoplasy was explored under different concavity constant (*k*) values with the following scheme: 3, 10, 15, 30, 60, 100 and 110. Stability of nodes to the *k* value results was presented as majority rule with cutoff 50 %. Jackknifing with probability of 36 % of removal with 3000 pseudoreplicates was conducted. The highest average value of resampling among simultaneous analyses treating gaps as an additional state, served as optimality criterion to select the preferred hypothesis. Absolute and relative Bremer supports up to 100 extra steps were calculated (Bremer, 1994; Goloboff and Farris, 2001; Goloboff et al., 2003; Goloboff et al., 2008). Successive calculation of longer trees by one step, retaining up to 1000 trees in memory every search were obtained with the command **sub hold 1000; bb=tbr fillonly** generating 100,000 trees. Informative characters were used to calculate CI, RI and fit for each analyses as well as CI and RI for each character to evaluate the levels of homoplasy for the morphological partition per character system.

The preferred hypothesis was obtained from simultaneous analysis of five genetic markers, continuous characters, and discrete morphological characters under IW, $k = 110$. Tree length was 20370.308, CI 0.115, RI 0.744 and fit 124.72. Gaps were treated as an additional state, all discrete characters were unordered and all continuous ordered, and jackknife value was

72.9. The CI, CR and Fit for the molecular and the morphological partitions shown similar levels of homoplasy, even though there were four times more pair bases than morphological characters.

This analysis had three times more terminals than that presented in chapter 1, with an additional 35 species, including 20 new species described in chapter 3. The effects of including additional terminals were minimal in the topology. However, compared to the topology in figure 10, the topology in figure 436 had an average increase in RBS values for the genera from 65 to 87, and a decrease in jackknife values from 86 to 81. The preferred topology recovered in chapter 4 (figure 436) confirmed the monophyly of genera recognized in chapter 1 (figure 10), however the relationships among them altered slightly. In comparison with figure 10, the topology in figure 436 had the following configuration: (*Konetontli* (*Maaykuyak* (*Vizcaino Syntropis*))) ((*Kuarapu*(*Balsateres*(*Thorellius*(*Kochius*)))) (*Mesomexovis*) (*Chihuahuanus Paravaejovis*)).

The revised, all-species phylogeny for Syntropinae permitted a discussion of biogeographical relationships in the subfamily. Syntropinae reaches its highest diversity, with five genera and 33 species, in the Baja California peninsula (Williams, 1980). This diversity comprises 99 % of *Paravaejovis*, the monotypic *Vizcaino*, one of two species of *Maaykuyak*, 99 % of *Kochius*, and 100 % of the species of *Syntropis.* The southern part of the Trans Mexican Volcanic Belt, including the Pacific coast and low lands of the Balsas Depression occupy second place. This region harbors 90 % of the *Mesomexovis*, 99 % of the *Konetontli*, and 100 % species of *Thorellius* and the monotypic *Balsateres* and *Kuarapu.* The rest of the diversity is distributed in the vast territory occupied by the deserts of North America, the Great Basin, the Mohave, the Sonoran and the Chihuahuan deserts, where *Chihuahuanus*, few species of *Paravaejovis*, and one species of *Maaykuyak* inhabit. The distribution of the species in this subfamily resembles

that of other groups of organisms (mammals, reptiles, amphibians, and cactus) and is concordant with putative cryptic vicariance events, particularly in the Baja California Peninsula.

Table 23. Classification of the scorpion subfamily Syntropinae proposed here.

Syntropinae Kraepelin, 1905
- *Balsateres* González-Santillán and Prendini, **n. gen.**
  - *Balsateres cisnerosi* (Ponce and Sissom, 2004)
- *Chihuahuanus* González-Santillán and Prendini, **n. gen.**
  - *Chihuahuanus bilineatus* (Pocock, 1898)
  - *Chihuahuanus coahuilae* (Williams, 1968)
  - *Chihuahuanus crassimanus* (Pocock, 1898)
  - *Chihuahuanus glabrimanus* (Sissom and Hendrixson, 2005)
  - *Chihuahuanus globosus* (Borelli, 1915)
  - *Chihuahuanus kovariki* (Soleglad and Fet, 2008)
  - *Chihuahuanus panchovillai*, **n. sp.**
  - *Chihuahuanus russelli* (Williams, 1971)
- *Kochius* Soleglad and Fet, 2008
  - *Kochius barbatus* (Williams, 1971)
  - *Kochius bruneus* (Williams, 1971)
  - *Kochius catavina*, **n. sp.**
  - *Kochius cerralvensis* (Williams, 1971)
  - *Kochius danzante*, **n. sp.**
  - *Kochius hirsuticauda* (Banks, 1910)
  - *Kochius insularis* (Williams, 1971)
  - *Kochius jatay*, **n. sp.**
  - *Kochius kiliwa*, **n. sp.**
  - *Kochius magdalensis* (Williams, 1971)
  - *Kochius maroma*, **n. sp.**
  - *Kochius moosni*, **n. sp.**
  - *Kochius punctipalpi* (Wood, 1863)
  - *Kochius sonorae* (Williams, 1971)
  - *Kochius villosus* (Williams, 1971)
- *Konetontli* González-Santillán and Prendini, **n. gen.**
  - *Konetontli acapulco* (Armas and Martín-Frías, 2001)
  - *Konetontli chamelaensis* (Williams, 1986)
  - *Konetontli ignis*, **n. sp.**
  - *Konetontli ilitchi*, **n. sp.**
  - *Konetontli juxtlahuaca*, **n. sp.**
  - *Konetontli kuarapu* (Francke and Ponce-Saavedra, 2004)
  - *Konetontli migrus*, **n. sp.**
  - *Konetontli nayarit* (Armas and Martín-Frías, 2001)
  - *Konetontli pattersoni* (Williams and Haradon, in Williams, 1980)
  - *Konetontli zihuatanejensis* (Baldazo-Monsivais, 2003)
- *Kuarapu purhepecha* Francke and Ponce-Saavedra, 2010
- *Maaykuyak*, González-Santillán and Prendini, **n. gen.**
  - *Maaykuyak vittatus* (Williams, 1970)
  - *Maaykuyak waueri* (Gertsch and Soleglad, 1972)
- *Mesomexovis* González-Santillán and Prendini, **n. gen.**
  - *Mesomexovis atenango* (Francke and González-Santillán, 2007)
  - *Mesomexovis caxcan*, **n. sp.**
  - *Mesomexovis fasciatus* Sissom and Hughes, in prep.
  - *Mesomexovis hesperus* Sissom and Hughes, in prep.

Mesomexovis izazagai, **n. sp.**
Mesomexovis mintoni Sissom and Hughes, in prep.
Mesomexovis nigropictus (Pocock, 1898)
Mesomexovis oaxaca (Santibáñez-López and Sissom, 2010)
Mesomexovis occidentalis (Hoffmann, 1931)
Mesomexovis ofeliae, **n. sp.**
Mesomexovis ponce Sissom and Hughes, in prep.
Mesomexovis punctatus (Karsch, 1879)
Mesomexovis subcristatus (Pocock, 1898)
Mesomexovis tinctus, **n. sp.**
Mesomexovis tlayoli, **n. sp.**
Mesomexovis variegatus (Pocock, 1898)
Mesomexovis zaragozai, **n. sp.**
Syntropis Kraepelin, 1900
Syntropis aalbui Lowe, Soleglad, and Fet, 2007
Syntropis macrura Kraepelin, 1900
Syntropis williamsi Soleglad, Lowe, and Fet, 2007
Paravaejovis Williams, 1980
Paravaejovis cochimi, **n. sp.**
Paravaejovis confusus (Stahnke, 1940)
Paravaejovis diazi (Williams, 1970)
Paravaejovis elucidatus, **n. sp.**
Paravaejovis eusthenura (Wood, 1863)
Paravaejovis exploratus, **n. sp.**
Paravaejovis galbus (Williams, 1970)
Paravaejovis gravicaudus (Williams, 1970)
Paravaejovis hoffmanni (Williams, 1970)
Paravaejovis kino, **n. sp.**
Paravaejovis nigroguerreroensis, **n. sp.**
Paravaejovis pumilis (Williams, 1980)
Paravaejovis puritanus (Gertsch, 1958)
Paravaejovis schwenkmeyeri, (Williams, 1970)
Paravaejovis spinigerus (Wood, 1863)
Paravaejovis voluptatis, **n. sp.**
Paravaejovis waeringi (Williams, 1980)
Thorellius Soleglad and Fet, 2008
Thorellius cristimanus (Pocock, 1898)
Thorellius intrepidus (Thorell, 1876)
Thorellius tekuani, **n. sp.**
Thorellius wixarika, **n. sp.**
Thorellius yuyuawi, **n. sp.**
Vizcaino González-Santillán and Prendini, **n. gen.**
Vizcaino viscainensis (Williams, 1970)

Appendix 1

DNA specimens used for cladistic analysis of the subfamily Syntropinae (Kraepelin, 1905)

Outgroup

***Franckeus kochi* (Sissom, 1991)**: MEXICO: Hidalgo: *Municipio de Mixquihuala*, Valle del Mezquital, 8.vii.2005, R. Encino, juvenile (AMNH [LP 5363]).

***Pseudouroctonus glimmei* (Hjelle, 1972)**: U.S.A: California: *Stanislaus Co.*: Frank Raines Park, 2.3 mi SW on El Puerto Canyon Road, 21.iii.2004, E.S. Volschenk and W.E. Savary, juvenile (AMNH [LP 2688]).

***Serradigitus minutus* (Williams, 1970)**: MEXICO: Baja California Sur: 15 mi E of Cabo San Lucas, 1.vi.1999, M.E. Soleglad, juvenile (AMNH [LP 1674]).

***Serradigitus* sp.:** MEXICO: Sinaloa: 13.vii.2006, P. Berea, ♂ (AMNH [LP 6370]).

***Smeringurus grandis* (Williams, 1970)**: MEXICO: Baja California: *Municipio de Ensenada*: Punta Calamajue (abandoned fishing village), 29°41.119'N 114°09.774'W, 5.4 m, 1.vii.2008, H. Montaño and E. González, subadult ♀ (AMNH [LP 8690]).

***Stahnkeus deserticola* (Williams, 1970)**: U.S.A.: California: *Inyo Co.*: Death Valley National Park, Saline Valley Marsh, along Saline Valley Road, 36°41.651'N 117°49.917'W, 326 m, 4.ix.2005, R. Mercurio and L. Prendini, subadult ♂ (AMNH [LP 5032]).

***Uroctonites giulianii* Williams and Savary, 1991**: U.S.A.: California: *Inyo Co.*: Inyo National Forest, White Mountains, roadside of 168, 37º15'16.6"N 118º09'22.7"W, 2110 m 15.viii.2004, W.E. Savary, R. Mercurio, K. Bamba and M. McCoy, juvenile (AMNH [LP 3204]).

***Vaejovis carolinianus* (Beauvois, 1805)**: U.S.A.: South Carolina: 16.v.2000, ♀ (AMNH [LP 1576]).

***Vaejovis intermedius* Borelli, 1915**: U.S.A.: Texas: *Culberson Co.*: Indio Research Station, near Van Horn, ix.2002, L. Esposito, ♀ (AMNH [LP 2141A]).

***Vaejovis lapidicola* Stahnke, 1940**: U.S.A.: Arizona: *Coconino Co.*: Flagstaff, red sandstone quarry, SE end Switzer Mesa, just N of junction US Route 66 and Enterprise Road, 35°11.873'N 111°37.749'W, 3.viii.2000, J. Bigelow and C. Bigelow, ♂ (AMNH [LP 1814]).

***Vaejovis mexicanus* C. L. Koch, 1836**: MEXICO: Distrito Federal: Delegación Coyoacán House, 18.xii.2001, E. González, ♀ (AMNH [LP 1825]).

***Vaejovis pequeno* Hendrixson, 2001**: MEXICO: Sonora: *Municipio de Soyopa*: Sierra El Encinal, 9 km from crossroad in highway Mex16 to El Encinal 28º 35.412'N 109º27.148'W, 380 m, 24.vi.2006, E. González and P. Berea, ♀ (AMNH [LP 6308]).

***Vaejovis rossmani* Sissom, 1989**: MEXICO: Tamaulipas: Conrado Castillo, 29.vii.2002, O. Francke and L. Prendini, ♀ (AMNH [LP 2027]).

***Vaejovis* sp.**: MEXICO: Chiapas: 25.v.2005, O. Francke, M. Córdova, A. Jaimes and J. Ballesteros, ♂ (AMNH [LP 5327]); 2.xi.2004, O. Francke, R. Paredes and G. Villegas, ♀ (AMNH [LP 3711]).

***Wernerius spicatus* (Haradon, 1974)**: U.S.A.: California: *Riverside Co.*: Joshua Tree National Park, Little San Bernardino Mountains, Berdoo Canyon, 6.9 mi. NE on Berdoo Canyon Road. from Berdoo Canyon Road/Dillon Road junction on Berdoo Canyon Road 33°49'45.32"N 116°05'44.67"W, 2945 ft., 3.viii.208, Z.J. Valois and W.E. Savary, ♂ (AMNH [LP 8968]).

Ingroup

***Balsateres cisnerosi* (Ponce-Saavedra and Sissom, 2004)**: MEXICO: Michoacán: *Municipio de Carácuaro*: Las Cocinas, Hwy Nocupetaro-Carácuaro, 19°01.880'N 101°14.067'W, 672 m, 14.vii.2005, O. Francke, J. Ponce, M. Córdova, A. Jaimes, G. Francke and V. Capovila, subadult ♂ (AMNH [LP 5269]). *Municipio de Churumuco de Morelos*: Churumuco, [18°39.3927'N 101°39.1235'W], 8.ix.2001, R. Cancino, ♂ (AMNH [LP 2018]).

***Chihuahuanus bilineatus* (Pocock, 1898)**: MEXICO: Guanajuato: *Municipio de San Luis de La Paz*: San Luis de La Paz, 7 km E, 21°18.714'N 100°25.601'W, 2117 m, 24.viii.2006, O. Francke, W.D. Sissom, G. Casper, T. Anton, V. Totti, H. Montaño, C. Santibáñez and A. Ballesteros, ♀ (AMNH [LP 6594]). San Luis Potosí: *Municipio de Ciudad del Maíz*: Puerto Santa Catarina, 22°18.223'N 99°37.268'W, 1214 m, 22.viii.2006, O. Francke, W.D. Sissom, G. Casper, T. Anton, V. Totti, H. Montaño, C. Santibáñez and A. Ballesteros, ♀ (AMNH [LP 6507]). Zacatecas: *Municipio de Fresnillo*: Colonia Guanajuato, 23°04.749'N 103°05.139'W, 2250 m, 6.vii.2005, O. Francke, J. Ponce, M. Córdova, A. Jaimes, G. Francke and V. Capovila, ♀ (AMNH [LP 5306]).

***Chihuahuanus cazieri* (Williams, 1968)**: MEXICO: Coahuila: *Municipio de Cuatro Ciénegas*: Dunas de Yeso, 26°51.765'N 102°10.476'W, 776 m, 18.vii.2006, O. Francke, W.D. Sissom, M. Córdova, A. Jaimes and A. Ballesteros, ♂ (AMNH [LP 7163]); Sierra San Marcos, 26°54'47.63"N 102°8'15.23"W, 761 m, 18.vii.2006, E. González, B. Hendrixson, K. McWest and S. Grant, ♂ (AMNH [LP 7179]).

***Chihuahuanus coahuilae* (Williams, 1968)**: U.S.A.: New Mexico: *Luna Co.*: 1.6 km SE on Bonita Road from turnoff on Gap Road, Little Florida Mountains, 32°09'29.4"N 107°35'18.9"W, 1761 m, 3.ix.2007, L. Prendini and J. Huff, juvenile (AMNH [LP 7095]). MEXICO: Durango: *Municipio de Gómez Palacio*: Dinamita, 25°44.089'N 103°40.400'W, 1328 m, 29.vii.2005, O. Francke, H. Montaño, J. Ballesteros and C. Durán, ♂ (AMNH [LP 5353]). Coahuila: *Municipio de Cuatro Ciénegas*: Ojo de Agua, Ejido El Oso, 1039 m, 19.vii.2006, O. Francke, W.D. Sissom, K. McWest, B. Hendrixson, S. Grant, A. Jaimes, M. Córdova, E. González and A. Ballesteros, ♂ (AMNH [LP 6600]).

***Chihuahuanus crassimanus* (Pocock, 1898)**: U.S.A.: New Mexico: *Hidalgo Co.*: Granite Gap, Peloncillo Mountains, 32°05'43.1"N 108°58'13.7"W, 1367 m, 4.ix.2007, L. Prendini and J. Huff, subadult ♂ (AMNH [LP 7100]). Texas: *Brewster Co.*: Black Gap Wildlife Management Area, 10.5 km past camp 6 on Camp 14 Road, [29°32.84200'N 102°54.6285'W], 16.vii.2004, L. Jarvis, W.D. Sissom and T. Anton, ♂ (AMNH [LP 2972]). MEXICO: Durango: *Municipio de Tlahualilo*: Hwy 49, at deviation Montes Claros-Tlahualilo de Zaragoza, 26°9.242'N 103°31.284'W, 1107 m, 6.viii.2005, O. Francke, W.D. Sissom, K. McWest, C. Lee, H. Montaño, J. Ballesteros, L. Jarvis and C. Durán, juvenile (AMNH [LP 5365]).

***Chihuahuanus glabrimanus* (Sissom and Hendrixson, 2005)**: MEXICO: Guanajuato: *Municipio de San Diego de la Unión*: San Diego de la Unión, 8 km S, 21°23.1444'N 100°53.4522'W, 2078 m, 28.vii.2006, O. Francke, M. Córdova, A. Jaimes, E. González and A. Ballesteros, juvenile (AMNH [LP 6611]). Nuevo León: *Municipio de Galeana*: Providencia, 3 km NE, 25°8.6514'N 100°39.04'W, 1980 m, 17.vii.2006, O. Francke, E. González, M. Córdova, J. Ballesteros and A. Jaimes, ♂ (AMNH [LP 6558]). San Luis Potosí: *Municipio de Ciudad del Maíz*: Puerto Santa Catarina, 22°18.223'N 99°37.268'W, 1214 m, 22.viii.2006, O. Francke, W.D. Sissom, G. Casper, T. Anton, V. Totti, H. Montaño, C. Santibáñez and A. Ballesteros, juvenile (AMNH [LP 6610]).

***Chihuahuanus globosus* (Borelli, 1915)**: U.S.A.: Texas: *Brewster Co.*: Big Bend National Park, Boquillas Canyon, 29°12.0022'N 102°55.0285'W, 2.viii.2008, W.D. Sissom, T. Anton and G.

Casper, ♂ (AMNH [LP 8926]). MEXICO: Coahuila: *Municipio de Cuatro Ciénegas*: Sierra San Marcos, 26°54'47.63"N 102°8'15.23"W, 761 m, 18.vii.2006, E. González, B. Hendrixson, K. McWest and S. Grant, ♀ (AMNH [LP 6447]). *Municipio de Viesca*: Dunas de Bilbao, 25°25.586'N 102°53.654'W, 1098 m, 20.vii.2006, O. Francke, K. McWest, M. Córdova, A. Jaimes and A. Ballesteros, ♂ (AMNH [LP 6459]). Durango: *Municipio de Tlahualilo*: Hwy 49, at deviation Montes Claros-Tlahualilo de Zaragoza, 26°09.242'N 103°31.284'W, 1107 m, 6.viii.2005, O. Francke, W.D. Sissom, K. McWest, C. Lee, H. Montaño, J. Ballesteros, L. Jarvis and C. Durán, juvenile (AMNH [LP 5281]).

***Chihuahuanus kovariki* (Soleglad and Fet, 2008)**: MEXICO: Durango: Hwy 36, marker km 9, between crossroad San Andres Atotonilco and la Laguna de la Chaparra, 25°05.306'N 105°31.530'W, 2095 m, 11.viii.2005, O. Francke, W.D. Sissom, K. McWest, C. Lee, H. Montaño, J. Ballesteros, L. Jarvis and C. Durán, ♂ (AMNH [LP 5299]). *Municipio de Pánuco de Coronado*: La Mina, Hwy 137, between Pánuco de Colorado and San José de Avino, 24°31.809'N 104°18.941'W, 2217 m, 9.viii.2005, O. Francke, W.D. Sissom, K. McWest, C. Lee, H. Montaño, J. Ballesteros, L. Jarvis and C. Durán, juvenile (AMNH [LP 5305]).

***Chihuahuanus russelli* (Williams, 1971)**: U.S.A.: Arizona: *Cochise Co.*: Foothills of Pinaleno Mountains, 7.4 km from junction of Hwy 191 on Hwy 366, 32°41'33.9"N 109°45'13.3"W, 1132 m, 25.vii.2007, J. Huff, ♂ (AMNH [LP 7017]). New Mexico: *Quay Co.*: Glenrio, ca. 2.4 km W on Old US 66, 35°10'08.0"N 103°04'05.3"W, 1169 m, 3.ix.2007, K. McWest, H.M. Burrell and K.S.M. Torres, Juvenile (AMNH [LP 7266]). Texas: *Brewster Co.*: Black Gap Wildlife Management Area, 6.4 km past camp on Camp 14 Road, [29°32.84200'N 102°54.6285'W], 16.vii.2004, L. Jarvis, W.D. Sissom and T. Anton, ♂ (AMNH [LP 2971]).

***Kochius barbatus* (Williams, 1971)**: MEXICO: Baja California Sur: *Municipio de La Paz*: Las Cruces, 4 km NW, 24°13.511'N 110°07.410'W, 31 m, 24.vi.2008, H. Montaño and E. González, ♂ (AMNH [LP 8803]).

***Kochius bruneus* (Williams, 1971)**: MEXICO: Baja California Sur: *Municipio de Comondú*: San Miguel de Comondú, 2 km SW, 26°01'48.3"N 111°50'57"W, 199 m, 12.vii.2004, O. Francke, W.E. Savary, E. González and A. Valdez, juvenile (AMNH [LP 3153]). *Municipio de Loreto*: Loreto, 15 km W, 25°58'38.5"N 111°27'53.1"W, 213 m, 13.vii.2004, O. Francke, W.E. Savary, E. González and A. Valdez, ♂ (AMNH [LP 3154]); Loreto, ca. 3 km S along gravel road to San Javier, from junction with Route 1, [25°59'48.14"N 111°23'3.88"W], 38 m, 8.vii.2005, E. González, R. Mercurio, W.E. Savary and L. Prendini, ♂ (AMNH [LP 4555]).

***Kochius cerralvensis* (Williams, 1971)**: MEXICO: Baja California Sur: *Municipio de La Paz*: Isla Cerralvo, SW side, [24°10.9332'N 109°53.2332'W], 0–50 m, 27.v.2008, I.G. Nieto and E. González, ♂ (AMNH [LP 8779]).

***Kochius hirsuticauda* (Banks, 1910)**: U.S.A.: California: *Inyo Co.*: Death Valley National Park, Grapevine Canyon, Saline Valley Road, 36°33.591'N 117°35.219'W, 1290 m, 4.ix.2005, R. Mercurio and L. Prendini, ♂ (AMNH [LP 5049]). *San Bernardino Co.*: Park Moabi Road, 9.7 km from intersection with I-40, 34°42'35.7"N 114°30'59.7"W, 231 m, 9.ix.2007, L. Prendini and J. Huff, subadult ♂ (AMNH [LP 7199]). MEXICO: Baja California: *Municipio de Ensenada*: Punta Calamajue, abandoned fishing village, 29°41.119'N 114°09.774'W, 5.4 m, 1.vii.2008, H. Montaño and E. González, ♀ (AMNH [LP 8819]).

***Kochius insularis* (Williams, 1970)**: MEXICO: Baja California Sur: *Municipio de La Paz*: Isla Espíritu Santo, Playa Bonanza, 24°27.364'N 110°18.471'W, 0–50 m, 31.v.2008, I.G. Nieto and E. González, ♂ (AMNH [LP 8801]).

***Kochius magdalensis* (Williams, 1971)**: MEXICO: Baja California Sur: *Municipio de La Paz*: La Paz, 50 km NW, 24°05'56.2"N 110°43'41"W, 256 m, 7.vii.2004, O. Francke, E. González and A. Valdez, ♀ (AMNH [LP 3155]); La Paz, ca. 20 km N, junction Route 1 and road to San Juan de la Costa, 24°13.383'N 110°35.766'W, 20 m, 9.vii.2005, L. Prendini, E. González and R. Mercurio, juvenile (AMNH [LP 4552]); El Pilar, ca. 20 km NE of Las Pocitas, 24°28.762'N 111°01.125'W, 92 m, 25.vi.2008, H. Montaño and E. González, ♂ (AMNH [LP 8796]).
***Kochius punctipalpi* (Wood, 1863)**: MEXICO: Baja California Sur: *Municipio de Los Cabos*: Cabo San Lucas, 24 km E, [22°53.3833'N 109°54.933'W], 1.vi.1999, M.E. Soleglad, ♀ (AMNH [LP 1679]); Santiago, 23°26'24.5"N 109°43'34.6"W, 225 m, 9.vii.2004, O. Francke, E. González and A. Valdez, juvenile (AMNH [LP 3157]); San Bartolo, 6 km SW, 23°41.816'N 109°50.800'W, 100 m, 13.vii.2008, H. Montaño and E. González, ♂ (AMNH [LP 8843]).
***Kochius sonorae* (Williams, 1971)**: MEXICO: Sonora: *Municipio de Navojoa*: Microwaves Cerro Prieto, ca. 15 km E of Navojoa, 27°4.9368'N 109°17.4348'W, 375 m, 23.ix.2009, E. González and J.L. Castelo, juvenile (AMNH [LP 9974]). *Municipio de Soyopa*: Plutarco Elias Calles Dam, Ejido el Novillo, 28°58.827'N 109°30.160'W, 258 m, 22.vi.2006, P. Berea and E. González, ♂ (AMNH [LP 6301]). *Municipio de Yecora*: La Palma Agujerada Ranch, between Tepoca and Guizamopa, Road SON 117, 28°28.722'N 109°10.298'W, 847 m, 23.vi.2006, P. Berea and E. González, ♂ (AMNH [LP 6304]).
***Kochius villosus* (Williams, 1971)**: MEXICO: Baja California: *Municipio de Ensenada*: Misión San Borja, 28°44.607'N 113°45.233'W, 433 m, 13.vii.2005, E. González and W.E. Savary, ♂ (AMNH [LP 4544]). *Municipio de Loreto*: Juncalito, 25°49.892'N 111°19.691'W, 5 m, 20.v.2004, R. Mercurio, M. Nishiguchi et al., ♂ (AMNH [LP 3477]). *Municipio de Mulegé*: Microwave station "El Abulón", 27°17.483'N 113°01.916'W, 141 m, 12.vii.2005, W.E. Savary and E. González, ♂ (AMNH [LP 4554]).
***Konetontli acapulco* (Armas and Martín-Frías, 2001)**: MEXICO: Guerrero: *Municipio de José Azueta*: Colonia Agua de Correa, 17°38.6982'N 101°31.0932'W, 72 m, 1.viii.2008, O. Francke, H. Montaño, J. Ponce and A. Quijano, ♀ (AMNH [LP 9520]).
***Konetontli chamelaensis* (Williams, 1986)**: MEXICO: Jalisco: *Municipio de La Huerta*: Estación Biológica Chamela, Cutzmala, 19°29.875'N 105°02.608'W, 97 m, 30.viii.2007, O. Francke et al., juvenile (AMNH [LP 7675]).
***Konetontli nayarit* (Armas and Martín-Frías, 2001)**: MEXICO: Nayarit: *Municipio de Tepic*: Jesus María Corte, 4 km N, 2 km along gravel road E of main paved road, ca. 30 km N Tepic, 21°45.203'N 104°51.213'W, 126 m, 29.vii.2005, E. González and R. Mercurio, ♀ (AMNH [LP 4725]).
***Konetontli pattersoni* (Williams and Haradon, 1980)**: MEXICO: Baja California Sur: *Municipio de Los Cabos*: Sierra de La Laguna, 23°41'10"N 109°56'41.1"W, 850 m, 9.vii.2004, O. Francke, E. González and A. Valdez, juvenile (AMNH [LP 3149]); Sierra de La Laguna, 23°33'1.6"N 109°59'27.4"W, 1800 m, 21.vii.2004, O. Francke, W.E. Savary, E. González and A. Valdez, ♀ (AMNH [LP 3150]).
***Kuarapu purepecha* Francke and Ponce-Saavedra, 2010**: MEXICO: Michoacán: *Municipio de Huarana*: El Vado, [18°48'51"N 101°54'57"W], 248 m, 30.vii.2008, O. Francke, H. Montaño, J. Ponce and A. Quijano, juvenile (AMNH [LP 9517]).
***Maaykuyak vittatus* (Williams, 1970)**: MEXICO: Baja California Sur: *Municipio de Comondú*: San Miguel de Comondú, 26°02'26.7"N 111°49'55.3"W, 220 m, 12.vii.2004, O. Francke, W.E. Savary, E. González and A. Valdez, ♂ (AMNH [LP 3180]). *Municipio de La Paz*: La Paz, ca. 38

km N, 1 km off Route 1 on Ley Federal de la Reforma Agraria, 24°03.609'N 110°36.777'W, 256 m, 9.vii.2005, W.E. Savary and E. González, ♂ (AMNH [LP 4442]).
***Maaykuyak waueri* (Gertsch and Soleglad, 1972)**: U.S.A.: Texas: *Brewster Co.*: Black Gap Wildlife Management Area, 1.8 km down S fork of Camp 18 Road, [29°32.84200'N 102°54.6285'W], 18.vii.2004, L. Jarvis and T. Anton, juvenile (AMNH [LP 2973]). MEXICO: Coahuila: *Municipio de Cuatro Ciénegas*: Ojo de Agua, Ejido El Oso, 1039 m, 19.vii.2006, O. Francke, W.D. Sissom, K. McWest, B. Hendrixson, S. Grant, A. Jaimes, M. Córdova, E. González and A. Ballesteros, ♂ (AMNH [LP 6544]).
***Mesomexovis atenango* (Francke and González-Santillán, 2007)**: MEXICO: Guerrero: *Municipio de Ahuelicán*: Ahuelicán, 2 km W, Cerro de la Coronilla, 18°0.9768'N 99°31.72'W, 853 m, 30.i.2009, A. Valdez, O. Francke, R. Parede, S. Soriano and T. López, subadult ♀ (AMNH [LP 9982]). *Municipio de Atenango del Río*: Atenango del Río, [18°9.5158'N 99°4.1623'W], 17.viii.2000, E. González, O. Delgado, M. Capes and O. Francke, juvenile (AMNH [LP 2023]). *Municipio de Tepecoacuilco de Trujano*: Ahuehuepan, 2 km W, 18°00.911'N 99°31.407'W, 867 m, 14.vi.2007, O. Francke, Ponce et al., subadult ♂ (AMNH [LP 7058]).
***Mesomexovis spadix* (Pocock, 1898)**: MEXICO: Aguascalientes: *Municipio de Aguascalientes*: Potrero Los López, 22°05'35.07'N 102°31'19.76'W, 2139 m, 22.viii.2003, ♀ (AMNH [LP 2950]). Guanajuato: *Municipio de León*: San Antonio de Padua, [20°34.5167'N 100°57.2167'W], 29.vii.2004, juvenile (AMNH [LP 6373]). Zacatecas: *Municipio de Jalpa*: Jalpa, 5 km SW, 21°38.569'N 103°03.425'W, 1564 m, 7.viii.2005, ♀ (AMNH [LP 5280]).
***Mesomexovis oaxaca* (Santibáñez-López and Sissom, 2010)**: MEXICO: Oaxaca: *Municipio de San Pablo Villa Mitla*: Mitla, 4.5 km E, 17°15.642'N 96°32.427'W, 23.vii.2002, L. Prendini, O. Francke, E. González and J. Ponce, ♂ (AMNH [LP 2031]). *Municipio de Totolapan*: Totolapan, 4 km N, 16°41'45.9"N 96°18'52.1"W, 1078 m, 1.xi.2004, O. Francke, R. Paredes and G. Villegas, ♂ (AMNH [LP 3718]).
***Mesomexovis occidentalis* (Hoffmann, 1931)**: MEXICO: Guerrero: *Municipio de Acapulco*: Cumbres of Llano Largo, 16°49.505'N 99°49.999'W, 371 m, 16.vi.2007, O. Francke et al., juvenile (AMNH [LP 7056]). *Municipio de La Unión*: Majahua, N of Zihuatanejo, 17°47.8308'N 101°44.65'W, 11 m, 24.v.2006, O. Francke, A. Valdez, H. Montaño and A. Ballesteros, ♂ (AMNH [LP 6559]). Oaxaca: *Municipio de Huatulco*: Puerto Escondido, 15°50'40.9"N 97°01'11.9"W, 11.vii.2002, R. Cancino, ♂ (AMNH [LP 3118]). *Municipio de Pedro Juchatengo*: San Pedro Juchatengo, 3 km W, 16°21.8238'N 97°6.5838'W, 845 m, 27.vi.2006, O. Francke, A. Valdez, G. Villegas, H. Montaño and C. Santibáñez, juvenile (AMNH [LP 6602]).
***Mesomexovis punctatus* (Karsch, 1879)**: MEXICO: Estado de México: *Municipio de Otumba*: Santiago Tolman, Cerro Gordo, 19°43.6668'N 98°47.3166'W, 26.vii.2002, S. Reynaud and E. González, ♀ (AMNH [LP 2241]). Hidalgo: *Municipio de Zimapán*: Microwave station at Zimapán, 20°44'47"N 99°20'54"W, 1900 m, 3.viii.2002, L. Prendini, O. Francke, E. González and J. Ponce, ♂ (AMNH [LP 2080]).
***Mesomexovis subcristatus* (Pocock, 1898)**: MEXICO: Puebla: *Municipio de Tehuacán*: Tehuacán, 2 km E, 18°24.002'N 97°22.867'W, 1435 m, 25.vii.2002, L. Prendini, O. Francke, E. González and J. Ponce, ♀ (AMNH [LP 2049]). Oaxaca: *Municipio de Santiago Nacaltepec*: El Moral, 21 km N, 17°34.753'N 96°56.976'W, 1535 m, 23.vii.2002, L. Prendini, O. Francke, E. González and J. Ponce, ♂ (AMNH [LP 2084]). *Municipio de Cuicatlán*: Tomellin, 17°45.180'N 96°57.237'W, 605 m, 23.vii.2002, L. Prendini, O. Francke, E. González and J. Ponce, ♂ (AMNH [LP 2086]).

***Mesomexovis variegatus* (Pocock, 1898)**: MEXICO: Estado de México: *Municipio de Malinalco*: Malinalco, ca. 19 km S, on gravel road off State Route 4, 18°52.197'N 99°26.990'W, 1530 m, 25.vii.2005, E. González and R. Mercurio, ♂ (AMNH [LP 5185]). Guerrero: *Municipio de Chilpancingo*: Amojileca, 17°34.090'N 99°34.145'W, 1484 m, 20.vi.2007, O. Francke et al., juvenile (AMNH [LP 7068]). Morelos: *Municipio de Tlaquiltenango*: Estación del CEAMISH, 2 km NE, Quilamula, 18°30.657'N 99°0.798'W, 1086 m, 26.i.2006, M. Córdova and A. Jaimes, subadult ♂ (AMNH [LP 6536]).

***Paravaejovis coloradensis* (Williams, 1970)**: U.S.A.: California: *Imperial Co.*: Algodones Dunes, at junction of Olgiby Road S34 and Interstate Hwy 8, 32°45.454'N 114°50.203'W, 50 m, 31.viii.2005, R. Mercurio and L. Prendini, juvenile (AMNH [LP 5029]). *Riverside Co.*: Whitewater Canyon, off I10, Whitewater Canyon Road near Whitewater Trout Farm, 33°59'18.2"N 116°39'18.2"W, 665 m, 18.viii.2004, M. McCoy, W.E. Savary, R. Mercurio and K. Bamba, ♂ (AMNH [LP 3226]).

***Paravaejovis confusus* (Stahnke, 1940)**: U.S.A.: Arizona: *Maricopa Co.*: W of Phoenix, Surprise, soft soil Flats N White Tanks Mountains, 33°38'19.4"N 112°28'22.3"W, 418 m, 2007, Z. Valois, K.J. McWest, H.M. Burrell et al., juvenile (AMNH [LP 7272]). *Yavapai Co.*: Alamo Road, N side, 34°10'4.43"N 113°01'56.57"W, 867 m, 10.v.2008, Z. Valois and B. Hendrixson, ♀ (AMNH [LP 8517]). California: *San Bernardino Co.*: Twentynine Palms, 45 km E on Hwy 62, 34°04'37.0"N 115°34'03.8"W, 572 m, 11.ix.2007, L. Prendini and J. Huff, juvenile (AMNH [LP 7107]). MEXICO: Sonora: *Municipio de Puerto Peñasco*: Sonoyta 95 km NW, off Route 2, W of Microondas Cerro Lava, 32°06.175'N 113°47.105'W, 273 m, 28.vi.2005, R. Mercurio and E. González, ♂ (AMNH [LP 4450]).

***Paravaejovis diazi* (Williams, 1970)**: MEXICO: Baja California Sur: *Municipio de Comondú*: Ciudad Constitución, 32 km SW, 24°55'17"N 111°58'5.5"W, 26 m, 11.vii.2004, O. Francke, W.E. Savary, E. González and A. Valdez, ♀ (AMNH [LP 3165]); S of El Cayuco "Fish Camp", 24°34.672'N 111°40.645'W, 23 m, 24.v.2004, R. Mercurio, M. Nishiguchi et al., juvenile (AMNH [LP 3482]). *Municipio de La Paz*: La Paz, 75 km NW, 24°05'56.2"N 110°45'41"W, 256 m, 7.vii.2004, O. Francke, E. González and A. Valdez, ♂ (AMNH [LP 3169]); La Paz, ca. 5 km N, junction Route 1 and road to San Juan de la Costa, 24°08.500'N 110°28.566'W, 30 m, 9.vii.2005, R. Mercurio, W.E. Savary, L. Prendini and E. González, ♀ (AMNH [LP 4436]); San Evaristo, 5 km S, 24°52.901'N 110°41.404'W, 5–50 m, 12.vii.2008, H. Montaño and E. González, ♂ (AMNH [LP 8839]).

***Paravaejovis eusthenura* (Wood, 1863)**: MEXICO: Baja California Sur: *Municipio de La Paz*: La Paz, 18 km SE, 24°02'45.9"N 110°08'51.9"W, 625 m, 8.vii.2004, O. Francke, E. González and A. Valdez, ♀ (AMNH [LP 3168]). *Municipio de Los Cabos*: Cabo San Lucas, 24 km E, [22°53.3833'N 109°54.933'W], 1.vi.1999, M.E. Soleglad, ♀ (AMNH [LP 1689]); San José del Cabo, ca. 10 km S off Route 1, 23°1.7622'N 109°43.49'W, 50 m, 10.vii.2005, W.E. Savary, E. González and R. Mercurio, juvenile (AMNH [LP 4448]).

***Paravaejovis gravicaudus* (Williams, 1970)**: MEXICO: Baja California Sur: *Municipio de Comondú*: San Miguel de Comondú, 2 km SW, 26°01'48.3"N 111°50'57"W, 199 m, 12.vii.2004, O. Francke, W.E. Savary, E. González and A. Valdez, juvenile (AMNH [LP 3163]). *Municipio de La Paz*: Isla San José, Fishing camp Palma Sola, 25°03.091'N 110°40.037'W, 0–50 m, 3.vi.2008, I.G. Nieto and E. González, ♂ (AMNH [LP 8783]); El Pilar, ca. 20 km NE of Las Pocitas, 24°28.762'N 111°01.125'W, 92 m, 25.vi.2008, H. Montaño and E. González, ♀ (AMNH [LP 8793]).

***Paravaejovis hoffmanni* (Williams, 1970)**: MEXICO: Baja California: *Municipio de Ensenada*: Misión de San Francisco de San Borja de Adac, 5 km W, 28°44.558'N 113°47.935'W, 380 m, 30.vi.2008, H. Montaño and E. González, ♂ (AMNH [LP 8797]). *Municipio de Guerrero Negro*: Vizcaino desert, 27°29'54.7"N 114°17'35.6"W, 223 m, 16.vii.2004, O. Francke, W.E. Savary, E. González and A. Valdez, ♀ (AMNH [LP 3166]). *Municipio de Mulegé*: Microwave station "El Abulón", 27°17.483'N 113°01.916'W, 141 m, 12.vii.2005, W.E. Savary and E. González, juvenile (AMNH [LP 5096]); Sierra del Placer, 21 km to junction Bahía Tortugas and Bahía Asunción, 98 km E of Vizcaino towards Bahía Tortugas, 27°28.928'N 114°17.093'W, 262 m, 28.vi.2008, H. Montaño and E. González, ♀ (AMNH [LP 8812]).
***Paravaejovis pumilis* (Williams, 1970)**: MEXICO: Baja California Sur: *Municipio de Comondú*: Ciudad Constitución, 32 km SW, 24°55'17"N 111°58'5.5"W, 26 m, 11.vii.2004, O. Francke, W.E. Savary, E. González and A. Valdez, ♂ (AMNH [LP 3137]); S of El Cayuco "Fish Camp", 24°34.672'N 111°40.645'W, 23 m, 24.v.2004, R. Mercurio, M. Nishiguchi et al., ♀ (AMNH [LP 3476]); El Cayuco Fish camp, sand dunes, 24°34.666'N 111°40.633'W, 6 m, 11.vii.2005, W.E. Savary, E. González, L. Prendini and R. Mercurio, subadult ♀ (AMNH [LP 4740]).
***Paravaejovis puritanus* (Gertsch, 1958)**: U.S.A.: California: *San Diego Co.*: San Diego Wild Animal Park, USGS pitfall trap sites, 33°06'5.72"N 116°58'21.47"W, 327 m, 30.vii.2008, Z. Valois, W.E. Savary, J.P. Montagne and T. Matsuda, subadult ♀ (AMNH [LP 8900]). MEXICO: Baja California: *Municipio de Ensenada*: Punta Banda, between El Rincon and La Bufadora, ca. 1 km SE of Pico Banda off BCN 23, 31°44'N 116°43.025'W, 139 m, 1.vii.2005, E. González, W.E. Savary, L. Prendini and R. Mercurio, ♀ (AMNH [LP 5093]).
***Paravaejovis schwenkmeyeri* (Williams, 1970)**: MEXICO: Baja California: Municipio de Ensenada: Cataviña, NW of El Descanso, 29°46.687'N 114°46.441'W, 635 m, 18.v.2004, R. Mercurio, M. Nishiguchi et al., ♀ (AMNH [LP 3479]); Misión San Borja, 28°44.607'N 113°45.233'W, 433 m, 13.vii.2005, E. González and W.E. Savary, juvenile (AMNH [LP 4413]); Punta Prieta, 37 km N, off Route 1, 29°15.116'N 114°10.10'W, 588 m, 13.vii.2005, L. Prendini and R. Mercurio, juvenile (AMNH [LP 4451]); Punta Calamajue, abandoned fishing village, 29°41.119'N 114°09.774'W, 5.4 m, 1.vii.2008, H. Montaño and E. González, ♂ (AMNH [LP 8821]). Municipio de Loreto: Loreto, 25 km S, on gravel road ca. 0.25 km E Route 1, 25°48.666'N 111°19.266'W, 6 m, 7.vii.2005, W.E. Savary, L. Prendini, R. Mercurio and E. González, subadult ♀ (AMNH [LP 4430]).
***Paravaejovis spinigerus* (Wood, 1863)**: U.S.A.: Arizona: *Yavapai Co.*: Kaibab National Forest, Ash Fork, 10 km S on Hwy 89 from intersection with I-40, at boat ramp 3262, 35°04'56.5"N 112°24'19.9"W, 1544 m, 8.ix.2007, L. Prendini and J. Huff, juvenile (AMNH [LP 7176]). New Mexico: *Hidalgo Co.*: Granite Gap on Hwy 80, N of Rodeo, 32°05'34.2"N 108°58'12.1"W, 1367 m, 22.vii.2007, J. Huff, juvenile (AMNH [LP 7015]). MEXICO: Chihuahua: *Municipio de Batopilas*: Military check point Batopilas, 27°03.502'N 107°43.054'W, 652 m, 2.viii.2005, O. Francke, K. McWest, H. Montaño, J. Ballesteros and L. Jarvis, ♂ (AMNH [LP 5282]). *Municipio de Janos*: Hwy MEX 2 km, 75 between Casas Grandes and Agua Prieta, 31°19.067'N 108°43.331'W, 1723 m, 26.vi.2006, P. Berea and E. González, juvenile (AMNH [LP 6317]). Sonora: *Municipio de Huatabampo*: Huatabampito costal sand dunes, 26°41.8176'N 109°36.3576'W, 0 m, 22.ix.2009, E. González and J.L. Castelo, ♀ (AMNH [LP 9970]).
***Paravaejovis waeringi* (Williams, 1970)**: U.S.A.: California: *Riverside Co.*: Intersection of Dillon Road and Landfill Road, 33°44'06.3"N 116°09'53.5"W, 16 m, 12.ix.2007, L. Prendini and J. Huff, juvenile (AMNH [LP 7119]). *San Diego Co.*: Borrego Springs, [33°14.8333'N 116°22.31666'W], 14.vii.1999, M.E. Soleglad, ♀ (AMNH [LP 1688]). MEXICO: Sonora:

Municipio de Puerto Peñasco: Sand dunes off road to Cerro Lava, 32°02.908'N 113°33.378'W, 230 m, 28.vi.2005, E. González and R. Mercurio, ♂ (AMNH [LP 4433]). *Municipio de Mexicali*: San Felipe, sand dunes, 11 km S, 30°57.312'N 114°47.734'W, 11 m, 15.vii.2005, E. González, W.E. Savary, L. Prendini and R. Mercurio, juvenile (AMNH [LP 4431]).

***Syntropis macrura* Kraepelin, 1900**: MEXICO: Baja California Sur: *Municipio de Comondú*: San Miguel de Comondú, 26°02'26.7"N 111°49'55.3"W, 220 m, 12.vii.2004, O. Francke, W.E. Savary, E. González and A. Valdez, ♂ (AMNH [LP 3146]); San José de Comondú, 30 km N, between Rosarito and San Isidro, 26°21.252'N 111°50.109'W, 258 m, 27.vi.2008, H. Montaño and E. González, ♀ (AMNH [LP 8709]).

***Syntropis williamsi* Soleglad, Lowe, and Fet, 2007**: MEXICO: Baja California Sur: *Municipio de La Paz*: El Pilar, ca. 20 km NE of Las Pocitas, 24°28.762'N 111°01.125'W, 92 m, 25.vi.2008, H. Montaño and E. González, subadult ♀ (AMNH [LP 8706]); Isla San José, Fishing camp Palma Sola, 25°03.091'N 110°40.037'W, 0–50 m, 3.vi.2008, I.G. Nieto and E. González, juvenile (AMNH [LP 8707]); San Evaristo, 10-15 km S, dirty road, 24°47.757'N 110°40.502'W, 27–50 m, 12.vii.2008, H. Montaño and E. González, ♂ (AMNH [LP 8826]).

***Thorellius cristimanus* (Pocock, 1898)**: MEXICO: Colima: *Municipio de Coquimatlán*: Road to Coquimatlán marker km 71, 19°6.7746'N 103°51.1848'W, 336 m, 26.v.2006, O. Francke, A. Valdez, H. Montaño and A. Ballesteros, juvenile (AMNH [LP 6551]). Jalisco: *Municipio de El Grullo*: Puerta de Barro, 2 km N, La Grulla, 19°51.509'N 104°13.420'W, 1059 m, 9.vii.2005, O. Francke, J. Ponce, M. Córdova, A. Jaimes, G. Francke and V. Capovila, ♂ (AMNH [LP 5323]), juvenile (AMNH [LP 5328]). Michoacán: *Municipio de Alvaro Obregón*: Alvaro Obregón, 19°02.310'N 102°58.405'W, 462 m, 11.vii.2005, O. Francke, J. Ponce, M. Córdova, A. Jaimes, G. Francke and V. Capovila, juvenile (AMNH [LP 5325]).

***Thorellius intrepidus* (Thorell, 1876)**: MEXICO: Colima: *Municipio de Comala*: Comala, [19°19.00'N 103°45.00'W], 9.iv.2004, P. Berea, subadult ♀ (AMNH [LP 6377]). *Municipio de Colima*: Los Ortices, 19°6'46.8"N 103°44'22.6"W, 343 m, 9.iv.2004, P. Berea, ♂ (AMNH [LP 6379]). Jalisco: *Municipio de La Huerta*: Estación Biológica Chamela, El Tejon Trail, 19°29.836'N 105°02.491'W, 18.viii.2005, J.L. Castelo, juvenile (AMNH [LP 5309]).

***Vizcaino viscainensis* (Williams, 1970)**: MEXICO: Baja California Sur: *Municipio de Mulegé*: Guerrero Negro, 12 km S, 27°56'5.8"N 113°54'23.1"W, 25 m, 15.vii.2004, O. Francke, W.E. Savary, E. González and A. Valdez, ♂ (AMNH [LP 3174]); Sierra del Placer, 21 km to junction Bahía Tortugas and Bahía Asunción, 98 km E of Vizcaino towards Bahía Tortugas, 27°28.928'N 114°17.093'W, 262 m, 28.vi.2008, H. Montaño and E. González, juvenile (AMNH [LP 8809]).

Appendix 2

Morphological specimens used for cladistic analysis of the subfamily Syntropinae (Kraepelin, 1905)

Outgroup

***Franckeus kochi* (Sissom, 1991):** MEXICO: Hidalgo: Grutas of Tolantongo, 29°39.049'N 98°59.927'W, 1256 m, 29.iv.2005, O. Francke, J. Ballesteros, A. Valdez and H. Montaño, ♂, ♀ (AMNH [ARA00003161]).

***Pseudouroctonus glimmei* (Hjelle, 1972):** U.S.A.: California: *Lake Co.*: Rayhouse Road, approx. 5 mi N, at junction of Davis and Cache Creeks, 900 ft, 15.vi.1969 J.T. Hjelle and M. Bolander, Holotype ♂, Allotype (CAS Type No. 3502).

***Serradigitus minutus* (Williams, 1970):** MEXICO: Baja California Sur: *Municipio de La Paz*: Libramiento to Pichilingue, marker km 4, by the termoelectrica Punta Prieta, 24°12.843'N 110°16.214'W, 105 m, 23.vi.2008, I.G. Nieto and M. Correa ♂, ♀ (AMNH [ARA00002903]).

Serradigitus sp. MEXICO: Sinaloa: *Municipio de La Cruz*: Casas Viejas, 24°2'24.8"N 106°48'54.6"W, 92 m, 13.vii.2006, P. Berea, ♂, ♀ (AMNH).

***Smeringurus grandis* (Williams, 1970):** MEXICO: Baja California: *Municipio de Ensenada*: Punta Bufeo, 4 km S, from road to San Felipe, 29°51.433'N 114°26.500'W, 28 m, 14.vii.2005, E. González, W.E. Savary, R. Mercurio and L. Prendini, ♂, ♀ (AMNH [ARA00003025]).

***Stahnkeus deserticola* (Williams, 1970):** U.S.A.: California: *San Bernardino Co.*: Death Valley National Park, Saratoga Springs, 35°40.843'N 116°25.264'W, 83 m, 1.ix.2005, R. Mercurio and L. Prendini, ♂, ♀ (AMNH).

***Uroctonites giulianii* Williams and Savary, 1991:** U.S.A.: California: *Inyo Co.*: Inyo National Forest, White Mountain. 0.7 mi S Schulman Grove, 3080 m, 4.ix.1988, S.C. Williams and V.F. Lee, Paratype ♀ (AMNH); Waucoba Canyon, 6500-7500 ft, 9.vi.1976, Paratype ♂ (CAS).

***Vaejovis carolineanus* (Beauvois, 1805):** U.S.A.: Georgia: *Rabun Co.*: 5-9.ix.1959, K. Ulmer, ♂, ♀ (AMNH [LP 6370]).

***Vaejovis intermedius* Borelli, 1915:** MEXICO: Durango: *Municipio de Peñón Blanco*: Peñon Blanco, 8 km N, 24°51.148'N 104°0.1.989'W, 1667 m, 11.viii.2005, O. Francke, D. Sissom, K. McWest, C. Lee, H. Montaño, J. Ballesteros, L. Jarvis and C. Durán, ♂, ♀ (AMNH [LP 5289]).

***Vaejovis lapidicola* Stahnke, 1940:** U.S.A.: Arizona: *Coconino Co.*: Coconino National Forest, Oak Creek Canyon, 35°01'55.2"N 111°44'01.7"W, 1969 m, 7.ix.2007, L. Prendini and J. Huff, ♂, ♀ (AMNH [ARA00003115]);

***Vaejovis mexicanus* C. L. Koch, 1836:** MEXICO: Distrito Federal: Pedregal de San Nicolas, NE side of Cerro Ajusco, 1999 M. Sousa, ♂, ♀ (AMNH).

***Vaejovis pequeno* Hendrixson, 2001:** MEXICO: Sonora: *Municipio de Soyopa*: Sierra El Encinal, dirty road between Tonichi and El Encinal, 28°33.628'N 109°20.590'W, 24.vi.2006, P. Berea and E. González, ♂, ♀ (AMNH [ARA00003159]); Rio Cuchujaqui, E of Alamos, 14.i.1964, V.E. Roth, Paratype ♂, ♀ (AMNH).

***Vaejovis rossmani* Sissom, 1989:** MEXICO: Tamaulipas: Surface, Rancho Nuevo, 10.iv.1982, P. Sprouse, Paratypes ♂, ♀ (CNAN).

Vaejovis sp. MEXICO: Chiapas: El Aguacero, 16°45.374'N 93°31.468'W, 764 m, 25.v.2005, O. Francke, A. Jaimes and A. Ballesteros, ♂, ♀ (AMNH).

***Wernerius spicatus* (Haradon, 1974):** U.S.A.: California: *Riverside Co.*: Berdoo Canyon, 6.9 mi NE of junction with Dillon Road, Little San Bernardino Mountains, 31.iii.1972, R.M. Haradon and J.L. Marks, Holotype ♀ (CAS Type No. 12058).

Ingroup

***Balsateres cisnerosi* (Ponce-Saavedra and Sissom, 2004):** MEXICO: Michoacán: *Municipio de La Huacana*: El Vado, 18°48.908'N 101°54.976'W, 198 m, 20.v.2007, O. Francke, J. Ponce, M. Villaseñor and A. Quijano, ♂, ♀ (CNAN-IBUNAM).

***Chihuahuanus bilineatus* (Pocock, 1898):** MEXICO: Tamaulipas: *Municipio de Jaumave*: El Salto, between Palmillas and Jaumave, 23°21.4398'N 99°30.9408'W, 1115 m, 23.viii.2006, O. Francke, W.D. Sissom, G. Casper, T. Anton, V. Totti, H. Montaño and C. Santibáñez, ♂, ♀ (CAS [ARA00001883]).

***Chihuahuanus cazieri* (Williams, 1968):** MEXICO: Coahuila: *Municipio de Cuatro Ciénegas*: Cuatro Ciénegas de Carranza, 0.5 km S of town, 740 m, 28.vii.1967, S.C. Williams and W.S. Brown, Holotype ♂ (CAS Type No. 10169); Cuatro Ciénegas de Carranza, 0.5 km SW, 740 m, 28.vii.1967, S.C. Williams and W.S. Brown, Paratypes ♂, ♀ (AMNH).

***Chihuahuanus coahuilae* (Williams, 1968):** MEXICO: Coahuila: *Municipio de Cuatro Ciénegas*: Cuatro Ciénegas de Carranza, 0.5 km SW, 740 m, 28.vii.1967, Holotype ♂ (CAS Type No. 10170); Ojo de Agua, Ejido El Oso, 27°0.0558'N 102°0.2262'W, 1039 m, 19.vii.2006, O. Francke, W.D. Sissom, K. McWest, B. Hendrixson, S. Grant, A. Jaimes and M. Córdova, 2 ♂, 2 ♀ (CNAN-IBUNAM [ARA00000084]).

***Chihuahuanus crassimanus* (Pocock, 1898):** U.S.A.: Texas: *Hudspeth Co.*: Sierra Blanca, 9 miles W, 18.viii.1962, C.A. Trilpehorn ♀ (OSAL). MEXICO: Coahuila: *Municipio de Cuatro Ciénegas*: Dunas de Yeso, 26°51.7650'N 102°10.47'W, 776 m, 18.vii.2006, O. Francke, W.D. Sissom, M. Córdova, A. Jaimes and A. Ballesteros, ♂ (AMNH [ARA00001105]); Sierra San Marcos II, 26°54.7998'N 102°8.25'W, 761 m, 18.vii.2006, E. González, B. Hendrixson, K. McWest and S. Grant, ♀ (AMNH [ARA00001110]). Durango: *Municipio de Tlahualilo*: Tlahualilo de Zaragoza, ca. 15 km NW, junction Montes Claros-Tlahualilo de Zaragoza, 26°9.2418'N 103°31.28'W, 1107 m, 6.viii.2005, O. Francke, W.D. Sissom, K. McWest, C. Lee, H. Montaño, J. Ballesteros and L. Jarvis, ♂ (AMNH [ARA00003170]).

***Chihuahuanus glabrimanus* (Sissom and Hendrixson, 2005):** MEXICO: Guanajuato: *Municipio de San Diego de la Unión*: San Diego de la Unión, 8 km S, 21°23.1444'N 100°53.4522'W, 2078 m, 28.vii.2006, E. González, M. Córdova, A. Jaimes, A. Ballesteros and O. Francke, ♂ (AMNH). San Luis Potosí: Municipio de Villa de Arista: Villa de Arista, 10 km E, 22°30.760'N 100°45.499'W, 30.viii.2006, O. Francke, W.D. Sissom, G. Casper, T. Anton, V. Totti, H. Montaño, C. Santibáñez and A. Ballesteros, 4 ♂, ♀ (CAS [ARA000001909]).

***Chihuahuanus globosus* (Borelli, 1915):** MEXICO: Coahuila: Gypsum dunes, 13 km SW town Cuatro Ciénegas de Carranza, 780 m, 27.vii.1967, S.C. Williams and W.S. Brown, Holotype ♂ of *V. gilvus* (CAS Type No. 10172). *Municipio de Cuatro Ciénegas*: Cuatro Ciénegas 16 mi. SW, W. point of Laguna Grande dunes, 9.viii.1968, S.C. Williams, M. Bentzien, J. Bigelow, and W.L. Minckley, ♂, ♀ (AMNH). *Municipio de Viesca*: Dunas de Bilbao, 25°25.5858'N 102°53.6538'W, 1098 m, 20.vii.2006, O. Francke, K. McWest, M. Córdova, A. Jaimes and A. Ballesteros, 4 ♂, ♀ (CAS [ARA00001879]).

***Chihuahuanus kovariki* (Soleglad and Fet, 2008):** MEXICO: Durango: Hwy 137, marker km 4, between Once de Marzo and San Juan del Río, San Francisco de Lajas, 24°51.764'N 104°38.846'W, 1893 m, 10.viii.2005, O. Francke, W.D. Sissom, K. McWest, C. Lee, H.

Montaño, J. Ballesteros, L. Jarvis and C. Durán, ♂ (AMNH). Yerbanis, 80 mi NW Durango, 19.viii.1947, W.J. Gertsch, ♀ (AMNH).

***Chihuahuanus russelli* (Williams, 1971):** U.S.A.: Arizona: *Cochise Co.*: Portal, 4770 ft, 26.viii.1965, S.C. Wiliams and G. Fernald, Holotype ♂ (CAS Type No. 11471). New Mexico: Rodeo, 10 mi N, 22.ix.1963, V. Roth, ♀ (AMNH). Texas: *Brewster Co.*: Big Ben National Park, Pine Canyon Trail, Chisos Mountains, 29.26784827°N 103.23708924°W, 1.viii.2008, W.D. Sissom, G. Casper and T. Anton, 2 ♂ (AMNH).

***Kochius barbatus* (Williams, 1971):** MEXICO: Baja California Sur: *Municipio de La Paz*: Las Cruces, 25 ft, 29.vii.1968, S.C. Williams and M.A. Cazier, Holotype ♀ of *V. p. barbatus* (CAS Type No.10469); Paratype ♀ (AMNH); Las Cruces, 4 km NW, 24°13.5108'N 110°7.41'W, 31 m, 24.vi.2008, H. Montaño and E. González, ♂ (CNAN-IBUNAM [ARA00002274]); ♂ (AMNH [ARA00002884]).

***Kochius bruneus* (Williams, 1971):** MEXICO: Baja California Sur: *Municipio de Comondú*: San José de Comondú, 5 mi SW, 1000 ft, 2.vii.1968, S.C. Williams and M.A. Cazier, Holotype ♂ (CAS Type No.10410); San José de Comondú, 30 km N, between Rosarito and San Isidro, 26°21.2520'N 111°50.10'W, 258 m, 27.vi.2008, H. Montaño and E. González, 2 ♂, 2 ♀ (AMNH [ARA00002854]). Baja California: San Ignacio, 500 ft, 24.vi.1968, S.C. Williams and M.A. Cazier, Holotype ♂, Allotype of *V. bruneus loretoensis* (CAS Type No.10466).

***Kochius cerralvensis* (Williams, 1971):** MEXICO: Baja California Sur: *Municipio de La Paz*: Isla Cerralvo, Bahia Limoña, 31.v.1969, S.C. Williams, Holotype ♂ (CAS Type No.11470); Isla Cerralvo, Piedras Gordas, 17.v.1970, S.C. Williams and V.F. Lee, Paratypes ♂, ♀ (AMNH); Isla Cerralvo, SW side, 24°10.9332'N 109°53.2332'W, 50 m, 27.v.2008, E. González and I.G. Nieto, ♂, ♀ (AMNH [ARA00002880]).

***Kochius hirsuticauda* (Banks, 1910):** U.S.A.: Arizona: *Yuma Co.*: Palm Canyon, Kofa Mountains, 12.x.1968, A. Cazier et al., ♂, ♀ (AMNH). California: *San Diego Co.*: Anza-Borrego Desert State Park, Pinyon Mountain Road, ca. 4.8 km towards Pinyon Mountain Valley from junction with Route S2, 33°03.043'N 116°23.270'W, 870 m, 30.viii.2005, R. Mercurio and L. Prendini, ♂, ♀ (AMNH).

***Kochius insularis* (Williams, 1970):** MEXICO: Baja California Sur: Isla Partida, Central Valley, 10.vii.1968, S.C. Williams, M. Bentzien and B. Fox, Holotype ♂ (CAS Type No.10422). Allotype (CAS). *Municipio de La Paz*: Isla Espíritu Santo, Playa Bonanza, 24°27.3636'N 110°18.47'W, 50 m, 31.v.2008, E. González and I.G. Nieto, ♂, ♀ (AMNH [ARA00002875]); ♂, ♀ (CNAN-IBUNAM [ARA00002260]).

***Kochius magdalensis* (Williams, 1971):** MEXICO: Baja California Sur: *Municipio de La Paz*: La Paz, 75 mi NW, 200 ft, 4.vii.1968, S.C. Williams and M.A. Cazier, Holotype ♂ (CAS Type No.10468); El Pilar, ca. 20 km NE of Las Pocitas, 24°28.7616'N 111°1.12'W, 92 m, 25.vi.2008, H. Montaño and E. González, ♂, ♀ (AMNH [ARA00002874]); ♂, ♀ (CNAN-IBUNAM [ARA00002259]); junction Route 1, 5 km N, and road to Juan de la Costa, 24°08.500'N 110°28.566'W, 30 m, 9.vi.2005, E. González, W.E. Savary, R. Mercurio and L. Prendini, ♂ (AMNH).

***Kochius punctipalpi* (Wood, 1863):** MEXICO: Baja California Sur: *Municipio de Los Cabos*: Santiago, 23°26.4'N 109°43.5666'W, 225 m, 9.vii.2004, O. Francke, E. González and A. Valdez, ♂, ♀ (AMNH [ARA00001471]); San José del Cabo, ca. 10 km S off Route 1, 23°1.7622'N 109°43.49'W, 50 m, 10.vii.2005, W.E. Savary, E. González and R. Mercurio, ♂, ♀ (AMNH [ARA00001473]). *Municipio de La Paz*: La Paz, 15 km SE, 24°3.7332'N 110°10.53'W, 476 m, 8.vii.2004, O. Francke, E. González and A. Valdez, ♂ (AMNH [ARA00001472]).

***Kochius sonorae* (Williams, 1971):** MEXICO: Sonora: Alamos, 11.2 mi W, 23.i.1966, R. Winokur, C. Mays and M.A. NiKerson, Holotype ♂ (CAS Type No.10472). *Municipio de Navojoa*: Microwave Cerro Prieto, 15 km E of Navojoa, 27°4.9830'N 109°17.4498'W, 375 m, 23.viii.2009, E. González and J.L. Castelo, ♂, ♀ (AMNH [ARA00003157]); Navojoa, 32 km S, 12.ix.1966, J. and W. Ivie, ♂, ♀ (AMNH). *Municipio de Soyopa*: Sierra el Encinal, 9 km from Hwy MEX 16 on dirty road to El Encinal, 28°35.4120'N 109°27.1476'W, 380 m, 24.vi.2006, E. González and P. Berea, 2 ♂ (AMNH [ARA00002539]); dirty road between El Encinal and Tonichi, 28°33.2388'N 109°21.64'W, 645 m, 1.vii.2006, E. González and P. Berea, 2 ♂ (AMNH [ARA00003015]).

***Kochius villosus* (Williams, 1971):** MEXICO: Baja California Sur: *Municipio de Comondú*: San Miguel Comondú, 5–10 mi SW, 800–1000 ft, 3.vii.1968, S.C. Williams and M.A. Cazier, Holotype ♂ of *V. bruneus villosus* (CAS Type No.10467); Paratypes ♂, ♀ (AMNH). *Municipio de La Paz*: San Evaristo, 10–15 km S, dirty road, 24°47.7570'N 110°40.5018'W, 50 m, 12.vii.2008, H. Montaño and E. González, ♂ (CNAN-IBUNAM [ARA00002275]). *Municipio de Loreto*: Juncalito, 25°49.8918'N 111°19.6908'W, 5 m, 20.v.2004, R. Mercurio and M. Nishiguchi, ♂, ♀ (AMNH [ARA00003132]). *Municipio de Mulegé*: San Ignacio, 152 m, 24.vi.1968, S.C. Williams and M.A. Cazier, Paratypes ♂, ♀ (AMNH).

***Konetontli acapulco* (Armas and Martín-Frías, 2001):** MEXICO: Guerrero: Colonia Francisco Villa, Acapulco, 25.v.1999, E. Martín and A. Losoya, Holotype ♂ (CNAN-IBUNAM). *Municipio de José Azueta*: Colonia Agua de Correa, 17°38.6982'N 101°31.0932'W, 72 m, 1.viii.2008, O. Francke, H. Montaño, J. Ponce and A. Quijano, ♀ (CNAN-IBUNAM).

***Konetontli chamelaensis* (Williams, 1986):** MEXICO: Jalisco: *Municipio de La Huerta*: Estación de Biología de Chamela, UNAM 10-13.vii.1985, S.C. Williams, Holotype ♂, Allotype (CAS Type No. 15744); 1.vi.1994, N. Martigera, ♀ (CNAN-IBUNAM); 31.v.1990, N. Martínez, (CNAN-IBUNAM); 19°29.875'N 105°02.608'W, 97 m, 30.viii.2007, O. Francke et al., ♀ (AMNH [LP 7675]); 19°29.8752'N 105°2.6082'W, 24.x.2005, E. González and J.L. Castelo, 2 ♂ (CNAN-IBUNAM); Rincón de Ixtlán, Chamela, 19°32'N 105°4'W, 25.x.2005, E. González, ♀ (CNAN-IBUNAM).

***Konetontli kuarapu* (Francke and Ponce-Saavedra, 2005):** MEXICO: Michoacán: *Municipio de Parácuaro*: La Batea, 19°07'54"N 102°07'48"W, 361 m, 21.x.2000, J. Ponce et al., Holotype ♂ (CNAN-IBUNAM); ♂ (AMNH); El Valle, 19°8.84883'N 102°13.222833'W, 21.x.2000, J. Ponce et al., ♂, ♀ (CNAN-IBUNAM).

***Konetontli nayarit* (Armas and Martín-Frías, 2001):** MEXICO: Nayarit: *Municipio de Compostela*: Felipe Carrillo Puerto, 4 km NE, 16.vii.1999, J.A. Fernández, Holotype ♂ (CNAN-IBUNAM). *Municipio de El Nayar*: Río Santiago, 16.v.1996, E. Barrera, ♀ (AMNH).

***Konetontli pattersoni* (Williams and Haradon, 1980):** MEXICO: Baja California Sur: *Municipio de Los Cabos*: Sierra de la Laguna, 23°14.2848'N 109°57.1314'W, 782 m, 10.vii.2004, A. Valdez, E. González, O. Francke and W.E. Savary, ♀ (AMNH [ARA00003082]); 23°41.1666'N 109°56.6832'W, 850 m, 9.vii.2004, A. Valdez and E. González, ♀ (AMNH [ARA00003083]); Sierra de la Laguna, nucleous zone, 23°33.0162'N 109°59.4498'W, 1800 m, 20.vii.2006, A. Valdez, E. González, O. Francke and W.E. Savary, 2 ♂ (AMNH [ARA00003064]); La Laguna, Sierra de la Laguna, 1–3.viii.1974, R.M. Haradon, V.F. Lee and W.E. Saavary, Holotype ♂, Allotype (CAS Type No. 12250).

***Kuarapu purepecha* Francke and Ponce-Saavedra, 2010:** MEXICO: Michoacán: *Municipio de La Huacana*: El Vado, km 17 road Zicuaran-Churumuco, 18°48.8520'N 101°54.9558'W, 248 m, 30.vi.2008, O. Francke, H. Montaño, J. Ponce and A. Quijano, Paratypes ♂, ♀ (AMNH).

***Maaykuyak vittatus* (Williams, 1970):** MEXICO: Baja California Sur: *Municipio de Comondú*: San Miguel Comondú, 5 mi SW, 1000 ft, 2.vii.1968, S.C. Williams and M.A. Cazier, Holotype ♂ (CAS Type No. 10430); San Miguel Comondú, 8–16 km SW, 304 m, 3.vii.1968, S.C. Williams and M.A. Cazier, Paratypes ♂, ♀ (AMNH).
***Maaykuyak waueri* (Gertsch and Soleglad, 1972):** U.S.A.: Texas: *Brewster Co.*: Big Ben National Park, The Basin, Chisos Mountains, 28.ix.1950 Holotype ♀ (AMNH). MEXICO: Durango: *Municipio de Tlahualilo*: Hwy 49, at deviation Montes Claros-Tlahualilo de Zaragoza, 26°9.242'N 103°31.284'W, 1107 m, 6.viii.2005, O. Francke, W.D. Sissom, K. McWest, C. Lee, H. Montaño, J. Ballesteros, L. Jarvis and C. Durán, ♂ (AMNH).
***Mesomexovis atenango* (Francke and González-Santillán, 2007):** MEXICO: Guerrero: *Municipio de Tepecoacuilco de Trujano*: Cerro de la Coronilla, 3.4 km NE Ahuehuepan, 18°0'57"N 99°31'32"W, 857 m, A. Valdez, T. López and C. Quijano, Paratypes ♂, ♀ (AMNH); Cerro de la Coronilla, 18°0.9756'N 99°31.7256'W, 844 m, 27.vi.2008, O. Francke, A. Quijano and C. Santibáñez, ♂, ♀ (AMNH). *Municipio de Copalillo*: Totonimitla, Papalutla, 18°1.4700'N 98°53.8092'W, 650 m, 28.i.2011, U. Lonjino and J. Mendez, ♂, ♀ (CNAN-IBUNAM).
***Mesomexovis spadix* (Pocock, 1898):** MEXICO: Guanajuato: *Municipio de León*: León, iv.2004, P. Berea, ♂, ♀ (CNAN-IBUNAM).
***Mesomexovis oaxaca* (Santibáñez-López and Sissom, 2010):** MEXICO: Oaxaca: *Municipio de Ocotlán*: Chichicapan, 4.8 km E, 1645 m, 23.viii.1966, C.M. Bogert, ♂, ♀ (AMNH). *Municipio de San Pablo Villa Mitla*: Mitla, 8 km NE, on ridge ca. 6800–7200, near ruins called El crucero, 27.viii.1963, C.M. Bogert, G. Sluder and N. Bucknall, ♂, ♀ (AMNH). *Municipio de Tlacolula de Matamoros*: Tlacolula, 16.vii.1955, C. and P. Vaurie, Paratypes ♂, ♀ (AMNH).
***Mesomexovis occidentalis* (Hoffmann, 1931):** MEXICO: Guerrero: *Municipio de Acapulco*: Acapulco, Holotype ♀ of *V. subcristatus occidentalis* (AMNH); same locality, H. Hoffmann, Paratypes ♂, ♀ (AMNH). Cumbres of Llano Largo, 16°49.505'N 99°49.999'W, 371 m, 19.vi.2007, O. Francke, H. Montaño and A. Ballesteros, ♂ (CAS [ARA00001975]). *Municipio de Copala*: Microwaves Fogos, E of Copala, 16°33.9918'N 98°53.30'W, 103 m, 22.vi.2007, O. Francke, H. Montaño, L. Escalante and A. Ballesteros, ♂, ♀ (CNAN-IBUNAM).
***Mesomexovis punctatus* (Karsch, 1879):** MEXICO: Hidalgo: *Municipio de Zimapán*: Microwave antenna at Zimapan, 20°44.7828'N 99°20.8998'W, 1900 m, 3.viii.2002, L. Prendini, O. Francke, E. González and J. Ponce, 2 ♂, 2 ♀ (AMNH [ARA00001170]).
***Mesomexovis subcristatus* (Pocock, 1898):** MEXICO: Oaxaca: *Municipio de Cuicatlán*: Tomellin, 17°45.180'N 96°57.237'W, 605 m, 23.vii.2002, L. Prendini, O. Francke, E. González and J. Ponce, ♂, ♀ (AMNH [LP 2086]). Puebla: *Municipio de Tehuacán*: Tehuacán, 2 km E, 18°24.002'N 97°22.867'W, 1435 m, 25.vii.2002, L. Prendini, O. Francke, E. González and J. Ponce, ♂, ♀ (AMNH [LP 2048]).
***Mesomexovis variegatus* (Pocock, 1898):** MEXICO: Guerrero: *Municipio de Buenavista de Cuellar*: El Comal, 18°27.086'N 99°17.139'W, 1749 m, 13.vi.2007, O. Francke et al., ♂, ♀ (AMNH [ARA00002623]).
***Paravaejovis coloradensis* (Williams, 1970):** U.S.A.: California: *Imperial Co.*: 2 mi W Andrade, 6.vii.1969, S.C. Williams and V.F. Lee, Holotype ♂ (CAS Type No.10411). *San Diego Co.*: Anza-Borrego Desert State Park, Culp Valley Camp, 33°13.4118'N 116°27.26'W, 1033 m, 30.viii.2005, R. Mercurio and L. Prendini, ♂, ♀ (AMNH [ARA00001497]).
***Paravaejovis confusus* (Stahnke, 1940):** U.S.A.: Arizona: Wickenburg, 20.iv.1938, A.L. Corbin, Syntypes 2 ♀ (CAS Type No.105170). *Mohave Co.*: Warm Springs Wash, 4.7 km N

Topock, 34°44.8662'N 114°28.8996'W, 147 m, 9.ix.2007, L. Prendini and J. Huff, 5 ♂, 2 ♀ (AMNH [ARA00003117]).

***Paravaejovis diazi* (Williams, 1970):** MEXICO: Baja California Sur: Punta San Telmo on Gulf coast, 25 ft, 26.v.1969, S.C. Williams, Holotype ♂ of *V. diazi transmontanus* (CAS Type No.10414). 34.4 km W Ciudad Constitución (=El Crucero, 21.4 mi W, Magdalena Plain), 75 ft, 26.vii.1968, S.C. Williams and M.A. Cazier, Holotype ♂ (CAS Type No.10413). *Municipio de La Paz*: Las Cruces, 8 km SW, 30.vii.1968, S.C. Williams and M.A. Cazier, Paratypes ♂, ♀ (AMNH).

***Paravaejovis eusthenura* (Wood, 1863):** MEXICO: Baja California Sur: *Municipio de Los Cabos*: San José del Cabo, ca. 10 km S off Route 1, 23°1.7622'N 109°43.49'W, 50 m, 10.vii.2005, W.E. Savary, E. González and R. Mercurio, ♂, ♀ (AMNH [ARA00003177]). *Municipio de La Paz*: La Paz, 18 km SE, 24°2.7498'N 110°8.85'W, 626 m, 8.vii.2004, O. Francke, E. González and A. Valdez, ♂, ♀ (AMNH [ARA00001192]).

***Paravaejovis gravicaudus* (Williams, 1970):** MEXICO: Baja California Sur: Los Aripes, 21.4 mi W, 900 ft, 25.vii.1968, S.C. Williams, J. Bigelow, and M. Bentzien, Holotype ♂ (CAS Type No.10418). *Municipio de Comondú*: San Miguel de Comondú, 2 km SW, 3.vii.1968, M.A. Cazier et al., Paratypes ♂, ♀ (AMNH).

***Paravaejovis hoffmanni* (Williams, 1970):** MEXICO: Baja California Sur: *Municipio de Comondú*: San Jose de Comondú, 24 mi NE, 900 ft, 15.v.1969, S.C. Williams, Holotype ♂ of *V. hoffmanni fuscus* (CAS Type No.10421). Baja California: *Municipio de Ensenada*: Laguna Manuela, 4.8 km N, 152 m, 22.vi.1968, S.C. Williams and M.A. Cazier, Paratypes ♂, ♀ (AMNH); Manuela 3 mi N, 500 ft, 22.vi.1968 S.C. Williams and M.A. Cazier, Holotype ♂ (CAS Type No.10420).

***Paravaejovis pumilis* (Williams, 1970):** MEXICO: Baja California Sur: El Crucero, 26.8 mi W, Magdalena Plain, 50 m, 26.vii.1968, S.C. Williams and M.A. Cazier, Holotype ♂ (CAS Type No.10425). *Municipio de Comondú*: El Cayuco Fish camp, sand dunes, 24°34.6656'N 111°40.6326'W, 6 m, 11.vii.2005, W.E. Savary, E. González, L. Prendini and R. Mercurio, 2 ♀ (AMNH [ARA00003173]).

***Paravaejovis puritanus* (Gertsch, 1958):** MEXICO: Baja California Sur: Rancho Canipolé, 1 mi SW, 800 ft, 15.v.1969, S.C. Williams, Holotype ♂ of *V. terradomus* (CAS Type No.10428). Baja California: *Municipio de Ensenada*: Santo Tomas, 8.vii.1953, W.J. and J.W. Gertsch, Holotype ♂ (AMNH).

***Paravaejovis schwenkmeyeri* (Williams, 1970):** MEXICO: Baja California: Bahia de Los Angeles, 25 ft, 19.vi.1968, S.C. Williams and M.A. Cazier, Holotype ♂ (CAS Type No.10426). Baja California Sur: San Raymundo, 12.9 km NW, 152 m, 30.vi.1968, M.A. Cazier et al., Topotypes ♂, ♀ (AMNH).

***Paravaejovis spinigerus* (Wood, 1863):** U.S.A.: Arizona: *Maricopa Co.*: Sunflower, turnoff to Bushnell Tanks, 33°52'08.8"N 111°27'54.4"W, 1057 m, 6.iv.2007, J. Huff and L. Prendini, ♂, ♀ (AMNH).

***Paravaejovis waeringi* (Williams, 1970):** MEXICO: Baja California: *Municipio de Ensenada*: Oakies Landing, 27 mi S of Puertocitos, 12.vi.1968, S.C. Williams and M.A. Cazier, Holotype ♂ (CAS Type No.10431); Puertocitos, 44 km S, Oakies Landing, 12.vi.1968, S.C. Williams and M.A. Cazier, Paratype ♂ (AMNH); Puertocitos, 11.vi.1968, S.C. Williams and M.A. Cazier, 2 ♂, ♀ (CAS); Oakies Landing, 27 mi S of Puertocitos, 12.vi.1968, S.C. Williams and M.A. Cazier, Allotype (CAS). U.S.A.: California: *Imperial Co.*: Algodones Dunes, along Grays Wells

Road, S of Interstate Hwy 8, W of Imperial Sand Dunes Recreation Area, 32°44.1756'N 114°53.43'W, 50 m, 31.viii.2005, R. Mercurio and L. Prendini, ♀ (AMNH [ARA00001499]).
***Syntropis aalbui* (Soleglad, Lowe, and Fet, 2007):** MEXICO: Baja California: Blue Palm Canyon, 5 km N Cataviña, 13.vii.1979, R. Aalbu, Holotype ♀ (MNHG).
***Syntropis macrura* Kraepelin, 1900:** MEXICO: Baja California Sur: N Los Aripes, 25.vi.1985, W.R. Lourenco and G.A. Polis, ♂, ♀ (NHNG). *Municipio de Comondú*: San José Comondú, 27.viii.2006, C. Palacios, ♂ (CAECIB).
***Syntropis williamsi* Soleglad, Lowe, and Fet, 2007:** MEXICO: Baja California Sur: N Los Aripes, 25.vi.1985, W.R. Lourenco and G.A. Polis, Holotype ♀ (NHNG). *Municipio de La Paz*: El Pilar, ca. 20 km NE of Las Pocitas, 24°28.7616'N 111°1.12'W, 92 m, 25.vi.2008, H. Montaño and E. González, ♂ (AMNH [ARA00002825]).
***Thorellius cristimanus* (Pocock, 1898):** MEXICO: Colima: *Municipio de Colima*: Colima, in house, Holotype ♂ of *V. intrepidus atrox* (AMNH); same locality, Paratypes ♂, ♀ (AMNH). *Municipio de Tonila*: Tonila, 3.2 km S, 28.viii.1965, W.J. Gertsch and R. Hastings, ♂, ♀ (AMNH).
***Thorellius intrepidus* (Thorell, 1876):** MEXICO: Colima: *Municipio de Armería*: Mine La Salada NW Ixtlahuacan, 19°01.680'N 103°47.036'W, 275 m, Mine staff, ♂, ♀ (AMNH). *Municipio de Tecomán*: Tecomán, 18°54'30"N 103°52'28"W, ♂, ♀ (AMNH).
***Vizcaino viscainensis* (Williams, 1970):** MEXICO: Baja California Sur: *Municipio de Mulegé*: Las Bombas, 3.2 km E, 30 m, 16.iv.1969, S.C. Williams, 2 ♀ (AMNH); Sierra del Placer, 21 km to junction Bahía Tortugas and Bahía Asunción, 98 km E of Vizcaino towards Bahía Tortugas, 27°28.9278'N 114°17.0928'W, 262 m, 28.vi.2008, H. Montaño and E. González, 8 ♂, 6 ♀ (CNAN-IBUNAM [ARA00002245]). Baja California: Miler's Landing, 2 mi NW, 25 ft, 21.vi.1968 S.C. Williams and M.A. Cazier, Holotype ♂ of *V. viscainensis* (CAS Type No. 10429).

Appendix 3

Morphological continuous character used for cladistic analysis of the subfamily Syntropinae (Kraepelin, 1905)

Polymorphisms are indicated as ranges. Missing data was entered as? for the following terminals : *Vaejovis* sp. 3711, *Chihuahuanus bilineatus* 6507, 6594, *Chihuahuanus cazieri* 7179, *Chihuahuanus coahuilae* 6600, 7095, *Chihuahuanus crassimanus* 5365, 7100, *Chihuahuanus glabrimanus* 6610, 6611, *Chihuahuanus globosus* 6447, 6459, 8926, *Chihuahuanus kovariki* 5305, *Chihuahuanus russelli* 7017, *Kochius bruneus* 3154, *Kochius bruneus* 4555 , *Kochius hirsuticauda* 7199, 8819, *Kochius magdalensis* 4552, 8796, *Kochius punctipalpi* 3157, 8843, *Kochius sonorae* 6304 , 9974, *Kochius villosus* 4544, *Konetontli pattersoni* 3150, *Maaykuyak vittatus* 4442, *Maaykuyak waueri* 6544, *Mesomexovis atenango* 7058, 9982, *Mesomexovis oaxaca* 3718, 6602, *Mesomexovis occidentalis* 6559, 7056, *Mesomexovis punctatus* 2241, *Mesomexovis spadix* 5280, *Mesomexovis subcristatus* 2084, 2086, *Mesomexovis variegatus* 6536, 7068, *Paravaejovis coloradensis* 3226, 5029, *Paravaejovis confusus* 7107, 7272, 8517, *Paravaejovis diazi* 3169, 3482, 4436, 8839, *Paravaejovis eusthenura* 3168, 4448, *Paravaejovis gravicaudus* 8783, 8793, *Paravaejovis hoffmanni* 5096, 8812, *Paravaejovis pumilis* 3476, *Paravaejovis pumilis* 4740, *Paravaejovis puritanus* 5093, 8900, *Paravaejovis schwenkmeyeri* 4430, 4451, 8821, *Paravaejovis spinigerus* 5282, 6317, 7176, 9970, *Paravaejovis waeringi* 4433, 7119, *Syntropis macrura* 8709, *Syntropis williamsi* 8707, 8826, *Balsateres cisnerosi* 5269, *Thorellius cristimanus* 5325, 5328, 6551, *Thorellius intrepidus* 6377, 6379, *Vizcaino viscainensis* 8809

Outgroup

***Franckeus kochi* 5363**
1.120-1.200 1.043 0.000 0.400 0.250 0.500 0.380 1.200 0.750 0.857 0.545 0.303 1.500 0.727 0.727 0.800 2.000 1.333 1.333 0.800 1.500 1.649 1.200 0.800 0.500 2.000 0.285 0.000 0.999 0.400 0.857 0.750 0.857 1.000 1.428 0.666 0.500 0.666 0.666 0.666 0.500 0.400 0.285 0.666 2.000

***Pseudouroctonus glimmei* 2688**
0.320 0.260-0.347 0.000 0.000 0.000 0.250 0.000 0.800 0.250 0.285 0.181 0.000 0.500 0.363 0.363 0.400 0.000 0.000 0.000 0.000 0.500 0.947 0.000 0.000 0.000 0.000 0.571 0.000 0.333 0.000 0.000 0.000 0.000 0.000 0.000 0.285 0.000 0.000 0.000 0.000 0.333 0.000 0.000 0.000 0.333 0.000

***Serradigitus minutis* 1674**
0.480 0.521 0.500 0.400 0.250 0.500 0.380 1.200 0.500 0.571 0.363 0.303 1.000 0.363 0.363 0.400 1.000 0.666 0.666 0.400 1.500 1.298 0.400 0.400 0.500 2.000 0.571 0.000 0.333 0.000 0.285 0.500 0.571 0.000 0.285 0.333 0.500 0.333 0.333 0.333 0.000 0.000 0.285 0.000 2.000

***Serradigitus* sp. 6370**
0.480 0.521 0.500 0.400 0.500 0.500 0.095 0.800 0.250 0.571 0.363-0.545 0.181 1.000 0.363 0.363 0.400 0.000 0.000 0.666 0.400 1.000 1.298 0.400 0.000 0.500 2.000 0.571 0.000 0.000 0.000 0.285 0.500 0.571 0.000 0.285 0.333 0.000 0.333 0.333 0.333 0.000 0.000 0.571 0.000 2.000

***Smeringurus grandis* 8690**
1.920-2.000 1.391 0.000 0.000 0.250 0.500 0.190 1.200 1.250 1.428 0.909 0.363 2.000 2.000 2.000 2.000 2.000 1.333 1.333 0.800 0.500 1.298 0.400 0.400 0.500 0.000 0.285 0.000 0.333 0.000 0.000 0.500 0.285 0.000 0.571 0.666 1.000 0.333 0.333 1.333 0.000 0.000 0.285 0.999 0.000

***Stahnkeus deserticola* 5032**
1.280-1.440 1.217 0.000 0.000 0.250 0.500 0.095 0.800 0.500 0.571 0.363 0.000 1.000 0.363 0.363 0.600 0.000 0.666 0.666 0.400 1.500 1.298 0.400 0.400 0.500 2.000 0.571 0.000 0.333 0.000 0.285 0.500 0.571 0.000 0.000 0.666 0.000 0.333 0.333 0.666 0.000 0.000 0.285 0.000 2.000

***Uroctonites giulianii* 3204**

0.000 0.000-0.086 0.000 0.400 0.250 0.250 0.095 0.800 0.250 0.285 0.181 0.060 1.000 0.363 0.363 0.400 2.000 0.000 0.000 0.000 2.000 1.298 0.400 0.400 0.500 2.000 0.571 0.000 0.999 0.000 0.571 0.000 0.000 0.000 0.857 0.999 0.500 0.333 0.666 0.500 0.000 0.000 0.000 0.333 2.000

***Vaejovis carolinianus* 1576**

0.480 0.521 0.000 0.400 0.250 0.250 0.095 0.800 0.250 0.285 0.181 0.060 1.000 0.363 0.363 0.400 0.000 0.000 0.000 0.000 2.000 2.000 0.400 0.800 0.500 2.000 0.285 0.000 0.333 0.000 0.285 0.000 0.285 0.000 1.428 0.333 0.000 0.333 0.666 0.333 0.000 0.000 0.000 0.000 2.000

***Vaejovis intermedius* 2141A**

1.120 1.217 0.000 1.200 1.000 1.750 1.523 2.000 2.000 2.000 2.000 2.000 2.000 1.090 0.727 2.000 2.000 1.333 1.333 0.800 1.500 1.649 0.800 0.800 0.500 2.000 0.857 0.000 0.999 0.800 0.857 0.750 0.857 1.000 1.428 0.999 1.000 1.333 0.666 1.000 0.500 0.400 0.285 0.666 2.000

***Vaejovis lapidicola* 1814**

0.400 0.434 0.500 0.400 0.250 0.500 0.190 0.800 0.250 0.571 0.363 0.060 1.000 0.545 0.545 0.600 0.000 0.666 0.000 0.000 1.000 0.947 0.400 0.400 0.500 2.000 0.285 0.000 0.333 0.400 0.285 0.250 0.285 0.000 0.571 0.333 0.000 0.333 0.000 0.333 0.500 0.000 0.285 0.000 2.000

***Vaejovis mexicanus* 1825**

0.880 0.782-0.869 0.000 0.400 0.250 0.500 0.190 0.800 0.250 0.285 0.181 0.000 0.500 0.363 0.363 0.400 0.000 0.000 0.000 0.000 1.500 1.649 0.000 0.000 0.500 2.000 0.571 0.000 0.000 0.000 0.285 0.000 0.285 0.000 0.571 0.333 0.000 0.000 0.333 0.333 0.000 0.000 0.571 0.999 2.000

***Vaejovis pequeno* 6308**

0.480 0.521 0.500 0.400 0.250 0.500 0.285 0.800 0.250 0.285 0.363 0.181 1.000 0.363 0.363 0.400 0.000 0.000 0.000 0.000 1.500 0.947 0.400 0.400 0.500 2.000 0.571 0.000 0.000 0.000 0.285 0.500 0.571 0.000 0.571 0.333 0.000 0.333 0.333 0.333 0.000 0.000 0.285 0.000 2.000

***Vaejovis rossmani* 2027**

0.400 0.347-0.434 0.000 0.000 0.250 0.250 0.095 0.800 0.250 0.285 0.181 0.121 1.000 0.363 0.363 0.400 0.000 0.666 0.666 0.400 1.000 1.649 0.400 0.400 0.500 0.000 0.571 0.000 0.999 0.000 0.285 0.250 0.571 0.000 0.571 0.333 0.000 0.333 0.333 0.500 0.000 0.000 0.285 0.333 2.000

***Vaejovis* sp. 5327**

0.480 0.521 0.500 0.400 0.250 0.250 0.285 0.800 0.750 0.857 0.545 0.121-0.242 0.500 0.363 0.363 0.400 1.000 1.333 1.333 0.800 1.000 1.649 0.400 0.400 0.500 2.000 0.571 0.000 0.000 0.000 0.285 0.500 0.571 1.000 0.571 0.333 0.500 0.333 0.000 0.500 0.500 0.400 0.285 0.333 2.000

***Wernerius spicatus* 8968**

0.320 0.347 0.000 0.400 0.250 0.500 0.190 0.800 0.250 0.285 0.181-0.363 0.060 1.000 0.363 0.363 0.400 0.000 0.000 0.000 0.000 1.500 2.000 0.400 0.400 0.500 2.000 0.571 0.000 0.666 0.400 0.285 0.250 0.571 0.000 0.857 0.666 0.500 0.333 0.666 0.333 0.000 0.000 0.285 0.000 2.000

Ingroup

***Chihuahuanus bilineatus* 5306**

0.720-0.800 0.869 0.500 0.800 0.500 0.500 0.476 1.200 0.500 0.857 0.545 0.363 1.000 0.363 0.727 0.800 2.000 1.333 1.333 0.800 1.000 0.947 1.200 0.400 0.500 2.000 0.571 0.000 0.999 0.800 0.285 0.750 0.857 2.000 1.142 0.999 0.500 0.666 0.666 0.500 0.500 0.400 0.571 0.999 2.000

***Chihuahuanus cazieri* 7163**

0.720-0.880 0.608-0.695 0.000 0.000 0.250 0.250 0.285 0.800 0.250 0.285 0.363 0.060 1.000 0.363 0.363 0.600 0.000 0.000 0.000 0.000 1.000 1.298 1.200 0.400 0.500 2.000 0.571 0.000 0.333 0.000 0.285 0.250 0.571 0.000 0.857 0.666 0.500 0.666 0.666 0.666 0.000 0.000 0.285 0.333 2.000

***Chihuahuanus coahuilae* 5353**

0.720 0.608 0.000 0.400 0.250 0.250 0.476 0.800 0.250 0.285 0.181 0.303 1.000 0.363 0.363 0.400 0.000 0.000 0.000 0.000 1.500 1.298 0.800 0.400 0.500 2.000 0.571 0.000 0.666 0.000 0.285 0.250 0.571 0.000 0.857 0.666 0.500 0.666 0.666 0.666 0.000 0.000 0.285 0.333 2.000

***Chihuahuanus crassimanus* 2972**

0.800-0.880 0.608-0.695 0.000 0.400 0.750 1.000 0.666 1.200 0.500 0.857 0.545 0.424 1.000 0.545 0.363 0.800 1.000 0.666 1.333 0.400 1.500 1.649 1.200 1.200 0.500 2.000 1.142 0.000 0.999 1.600 1.142 0.750 0.857 0.000 1.142 1.333 1.500 0.999 0.666 1.166 1.000 0.400 0.857 0.999 2.000

***Chihuahuanus glabrimanus* 6558**

0.720 0.608 0.000 1.200 0.750 1.000 0.476 1.200 0.500-0.750 0.571-0.857 0.545-0.727 0.484 1.000 0.363 0.363 0.800 0.000 0.666 0.000 0.000 1.000 1.649 1.200 1.200 0.500 2.000 0.571 0.000 0.999 0.800 0.571 1.000 1.142 1.000 0.857 0.333 1.000 0.999 0.666 0.666 0.500 0.400 0.571 0.999 2.000

***Chihuahuanus globosus* 5281**

0.640 0.521 0.500 1.200 0.750 0.750 0.380 1.200 0.500 0.571 0.363 0.181 1.000 0.363 0.363 0.800 0.000 0.666 0.666 0.400 1.500 1.649 1.200 1.200 0.500 2.000 0.571 0.000 0.999 1.200 0.857 1.000 0.857 1.000 1.142 0.666 0.500 0.999 0.666 0.666 0.500 0.400 0.857 0.999 2.000

***Chihuahuanus kovariki* 5299**

0.640 0.695 0.500 0.800 0.750 1.250 0.857 1.600 0.750 0.857-1.428 0.545-0.909 0.545-0.606 1.000 0.545 0.545 0.800 1.000 0.666 0.666 0.400 1.500 1.298 2.000 2.000 0.500 2.000 2.000 1.000 0.999 2.000 1.428 1.250 0.571 2.000 2.000 2.000 1.500 2.000 1.333 0.833 1.000 0.800 1.428 1.666 2.000

***Chihuahuanus russelli* 2971**

0.800 0.608-0.695 0.000 0.400 0.250 0.500 0.285 0.800 0.250 0.285 0.363 0.121 1.000 0.363 0.363 0.400 0.000 0.000 0.000 0.000 1.000 1.298 0.800 0.400 0.500 2.000 0.571 0.000 0.666 0.400 0.285 0.250 0.571 0.000 1.142 0.666 0.500 0.999 0.666 0.666 0.500 0.000 0.571 0.333 2.000

***Chihuahuanus russelli* 7266**

0.800 0.608-0.695 0.000 0.400 0.250 0.500 0.285 0.800 0.250 0.285 0.363 0.121 1.000 0.363 0.363 0.400 0.000 0.000 0.000 0.000 1.000 1.298 0.800 0.400 0.500 2.000 0.571 0.000 0.666 0.400 0.285 0.250 0.571 0.000 1.142 0.666 0.500 0.999 0.666 0.666 0.500 0.000 0.571 0.333 2.000

***Kochius barbatus* 8803**

0.880-0.960 0.956 0.000 0.400 0.000 0.250 0.190 0.800 0.250 0.285 0.181 0.060-0.121 1.000 0.363 0.363 0.600 0.000 0.000 0.000 0.000 1.000 1.298 0.000 0.000 0.500 2.000 0.571 0.000 0.000 0.000 0.285 0.000 0.571 0.000 0.000 0.000 0.000 0.333 0.000 0.166 0.000 0.000 0.000 0.333 2.000

***Kochius bruneus* 3153**

0.800 0.695-0.782 0.000 0.400 0.250 0.500 0.190 0.800 0.250 0.285 0.181 0.060 1.000 0.363 0.363 0.400 0.000 0.000 0.000 0.000 1.000 1.298 0.000 0.000 0.500 2.000 0.571 0.000 0.000 0.000 0.285 0.000 0.571 0.000 0.000 0.000 0.000 0.000 0.000 0.166 0.000 0.000 0.000 0.333 2.000

***Kochius cerralvensis* 8779**

0.800 0.869 0.000 0.400 0.250 0.250 0.285 0.800 0.250 0.285 0.181 0.060-0.181 0.500 0.363 0.363 0.400 0.000 0.000 0.000 0.000 1.000 0.947 0.000 0.000 0.500 2.000 0.571 0.000 0.000 0.000 0.285 0.000 0.571 0.000 0.000 0.000 0.000 0.333 0.000 0.166 0.000 0.000 0.000 0.333 2.000

***Kochius hirsuticauda* 5049**

0.800 0.782 0.000 0.000 0.250 0.250 0.095 0.800 0.250 0.285 0.181 0.060 1.000 0.363 0.363 0.400 0.000 0.000 0.000 0.000 1.500 1.298 0.000 0.000 0.500 2.000 0.571 0.000 0.000 0.000 0.285 0.000 0.571 0.000 0.000 0.000 0.000 0.000 0.000 0.166 0.000 0.000 0.000 0.333 2.000

***Kochius insularis* 8801**

0.880 0.782 0.000 0.000 0.000 0.250 0.190 0.800 0.250 0.285 0.181 0.060-0.121 1.000 0.363 0.363 0.400 0.000 0.000 0.000 0.000 0.500 1.649 0.000 0.000 0.500 2.000 0.571 0.000 0.000 0.000 0.285 0.000 0.571 0.000 0.000 0.000 0.000 0.000 0.000 0.166 0.000 0.000 0.000 0.333 2.000

***Kochius loretoensis* 4554**

0.800-0.880 0.869 0.000 0.000 0.000 0.000 0.095 0.800 0.250 0.285 0.181 0.060 1.000 0.363 0.363 0.400 0.000 0.000 0.000 0.000 1.500 1.649 0.000 0.000 0.500 2.000 0.571 0.000 0.000 0.000 0.285 0.000 0.571 0.000 0.000 0.000 0.000 0.000 0.000 0.166 0.000 0.000 0.000 0.333 2.000

***Kochius magdalensis* 3155**

0.880 0.869 0.000 0.400 0.250 0.250 0.190 0.800 0.250 0.285 0.181 0.060-0.181 1.000 0.363 0.363 0.400 0.000 0.000 0.000 0.000 1.000 1.298 0.000 0.000 0.500 2.000 0.571 0.000 0.000 0.000 0.285 0.000 0.571 0.000 0.000 0.000 0.000 0.000 0.000 0.166 0.000 0.000 0.000 0.333 2.000

***Kochius punctipalpi* 1679**

0.880-0.960 0.956 0.000 0.400 0.250 0.250 0.190 0.800 0.250 0.285 0.181 0.121 1.000 0.363 0.363 0.400 0.000 0.000 0.000 0.000 0.500 1.298 0.000 0.000 0.500 2.000 0.571 0.000 0.000 0.000 0.285 0.000 0.571 0.000 0.000 0.000 0.000 0.000 0.000 0.166 0.000 0.000 0.000 0.333 2.000

***Kochius sonorae* 6301**

0.560 0.608 0.000 0.000 0.000 0.000 0.095 0.800 0.250 0.285 0.181 0.000 1.000 0.363 0.363 0.400 0.000 0.000 0.000 0.000 1.000 1.649 0.000 0.000 0.500 2.000 0.571 0.000 0.000 0.000 0.285 0.000 0.571 0.000 0.000 0.000 0.000 0.000 0.000 0.166 0.000 0.000 0.000 0.333 2.000

***Kochius villosus* 3477**

0.800 0.956 0.000 0.000 0.000 0.000 0.095 0.800 0.250 0.285 0.181 0.060 1.000 0.363 0.363 0.400 0.000 0.000 0.000 0.000 1.000 1.649 0.000 0.000 0.500 2.000 0.571 0.000 0.000 0.000 0.285 0.000 0.571 0.000 0.000 0.000 0.000 0.000 0.000 0.166 0.000 0.000 0.000 0.333 2.000

***Konetontli acapulco* 9520**

0.560 0.608 0.000 0.400 0.250 0.250 0.380 1.200 0.500-0.750 0.571-1.142 0.363-0.727 0.181-0.363 1.000 0.363 0.363 0.600 0.000 0.666 0.666 0.400 1.500 1.649 0.400 0.400 0.500 2.000 0.571 0.000 0.666 0.400 0.285 0.750 0.571 0.000 0.571 0.666 0.000 0.666 0.000 0.666 0.500 0.400 0.571 0.333 2.000

***Konetontli chamelaensis* 7675**

0.160-0.240 0.260 0.000 0.000 0.000 0.250 0.190 1.200 0.500 0.571 0.363 0.121 0.500 0.363 0.363 0.400 0.000 0.000 0.000 0.000 1.000 1.298 0.400 0.400 0.500 2.000 0.571 0.000 0.666 0.000 0.285 0.750 0.571 0.000 0.571 0.666 0.000 0.333 0.000 0.333 0.000 0.000 0.285 0.333 2.000

***Konetontli nayarit* 4725**

0.400 0.434 0.000 0.000 0.250 0.250 0.190 0.000 0.250 0.285 0.363 0.060 0.500 0.363 0.363 0.400 0.000 0.000 0.000 0.000
1.500 0.596 0.400 0.400 0.500 2.000 0.571 0.000 0.666 0.000 0.285 0.500 0.571 0.000 0.571 0.666 0.000 0.333 0.000 0.500
0.000 0.000 0.285 0.333 2.000

***Konetontli pattersoni* 3149**

0.400 0.434-0.521 0.000 0.000 0.250 0.250 0.190 0.800 0.500 0.571 0.363 0.060 0.500 0.363 0.363 0.400 0.000 0.000 0.000
0.000 1.500 0.947 0.400 0.400 0.500 2.000 0.571 0.000 0.666 0.000 0.285 0.750 0.571 0.000 0.571 0.666 0.000 0.333 0.000
0.500 0.000 0.000 0.285 0.333 2.000

***Kuarapu purhepecha* 9517**

0.800 0.782-0.869 0.000 0.000 0.250 0.250 0.190 0.800 0.250 0.285-0.571 0.363 0.060-0.181 1.000 0.363 0.363 0.400 0.000
0.000 0.000 0.000 1.000 0.947 0.800 0.000 0.500 2.000 0.571 0.000 0.333 0.000 0.285 0.500 0.571 0.000 0.285 0.333 0.000
0.666 0.000 0.333 0.000 0.400 0.571 0.000 2.000

***Maaykuyak vittatus* 3180**

0.960-1.040 0.869 0.000 0.400 0.250 0.500 0.476 1.200 0.750 0.857 0.727 0.545 1.000 0.363 0.363 0.800 0.000 0.666 1.333
0.800 1.000 0.947 1.200 0.000 0.500 2.000 0.857 0.000 0.666 0.400 1.142 1.000 0.571 0.000 1.142 0.000 0.500 0.666 0.333
0.666 0.500 0.400 0.285 0.000 2.000

***Maaykuyak waueri* 2973**

0.480 0.434 0.500 0.800 0.500 0.750 0.476 1.200 0.750 0.857 0.545 0.242 1.000 0.545 0.545 0.800 0.000 0.666 1.333 2.000
1.000 1.298 0.800 0.400 0.500 2.000 0.571 0.000 0.666 0.400 0.571 0.750 0.857 1.000 1.142 0.666 0.500 0.666 0.666 0.666
0.500 0.400 0.857 0.333 2.000

***Mesomexovis atenango* 2023**

0.720-0.800 0.695-0.782 0.000 0.400 0.750 0.750 0.476 0.000 0.250 0.285 0.181 0.242 1.000 0.363 0.363 0.600 0.000 0.000
0.000 0.000 1.000 1.298 0.800 0.000 0.500 2.000 0.571 0.000 0.333 0.400 0.571 0.500 0.571 1.000 0.571 0.333 0.500 0.999
0.333 0.666 0.500 0.400 0.571 0.999 2.000

***Mesomexovis oaxaca* 2031**

0.960-1.040 0.869-0.956 0.500 1.200 0.750 1.000 1.047 0.800-1.200 0.750 0.857 0.727-0.909 0.484-0.666 1.000 0.545 0.545
0.600 0.000 0.666 1.333 1.200 1.000 1.298 1.600 0.800 0.500 2.000 0.857 0.000 1.333 1.600 0.857 2.000 1.428 1.000 1.142
0.999 1.000 0.999 0.666 0.666 1.000 0.400 0.857 1.333 2.000

***Mesomexovis occidentalis* 3118**

1.200 1.043 0.000 0.800 0.500 0.750 0.476 0.000 0.750 0.571 0.363 0.363 1.000 0.363 0.363 0.600 0.000 0.000 0.000 0.000
1.000 1.298 0.800 0.800 0.500 2.000 0.857 0.000 0.666 1.200 0.857 1.750 0.571 1.000 1.142 0.666 1.000 0.333 0.666 0.666
0.500 0.400 1.142 0.666 2.000

***Mesomexovis punctatus* 2080**

0.880 0.695-0.782 0.500 1.200 0.750 1.000 0.952 0.800 0.750 0.857 1.090 0.666 1.000 0.727 0.727 0.800 0.000 0.000 0.666
0.800 1.500 1.298 1.600 0.800 0.500 2.000 0.571 1.000 0.999 1.600 1.142 1.250 1.142 1.000 1.428 0.999 0.500 0.999 0.666
1.000 0.500 0.400 0.571 0.333 2.000

***Mesomexovis spadix* 2950**

1.120 0.782-0.869 0.000 0.400 0.500 0.500 0.476 0.800-1.200 0.500-0.750 0.857 0.545-0.727 0.242-0.303 1.000 0.363 0.363
0.400 0.000 0.666 0.666 0.800 1.500 1.298 0.800 0.800 0.500 2.000 0.571 0.000 0.666 0.800 0.285 0.750 1.142 1.000 1.142
0.999 1.000 0.333 0.666 0.666 0.500 0.000 0.571 0.999 2.000

***Mesomexovis spadix* 6373**

1.120 0.782-0.869 0.000 0.400 0.500 0.500 0.476 0.800-1.200 0.500-0.750 0.857 0.545-0.727 0.242-0.303 1.000 0.363 0.363
0.400 0.000 0.666 0.666 0.800 1.500 1.298 0.800 0.800 0.500 2.000 0.571 0.000 0.666 0.800 0.285 0.750 1.142 1.000 1.142
0.999 1.000 0.333 0.666 0.666 0.500 0.000 0.571 0.999 2.000

***Mesomexovis subcristatus* 2049**

0.880 0.869-0.956 0.500 1.200 0.750 1.000 0.571 1.200 0.750 0.857 0.545 0.424 1.000 0.545 0.545 0.800 0.000 0.000 0.000
0.000 1.500 1.298 0.800 0.000 0.500 2.000 0.857 0.000 0.999 0.800 0.857 1.000 1.142 1.000 1.142 0.666 1.000 0.333 0.666
0.666 0.500 0.400 0.857 0.999 2.000

***Mesomexovis variegatus* 5185**

1.120 0.956 0.000 0.800 0.500 0.750 0.476 0.800 0.750 0.857 0.727 0.424 0.500 0.363 0.363 0.600 2.000 1.333 1.333 0.800
1.500 1.649 0.800 0.400 0.500 2.000 0.571 0.000 0.666 0.800 0.571 0.750 0.857 1.000 1.142 0.999 0.500 0.666 0.666 0.666
0.000 0.000 0.571 0.666 2.000

***Paravaejovis coloradensis* 1688**

0.640-0.720 0.608 0.000 0.000 0.250 0.250 0.095 0.800 0.250 0.285 0.181-0.363 0.181 1.000 0.363 0.363 0.400 0.000 0.000
0.000 0.000 0.000 1.000 1.298 0.400 0.400 0.500 2.000 0.571 0.000 0.666 0.000 1.142 0.000 0.571 0.000 0.857 0.999 0.500 0.333
0.333 0.500 0.500 0.400 0.571 0.333 2.000

***Paravaejovis confusus* 4450**

0.800-0.880 0.695 0.000 0.400 0.250 0.250 0.190 0.800 0.250 0.285 0.181 0.121 1.000 0.363 0.363 0.400 0.000 0.000 0.000
0.000 1.000 1.298 0.400 0.400 0.500 2.000 0.571 0.000 0.666 0.000 1.142 0.250 0.285 0.000 1.142 0.999 0.500 0.999 0.333
0.500 0.500 0.400 0.571 0.333 2.000

***Paravaejovis diazi* 3165**

0.880 0.695 0.000 0.400 0.750 1.000 0.571 0.800 0.250 0.285 0.181-0.363 0.242-0.363 0.500 0.363 0.363 0.400 0.000 0.000
0.000 0.000 1.000 1.298 0.800 0.400 0.500 2.000 0.571 0.000 0.333 1.200 0.857 1.000 0.857 0.000 0.857 0.666 0.500 0.666
0.666 0.666 0.500 0.400 0.571 0.666 2.000

***Paravaejovis eusthenura* 1689**

0.960 0.695 0.000 0.400 0.750 1.000 0.666 1.200 0.500 0.571 0.363 0.606 0.500 0.363 0.363 0.400 0.000 0.666 0.000 0.000
1.000 0.947 2.000 1.200 2.000 2.000 1.142 1.000 0.999 2.000 1.428 1.750 2.000 2.000 1.714 1.666 2.000 2.000 2.000 2.000
1.000 0.800 2.000 1.333 2.000

***Paravaejovis gravicaudus* 3163**

1.440-1.520 1.304-1.391 0.000 0.400 0.500 0.500 0.666 0.800 0.500 0.857 0.727 0.484 1.000 0.363 0.363 0.600 0.000 0.666
0.666 0.000 1.500 0.947 2.000 1.200 1.000 2.000 1.142 1.000 1.666 1.600 1.142 2.000 1.428 2.000 1.428 1.666 1.500 1.333
1.333 1.166 1.000 1.200 1.428 0.666 2.000

***Paravaejovis hoffmanni* 3166**

0.880-0.960 0.782 0.000 0.400 0.750 1.000 0.476 0.800 0.250 0.285 0.181 0.181 0.500 0.363 0.363 0.400 0.000 0.000 0.000
0.000 1.000 1.649 0.800 0.800 0.500 2.000 0.857 0.000 0.666 1.200 0.857 1.250 1.142 2.000 0.857 0.666 2.000 0.666 0.666
0.666 0.500 0.400 0.571 0.666 2.000

***Paravaejovis hoffmanni* 8797**

0.880-0.960 ?0.000 0.400 0.750 1.000 0.666 0.800 0.250 0.285-0.571 0.363 0.363-0.424 0.500 0.363 0.363 0.400 0.000 0.000
0.000 0.000 1.000 1.298 1.200 0.400 0.500 2.000 0.857 0.000 0.999 1.200 1.142 1.000 1.142 2.000 0.857 0.999 0.500 0.999
0.666 0.666 1.500 0.800 0.571 0.666 2.000

***Paravaejovis pumilis* 3137**

0.400 0.086 0.500 0.800 0.500 0.500 0.285 0.800 0.250 0.571 0.727 0.484 0.500 0.363 0.363 0.400 0.000 0.000 0.666 0.000
1.000 1.298 0.400 0.000 0.500 2.000 0.000 0.000 0.333 0.000 0.285 0.250 0.571 0.000 0.857 0.333 0.000 0.333 0.333 0.000
0.000 0.000 0.285 0.000 2.000

***Paravaejovis puritanus* 3479**

0.880 0.782 0.000 0.400 0.250 0.750 0.285 0.800 0.500 0.571 0.363 0.181 1.000 0.363 0.363 0.600 0.000 0.000 0.000 0.000
1.000 0.947 1.200 0.400 0.500 2.000 1.142 0.000 0.999 0.400 0.571 0.750 0.571 1.000 1.142 0.333 0.500 0.999 0.666 0.666
0.500 1.200 0.571 0.666 2.000

***Paravaejovis schwenkmeyeri* 4413**

0.800 0.695-0.782 0.000 0.400 0.250 0.500 0.285 0.800 0.250 0.285 0.181 0.181 1.000 0.363 0.363 0.400 0.000 0.000 0.000
0.000 1.000 0.947 0.800 0.400 0.500 2.000 0.571 0.000 0.333 0.400 0.571 0.500 0.571 1.000 0.857 0.666 0.500 0.666 0.333
0.666 0.500 0.400 0.857 0.666 2.000

***Paravaejovis spinigerus* 7015**

1.440 1.217-1.304 0.000 0.400 0.250 0.500 0.285 1.200 0.750 0.857 0.545 0.363 1.500 0.545 0.545 0.800 0.000 0.666 0.666
0.400 1.500 0.947 1.600 0.800 0.500 2.000 0.857 1.000 0.999 0.800 0.857 1.000 1.142 2.000 0.857 1.333 1.000 0.999 0.666
0.666 0.000 0.400 0.571 0.666 2.000

***Paravaejovis waeringi* 4431**

0.880 0.608-0.695 0.000 0.400 0.250 0.750 0.380 0.800 0.250 0.285 0.181 0.181 1.000 0.363 0.363 0.400 0.000 0.000 0.000
0.000 1.000 0.947 0.400 0.400 0.500 2.000 0.571 0.000 0.666 0.000 1.142 0.500 0.000 0.000 0.857 0.999 0.500 0.333 0.333
0.500 0.500 0.400 0.571 0.333 2.000

***Syntropis macrura* 3146**

1.520-1.600 1.913-2.000 0.000 0.400 0.500 1.000 0.857 1.200 0.500 1.142 0.727 0.545 2.000 0.727 0.909 1.000 0.000 0.000
0.000 0.000 1.000 0.596 0.400 0.000 0.500 2.000 1.142 0.000 0.333 0.000 0.857 1.000 0.857 0.000 0.857 0.999 0.000 0.666
0.333 1.000 1.500 1.600 1.714 1.666 2.000

***Syntropis williamsi* 87 06**

1.440 1.652 0.000 0.000 0.250 0.250 0.476 0.800 0.500 0.571 0.545-0.727 0.424 1.000 0.545 0.727 0.800 0.000 0.000 0.000
0.000 1.500 0.596 0.400 0.000 0.500 2.000 0.571 0.000 0.000 0.000 0.000 0.500 0.571 0.000 1.142 0.000 0.000 0.333 0.333
0.500 0.000 0.000 0.571 0.666 2.000

***Thorellius cisnerosi* 2018**

1.040 1.217 0.000 0.000 0.000 0.250 0.190 0.400 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
1.500 1.649 0.400 0.000 0.500 2.000 0.571 0.000 0.000 0.000 0.285 0.500 0.571 0.000 0.285 0.000 0.000 0.333 0.000 0.166
0.500 0.000 0.571 0.333 2.000

***Thorellius cristimanus* 5323**

1.040 1.130 0.500 0.800 0.500 0.750 0.190-0.285 0.000 0.250 0.285 0.181 0.121 0.500 0.363 0.363 0.400 0.000 0.000 0.000
0.000 2.000 1.298 0.800 0.000 0.500 2.000 0.571 0.000 0.333 0.400 0.285 0.500 1.142 0.000 0.571 0.666 0.000 0.666 0.333
0.666 1.000 0.400 0.857 0.999 2.000

***Thorellius intrepidus* 5309**

1.120-1.360 1.304 0.500 1.200 0.750 0.750 0.285 0.800 0.500 0.571 0.363 0.303 1.000 0.363 0.363 0.400 0.000 0.000 0.000
0.000 1.500 1.649 0.400 0.000 0.500 2.000 0.571 0.000 0.000 0.000 0.285 0.750 0.571 0.000 0.285 0.000 0.000 0.333 0.000
0.166 0.500 0.000 0.571 0.999 2.000

***Vizcaino viscainensis* 3174**

0.720 0.608-0.695 0.000 0.400 0.250 0.500 0.190 0.800 0.500 0.571 0.363 0.181 1.000 0.363 0.363 0.600 0.000 0.666 0.000
0.000 1.000 0.947 0.800 0.400 0.500 2.000 0.571 0.000 0.333 0.000 0.285 0.500 0.571 0.000 0.285 0.333 0.500 0.000 0.333
0.333 0.500 0.400 0.285 0.000 2.000

Appendix 4

Morphological discrete character used for cladistic analysis of the subfamily Syntropinae (Kraepelin, 1905). Polimorphism are indicate as *x* = [01] and *y* = [23]

Outgroup

***Franckeus kochi* 5363**
2104021320 0000200002 1102221132 ?021101011 0210000002 1012010111 0000001001 0000001001
1200100101 0002120100 0101000110 1010210121 0100000111 1200202130 1000001212 0112110110
0001101011 0112200001 0111100101 1110012000 000101

***Pseudouroctonus glimmei* 2688**
2131141223 1113121401 1121201432 1001111111 1010121001 1011010111 0011111121 1100210001
1200101131 1002110110 1111110110 1010111111 1000010000 0000202120 1000200123 0101110000
0001101110 1111101002 0110000000 0020100001 111100

***Serradigitus minutis* 1674**
0100021020 0000000001 1201121001 ??21100011 0??1110001 0011010111 0000011111 1100001001
1200111000 0103111110 1101101110 1011110111 1100000000 0000002101 1101011301 0145110111
0001101010 0011100001 0011000000 1110000000 000001

***Serradigitus* sp. 6370**
0130021020 0000000001 1201121001 ??21101011 0??1110001 1011010111 0000001111 1100011001
1200111000 0103110110 0101101110 1011110111 0000010000 0000102110 1101201311 0123110110
0001101010 0011200001 0000000111 0110000100 000001

***Smeringurus grandis* 8690**
1122341110 2223121312 2011211341 1111100000 0100200001 1011010111 0011111000 2000001000
10?0000101 0001020000 1100000220 0101200220 0010010111 1111202130 0000001311 1122000100
1111111000 1111310101 1011000000 0010100000 110000

***Stahnkeus deserticola* 5032**
1123221220 1023121321 2102221111 0111101011 1211000001 1011010111 0011111111 1100011001
1200111000 0103120100 0101001110 1011210221 1101000000 0000014001 1101012400 0156110111
0001101010 0011200001 0011100000 0120100001 111100

***Uroctonites giulianii* 3204**
2134141223 1114131332 0201200432 1101011111 2212122001 1011010111 0011111120 1100000000
00?0000120 0100010110 1100210110 1000111121 1000010000 0000201120 2000200023 0101110000
0001101111 2222100001 0110000000 0020000000 111100

***Vaejovis carolinianus* 1576**
2114021322 0000200202 1102221131 ?021101011 1211110001 1011010111 0011111111 1100000001
1200100101 0002120100 0101000110 1010200221 0100010000 0000202120 1000101123 0112110100
0001101121 1222200001 0111011101 1111013120 000111

***Vaejovis intermedius* 2141A**
2214011322 0000200202 1112221131 ?021101011 0210000002 1012010111 0000001001 0000001001
1200100101 0002120100 0201000110 1010210121 0101000001 1200202120 1000001212 0112110110
0001101010 0111200001 0011100000 0020012001 000000

***Vaejovis lapidicola* 1814**
2104221020 0000001002 1101221132 ?121101011 1011110001 1011010111 0011111111 1100001001
1200100101 1012120110 0101110110 1010210221 0100010000 0000202120 1000101122 0101110100
0001101010 0111200002 0011000000 0020000001 000001

***Vaejovis mexicanus* 1825**
2124241303 2212231432 1122221432 0121101011 1012222001 1011010111 0021111111 1100200001
10?0000101 0012120110 1101100110 1010210221 0000110000 0100202120 1000100123 0101110100
0001101110 1222201022 0111011001 1111010220 000111

***Vaejovis pequeno* 6308**
0130021020 0000000001 1201121001 ??21101011 0??1110001 1011010111 0011111111 1100011001
1200111000 0103110110 0101101110 1011110111 1100010000 0000102110 1101201311 0123110100
0001101010 0011200001 0101000001 1110010120 000101

***Vaejovis rossmani* 2027**

0000001020 0000000002 1101221102 ??21101011 1011110001 1011010111 0011111111 1100200001
10?1000101 1012120110 0101100110 1010210211 0000011000 0000202120 1000100123 0101110100
0001101221 2222200022 0111011001 1111002230 000111

***Vaejovis* sp. 3711**

2104041020 0000000002 2201221202 ??21101011 1011110002 1011010111 0000001111 1100210101
10?0000101 0012121110 1101110110 1011200221 0000110000 0000202120 1000100123 0101110100
0001111121 1222300022 0101011001 1110010120 000111

***Vaejovis* sp. 5327**

2104041020 0000000002 2201221202 ??21101011 1011110002 1011010111 0000001111 1100210101
10?0000101 0012121110 1101110110 1011200221 0000110000 0000202120 1000100123 0101110100
0001111121 1222300022 0101011001 1110010120 000111

***Wernerius spicatus* 8968**

2134221220 0004132010 1101220112 ??11111111 0211001001 1111010111 0011111111 1000010101
2200111000 0103110100 0101100110 1011110111 1101010000 0100202120 1001201421 0122110010
0001111010 0011100001 0011000000 0020100001 111000

Ingroup

***Chihuahuanus bilineatus* 5306**

2204002330 0004232042 2201021001 ??10100011 0??0000001 1011010111 1000211001 0000101001
1210111000 0103120100 0101100110 1011210221 0001011000 0100102120 1001201123 0023110100
0001111010 0011201002 1011000101 0111100000 000001

***Chihuahuanus bilineatus* 6507**

2204002330 0004232042 2201021001 ??10100011 0??0000001 1011010111 1000211001 0000101001
1210111000 0103120100 0101100110 1011210221 0001011000 0100102120 1001201123 0023110100
0001111010 0011201002 1011000101 0111100000 000001

***Chihuahuanus bilineatus* 6594**

2204002330 0004232042 2201021001 ??10100011 0??0000001 1011010111 1000211001 0000101001
1210111000 0103120100 0101100110 1011210221 0001011000 0100102120 1001201123 0023110100
0001111010 0011201002 1011000101 0111100000 000001

***Chihuahuanus cazieri* 7163**

1123221222 0003121422 1101221001 ??11101011 0??1111001 1011010111 1011111001 0000101001
1210111000 0103120101 0101100110 1011210221 0001111000 0000102120 1001201212 0123110100
0001111010 0011201002 1010000000 0121100000 110000

***Chihuahuanus cazieri* 7179**

1123221222 0003121422 1101221001 ??11101011 0??1111001 1011010111 1011111001 0000101001
1210111000 0103120101 0101100110 1011210221 0001111000 0000102120 1001201212 0123110100
0001111010 0011201002 1010000000 0121100000 110000

***Chihuahuanus coahuilae* 5353**

2204012330 0004232042 2201221001 ??11100011 0??0000001 1011010111 1000211001 0000101001
1210111000 0103120100 0101100110 1011210221 0001011000 0100102120 1001201222 0123110100
1001111010 0011201002 1011000000 0111100000 000001

***Chihuahuanus coahuilae* 6600**

2204012330 0004232042 2201221001 ??11100011 0??0000001 1011010111 1000211001 0000101001
1210111000 0103120100 0101100110 1011210221 0001011000 0100102120 1001201222 0123110100
1001111010 0011201002 1011000000 0111100000 000001

***Chihuahuanus coahuilae* 7095**

2204012330 0004232042 2201221001 ??11100011 0??0000001 1011010111 1000211001 0000101001
1210111000 0103120100 0101100110 1011210221 0001011000 0100102120 1001201222 0123110100
1001111010 0011201002 1011000000 0111100000 000001

***Chihuahuanus crassimanus* 2972**

1123221322 0003221422 1102221112 ??11101011 0211111001 1011010111 1011111001 0000101001
1210111000 0103120101 0101100110 1011210221 0001111000 00001021*y*0 1*x*01201212 0123110100
0001111010 0011201002 1010000000 0121100000 110000

***Chihuahuanus crassimanus* 5365**

1123221322 0003221422 1102221112 ??11101011 0211111001 1011010111 1011111001 0000101001
1210111000 0103120101 0101100110 1011210221 0001111000 00001021*y*0 1*x*01201212 0123110100
0001111010 0011201002 1010000000 0121100000 110000

***Chihuahuanus crassimanus* 7100**

1123221322 0003221422 1102221112 ??11101011 0211111001 1011010111 1011111001 0000101001
1210111000 0103120101 0101100110 1011210221 0001111000 00001021*y*0 1*x*01201212 0123110100
0001111010 0011201002 1010000000 0121100000 110000

***Chihuahuanus glabrimanus* 6558**
2234312332 0004232042 2201321002 ??11100011 0??0000001 1011011110 0102111001 0000101001
1210111000 0103120100 0001100110 1011110121 0001011001 0100102120 1001201222 0123110100
1001111010 0011201002 1011000000 0020100001 111000

***Chihuahuanus glabrimanus* 6610**
2234312332 0004232042 2201321002 ??11100011 0??0000001 1011011110 0102111001 0000101001
1210111000 0103120100 0001100110 1011110121 0001011001 0100102120 1001201222 0123110100
1001111010 0011201002 1011000000 0020100001 111000

***Chihuahuanus glabrimanus* 6611**
2234312332 0004232042 2201321002 ??11100011 0??0000001 1011011110 0102111001 0000101001
1210111000 0103120100 0001100110 1011110121 0001011001 0100102120 1001201222 0123110100
1001111010 0011201002 1011000000 0020100001 111000

***Chihuahuanus globosus* 5281**
2234312332 0004232042 2201221001 ??11100011 0??0000001 1011010111 1022111001 0000101001
1210111000 0103120100 0101100210 1011210221 0001011000 0100102120 1001201212 0123110100
1111111010 0011201002 1011000000 0020100001 111000

***Chihuahuanus globosus* 6447**
2234312332 0004232042 2201221001 ??11100011 0??0000001 1011010111 1022111001 0000101001
1210111000 0103120100 0101100210 1011210221 0001011000 0100102120 1001201212 0123110100
1111111010 0011201002 1011000000 0020100001 111000

***Chihuahuanus globosus* 6459**
2234312332 0004232042 2201221001 ??11100011 0??0000001 1011010111 1022111001 0000101001
1210111000 0103120100 0101100210 1011210221 0001011000 0100102120 1001201212 0123110100
1111111010 0011201002 1011000000 0020100001 111000

***Chihuahuanus globosus* 8926**
2234312332 0004232042 2201221001 ??11100011 0??0000001 1011010111 1022111001 0000101001
1210111000 0103120100 0101100210 1011210221 0001011000 0100102120 1001201212 0123110100
1111111010 0011201002 1011000000 0020100001 111000

***Chihuahuanus kovariki* 5299**
2234312332 0004231032 1101221002 ??11100011 0??0000001 1011010111 1000211001 0000101001
1210111000 0103120100 0101100110 1011210221 0001011000 0110102120 1001201212 0123110100
?001111010 0011201002 1011000000 0020100001 111000

***Chihuahuanus kovariki* 5305**
2234312332 0004231032 1101221002 ??11100011 0??0000001 1011010111 1000211001 0000101001
1210111000 0103120100 0101100110 1011210221 0001011000 0110102120 1001201212 0123110100
?001111010 0011201002 1011000000 0020100001 111000

***Chihuahuanus russelli* 2971**
1123321322 0004231422 1102221112 ??11101011 0211111001 1011010111 1022111001 0000101001
1210111000 0103120100 0101100110 1011210221 0001111001 1210102120 1001201212 0123110100
0001111010 0011201002 1010000000 0020100000 110000

***Chihuahuanus russelli* 7017**
1123321322 0004231422 1102221112 ??11101011 0211111001 1011010111 1022111001 0000101001
1210111000 0103120100 0101100110 1011210221 0001111001 1210102120 1001201212 0123110100
0001111010 0011201002 1010000000 0020100000 110000

***Chihuahuanus russelli* 7266**
1123321322 0004231422 1102221112 ??11101011 0211111001 1011010111 1022111001 0000101001
1210111000 0103120100 0101100110 1011210221 0001111001 1210102120 1001201212 0123110100
0001111010 0011201002 1010000000 0020100000 110000

***Kochius barbatus* 8803**
1120221220 1111121400 1111221432 1011101111 1001221001 1011010111 1011111111 1101001001
1210111000 0103130121 2101100110 1011210221 0001011111 1210102120 1001201311 1123100100
0001101010 0011201002 1011000000 0020100001 011000

***Kochius bruneus* 3153**
1121221220 0011121300 1111221432 ?011101111 1001221001 1011010111 1011111111 1111001001
1210111000 0103130121 2101100110 1011210221 0000011000 0000102130 1001201111 1123100100
0001101010 0011201002 0110000000 0020100001 011100

***Kochius bruneus* 3154**

1121221220 0011121300 1111221432 ?011101111 1001221001 1011010111 1011111111 1111001001
1210111000 0103130121 2101100110 1011210221 0000011000 0000102130 1001201111 1123100100
0001101010 0011201002 0110000000 0020100001 011100

***Kochius bruneus* 4555**

1121221220 0011121300 1111221432 ?011101111 1001221001 1011010111 1011111111 1111001001
1210111000 0103130121 2101100110 1011210221 0000011000 0000102130 1001201111 1123100100
0001101010 0011201002 0110000000 0020100001 011100

***Kochius cerralvensis* 8779**

1121221220 1111121300 1111221432 1011101111 1001221001 1011010111 1011111111 1111001001
1210111000 0103130121 2101100110 1011210221 0011011111 1210102120 1001201311 1123100100
0001101010 0011201002 0011000000 0020100001 011000

***Kochius hirsuticauda* 5049**

1121221220 0011121300 1111221432 ?011101111 1001221001 1011010111 1011111111 1111001001
1210111000 0103130121 2111100110 1011210221 0000011000 0000102130 1001201111 1123100100
0001111010 0011201002 0010000000 0020100001 011000

***Kochius hirsuticauda* 7199**

1121221220 0011121300 1111221432 ?011101111 1001221001 1011010111 1011111111 1111001001
1210111000 0103130121 2111100110 1011210221 0000011000 0000102130 1001201111 1123100100
0001111010 0011201002 0010000000 0020100001 011000

***Kochius hirsuticauda* 8819**

1121221220 0011121300 1111221432 ?011101111 1001221001 1011010111 1011111111 1111001001
1210111000 0103130121 2111100110 1011210221 0000011000 0000102130 1001201111 1123100100
0001111010 0011201002 0010000000 0020100001 011000

***Kochius insularis* 8801**

1121221220 0011121300 1111221432 ?011101111 1001221001 1011010111 1011111111 1111001001
1210111000 0103130121 2111100110 1011210221 0000011000 0000102130 1001201211 1123100100
0001111010 0011001002 0010000000 0020100001 011000

***Kochius loretoensis* 4554**

1121221220 0011121300 1111221432 ?011101111 1011221001 1011010111 1011111111 2111001001
1210111000 0103130121 2101100110 1011210221 0000011000 0000202130 1001201011 1123100100
0001101011 0011201002 1110000000 0020100001 011101

***Kochius magdalensis* 3155**

1120221220 1111121300 1111221432 1011101111 1001221001 1011010111 1011111111 1101001001
1210111000 0103130121 2101100110 1011210221 0001011111 1210102120 1001201311 1123100100
0001101010 0011201002 0011000000 0020100001 011000

***Kochius magdalensis* 4552**

1120221220 1111121300 1111221432 1011101111 1001221001 1011010111 1011111111 1101001001
1210111000 0103130121 2101100110 1011210221 0001011111 1210102120 1001201311 1123100100
0001101010 0011201002 0011000000 0020100001 011000

***Kochius magdalensis* 8796**

1120221220 1111121300 1111221432 1011101111 1001221001 1011010111 1011111111 1101001001
1210111000 0103130121 2101100110 1011210221 0001011111 1210102120 1001201311 1123100100
0001101010 0011201002 0011000000 0020100001 011000

***Kochius punctipalpi* 1679**

1120221220 1111121300 1111221432 1011101111 1001221001 1011010111 1011111111 1100001001
1210111000 0103130121 2101100110 1011210221 0011011112 2210102120 1001201211 1123100100
0001101010 0011201002 1011000000 0020100001 111000

***Kochius punctipalpi* 3157**

1120221220 1111121300 1111221432 1011101111 1001221001 1011010111 1011111111 1100001001
1210111000 0103130121 2101100110 1011210221 0011011112 2210102120 1001201211 1123100100
0001101010 0011201002 1011000000 0020100001 111000

***Kochius punctipalpi* 8843**

1120221220 1111121300 1111221432 1011101111 1001221001 1011010111 1011111111 1100001001
1210111000 0103130121 2101100110 1011210221 0011011112 2210102120 1001201211 1123100100
0001101010 0011201002 1011000000 0020100001 111000

***Kochius sonorae* 6301**

1121221220 1111121300 1111221432 1011101111 1001221001 1011010111 1011111111 1111001001
1210111000 0103130121 2111100110 1011210221 0001011000 0000102120 1001201121 1123100100
0001101010 0011201002 0011000000 0020100000 001001

***Kochius sonorae* 6304**

1121221220 1111121300 1111221432 1011101111 1001221001 1011010111 1011111111 1111001001
1210111000 0103130121 2111100110 1011210221 0001011000 0000102120 1001201121 1123100100
0001101010 0011201002 0011000000 0020100000 001001

***Kochius sonorae* 9974**

1121221220 1111121300 1111221432 1011101111 1001221001 1011010111 1011111111 1111001001
1210111000 0103130121 2111100110 1011210221 0001011000 0000102120 1001201121 1123100100
0001101010 0011201002 0011000000 0020100000 001001

***Kochius villosus* 3477**

1120221220 0011121300 1111221432 ?011101111 1011221001 1011010111 1011111111 1111001001
1210111000 0103130121 2101100110 1011210221 0000011000 0000102130 1001201211 1123100100
0001101010 0011201002 0110000000 0020100001 011100

***Kochius villosus* 4544**

1120221220 0011121300 1111221432 ?011101111 1011221001 1011010111 1011111111 1111001001
1210111000 0103130121 2101100110 1011210221 0000011000 0000102130 1001201211 1123100100
0001101010 0011201002 0110000000 0020100001 011100

***Konetontli acapulco* 9520**

1123012330 0004230002 1201221002 ??11101011 0??1110002 1011100111 1000000111 1100001101
1210111000 0103111110 1101100110 1011110131 0001011000 0000202130 1001201210 0112110100
0001111110 0111200001 0011000001 0010000000 000001

***Konetontli chamelaensis* 7675**

0000000000 0000000002 2100221001 ???0101011 0??1110001 1011010111 1011111111 1100011101
1210111000 0103111110 1101100110 1011110131 0001011000 0000102110 1101201222 0112110100
0001111110 1111200001 0011000000 1010000120 000001

***Konetontli nayarit* 4725**

2234012330 0000200002 2200221002 ??11101011 0??1110001 1011010111 1011111111 1100010111
1210111000 0103111110 1001100110 1011110131 0001011000 0000202120 1001201123 0112110100
0001111110 0111200001 0011000001 1110010120 000001

***Konetontli pattersoni* 3149**

2234010000 0000000002 2101221002 ???1101011 0??1210001 1011010111 1111111111 1100011101
1210111000 0103111110 1101100110 1011110131 0001011000 0100202120 1001201123 0112110100
0001111110 0111200001 0011000001 1010002120 000001

***Konetontli pattersoni* 3150**

2234010000 0000000002 2101221002 ???1101011 0??1210001 1011010111 1111111111 1100011101
1210111000 0103111110 1101100110 1011110131 0001011000 0100202120 1001201123 0112110100
0001111110 0111200001 0011000001 1010002120 000001

***Kuarapu purhepecha* 9517**

0000000000 0000000001 1101221002 ???0101011 0??1000001 1011010111 0011111111 1100001001
1210111000 0103120101 0101000110 1011200221 1101100001 1110102110 1101201311 0134110100
0001111010 0011311001 0011000001 1111113000 000101

***Maaykuyak vittatus* 3180**

0000000000 0000000002 2101221001 ???0101011 0??0000001 1011010111 1000111021 0000201001
1210111000 0103120100 0101100110 1011210221 0001011000 0000202130 1001201223 0122110110
0001101010 0110201002 0011000000 0010000000 001001

***Maaykuyak vittatus* 4442**

0000000000 0000000002 2101221001 ???0101011 0??0000001 1011010111 1000111021 0000201001
1210111000 0103120100 0101100110 1011210221 0001011000 0000202130 1001201223 0122110110
0001101010 0110201002 0011000000 0010000000 001001

***Maaykuyak waueri* 2973**

0000000000 0000000002 2200321001 ???0101011 0??1000001 1000010111 1100000021 0000201001
1210111000 0103110100 0201100110 1011210111 0000011000 0000102110 1101201123 0122110100
0001111110 0010200002 0001100100 0110000000 100001

***Maaykuyak waueri* 6544**

0000000000 0000000002 2200321001 ???0101011 0??1000001 1000010111 1100000021 0000201001
1210111000 0103110100 0201100110 1011210111 0000011000 0000102110 1101201123 0122110100
0001111110 0010200002 0001100100 0110000000 100001

***Mesomexovis atenango* 2023**

0200012330 0004232042 1101221002 ?011101011 0??0000001 1011010111 1011111001 0000001001
1210111000 0103120100 0101100110 1011210221 0001010111 1210102130 1001201211 0123110110
0000101010 0011201000 1011000000 0020100000 111000

***Mesomexovis atenango* 7058**

0200012330 0004232042 1101221002 ?011101011 0??0000001 1011010111 1011111001 0000001001
1210111000 0103120100 0101100110 1011210221 0001010111 1210102130 1001201211 0123110110
0000101010 0011201000 1011000000 0020100000 111000

***Mesomexovis atenango* 9982**
0200012330 0004232042 1101221002 ?011101011 0??0000001 1011010111 1011111001 0000001001
1210111000 0103120100 0101100110 1011210221 0001010111 1210102130 1001201211 0123110110
0000101010 0011201000 1011000000 0020100000 111000

***Mesomexovis oaxaca* 2031**
0200012330 0004232442 2101221002 ?111101011 0??0000002 0012010111 1000001221 2000001001
1210111000 0103120100 0201100110 1011210221 0001110111 1210202130 1001201221 0123110100
0000101121 0222211000 0010001000 0011100000 000001

***Mesomexovis oaxaca* 3718**
0200012330 0004232442 2101221002 ?111101011 0??0000002 0012010111 1000001221 2000001001
1210111000 0103120100 0201100110 1011210221 0001110111 1210202130 1001201221 0123110100
0000101121 0222211000 0010001000 0011100000 000001

***Mesomexovis oaxaca* 6602**
\0200012330 0004232442 2101221002 ?111101011 0??0000002 0012010111 1000001221 2000001001
1210111000 0103120100 0201100110 1011210221 0001110111 1210202130 1001201221 0123110100
0000101121 0222211000 0010001000 0011100000 000001

***Mesomexovis occidentalis* 3118**
2234312332 0004232442 2101221002 ?111101011 0??0000001 1011010111 1022111221 2000001001
1210111000 0103120100 0101100110 1011210221 0001110111 1210202130 1001201211 0123110100
0000101121 0222211000 0010001000 0010103000 000101

***Mesomexovis occidentalis* 6559**
2234312332 0004232442 2101221002 ?111101011 0??0000001 1011010111 1022111221 2000001001
1210111000 0103120100 0101100110 1011210221 0001110111 1210202130 1001201211 0123110100
0000101121 0222211000 0010001000 0010103000 000101

***Mesomexovis occidentalis* 7056**
2234312332 0004232442 2101221002 ?111101011 0??0000001 1011010111 1022111221 2000001001
1210111000 0103120100 0101100110 1011210221 0001110111 1210202130 1001201211 0123110100
0000101121 0222211000 0010001000 0010103000 000101

***Mesomexovis punctatus* 2080**
0200012330 0004232042 2101321001 ?011101011 0??0000012 0012010111 1000001021 0000001001
1210111000 0103120100 0001100110 1011210021 0001010001 1210102120 1001201211 0123110100
0000111010 0011201000 0011000000 0010100000 000001

***Mesomexovis punctatus* 2241**
0200012330 0004232042 2101321001 ?011101011 0??0000012 0012010111 1000001021 0000001001
1210111000 0103120100 0001100110 1011210021 0001010001 1210102120 1001201211 0123110100
0000111010 0011201000 0011000000 0010100000 000001

***Mesomexovis spadix* 2950**
0200012330 0004232042 2101221001 ?011101011 0??0000012 1012010111 1000001021 0000000001
1210111000 0103120100 0001100110 1011210221 0001010000 1100102120 1001201222 0123110100
0000101010 0011211002 0011000001 0010103020 000101

***Mesomexovis spadix* 5280**
0200012330 0004232042 2101221001 ?011101011 0??0000012 1012010111 1000001021 0000000001
1210111000 0103120100 0001100110 1011210221 0001010000 1100102120 1001201222 0123110100
0000101010 0011211002 0011000001 0010103020 000101

***Mesomexovis spadix* 6373**
0200012330 0004232042 2101221001 ?011101011 0??0000012 1012010111 1000001021 0000000001
1210111000 0103120100 0001100110 1011210221 0001010000 1100102120 1001201222 0123110100
0000101010 0011211002 0011000001 0010103020 000101

***Mesomexovis subcristatus* 2049**
0200012330 0004232042 2101321001 ?011100011 0??0000001 1012010111 1000021001 0000001001
1210111000 0103120100 0201100110 1011210021 0001110111 1210102120 1001201311 0123110100
0000111010 0011211000 0010000000 0010100000 000001

***Mesomexovis subcristatus* 2084**
0200012330 0004232042 2101321001 ?011100011 0??0000001 1012010111 1000021001 0000001001
1210111000 0103120100 0201100110 1011210021 0001110111 1210102120 1001201311 0123110100
0000111010 0011211000 0010000000 0010100000 000001

***Mesomexovis subcristatus* 2086**

0200012330 0004232042 2101321001 ?011100011 0??0000001 1012010111 1000021001 0000001001
1210111000 0103120100 0201100110 1011210021 0001110111 1210102120 1001201311 0123110100
0000111010 0011211000 0010000000 0010100000 000001

***Mesomexovis variegatus* 5185**
2204312330 0004232042 2101321001 ?011101011 0??0220002 1012010111 1000001221 2000000001
1210111000 0103120100 0201100110 1011210221 0001011000 1100202120 1001201222 0123110100
0000101010 0111211002 0111001001 1111113030 000201

***Mesomexovis variegatus* 6536**
2204312330 0004232042 2101321001 ?011101011 0??0220002 1012010111 1000001221 2000000001
1210111000 0103120100 0201100110 1011210221 0001011000 1100202120 1001201222 0123110100
0000101010 0111211002 0111001001 1111113030 000201

***Mesomexovis variegatus* 7068**
2204312330 0004232042 2101321001 ?011101011 0??0220002 1012010111 1000001221 2000000001
1210111000 0103120100 0201100110 1011210221 0001011000 1100202120 1001201222 0123110100
0000101010 0111211002 0111001001 1111113030 000201

***Paravaejovis coloradensis* 1688**
1234312332 0004232042 1101221121 ??11101011 0211000001 1011010111 1021111001 0000001001
1210111000 0103120100 0101100110 1011210221 0001011000 0000202120 1001211310 0123110101
0001111010 0011211002 1011000000 0020100000 111000

***Paravaejovis coloradensis* 3226**
1234312332 0004232042 1101221121 ??11101011 0211000001 1011010111 1021111001 0000001001
1210111000 0103120100 0101100110 1011210221 0001011000 00002021*y*0 1*x*01211310 0123110101
0001111010 0011211002 1011000000 0020100000 111000

***Paravaejovis coloradensis* 5029**
1234312332 0004232042 1101221121 ??11101011 0211000001 1011010111 1021111001 0000001001
1210111000 0103120100 0101100110 1011210221 0001011000 00002021*y*0 1*x*01211310 0123110101
0001111010 0011211002 1011000000 0020100000 111000

***Paravaejovis confusus* 4450**
1234312332 0004232042 1101221221 ??11101011 0211000001 1011010111 1021111001 0000001001
1210111000 0103120100 0101100110 1011210221 0001011000 0000202120 1001211310 0123110101
0001111010 0011211002 1011000000 0020100000 111000

***Paravaejovis confusus* 7107**
1234312332 0004232042 1101221221 ??11101011 0211000001 1011010111 1021111001 0000001001
1210111000 0103120100 0101100110 1011210221 0001011000 0000202120 1001211310 0123110101
0001111010 0011211002 1011000000 0020100000 111000

***Paravaejovis confusus* 7272**
1234312332 0004232042 1101221221 ??11101011 0211000001 1011010111 1021111001 0000001001
1210111000 0103120100 0101100110 1011210221 0001011000 0000202120 1001211310 0123110101
0001111010 0011211002 1011000000 0020100000 111000

***Paravaejovis confusus* 8517**
1234312332 0004232042 1101221221 ??11101011 0211000001 1011010111 1021111001 0000001001
1210111000 0103120100 0101100110 1011210221 0001011000 0000202120 1001211310 0123110101
0001111010 0011211002 1011000000 0020100000 111000

***Paravaejovis diazi* 3165**
1204012330 0004232042 1101321001 ??11101010 0??1120001 1012010111 1000221021 0000001001
1210111000 0103120100 0101100210 1011210221 0011011101 1210202120 1001201311 0123010101
1001111010 0011201001 1011000000 0020200000 111000

***Paravaejovis diazi* 3169**
1204012330 0004232042 1101321001 ??11101010 0??1120001 1012010111 1000221021 0000001001
1210111000 0103120100 0101100210 1011210221 0011011101 1210202120 1001201311 0123010101
1001111010 0011201001 1011000000 0020200000 111000

***Paravaejovis diazi* 3482**
1204012330 0004232042 1101321001 ??11101010 0??1120001 1012010111 1000221021 0000001001
1210111000 0103120100 0101100210 1011210221 0011011101 1210202120 1001201311 0123010101
1001111010 0011201001 1011000000 0020200000 111000

***Paravaejovis diazi* 4436**
1204012330 0004232042 1101321001 ??11101010 0??1120001 1012010111 1000221021 0000001001
1210111000 0103120100 0101100210 1011210221 0011011101 1210202120 1001201311 0123010101
1001111010 0011201001 1011000000 0020200000 111000

***Paravaejovis diazi* 8839**

1204012330 0004232042 1101321001 ??11101010 0??1120001 1012010111 1000221021 0000001001
1210111000 0103120100 0101100210 1011210221 0011011101 1210202120 1001201311 0123010101
1001111010 0011201001 1011000000 0020200000 111000

***Paravaejovis eusthenura* 1689**
0000000000 0000000002 1101321001 ???0101010 0??1320001 1012010111 1022221021 0000001001
1210111000 0103120100 0201100210 1011210221 0011011000 0110202120 1001201311 0123110101
1001111010 0011201001 1011000000 0020000000 111000

***Paravaejovis eusthenura* 3168**
0000000000 0000000002 1101321001 ???0101010 0??1320001 1012010111 1022221021 0000001001
1210111000 0103120100 0201100210 1011210221 0011011000 0110202120 1001201311 0123110101
1001111010 0011201001 1011000000 0020000000 111000

***Paravaejovis eusthenura* 4448**
0000000000 0000000002 1101321001 ???0101010 0??1320001 1012010111 1022221021 0000001001
1210111000 0103120100 0201100210 1011210221 0011011000 0110202120 1001201311 0123110101
1001111010 0011201001 1011000000 0020000000 111000

***Paravaejovis gravicaudus* 3163**
2234312332 0004232042 2101221001 ??11101011 0??1310002 0012010111 1000001021 0000001001
1210111000 0103120100 0201100110 1011210021 0001011000 1000202120 1001211311 0123110101
0000001010 0011201001 1011000000 0010002001 000000

***Paravaejovis gravicaudus* 8783**
2234312332 0004232042 2101221001 ??11101011 0??1310002 0012010111 1000001021 0000001001
1210111000 0103120100 0201100110 1011210021 0001011000 1000202120 1001211311 0123110101
0000001010 0011201001 1011000000 0010002001 000000

***Paravaejovis gravicaudus* 8793**
2234312332 0004232042 2101221001 ??11101011 0??1310002 0012010111 1000001021 0000001001
1210111000 0103120100 0201100110 1011210021 0001011000 1000202120 1001211311 0123110101
0000001010 0011201001 1011000000 0010002001 000000

***Paravaejovis hoffmanni* 3166**
0000000000 0000000002 1101321001 ???0101010 0??1100001 1012010111 1000221001 0000001001
1210111000 0103120100 0101100210 1011210221 0011011000 01102021*y*0 1*x*01201311 0123010101
1001111010 0011201001 1011000000 0020000000 111000

***Paravaejovis hoffmanni* 5096**
0000000000 0000000002 1101321001 ???0101010 0??1100001 1012010111 1000221001 0000001001
1210111000 0103120100 0101100210 1011210221 0011011000 01102021*y*0 1*x* 01201311 0123010101
1001111010 0011201001 1011000000 0020000000 111000

***Paravaejovis hoffmanni* 8797**
2004000000 0000000002 1101221001 ???0101010 0??1320001 1011010111 1000221021 0000001001
1210111000 0103120100 0101100210 1011210221 0001011100 0110202130 1001201311 0123110101
?011111010 0011201001 1011000000 0000000001 101000

***Paravaejovis hoffmanni* 8812**
0000000000 0000000002 1101321001 ???0101010 0??1100001 1012010111 1000221001 0000001001
1210111000 0103120100 0101100210 1011210221 0011011000 01102021*y*0 1*x*01201311 0123010101
1001111010 0011201001 1011000000 0020000000 111000

***Paravaejovis pumilis* 3137**
0000000000 0000000002 1200221001 ???0101011 0??1210001 1001010111 1022221020 0000001001
1210111000 0103110100 0101200211 1112100131 0011011000 0210102120 1011201121 0100?11100
1111111010 0011000001 1011000000 0020200000 111000

***Paravaejovis pumilis* 3476**
0000000000 0000000002 1200221001 ???0101011 0??1210001 1001010111 1022221020 0000001001
1210111000 0103110100 0101200211 1112100131 0011011000 0210102120 1011201121 0100?11100
1111111010 0011000001 1011000000 0020200000 111000

***Paravaejovis pumilis* 4740**
0000000000 0000000002 1200221001 ???0101011 0??1210001 1001010111 1022221020 0000001001
1210111000 0103110100 0101200211 1112100131 0011011000 0210102120 1011201121 0100?11100
1111111010 0011000001 1011000000 0020200000 111000

***Paravaejovis puritanus* 3479**
2234012332 0004232042 1101221001 ??11101011 0??1320001 1011010111 1011221221 0000011001
1210111000 0103120100 0101100110 1011210221 0001111000 1110102120 1001211311 0123110101
1010101010 0011211001 1011000000 1111002001 001001

***Paravaejovis puritanus* 5093**

2234012332 0004232042 1101221001 ??11101011 0??1320001 1011010111 1011221221 0000011001
1210111000 0103120100 0101100110 1011210221 0001111000 1110102120 1001211311 0123110101
1010101010 0011211001 1011000000 1111002001 001001

***Paravaejovis puritanus* 8900**
2234012332 0004232042 1101221001 ??11101011 0??1320001 1011010111 1011221221 0000011001
1210111000 0103120100 0101100110 1011210221 0001111000 1110102120 1001211311 0123110101
1010101010 0011211001 1011000000 1111002001 001001

***Paravaejovis schwenkmeyeri* 4413**
2034302332 0004232042 1101221001 ??11101011 0??1310001 1011010111 1002221021 0000001001
1210111000 0103120100 0101100110 1011210221 0001011001 1210102120 1001211311 0123110101
1010101010 0011201001 1011000000 0020000000 111000

***Paravaejovis schwenkmeyeri* 4430**
2034302332 0004232042 1101221001 ??11101011 0??1310001 1011010111 1002221021 0000001001
1210111000 0103120100 0101100110 1011210221 0001011001 1210102120 1001211311 0123110101
1010101010 0011201001 1011000000 0020000000 111000

***Paravaejovis schwenkmeyeri* 4451**
2034302332 0004232042 1101221001 ??11101011 0??1310001 1011010111 1002221021 0000001001
1210111000 0103120100 0101100110 1011210221 0001011001 1210102120 1001211311 0123110101
1010101010 0011201001 1011000000 0020000000 111000

***Paravaejovis schwenkmeyeri* 8821**
2034302332 0004232042 1101221001 ??11101011 0??1310001 1011010111 1002221021 0000001001
1210111000 0103120100 0101100110 1011210221 0001011001 1210102120 1001211311 0123110101
1010101010 0011201001 1011000000 0020000000 111000

***Paravaejovis spinigerus* 5282**
2234312332 0004232042 2101221001 ??11101011 0??1310002 0012010111 1000001021 0000001001
1210111000 0103120100 0201100110 1011210221 0001011000 1000202130 1001211211 0123110101
0000001010 0011201001 1011000000 0010000001 100000

***Paravaejovis spinigerus* 6317**
2234312332 0004232042 2101221001 ??11101011 0??1310002 0012010111 1000001021 0000001001
1210111000 0103120100 0201100110 1011210221 0001011000 1000202130 1001211211 0123110101
0000001010 0011201001 1011000000 0010000001 100000

***Paravaejovis spinigerus* 7015**
2234312332 0004232042 2101221001 ??11101011 0??1310002 0012010111 1000001021 0000001001
1210111000 0103120100 0201100110 1011210221 0001011000 1000202130 1001211211 0123110101
0000001010 0011201001 1011000000 0010000001 100000

***Paravaejovis spinigerus* 7176**
2234312332 0004232042 2101221001 ??11101011 0??1310002 0012010111 1000001021 0000001001
1210111000 0103120100 0201100110 1011210221 0001011000 1000202130 1001211211 0123110101
0000001010 0011201001 1011000000 0010000001 100000

***Paravaejovis spinigerus* 9970**
2234312332 0004232042 2101221001 ??11101011 0??1310002 0012010111 1000001021 0000001001
1210111000 0103120100 0201100110 1011210221 0001011000 1000202130 1001211211 0123110101
0000001010 0011201001 1011000000 0010000001 100000

***Paravaejovis waeringi* 4431**
1234312332 0004232042 1101221121 ??11101011 0211000001 1011010111 1021111001 0000001001
1210111000 0103120100 0101100110 1011210221 0001011000 0000202120 1001211310 0123110101
0001111010 0011211002 1011000000 0020100000 011000

***Paravaejovis waeringi* 4433**
1234312332 0004232042 1101221121 ??11101011 0211000001 1011010111 1021111001 0000001001
1210111000 0103120100 0101100110 1011210221 0001011000 0000202120 1001211310 0123110101
0001111010 0011211002 1011000000 0020100000 011000

***Paravaejovis waeringi* 7119**
1234312332 0004232042 1101221121 ??11101011 0211000001 1011010111 1021111001 0000001001
1210111000 0103120100 0101100110 1011210221 0001011000 0000202120 1001211310 0123110101
0001111010 0011211002 1011000000 0020100000 011000

***Syntropis macrura* 3146**
2234312330 0004231032 1122221221 ??11100000 0210000001 1011010201 0000001000 0000001001
1210111110 0103120102 0101000220 1011200001 1001110110 1210203030 1001212311 0123110110
0000000010 0001211000 0010000000 0020100001 111000

***Syntropis macrura* 8709**

2234312330 0004231032 1122221221 ??11100000 0210000001 1011010201 0000001000 0000001001
1210111110 0103120102 0101000220 1011200001 1001110110 1210203030 1001212311 0123110110
0000000010 0001211000 0010000000 0020100001 111000

***Syntropis williamsi* 8706**
1133311330 0004231032 1122221111 ??11100000 0210000001 1011010201 0000001000 0000001001
1210111110 0103120102 0101000220 1011200001 1001010110 1210203030 1001212311 0123110110
0000000010 0011211000 0010000000 0020100001 111000

***Syntropis williamsi* 8707**
1133311330 0004231032 1122221111 ??11100000 0210000001 1011010201 0000001000 0000001001
1210111110 0103120102 0101000220 1011200001 1001010110 1210203030 1001212311 0123110110
0000000010 0011211000 0010000000 0020100001 111000

***Syntropis williamsi* 8826**
1133311330 0004231032 1122221111 ??11100000 0210000001 1011010201 0000001000 0000001001
1210111110 0103120102 0101000220 1011200001 1001010110 1210203030 1001212311 0123110110
0000000010 0011211000 0010000000 0020100001 111000

***Thorellius cisnerosi* 2018**
2234332330 0004232401 1101321002 ?011101010 0??0000110 0100101011 1000000001 0000000001
1210111000 0103100100 0001100110 1011010021 0001010001 1110103020 1001201311 0123110100
0000001010 0111212000 0011000000 0020100001 111000

***Thorellius cisnerosi* 5269**
2234332330 0004232401 1101321002 ?011101010 0??0000110 0100101011 1000000001 0000000001
1210111000 0103100100 0001100110 1011010021 0001010001 1110103020 1001201311 0123110100
0000001010 0111212000 0011000000 0020100001 111000

***Thorellius cristimanus* 5323**
2124221221 2213121402 1101221432 1011101011 0011320001 1011010111 1022211001 0000011001
1210111000 0103120100 0101100110 1011210221 0011010111 1110102120 1001201311 0123110100
0000001110 0111212001 0110011000 2210100000 000200

Thorellius cristimanus 5325
2124221221 2213121402 1101221432 1011101011 0011320001 1011010111 1022211001 0000011001
1210111000 0103120100 0101100110 1011210221 0011010111 1110102120 1001201311 0123110100
0000001110 0111212001 0110011000 2210100000 000200

***Thorellius cristimanus* 5328**
2124221221 2213121402 1101221432 1011101011 0011320001 1011010111 1022211001 0000011001
1210111000 0103120100 0101100110 1011210221 0011010111 1110102120 1001201311 0123110100
0000001110 0111212001 0110011000 2210100000 000200

***Thorellius cristimanus* 6551**
2124221221 2213121402 1101221432 1011101011 0011320001 1011010111 1022211001 0000011001
1210111000 0103120100 0101100110 1011210221 0011010111 1110102120 1001201311 0123110100
0000001110 0111212001 0110011000 2210100000 000200

***Thorellius intrepidus* 5309**
2224321221 2011121422 1101221002 1011101011 0??1320001 1011010111 1022211001 0000011001
1210111000 0103120100 0101100110 1011210221 0011010112 2210103020 1001201311 0023110100
0000001110 1111212001 0110011000 2210103000 001200

***Thorellius intrepidus* 6377**
2224321221 2011121422 1101221002 1011101011 0??1320001 1011010111 1022211001 0000011001
1210111000 0103120100 0101100110 1011210221 0011010112 2210103020 1001201311 0023110100
0000001110 1111212001 0110011000 2210103000 001200

***Thorellius intrepidus* 6379**
2224321221 2011121422 1101221002 1011101011 0??1320001 1011010111 1022211001 0000011001
1210111000 0103120100 0101100110 1011210221 0011010112 2210103020 1001201311 0023110100
0000001110 1111212001 0110011000 2210103000 001200

***Vizcaino viscainensis* 3174**
1133211330 0004232042 1201221001 ??11101011 0??1000001 1011010111 0022221111 1100001001
1210111000 0103120100 0101100110 1011200221 0001010000 1100102110 0101212311 0134110100
1111111010 0011211111 1011000000 0020100001 111000

***Vizcaino viscainensis* 8809**
1133211330 0004232042 1201221001 ??11101011 0??1000001 1011010111 0022221111 1100001001
1210111000 0103120100 0101100110 1011200221 0001010000 1100102110 0101212311 0134110100
1111111010 0011211111 1011000000 0020100001 111000

Appendix 5

List of 251 morphological characters and character states scored for phylogenetic analyses of 66 vaejovid species, including 11 genera. Character states are scored 0–6, unknown (?) and innaplicable (-).

Continuous characters

Continuous characters have rarely been used in phylogenetic analyses of scorpions (Prendini et al., 2003, Goloboff et al., 2006). Several authors have questioned the utility of this type of characters in phylogenetic analyses (Pimentel and Riggins, 1987; Cranston and Humphries, 1988; Crowe, 1994; Felsenstein, 1988; Hendrixson and Bond, 2009). Nevertheless, the real challenge presented by this type of evidence is finding an efficient way of character coding (Farris, 1990; Prendini, 2000). Under a cladistic approach, the application of adequate optimization methods (Farris, 1970; Goloboff, 1998) has made possible the use of such characters in quantitative analyses (Goloboff et al., 2006; Goloboff et al., 2008). Counts of macro setae and pectinal teeth are used in this context. The macrosetal counts consider here, are part of a more complex structure, the carinae, which have been thoroughly examined by Prendini et al., (in prep.). The terminology and hypotheses of serial homology proposed by Prendini et al. are applied here for the first time. Although a topological homology map per single macroseta is achievable under the "placeholder" approach proposed by Volschenk and Prendini (2008) and Prendini et al. (2010); this surpasses the scope of this work thus a relative expression of setation is represented here by counting the number of units (setae) positioned along of each pedipalp and selected metasomal carinae. Santibáñez-López and Sissom (2010) pointed out some issues in coding metasomal carina setae. The main concern is whether offset setae correspond to one or the adjacent carinae, particularly in ventrosubmedian pairs of carinae. To cope with this issue, the setae of uncertain position were added to the count of the closest carina and the variation in number was taken as a range. These offset setae were taken when they were close to one side of the carinae but when there were distant enough the carinae were coded as accessory.

0. Pectinal teeth, number (male): tooth count.
1. Pectinal teeth, number (female): tooth count.
2. Number of setae along dorsal lateral carinae of metasomal segment I.
3. Number of setae along dorsal lateral carinae of metasomal segment II.
4. Number of setae along dorsal lateral carinae of metasomal segment III.
5. Number of setae along dorsal lateral carinae of metasomal segment IV.
6. Number of setae along dorsal lateral carinae of metasomal segment V.
7. Number of setae along ventral lateral carinae of metasomal segment I.
8. Number of setae along ventral lateral carinae of metasomal segment II.
9. Number of setae along ventral lateral carinae of metasomal segment III.
10. Number of setae along ventral lateral carinae of metasomal segment IV.
11. Number of setae along ventral lateral carinae of metasomal segment V.
12. Number of setae along ventral submedian carinae of metasomal segment I.
13. Number of setae along ventral submedian carinae of metasomal segment II.

14. Number of setae along ventral submedian carinae of metasomal segment III.
15. Number of setae along ventral submedian carinae of metasomal segment IV.
16. Number of accessory setae in ventral intercarinal space of metasomal segment I.
17. Number of accessory setae in ventral intercarinal space of metasomal segment II.
18. Number of accessory setae in ventral intercarinal space of metasomal segment III.
19. Number of accessory setae in ventral intercarinal space of metasomal segment IV.
20. Metasomal segment I width/depth ratio.
21. Metasomal segment V width/depth ratio.
22. Number of setae along chela, dorsal prolateral (dpl) and dorsal prosubmedian (dps).
23. Number of setae along chela, dorsal median (dm) and dorsal retrosubmedian (drs).
24. Number of setae along patella, ventral prolateral (vpl) carina.
25. Number of setae along patella, ventral median (vm) carina.
26. Number of setae along femur, prolateral ventral (plv) carina.
27. Number of setae along chela, dorsal retrosubmedian accessory (drsa) carina.
28. Number of setae along patella, dorsal retrolateral (drl) carina.
29. Number of setae along patella, dorsal prolateral (dpl) carina.
30. Number of setae along patella, ventral retrolateral (vrl) carina.
31. Number of setae along femur, dorsal retrolateral (drl) carina.
32. Number of setae along femur, dorsal prolateral (dpl) carina.
33. Number of setae along femur, ventral prolateral (vpl) carina.
34. Number of setae along chela, dorsal retrolateral (drl) and retrolateral dorsal (rld) carinae.
35. Number of setae along chela, retrolateral median (rlm) and retrolateral ventrosubmedian (rlvs) carinae.
36. Number of setae along chela, ventral median (vm) and ventral prosubmedian (vps) carinae.
37. Number of setae along chela, prolateral median (plm) and prolateral ventrosubmedian (plvs) carinae.
38. Number of setae along chela, ventral prolateral (vpl) and prolateral ventral (plv) carinae.
39. Number of setae along chela, ventral retrosubmedian (vrs) and ventral retrolateral (vrl) carinae.
40. Number of setae along patella, prolateral median (plm) ('dorsal patellar spur carina') carina.
41. Number of setae along patella, prolateral ventral (plv) ('ventral patellar spur carina') carina.
42. Number of setae along femur, prolateral ventrosubmedian (plvs) carina.
43. Number of setae along femur, retrolateral dorsosubmedian (rlds) carina.
44. Number of setae along femur, ventral median (vm) carina.

Pedipalp carinae

It was previously established that scorpions have between eight and 10 carinae on pedipalp chela (Vachon, 1952; Stahnke, 1970; Stockwell, 1989; Soleglad and Sissom, 2001; Prendini, 2000), according to the group of scorpions. However the nomenclature and homologies have been used inconsistently over the years. Moreover, different nomenclature has been used with respect to the carinae on patella and femur (for example, Soleglad and Sissom, 2001; Soleglad and Fet, 2003b). Prolateral and retrolateral carinae on these last segments contain valuable information for internal relations among vaejovids, but have never been explored in a phylogenetic context. This character system has been thoroughly reanalyzed by Prendini *et al*. (in prep.). Major findings of that work include an overall assessment of the carinae on each segment of pedipalps and

hypothesized homologies among each carina per segment. A new terminology that reflects the topology, according to several landmarks for each carina was produced. Of the complete complement of observed carinae across the order Scorpiones, Syntropinae has 12 informative carinae on the chelae; the patella has 6 and the femur has two (figures 19-21). Each carina was studied and coded as a complex structure containing different levels of information. To codify, the system was broken up in the following aspects: infuscation, ornamentation and setation. Each aspect was evaluated separately. The infuscation is discussed in the character system color and pigmentation. The ornamentation was divided in three aspects: its presence or absence, and if present, its longitudinal and vertical development. Finally, the texture of the carinae was assessed by contrasting granular and smooth conditions. A total of 404 multistate and binary characters were originally constructed spanning the complete family Vaejovidae. From that set, the Syntropinae was extracted and obvious redundancies and co-variation in some carinae were discarded or fused, totaling 30 characters (characters 45–74).

The ornamentation or macrosculpture of carinae was coded according to the following criteria. Granular: there is difference in ornamentation (height and/or texture) from adjacent intercarinal surfaces and the carinae has costate to granular surfaces, i.e. fused granules, e.g. crenulate, serrate or dentate. Smooth: there is difference in ornamentation (height and/or texture) from adjacent intercarinal surfaces and has a smooth costate or costate surface.

The length of carinae was coded according to the following criteria. Vestigial with marginal tubercle: there is an obsolete carina but with a prominent granule at proximal or distal margin of segment. Vestigial: there is a very short ridge proximally or distally on the segment, but there is not a distal well-developed tubercle. Partial: there is a truncated ridge or becomes progressively weaker distally or proximally, i.e. not extending full length of segment. Complete: the ridge extends full length of segment.

45. Chela, dorsal median (dm) [=dorsal secondary (D3)] carina, ornamentation and length: no difference in ornamentation (0); granular and complete (1); smooth and complete (2).
46. Chela, dorsal prolateral (dpl) [=dorsal marginal (D4)] carina, ornamentation and length: no difference in ornamentation (0); granular and complete (1); smooth and complete (2).
47. Chela, dorsal retrolateral (drl) [=digital (D1)] carina, ornamentation and length: no difference in ornamentation (0); smooth and partial (1); granular and complete (2); smooth and complete (3).
48. Chela, dorsal retrosubmedian (drs) [=dem] carina, ornamentation and length: no difference in ornamentation (0); granular and vestigial, (1); granular and partial (2); granular and complete (3); smooth and complete.
49. Chela, dorsal retrosubmedian accessory (drsa) [=subdigital (D2)] carina, ornamentation and length: no difference in ornamentation (0); marginal tubercle (1); vestigial and granular (2); vestigial and smooth (3).
50. Chela, prolateral dorsal (pld) [=id] carina, ornamentation and length: no difference in ornamentation (0); smooth and vestigial (1); granular and partial (2); smooth and partial (3); granular and complete (4).
51. Chela, prolateral median (plm) [=dorsal internal (D5)] carina, ornamentation and length: no difference in ornamentation (0); granular and complete (1); smooth and complete (2).
52. Chela, prolateral ventral (plv) [internomedian (V3/I)] carina, ornamentation and length: no difference in ornamentation (0); granular and vestigial (1); granular and complete (2); smooth and complete (3).

53. Chela, prolateral ventrosubmedian (plvs) [=iva] carina, ornamentation and length: no difference in ornamentation (0); granular and vestigial (1); granular and complete (2); smooth and complete (3).
54. Chela, retrolateral dorsal (rld) carina, ornamentation and length: no difference in ornamentation (0); granular and partial (1); granular and complete (2) smooth and complete (3).
55. Chela, retrolateral subventral (rls) [=secondary accessory] and retrolateral subventral accessory (rlsa) carinae, ornamentation and length: no difference in ornamentation (0); granular and vestigial (1); smooth and vestigial (2).
56. Chela, retrolateral subventral accessory (rlsa) carina, ornamentation and length: no difference in ornamentation (0); granular and vestigial (1); smooth and vestigial (2).
57. Chela, retrolateral ventral (rlv) [=ev =EGS external subventral proximal] carina, ornamentation and length: no difference in ornamentation (0); granular and vestigial (1); granular and partial (2).
58. Chela, ventral median (vm) [=V2] carina, ornamentation and length: no difference in ornamentation (0); granular and vestigial (1); smooth and vestigial (2); granular and complete (3); granular and complete (4).
59. Chela, ventral prolateral (vpl) carina, ornamentation and length: no difference in ornamentation (0); granular and complete (1); smooth and complete (2).
60. Chela, ventral prosubmedian (vps) [=ventral internal (V2)] carina, ornamentation and length: no difference in ornamentation (0); smooth and vestigial (1); granular and complete (2); smooth and complete (3).
61. Chela, ventral retrolateral (vrl) [=ve (V1)] carina, ornamentation and length: no difference in ornamentation (0); granular and complete (1); smooth and complete (2).
62. Chela, retrolateral median (rlm) [=external secondary (E)] and retrolateral ventrosubmedian (rlvs) carinae, ornamentation and length: no difference in ornamentation (0); smooth and vestigial (1); smooth and partial (2); granular and complete (3); smooth and complete (4).
63. Chela, ventral retrosubmedian (vrs) carina, ornamentation and length: no difference in ornamentation (0); granular and vestigial (1); granular and partial (2); granular and complete (3) smooth and complete (4).
64. Femur, prolateral ventral (plv) [=iv] carina, ornamentation and length: no difference in ornamentation (0); granular and vestigial (1); granular and partial (2).
65. Femur, retrolateral dorsosubmedian (rlds) carina, ornamentation and length: granular and partial (0); granular and complete (1); smooth and complete (2).
66. Femur, retrolateral ventral (rlv) carina, ornamentation and length: no difference in ornamentation (0); granular and vestigial (1); smooth and vestigial (2).
67. Femur, ventral retrolateral (vrl) carina, ornamentation and length: no difference in ornamentation (0); granular and vestigial (1); granular and partial (2).
68. Femur, ventral retrosubmedian (vrs) carina, ornamentation and length: no difference in ornamentation (0); granular and vestigial (1); granular and partial (2).
69. Patella, dorsal retrolateral (drl) carina, ornamentation and length: no difference in ornamentation (0); smooth and vestigial (1); granular and complete (2); smooth and complete (3).
70. Patella, prolateral median (plm) [= (dorsal) internomedian carina ('dorsal patellar spur carina')] carina, ornamentation and length: vestigial (0); partial (1); complete (2).
71. Patella, prolateral subdorsal (pls) carina, ornamentation and length: no difference in ornamentation (0); marginal tubercle (1).

72. Patella, retrolateral median (rlm) carina, ornamentation and length: no difference in ornamentation (0); vestigial and granular (1); vestigial and smooth (2); granular and partial (3); granular and complete (4).
73. Patella, retrolateral dorsosubmedian (rlds) carina, ornamentation and length: no difference in ornamentation (0); granular and vestigial (1); smooth and vestigial (2); granular and partial (3); granular and complete (4).
74. Patella, ventral median (vm) carina, ornamentation and length: marginal tubercle (0); vestigial (1); partial (2).

Pedipalp ornamentation

Informative characters from the pedipalp segments ornamentation were coded. Among them, there is the shape of the chela in respect to dorso-ventral and pro-retrolateral surfaces. Prolateral surfaces ornamentation and comparison of carinae in respect to the degree of development. A total 17 characters for this character system were studied.

75. Chela, retrolateral subventral (rls) [=secondary accessory] carina, ornamentation, connection to ventral retrolateral (vrl) [=ve (V1)] carina: vrl and/or rls absent (-); vrl and rls carinae connected, continuous to external movable finger condyle (0); vrl disconnected from rls carina, discontinuous (1).
76. Chela, retrolateral median (rlm) [=external secondary (E)] carina, development relative to dorsal retrolateral (drl) [=digital (D1)] (if present) and ventral retrolateral (vrl) [=ve (V1)] carinae: as strongly developed (0); less strongly developed (1).
77. Chela, ventral prolateral (vpl)+prolateral ventral (plv) [=ventral internal (V3/I)] and prolateral ventrosubmedian (plvs)+prolateral median (plm) [=dorsal internal (D5)] carinae, relative development: vpl+plv [=V3] stronger than plvs+plm [=D5] (0); vpl+plv [=V3] and plvs+plm [=D5] carinae similarly developed (1); plvs+plm [=D5] stronger than vpl+plv [=V3] (2).
78. Chela, dorsal intercarinal surface, depression between dpl+dps [=D4] carina and dm+drs [=D3] carina at proximal margin [best observed in internal view]: absent or very shallow (0); deep (1).
79. Chela palm orientation: flat, angle D1:D3:D4 = 180° [flat/hexagonal or vaulted] and angle V1:V2:V3 = 180° [flat/hexagonal] (0); obtuse, angle D1:D3:D4 > 90° < 180° and angle V1:V2:V3 > 90° < 180° [rounded] (1).
80. Chela, palm orientation: planes D1|D4 and V1|V3 nonparallel, distance between D1|V1 < D4|V3 (0); planes D1|D4 and V1|V3 parallel, distance between D1|V1 = D4|V3 (1).
81. Patella, dorsal intercarinal surfaces: 0 = smooth (glabrous); 1 = uniformly finely granular (matte).
82. Patella, dorsal prolateral (dpl) and dorsal retrolateral (drl) carinae, relative orientation [patella, dorsal surface shape]: drl carina in approximately same plane as dpl carina, angle formed by dpl-drl-rlds carinae ca. 90°, dorsal surface flat [level with or slighly lower than drl and dpl carinae] (0); drl carina in approximately same plane as dpl carina, angle formed by dpl-drl-rlds carinae ca. 90°, dorsal surface concave [inclined to medial aspect of segment below drl and dpl carinae] (1).

83. Patella, prolateral ventral (plv) [= (ventral) internomedian carina ('ventral patellar spur carina') =iv] carina, landmark seta at distal margin, position relative to trichobothrium *i*: absent (-); approximately in line with trichobothrium (0); distal to trichobothrium (1).
84. Patella, prolateral intercarinal surfaces: smooth (glabrous) (0); uniformly finely granular (matte) (1); coarse granules on either smooth or finely granular surface (shagreened) (2).
85. Patella, retrolateral intercarinal surfaces: smooth (glabrous) (0); uniformly finely granular (matte) (1); coarse granules on either smooth or finely granular surface (shagreened) (2).
86. Patella, retrolateral dorsosubmedian (rlds) [= (dorsal) externomedian] and retrolateral median (rlm) [= (ventral) externomedian] carinae, relative development: rlm (ventral) more strongly developed than rlds (dorsal) (0); rlds (dorsal) more strongly developed than (rlm) (ventral) (1); rlm (ventral) and rlds (dorsal) similarly developed (2).
87. Patella, retrolateral dorsosubmedian (rlds) [= (dorsal) externomedian] and retrolateral median (rlm) [= (ventral) externomedian] carinae, development relative to ventral retrolateral (vrl) carina: as strongly developed (0); less strongly developed (1).
88. Patella, ventral intercarinal surfaces: smooth (glabrous) (0); uniformly finely granular (matte) (1); coarse granules on either smooth or finely granular surface (shagreened) (2).
89. Femur, dorsal surface: smooth (glabrous) (0); uniformly finely granular (matte) (1); coarse granules on either smooth or finely granular surface (2); scattered fine granulation (3).
90. Femur, ventral surface: smooth (glabrous) (0); uniformly finely granular (matte) (1); coarse granules on either smooth or finely granular surface (shagreened) (2).
91. Chela, ventral intercarinal spaces (ventral external to ventral internal carina): smooth (glabrous) (0); uniformly finely granular (matte) (1); coarse granules on either smooth or finely granular surface (shagreened) (2).

Metasomal carination

Metasomal carination is another common system in phylogenetic analyses. Stahnke (1970) conducted the first attempt to synthesize the nomenclature of scorpions used for the last two centuries. But Francke's (1977b) nomenclature was adopted shortly and has been used consistently by North American scorpionologist. Thus far, a maximum of 10 paired carinae for metasomal segment I–IV and seven carinae for metasomal segment V have been recognized across the order Scorpiones. Work in progress (Prendini et al., in prep.) has demonstrated that there are more units to consider across each metasomal segment, even in the more modified segment V. A good example of additional carinae is the lateral submedian carina expressed in *Troglotayosicus humiculum* (Ochoa et al., 2010). Although most of the carinae identified by Prendini et al. (in prep.) are vestigial, there are clearly discernible in some Syntropinae species (figure 22). Of the complete set, only eight were informative for this analysis.

92. Metasomal segment I–III, lateral median anterior/posterior (lm a/p) carina [= dorsolateral carina], ornamentation: granular (0); smooth (1).
93. Metasomal segment IV, lateral median anterior/posterior (lm a/p) carina [= dorsolateral carina], ornamentation: granular (0); smooth (1).
94. Metasomal segment V, lateral median anterior/posterior (lm a/p) carina [= median lateral carina], ornamentation: no difference in ornamentation (0); granular (1); smooth (2).

95. Metasomal segment V, lateral median anterior/posterior (lm a/p) carina [= median lateral carina], ornamentation length: no difference in ornamentation (0); partial (1).
96. Metasomal segment I–IV, dorsal lateral anterior/posterior (dl a/p) carina [= dorsosubmedian/dorsal carina], ornamentation: granular (0); smooth (1).
97. Metasomal segment V, dorsal lateral anterior/posterior (dl a/p) carina [= dorsolateral carina], ornamentation: no difference in ornamentation (0); smooth (1).
98. Metasomal segment I–IV, ventral lateral (vl) carina, ornamentation: no difference in ornamentation (0); granular (1); smooth (2).
99. Metasomal segment V, ventral lateral (vl) carina, ornamentation: granular (0); smooth (1).
100. Metasomal segment V, ventral lateral (vl) carina, ornamentation: length: vestigial (0); complete (1).
101. Metasomal segment I, lateral inframedian (lim) carina [= median lateral carina], ornamentation: granular (0); smooth (1).
102. Metasomal segment II and III, lateral inframedian (lim) carina [= median lateral carina], ornamentation: no difference in ornamentation (0); granular (1); smooth (2).
103. Metasomal segment I, lateral inframedian (lim) carina [= median lateral carina], ornamentation length: partial (0); complete (1).
104. Metasomal segment II, lateral inframedian (lim) carina [= median lateral carina], ornamentation length: vestigial (0); partial (1).
105. Metasomal segment III, lateral inframedian (lim) carina [= median lateral carina], ornamentation length: vestigial (0); partial (1).
106. Metasomal segment IV, lateral inframedian (lim) carina [= median lateral carina], ornamentation: no difference in ornamentation (0); granular (1).
107. Metasomal segment I, ventral submedian (vsm) carina, ornamentation: no difference in ornamentation (0); granular (1); smooth (2).
108. Metasomal segment II, ventral submedian (vsm) carina, ornamentation: no difference in ornamentation (0); granular (1); smooth (2).
109. Metasomal segment III, ventral submedian (vsm) carina, ornamentation: no difference in ornamentation (0); granular (1); smooth (2).
110. Metasomal segment IV, ventral submedian (vsm) carina, ornamentation: no difference in ornamentation (0); granular (1); smooth (2).
111. Metasomal segment V, ventral median (vm) carina, ornamentation: no difference in ornamentation (0); granular (1).

Metasomal ornamentation

112. Metasomal segment IV and V, lateral surfaces: smooth (glabrous) (0); uniformly finely granular (matte) (1); coarse granules on either smooth or finely granular surface (shagreened) (2).
113. Metasomal segment V, ventral surfaces: smooth (glabrous) (0); uniformly finely granular (matte) (1); coarse granules on either smooth or finely granular surface (shagreened) (2).
114. Metasomal segments I–IV, dorsosubmedian (dsm) (I–III/IV) and dorsolateral carinae (dsl) (I-IV), distal granules: not noticeably larger than preceding granules (0); significantly larger than preceding granules (1).

115. Metasomal segment I–III, lateral surfaces (dorsolateral keel to ventrolateral keel): smooth (glabrous) (0); uniformly finely granular (matte) (1); coarse granules on either smooth or finely granular surface (shagreened) (2).
116. Metasomal segment I–IV, ventral surfaces (left ventrolateral keel to right ventrolateral keel): smooth (glabrous) (0); uniformly finely granular (matte) (1).

Telson

The telson is another informative segment that has been use in several systematic studies. Its shape and ornamentation have proved to be informative but have not been completely explored. During the examination of this structure was discovered a glandular patch on the dorsal surface of the telson vesicle in some groups of Vaejovidae (figures 30A, B). Analogous structures have been reported in other scorpion groups, for example *Hadrurus* (Williams, 1970e, 1980) has a pair of aculear glands and in the family Bothriuridae (Kraepelin, 1908; Werner, 1934; San Martín, 1965; Prendini, 2000) was identified the androvestigium. For *Hadrurus* and bothriurids the structure is conspicuous, observed as a pair of white bosses protruding from surrounding cuticle, but in Vaejovidae is less notable, expressed most of the time as unique oval to fusiform hyaline patch. It appears that the character has derived independently at least three times in these groups but more investigation is needed. The structure is informative in syntropines and here has been coded as multistate. The state of conservation in some specimens sometimes precludes the visualization of this structure. This is more common in *C. bilineatus* in which this structure is very delicate and small.

The macrosetae found on the telson was used by Williams (1970a, 1971a, 1980) to differentiate members of the *punctipalpi* group now included in *Kochius*. A dense and long patch of macrosetae can be observed in most of these species, probably the most obvious case is *K. hirsuticauda*, this hairy expression seems to be unique among scorpions, though hypertrichosis can be observed in buthids and other families, the typical orientation of the noticeable translucent thin tip of the macrosetae directed towards the terminus of the aculeus is not observed in other scorpions (figure 33A).

The presence of subaculear tubercle in Diplocentridae is considered apomorphic (Pocock, 1893). However, other families, most notable the Buthidae also present this feature expressed as a sharper spiniform tubercle. A parallel evolution is observed buthids in vaejovids, *Konetontli*, *Wernerius*, and two other species present subaculear tubercle. The derivation of this character in vaejovids present at least two states: (1) the development of a conical spinoid tubercle with sharp tip and (*Wernerius*) (2) a more cylindrical spinoid tubercle with blunt tip (*Konetontli*) (figure 33B). Additionally, some species of *Konetontli* present a series of additional smaller spiniform tubercles running along the dorsal median carina (figure 33C). These kinds of tubercles are also common in buthids and sometimes the fusion of several tubercles form a crest, which is different to the structure observed in *Konetontli*.

117. Male setae of vesicle: of normal length, with setae shorter than aculeus (0); of long length with elongate setae, some setae as long as or longer than aculeus (1).
118. Telson, female setae of vesicle: of normal length, with setae shorter than aculeus (0); of long length with elongate setae, some setae as long as or longer than aculeus (1).

119. Telson, dorsal gland/s (male): surface unmodified (0); fusiform white spot of small to moderate size at the base of the aculeus (1); white spot of variable size and position on the medial surface of the vesicle (2).
120. Telson, ventral vesicle: smooth to fine scattered granulation (glabrous to matte) (0); coarse granulation (shagreened) (1).
121. Aculeus, dorsolateral microdenticles at base ('laterobasal serrations') (male): surface no modify (0); distinctive microdenticles (1)
122. Telson, subaculear tubercle: surface unmodified (0); laterally-compressed triangular tooth/spinoid conical tubercle with blunt tip (*Konetontli*) (1); spiniform tooth/spinoid conical tubercle with sharp tip (*Wernerius*) (2).
123. Telson, compound subaculear tubercle: unique laterally-compressed triangular tooth/spinoid conical tubercle with blunt tip (0); more than one laterally-compressed triangular tooth/spinoid conical tubercle with blunt tip running along the middle axis of vesicle (1)

Hemispermatophore

Although Stockwell (1989) pointed out variation of the microstructure of the hemispermatophore of the Scorpiones, independently Sissom (1989a, 1989b, 1991b) and Williams and Savary (1991) were the precursors in using those characters to delimit lineages within the Vaejovidae. The hemispermatophore represent a very informative system for familial and suprafamilial relationships. However, the hemispermatophore in Syntropinae has little utility at generic level. The characters used here assisted to polarize outgroup (figures 17A–E).

124. Hemispermatophore, ‘dorsal trough margin’ (carina) and ‘ventral trough margin’ (carina), terminal spine-like processes: fused into sclerotized crest or lobe (0); fused into a prominent, often bifurcated hook (vaejovids) (1).
125. Hemispermatophore, sperm duct, floor: bearing greatly reduced pouch-like invagination [considered ‘absent’ in *U. giulianii* by Stockwell (1989)] (0); bearing enlarged pouch-like invagination (1).
126. Hemispermatophore, sclerotized mating/sperm plug, type I (derived from inner lobe): not developed (0); sperm plug greatly reduced (inner lobe small) [sensu S89 = paruroctonoid type of mating plug] (1); sperm plug fully developed (inner lobe large, tapered) [sensu S89 = vaejovoid type of mating plug] (2).
127. Hemispermatophore, sclerotized mating/sperm plug, type I, distal barb margin: smooth (no hooks) (0); armed with hooks/teeth (1).
128. Hemispermatophore, sclerotized mating plug, type II (derived from floor of sperm duct): present, without spines (*Uroctonus*) (0); present, with spines (mexicanus group) (1).
129. Hemispermatophore, ‘dorsal’ trough margin’ (carina), shape: short, broad, dorsal trough margin curving proximally, medium distance between dorsal and ventral trough margins (0); long, narrow, dorsal trough margin curving proximally, long distance between dorsal and ventral trough margins (1).
130. Hemispermatophore, laminar ‘hooks’ and lobes [and homologous structures derived from terminal spine-like processes of ‘dorsal trough margin’ (carina) and ‘ventral trough margin’ (carina)], position: on dorsal/ectal surface (0); on lamina (ental/dorsal) margin (1).

131. Hemispermatophore, laminar ‘hooks’ and lobes [and homologous structures derived from terminal spine-like processes of ‘dorsal trough margin’ (carina) and ‘ventral trough margin’ (carina)], position: at base of distal lamina (0); ‘elevated’/distal on distal lamina (1).
132. Hemispermatophore, distal lamina, axial carina (sensu Lamoral, 1979): not developed (0); well developed, near dorsal/ental margin of lamina (may create laminar hook) (1).
133. Hemispermatophore, distal lamina, secondary hook created by extension of axial carina (sensu Lamoral, 1979): not developed (0); basal on lamina, well developed hook near primary hook created by fusion of trough margins (*Syntropis*) (1); basal on lamina, fused with primary hook to create ‘flange’ (*Uroctonites*) (2); distal on lamina margin, separated from primary hook or flange (3).
134. Hemispermatophore, distal lamina, dorsal/ental margin: straight (0); curved to ectal/dorsal surface, creating ‘inflection point’ (‘internal protuberance’ *sensu* Soleglad and Fet 2008) (1).
135. Hemispermatophore, distal lamina, distal/apical crest (carina): not developed (0); distinctively developed (1).
136. Hemispermatophore, distal lamina, basal constriction: no constricted (0); constricted (1).
137. Hemispermatophore, distal lamina, shape: even width almost to tip (0); broad near base, tapered to tip (1).

Genital operculum

The degree of fusion between the sclerites and the ability of the female genital opercula to open has been used to differentiate subfamilies in Vaejovidae (Soleglad and Fet, 2003a, 2008). Here is proposed a redefinition of the homologies used by Soleglad and Fet. It was confirmed that all Syntropinae have the sclerites of the genital opercula firmly fused such that they hinge opening as a flap completely exposing the genital aperture. This character was include in the analyses to aid in polarizing the outgroup.

138. Genital operculum of female, sclerites: separated for most of length, loosely connected at anterior edge (*Uroctonites*) (0); partially fused, separated at posterior 20–25% of their length, opercular sclerites connected to mesosoma on anterior half (paruroctonoids) (1); partially fused, separated at posterior 20–25% of their length, opercular sclerites connected to mesosoma on anterior third (*Pseudouroctonus*, *V. mexicanus* and *Vaejovis nitidulus*) (2); fused, strongly connected by membrane entire length, with clear median suture (Syntropinae and Stahnkeinae) (3).
139. Genital opercula of female, hinge of sclerites: sclerites unable to open as a distinct ‘flap’/s, connected to mesosoma on anterior half (0); sclerites able to open as single, distinct ‘flap’/s, connected to mesosoma on anterior third (1).

Mesosomal ornamentation

Although strong difference between the two major clades within Scorpiones (Buthidae and non-buthids, as presented in Stockwell, 1989) present different composition of complementary carinae on each sternite and tergites, Vaejovidae and in general the other families have never been evaluated in this regard. As part of ongoing work (Prendini et al., in prep.) each carina was homologized in those sclerites by mean of comparative analyses resulting in three informative.

There is a glandular patch on the distomedial area of sternite VII that is recorded for the first time here (figures 31A, B). This glandular patch represent a synapomorphy for *Kochius*, this is the only genus that has this gland expressed as an elevated boss. The presence of this gland in *Kuarapu* relates this genus to the *punctipalpi* clade. The gland is also present in *Syntropis* as a whitish spot but is considerable more extended.

140. Tergites I–VII (post-tergites): smooth (glabrous) (0); uniformly finely granular (matte) (1); combination of scattered coarse granules and finely granular surface (2); combination of dense fine and coarse granules (3).
141. Sternite III–VI, medial areas, granulation: smooth (glabrous) (0); uniformly finely granular (matte) (1).
142. Sternite V, posteromedian surface (male) [visible under UV]: unmodified (0); smooth, raised surface (1).
143. Sternite VII, lateral areas: smooth (glabrous) (0); uniformly finely granular (matte) (1); coarse granules on either smooth or finely granular surface (shagreened) (2).
144. Sternite VII of male glandular patch (visible under UV): obsolete or with very reduced distomedial white non elevated spot (0); with distomedial white elevated boss (1); white non elevated spot occupying entire intercarinal (submedian carinae) space of the sternite (*Syntropis*) (2).
145. Sternite VII, medial areas: smooth (glabrous) (0); uniformly finely granular (matte) (1); coarse granules on either smooth or finely granular surface (shagreened) (2).
146. Sternite VII, ventral lateral (vl) carina, ornamentation (macrosculpture), texture: no difference in ornamentation (height and/or texture) from adjacent intercarinal surfaces (0); difference in ornamentation (height and/or texture) from adjacent intercarinal surfaces, granular surface (includes costate-granular, i.e. fused granules, e.g. crenulate, serrate or dentate) (1); difference in ornamentation (height and/or texture) from adjacent intercarinal surfaces, smooth surface (includes costate, i.e. smooth costa) (2).
147. Sternite VII, ventral submedian (vsm) carina, ornamentation (macrosculpture), texture: no difference in ornamentation (height and/or texture) from adjacent intercarinal surfaces (0); difference in ornamentation (height and/or texture) from adjacent intercarinal surfaces, granular surface (includes costate-granular, i.e. fused granules, e.g. crenulate, serrate or dentate) (1).
148. Tergites I–VI, dorsal lateral anterior/posterior (dl a/p) carina [= dorsosubmedian carina], ornamentation (macrosculpture), longitudinal development (length): no difference in ornamentation (height and/or texture) from adjacent intercarinal surfaces (0); difference in ornamentation (height and/or texture) from adjacent intercarinal surfaces, vestigial (granule, cluster of granules or 'bump' restricted to basal or distal margin of segment) (1).

Pectines

An apomorphy for the order Scorpiones is the presence of pectines, an organ hypothesized to be a mechanoreceptor and a chemoreceptor involved in the process of mating. Basal first to basal third pair of teeth is modified in most *Serradigitus* and *Stahnkeus*, which is a synapomorphy for these genera. In syntropines, the pectines are not modified except for those psammophilous species. Few informative characters were used here primarily to polarize characters.

149. Pectines development, length, expressed relative to length of coxa of leg IV (female): long, distal edge reaching beyond distal edge of coxa (0); moderate, distal edge reaching to, but not beyond, distal edge of coxa (1); short, distal edge not reaching to distal edge of coxa (2).
150. Pectines development, length, expressed relative to length of coxa of leg IV (male): long, distal edge reaching beyond distal edge of coxa (0); moderate, distal edge reaching to, but not beyond, distal edge of coxa (1).
151. Pectines (female), first (proximal/basal) pectinal tooth: unmodified, similar to teeth, sensilla field present (0); modified, different from other teeth, usually rounded in shape and often larger, sensilla field absent (1).
152. Pectines, first proximal median lamella (scape), angle (female): approximately 90° (0); obtuse, >90° but <180° (1); straight or shallowly curved, approximately 180° (2).
153. Pectines (female), second pectinal tooth: unmodified, similar to teeth, sensilla field present (0); modified, different from other teeth, often enlarged, sensilla field absent (1).

Chelicerae

154. Movable finger, distal denticle alignment [prolateral and retrolateral distal teeth]: opposable, distal internal tooth completely overlaps distal external tooth in dorsal view, creating deep U-shaped notch in anterior view (0); not opposable, distal internal tooth does not overlap or at most partially overlaps distal external tooth in dorsal view, creating shallow V-shaped notch in anterior view (1).
155. Movable finger, distal denticle size [prolateral and retrolateral distal teeth]: subequal, distal external tooth slightly smaller than distal internal tooth (ventral > dorsal) (0); unequal, distal external tooth considerably smaller than distal internal tooth (ventral >> dorsal) (1).
156. Movable finger, ventral edge, serrula: present, well developed (0); present, reduced [vestigial] (1)
157. Movable finger, ventral edge: crenulate/1–7 small denticles [ventral accessory teeth sensu Stockwell (1989)] (*Pseudouroctonus*) (0); smooth (1).

Carapace ornamentation

A diagnostic character used to define the *nitidulus* group (=*Franckeus* and the *nigrescens* group, after Soleglad and Fet, 2008) was the obtuse emargination with anteromedian notch of the carapace (Sissom, 1991a). More recently Soleglad and Fet (2008) indicated that *Kochius* possess a distinctive carapace, which they described as having a subtle emargination that extends to the lateral eyes. They also pointed out that *Thorellius* have a similar derivation but that emargination did not reach lateral eyes and the medial notch was less pronounced. Furthermore, they mentioned that in contrast, the other Syntropini has the anterior margin of carapace straight. After studying a large sample of exemplars of all groups in the family Vaejovidae it was concluded that two independent characters may be constructed: (1) the frontal margin of the carapace and (2) the presence of the medial notch. This observation was tested in this analysis to confirm such independence and further to explore the potential phylogenetic content of each character. Vaejovid carapace has not previously been studied in terms of ornamentation or infuscation. Carapace macrosculpture development is largely homogeneous in Syntropinae. However, some informative variation was identified (figures 36A–D). A putative derivation in

Konetontli is the distinctive matte carapace, though is also present in other basal genera, *M. waueri* and more derived *P. pumilis*. Another related character state is the smooth surface of the interocular area of *Syntropis*, which may prove to be a synapomorphy. The most diverse and derived groups of Syntropinae are more similar showing carapace surfaces covered by shagreened granulation. Although carapace sulci and sutures have shown informative variation in some groups of scorpions (Prendini et al., 2003), Syntropinae has limited variation. However anterior and posterior sulci show some utility and were incorporated in this work. Variability of those structures and anterior displacement of ocular tubercle on the carapace are related adaptations to constructions of burrows in compacted soil (Prendini, 2001). Some Syntropine construct burrows but most of them inhabit loose or sandy substrata, hence most of them have a relatively flat carapace and more common observed advance position of ocular tubercle.

158. Carapace, anterior margin: concave (0); sublinear (1); convex (2).
159. Carapace anterolateral, median lateral, posterolateral, and posteromedian areas: smooth (glabrous) (0); uniformly finely granular (matte) (1); coarse granules on either smooth or finely granular surface (shagreened) (2).
160. Carapace, anteromedian (frontal) notch (emargination): obsolete [essentially straight or subtle indentation] (0); present, shallow [shallow to medium indentation] (1).
161. Carapace, anteromedian longitudinal sulcus, anterior furcation: no furcated (0); furcated (1).
162. Carapace interocular area: smooth (glabrous) (0); uniformly finely granular (matte) (1); coarse granules on either smooth or finely granular surface (shagreened) (2).
163. Carapace interocular surface, granulation distribution: entirely smooth (0); only granular along median longitudinal and anterior furcate sulci (1); frontal lobes and median region granular, with smooth areas (2); entire surface uniformly granular (3).
164. Carapace, median lateral sulci: pronounced/well developed (0); obsolete/indistinct (1).
165. Carapace, median ocular tubercle: raised (0); shallow (flat) (1).
166. Carapace, median ocular tubercle, superciliary carinae: higher than ocelli (0); lower than ocelli (1).

Pedipalp finger lobes and notches

A common aspect of pedipalp finger that has been used in systematics is the scalloped base of the fingers. Here it is presented a reinterpretation of putative homologies not only as a unique character, but it is proposed a correspondence between each lobe and notch present on the basal cutting edge of pedipalp fingers for male and female (figure 21B). An explicit correspondence between structures among vaejovids will be presented in more detail in a future contribution (Prendini et al., in prep.).

167. Chela fingers, closure [gap] (female): fingers fit together evenly, no gap evident when closed (0); fingers fit together unevenly, distinct gap evident when closed (1).
168. Chela fingers, closure [gap] (male): fingers fit together evenly, no or minimal gap evident when closed (0); fingers fit together unevenly, distinct gap evident when closed (1).
169. Pedipalp chela fingers, infuscation: none to diffuse (faint or weak) (0); distinct but only base (1); entire finger with obvious dark pigment pattern (2).
170. Chela fixed/movable fingers, terminal denticle: considerably larger than preceding denticles, hook-like (0); slightly larger than preceding denticles (1).

171. Chela fingertips: with distinct whitish sensory surface (0); unmodified, with plain, smooth, elevated area (1).
172. Chela, fixed finger dentate margin, basal/proximal notch [P2] (female): straight, no developed notch (0); emarginated, weak notch evident (1)
173. Chela, fixed finger, dentate margin, medial lobe [P3] (female): margin straight, no developed lobe (0); weak lobe present (1); unknown (?).
174. Chela, fixed finger, dentate margin, medial lobe [P3] (male): margin straight, no developed lobe (0); weak to moderate lobe present (1); strong lobe present (2) unknown (?).
175. Chela, movable finger, dentate margin, medial lobe [P3] (male): margin straight, no developed lobe (0); weak to moderate lobe present (1); strong lobe present (2); unknown (?).
176. Chela, fixed finger dentate margin, basal/proximal notch [P2] (male): straight, no developed notch (0); emarginated, weak notch evident (1); emarginated, moderate to strong notch evident (2).
177. Chela, movable finger dentate margin, basal/proximal notch [P2] (male): margin straight, no developed notch (0); emarginated, moderate to strong notch evident (1).
178. Chela, movable finger dentate margin, medial notch [P4] (male and female): margin straight, no developed notch (0); emarginated, moderate to strong notch evident (1).

Pedipalp finger dentition

Soleglad and Sissom (2001) elaborated this system in some detail for the family Euscorpiidae. They defined units using a modified version of Stahnke's (1970) terminology. Here it is defined a terminology that agrees integrally with all other terminology applied to the basic directionality of appendices in scorpion morphology, which has been proposed for few structures such as pedipalp carinae (Acosta et al., 2008) and is in line with the assessment of Prendini et al., (in prep.). For median denticles (MD), prolateral denticles (PD) and retrolateral denticles (RD), one array can be found in vaejovids, in which MDs and RDs are lined up in a continuous row and PDs are positioned on the retrolateral side of that row (figures 24A, B). In prior schemes of homology it has been considered the distal denticle, sometimes expressed as hook-like projection i.e. *Serradigitus*, as an independent entity in both fixed and movable fingers. Here it is proposed that both apical denticles should be regarded as part of the corresponding RD series. This homology implies that each terminal denticle is part of the RD series in the movable and fix fingers. Another structure observed in the Vaejovidae is the prolateral accessory denticles (PAD), which are particular to *Stahnkeus*, but common in other groups outside Vaejovidae (Soleglad and Sissom, 2001).

179. Chela fixed finger dentition, median denticle (MD) row, number of primary subrows: 3 (0); 5 (1); 6 (2).
180. Chela movable finger dentition, prolateral accessory denticles (PAD) [supernumerary granules *sensu* Sissom (1990)]: zero PAD (0); numerous irregularly positioned PAD, variable in number and position (*Serradigitus*) (1).
181. Chela fixed finger dentition, prolateral denticle (PD) number: 4 (0); 5 (1); 6 (2); 8 or more (3).
182. Chela movable finger dentition, prolateral denticle (PD8): present (0); absent (1).
183. Chela movable finger dentition, median denticle (MD) number of primary subrows and outer denticle (OD) number: 4 (0); 5 (1); 6 (2); 7 (3).

184. Chela movable finger dentition, median denticle (MD) row development of denticles: unmodified (0); flat, elongated and pointed, forming a serrated cutting edge (Soleglad and Sissom, 2001) (1).
185. Chela movable finger dentition, median denticle (MD) row, first (terminal) primary subrow: zero granules (0); one (occasionally two) granules (1); usually three or more granules (2).
186. Chela movable finger dentition, retrolateral denticle (RD6): present (0); absent (1).

Trichobothrial pattern

This character system has been used for almost 50 years (Vachon, 1974) to diagnose scorpions at most taxonomic hierarchies. This vachonian paradigm of homology has been challenged repeatedly (Francke and Soleglad, 1981; Francke, 1982; Volschenk and Prendini, 2008; Prendini et al., 2010); however its use is extensive in contemporary systematic studies and there are strong adherents to it (Fet et al., 2011). The main problem with this homology scheme is that the position of some trichobothria varies among taxa and to explain this displacement it was proposed a process of 'migration' (Vachon, 1974). Thus far, no evidence has been presented supporting the "migration" hypothesis. Only one alternative hypothesis has been proposed, in which this dislocation of trichobothria is produced as a byproduct of morphometric change (Francke, 1982). This hypothesis is more intuitive but has not been tested ever since its inception. A third approach to solve this problem of variation in position was presented by Prendini et al. (2010). The fundamental question they asked was, are these trichobothria that occupy different positions in different taxa homologous? They used the typhlochactids as a model due to contrasting patterns of trichobothrial distributions that facilitated this comparison and the manageable number of species known. The evidences presented by the authors indicate that the trichobothria deemed the same under the vachonian paradigm are different and thus they are not homologous. This conclusion was reach by using the placeholder approach. This procedure consists in localize landmarks (carinae, denticles, etc.) in association with the setae that permit isolate unambiguously the setae. It seems plausible to extrapolate this idea to other taxa with similar variation of position of trichobothria for example the Syntropinae. This interpretation of homology resides on the assumption that trichobothria and macrosetae could be part of a transformation series and thus microsetae, macroseta, trichobothria and petite trichobothria can be consider homologous as long as they maintain the same position. A corollary of this assumption is that regardless of the type of setae they can be expressed differentially, according to the selective pressure at a particular habitat. A limiting aspect for this interpretation could be caused by hypertrichosis, which make difficult localize corresponding homologous setae.

The number of taxa and extension of this analysis precluded the use of the placeholder approach extensively because is quite demanding. An effort to represent the relative position of some the trichobothria of the pedipalp fix finger was implemented. For instance, prolateral (*ib–it*) and retrolateral (*eb–et* series) trichobothria on the pedipalp fixed finger were associated with the presence of a macrosetae present in the same position as to PD and RD. Although the position of these granules seems to be reliable, it could become problematic when PADs are present, for example in *Stahnkeus*. However, the macrosetae are always in the homologous position and are more reliable than the granules even if PADs are present. The position of the trichobothria *ib–it* has been assigned on the basis of the length of the finger in most systematic studies. It appears that the elongation of the finger and the position of the trichobothria are

independent if the position of the landmark seta and granules is taken instead the length of the finger by itself. Here is proposed a new scheme of homologies where the use of landmark macrosetae made possible a more precise definition of this character system (figures 19–21). This approach produced novel synapomorphies reported for the first time that served to diagnose *Mesomexovis*, *Chihuahuanus*, and *Paravaejovis*.

187. Chela, manus, ventral surface, number of trichobothria: 4 (0 accessory) (0); 9 or more (5 or more accessory) (1).
188. Chela, position of trichobothrium *Dt*: manus, proximal third (0); manus, medial third (1).
189. Chela, trichobothrium *Db*, position: manus, dorsoexternal surface (below drl carina) (0); manus, dorsoexternal surface (on drl carina) (1); manus, 'dorsal' surface (above drl carina) (2).
190. Chela, fixed finger, external surface, position trichobothrium *db*: manus or base of fixed finger, not distal of articulation between fixed and movable fingers (0); proximal third of fixed finger, distal of articulation between fixed and movable fingers (1).
191. Chela, fixed finger, external surface, trichobothrium *eb*, position: base of fixed finger, near point of articulation between fixed and movable fingers (0); proximal third of fixed finger (1); medial to distal third of fixed finger (2).
192. Chela, fixed finger, external surface, trichobothrium *esb*, position: fixed finger, between RD 6 and/or associated macroseta, and junction with movable finger, but closer to junction (0); fixed finger, midway between RD 6 and/or associated macroseta, and junction with movable finger (1); fixed finger, at or close to RD 6 and/or associated macroseta (2); fixed finger, between RD 5 and RD 6, and/or associated macrosetae (3); fixed finger, at or close to RD 4 and/or associated macroseta (4). [RD numbering starts at terminal denticle].
193. Chela, fixed finger, external surface, trichobothrium *est*, position: between RD 3 and RD 4 (0); between RD 4 and RD 5 (1); between RD 5 and RD 6 (2). [RD numbering starts at terminal denticle].
194. Chela, fixed finger, external surface, trichobothrium *et*, position: between RD 2 and RD 3 (0); between RD 3 and RD 4, closer to or in line with RD 3 (1); between RD 3 and RD 4, midway (2); between RD 3 and RD 4, closer to or in line with RD 4 (3). [RD numbering starts at terminal denticle].
195. Chela, palm, Eb_1 position: external surface (0); on ventroexternal carina (1).
196. Chela, manus, external surface, trichobothrium Et_4 position: in line with trichobothrium Et_3 (0); distal to trichobothrium Et_3 (1).
197. Chela, internal surface, trichobothrium *ib* position: fixed finger, proximal to RD 7 and/or associated macroseta (0); fixed finger, at or close to RD 7 and/or associated macroseta (1); fixed finger, between RD 6 and RD 7, and/or associated macrosetae (2); fixed finger, at or close to RD 6 and/or associated macroseta (3); fixed finger, between RD 5 and RD 6, and/or associated macrosetae (4); fixed finger, at or close to RD 5 and/or associated macroseta (5). [RD numbering starts at terminal denticle].
198. Chela, internal surface, trichobothrium *it* position: fixed finger, proximal to RD 7 and/or associated macroseta (0); fixed finger, at or close to RD 7 and/or associated macroseta (1); fixed finger, between RD 6 and RD 7, and/or associated macrosetae (2); fixed finger, at or close to RD 6 and/or associated macroseta (3); fixed finger, between RD 5 and RD 6, and/or associated macrosetae (4); fixed finger, at or close to RD 5 and/or associated macroseta (5); fixed finger, between RD 4 and RD 5, and/or associated macrosetae (6). [RD numbering starts at terminal denticle].

199. Chela, manus, ventral surface, trichobothrium V_3 position: proximal third of manus (0); medial third of manus (1).
200. Chela, manus, ventral surface, trichobothrium V_4 position: ventral surface (0); on ventroexternal carina/external surface (1).
201. Femur, trichobothria *d* (d_1) and *i* ($i_{1–4}$) alignment: *d* proximal to or in line with *i* (0); *d* distal to *i* (1).
202. Patella, external surface, distance between trichobothria esb_1–esb_2 relative to distance between trichobothria em_1–em_2: esb_1–esb_2 <= em_1–em_2 (0); esb_1–esb_2 >>> $em1$–em_2 (1).
203. Patella, ventral surface, relative positions trichobothria v_1–v_3, position: v_2 approximately equidistant between $v1$ and v_3 (0); v_2 closer to v_1, distance v_3–v_2 > distance v_2–v_1 (1).
204. Pedipalp chela, trichobothrium Et_5, position: on manus, behind point of articulation between fixed and movable fingers, near to trichobothrium Et_4 (0); at base of fixed finger (in line with or distal to condyle), removed from Et_4 (1).

Leg setae patterns

Leg setae and spinules present an example of serial homology utilized with certain frequency in scorpion systematics (Pocock, 1893; Kraepelin, 1899; Gertsch and Soleglad, 1972; Francke, 1977b; Lamoral, 1980; Haradon, 1983, 1984a, 1984b, 1985; Sissom, 1990). The most recent attempt of organize coherently this character system in vaejovid scorpions was McWest's (2009) assessment. He produced an illustrated atlas of tarsal setae and spinules of vaejovid scorpions and discussed the patterns and putative homologies among these structures. Some of the ideas presented there were implemented in these analyses, but with an approach of serial homology and modification of the terminology (figures 23A, B). In order to accomplish this, setae that clearly lined up along the tarsi were treated as a compound unit that is assuming that the setae are connected by axons that retrieve sensorial information, it can be proposed that each row is an independent unit forming a sensorial net, such that each seta represents a subunit of that sensorial net. Little usable variation in this system was encountered for the Syntropinae and the external group included here, however 11 characters resulted informative.

205. Basitarsi I and II, setal combs (male): dorsal and retrodorsal setae separated into two parallel to subparallel rows (Haradon: in distal plus proximal subrows) (0); dorsal and retrodorsal setae together in a semilinear to linear row (Haradon: a single continuous row) (1).
206. Basitarsi I and II, setal combs (female): no developed, dorsal and retrodorsal setae (see Haradon 1985b: Table 1) separated into two parallel to subparallel rows (Haradon: in distal plus proximal subrows) (0); developed, dorsal and retrodorsal setae (see Haradon, 1985b: Table 1) together in a semilinear to linear row (Haradon: a single continuous row) (1).
207. Basitarsus III, setal combs (male, female): no developed, dorsal and retrodorsal setae (see Haradon 1985b: Table 1) separated into two parallel to subparallel rows (Haradon: in distal plus proximal subrows) (0); developed, dorsal and retrodorsal setae (see Haradon, 1985b: Table 1) together in a semilinear to linear row (Haradon: a single continuous row) (1).
208. Basitarsus III: retroventral series 8 [RV series in McWest, 2009: 8]: present (0); absent (1).
209. Basitarsus III: retroventral series 9 [RV series in McWest, 2009: 8]: present (0); absent (1).
210. Basitarsus III: ventral series 5 [DV in McWest, 2009: 8]: present (0); absent (1).
211. Basitarsus III: ventral series 6 [DV in McWest, 2009: 8]: present (0); absent (1).
212. Telotarsus I proventral macrosetae number: 2 (0); 3 (1); 4 (2).

213. Telotarsus II-III proventral macrosetae number: 2 (0); 3 (1); 4 (2).
214. Telotarsus IV proventral macrosetae number: 3 (0); 4 (1).
215. Telotarsus I retroventral macrosetae number: 2 (0); 3 (1); 4 (2).
216. Telotarsus II retroventral macrosetae number: 2 (0); 3 (1); 4 (2).
217. Telotarsus III retroventral macrosetae number: 2 (0); 3 (1); 4 (2).
218. Telotarsus IV retroventral macrosetae number: 2 (0); 3 (1); 4 (2).

Leg spinule patterns

219. Basitarsus (III), retroventral spinules/spinule clusters: distal spinules/spinule clusters or spinule clusters only (0); short distal row of spinules/spinule clusters (1); long, partial (not extending to end of segment) row of spinules/spinule clusters or spinule clusters (2); long, complete (extending to end of segment) row of spinules/spinule clusters (*Smeringurus*) (3)
220. Basitarsus (IV), retrolateral spinules/spinule clusters: distal spinules/spinule clusters only (0); row of scattered spinules/spinule clusters (1).
221. Telotarsi, ventral surface, spinules/spinule clusters, number of ventrodistal pairs [VDS in McWest, 2009]: 1 pair (0); 2 pairs (1); 3–4 pairs (2).
222. Telotarsi, ventral surface, spinules/spinule clusters, proximal row: curved/arc-shaped (0); consisting of loop or cluster (1).
223. Telotarsi, ventral surface, spinules, presence and type: isolated spinules, stout (0); isolated spinules, very elongate [*Vizcaino*] (1); isolated spinules, bristle-like [*mexicanus* group] (2).

Leg ornamentation

124. Legs, prolateral aspect of femur: smooth (glabrous) to scattered granulation (0); uniformly finely granular (matte) (1); coarse to dense granules on either smooth or finely granular surface (shagreened) (2).
225. Leg coxae II and IV proportions: IV/II (anterior lengths): IV_L/II_L = 1.3–2.0 (0); IV_L/II_L = 2.2–2.9 (1).

Color and infuscation

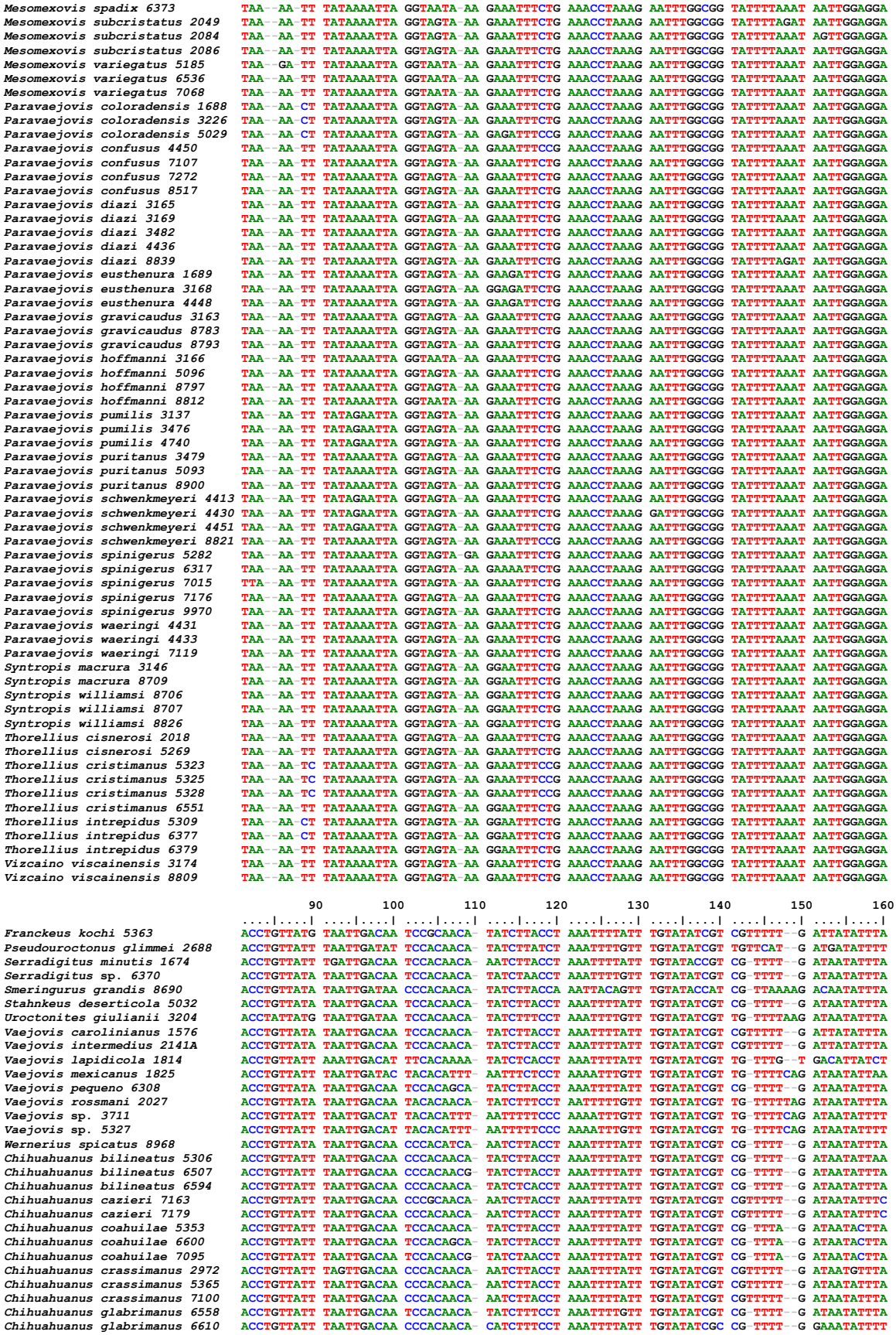
Infuscation in Syntropinae appears to be plastic. Usually, psammophilous forms, namely some *Chihuahuanus* and most *Paravaejovis* tend to have immaculate integument and pale coloration. In most cases, the color of the integument and the infuscation match the color of the substrate where scorpions live, so it is expected that species that live in light colored substrata will tend to be paler and devoid of infuscation and vice versa, for that matter. For instance, inhabitants of mesic and subtropical environments possess conspicuous pigmentation patterns and tan cuticle that match darker soils. This can be observed in most *Mesomexovis*, *Konetontli*, few *Paravaejovis* and *Chihuahuanus*. Although some adaptative, and thus convergent or parallel evolution could be the result of color and infuscation patterns, it is possible that some patters are actually derivations for groups of scorpions and may carry phylogenetic information. This idea was explored in the analysis by coding variable patterns observed in the Syntropinae.

226. Mesosoma, pedipalps, metasoma, and legs integument base coloration, regardless infuscation: light (0); dark (1).
227. Pedipalp, chela manus, intercarinal surfaces, infuscation: infuscated (0); not infuscated (1).
228. Pedipalp chela fingers, base coloration: darker than manus (0); similar to (as pale as or as dark as) manus (1).
229. Pedipalps, color pattern: all segments same color (0); femur and patella pale, chela darker (1).
230. Pedipalps, femur dorsal infuscation: none (0); infuscate (1).
231. Pedipalps, patella dorsal infuscation: none to fine diffused (0); infuscate (1).
232. Metasoma, segment V color: same color as IV (0); approximately same color as IV but darker (1).
233. Metasoma, segment IV color: same color as III (0); approximately same color as III but darker (1).
234. Metasomal segments I–IV, ventral infuscation: not infuscated (0); infuscated (1).
235. Metasoma, segment I–IV, dorsal infuscation between dorsolateral intercarinal spaces: none (0); infuscate (1).
236. Metasoma, segment V dorsal infuscation between dorsolateral intercarinal spaces: none (0); infuscate (1).
237. Mesosomal tergites, infuscation: entirely infuscate (0); mostly infuscate, except for lateral and posterior edges (1); little to no infuscation (2).
238. Telson infuscation, ventral surface: none (0); infuscate (1).
239. Telson coloration: lighter than segment V (0); similar coloration as segment V (1); darker than segment V (2).
240. Chelicerae, manus, dorsal surfaces: entirely pale or nearly so, fingers may be slightly infuscate (manus similar to or paler than carapace interocular surface) (0); with varying degrees of infuscation extending well onto manus (1).
241. Tergites I-VII, dorsal median (dm) carina [= median carina], pigmentation (infuscation), longitudinal development (length): no difference in pigmentation from adjacent intercarinal surfaces (0); faintly or strongly darker pigmentation than adjacent intercarinal surfaces, vestigial (pigmentation restricted to basal or distal margin of segment) (1); faintly or strongly darker pigmentation than adjacent intercarinal surfaces, partial (pigmentation not extending full length of segment) (2); faintly or strongly darker pigmentation than adjacent intercarinal surfaces, complete (pigmentation extending full length of segment) (3).
242. Sternite III–VI, infuscation: immaculate (0); fine lateral infuscation and infuscation around setae (1); infuscate throughout the sternite including around setae (2).
243. Sternite VII, infuscation: immaculate (0); fine lateral infuscation with infuscation around setae (1); infuscate throughout the sternite including around setae (2).
244. Carapace anterolateral surfaces, infuscation: infuscated (0); not infuscated (1).
245. Carapace posterolateral surfaces, infuscation: infuscated (0); not infuscated (1).
246. Carapace interocular surface, infuscation: partially infuscated (0); triangle lacking infuscation between lateral and median ocelli (1).
247. Carapace circumocular surfaces, infuscation: infuscation not reaching lateral ocelli (0); not infuscated (1).
248. Carapace, base coloration: light yellow to yellow brown (0); medium brown, orange brown, or reddish brown (1); dark brown to dark reddish brown (2).
249. Coxal region infuscation: immaculate (0); diffuse to moderate infuscation (1).

250. Legs, overall color: pale, from immaculate to lightly infuscate (0); moderately infuscate (1); very dark or heavily infuscated (2).

Appendix 6

Alignment of the rDNA 12S genomic partition for cladistic analysis of the subfamily Syntropinae (Kraepelin, 1905). The first 16 taxa are outgroup.


Mesomexovis spadix 6373 TAA--AA-TT TATAAAATTA GGTAATA-AA GAAATTTCTG AAACCTAAAG AATTTGGCGG TATTTTAAAT AATTGGAGGA
Mesomexovis subcristatus 2049 TAA--AA-TT TATAAAATTA GGTAGTA-AA GAAATTTCTG AAACCTAAAG AATTTGGCGG TATTTTAGAT AATTGGAGGA
Mesomexovis subcristatus 2084 TAA--AA-TT TATAAAATTA GGTAGTA-AA GAAATTTCTG AAACCTAAAG AATTTGGCGG TATTTTAAAT AGTTGGAGGA
Mesomexovis subcristatus 2086 TAA--AA-TT TATAAAATTA GGTAGTA-AA GAAATTTCTG AAACCTAAAG AATTTGGCGG TATTTTAAAT AATTGGAGGA
Mesomexovis variegatus 5185 TAA--GA-TT TATAAAATTA GGTAATA-AA GAAATTTCTG AAACCTAAAG AATTTGGCGG TATTTTAAAT AATTGGAGGA
Mesomexovis variegatus 6536 TAA--AA-TT TATAAAATTA GGTAATA-AA GAAATTTCTG AAACCTAAAG AATTTGGCGG TATTTTAAAT AATTGGAGGA
Mesomexovis variegatus 7068 TAA--AA-TT TATAAAATTA GGTAATA-AA GAAATTTCTG AAACCTAAAG AATTTGGCGG TATTTTAAAT AATTGGAGGA
Paravaejovis coloradensis 1688 TAA--AA-CT TATAAAATTA GGTAGTA-AA GAAATTTCTG AAACCTAAAG AATTTGGCGG TATTTTAAAT AATTGGAGGA
Paravaejovis coloradensis 3226 TAA--AA-CT TATAAAATTA GGTAGTA-AA GAAATTTCTG AAACCTAAAG AATTTGGCGG TATTTTAAAT AATTGGAGGA
Paravaejovis coloradensis 5029 TAA--AA-CT TATAAAATTA GGTAGTA-AA GAGATTTCCG AAACCTAAAG AATTTGGCGG TATTTTAAAT AATTGGAGGA
Paravaejovis confusus 4450 TAA--AA-TT TATAAAATTA GGTAGTA-AA GAAATTTCCG AAACCTAAAG AATTTGGCGG TATTTTAAAT AATTGGAGGA
Paravaejovis confusus 7107 TAA--AA-TT TATAAAATTA GGTAGTA-AA GAAATTTCTG AAACCTAAAG AATTTGGCGG TATTTTAAAT AATTGGAGGA
Paravaejovis confusus 7272 TAA--AA-TT TATAAAATTA GGTAGTA-AA GAAATTTCTG AAACCTAAAG AATTTGGCGG TATTTTAAAT AATTGGAGGA
Paravaejovis confusus 8517 TAA--AA-TT TATAAAATTA GGTAGTA-AA GAAATTTCTG AAACCTAAAG AATTTGGCGG TATTTTAAAT AATTGGAGGA
Paravaejovis diazi 3165 TAA--AA-TT TATAAAATTA GGTAGTA-AA GAAATTTCTG AAACCTAAAG AATTTGGCGG TATTTTAAAT AATTGGAGGA
Paravaejovis diazi 3169 TAA--AA-TT TATAAAATTA GGTAGTA-AA GAAATTTCTG AAACCTAAAG AATTTGGCGG TATTTTAAAT AATTGGAGGA
Paravaejovis diazi 3482 TAA--AA-TT TATAAAATTA GGTAGTA-AA GAAATTTCTG AAACCTAAAG AATTTGGCGG TATTTTAAAT AATTGGAGGA
Paravaejovis diazi 4436 TAA--AA-TT TATAAAATTA GGTAGTA-AA GAAATTTCTG AAACCTAAAG AATTTGGCGG TATTTTAAAT AATTGGAGGA
Paravaejovis diazi 8839 TAA--AA-TT TATAAAATTA GGTAGTA-AA GAAATTTCTG AAACCTAAAG AATTTGGCGG TATTTTAGAT AATTGGAGGA
Paravaejovis eusthenura 1689 TAA--AA-TT TATAAAATTA GGTAGTA-AA GAAGATTCTG AAACCTAAAG AATTTGGCGG TATTTTAAAT AATTGGAGGA
Paravaejovis eusthenura 3168 TAA--AA-TT TATAAAATTA GGTAGTA-AA GGAGATTCTG AAACCTAAAG AATTTGGCGG TATTTTAAAT AATTGGAGGA
Paravaejovis eusthenura 4448 TAA--AA-TT TATAAAATTA GGTAGTA-AA GAAGATTCTG AAACCTAAAG AATTTGGCGG TATTTTAAAT AATTGGAGGA
Paravaejovis gravicaudus 3163 TAA--AA-TT TATAAAATTA GGTAGTA-AA GAAATTTCTG AAACCTAAAG AATTTGGCGG TATTTTAAAT AATTGGAGGA
Paravaejovis gravicaudus 8783 TAA--AA-TT TATAAAATTA GGTAGTA-AA GAAATTTCTG AAACCTAAAG AATTTGGCGG TATTTTAAAT AATTGGAGGA
Paravaejovis gravicaudus 8793 TAA--AA-TT TATAAAATTA GGTAGTA-AA GAAATTTCTG AAACCTAAAG AATTTGGCGG TATTTTAAAT AATTGGAGGA
Paravaejovis hoffmanni 3166 TAA--AA-TT TATAAAATTA GGTAATA-AA GAAATTTCTG AAACCTAAAG AATTTGGCGG TATTTTAAAT AATTGGAGGA
Paravaejovis hoffmanni 5096 TAA--AA-TT TATAAAATTA GGTAGTA-AA GAAATTTCTG AAACCTAAAG AATTTGGCGG TATTTTAAAT AATTGGAGGA
Paravaejovis hoffmanni 8797 TAA--AA-TT TATAAAATTA GGTAGTA-AA GAAATTTCTG AAACCTAAAG AATTTGGCGG TATTTTAAAT AATTGGAGGA
Paravaejovis hoffmanni 8812 TAA--AA-TT TATAAAATTA GGTAATA-AA GAAATTTCTG AAACCTAAAG AATTTGGCGG TATTTTAAAT AATTGGAGGA
Paravaejovis pumilis 3137 TAA--AA-TT TATAGAATTA GGTAGTA-AA GAAATTTCTG AAACCTAAAG AATTTGGCGG TATTTTAAAT AATTGGAGGA
Paravaejovis pumilis 3476 TAA--AA-TT TATAGAATTA GGTAGTA-AA GAAATTTCTG AAACCTAAAG AATTTGGCGG TATTTTAAAT AATTGGAGGA
Paravaejovis pumilis 4740 TAA--AA-TT TATAGAATTA GGTAGTA-AA GAAATTTCTG AAACCTAAAG AATTTGGCGG TATTTTAAAT AATTGGAGGA
Paravaejovis puritanus 3479 TAA--AA-TT TATAAAATTA GGTAGTA-AA GAAATTTCTG AAACCTAAAG AATTTGGCGG TATTTTAAAT AATTGGAGGA
Paravaejovis puritanus 5093 TAA--AA-TT TATAAAATTA GGTAGTA-AA GAAATTTCTG AAACCTAAAG AATTTGGCGG TATTTTAAAT AATTGGAGGA
Paravaejovis puritanus 8900 TAA--AA-TT TATAAAATTA GGTAGTA-AA GAAATTTCTG AAACCTAAAG AATTTGGCGG TATTTTAAAT AATTGGAGGA
Paravaejovis schwenkmeyeri 4413 TAA--AA-TT TATAGAATTA GGTAGTA-AA GAAATTTCTG AAACCTAAAG AATTTGGCGG TATTTTAAAT AATTGGAGGA
Paravaejovis schwenkmeyeri 4430 TAA--AA-TT TATAGAATTA GGTAGTA-AA GAAATTTCTG AAACCTAAAG GATTTGGCGG TATTTTAAAT AATTGGAGGA
Paravaejovis schwenkmeyeri 4451 TAA--AA-TT TATAGAATTA GGTAGTA-AA GAAATTTCTG AAACCTAAAG AATTTGGCGG TATTTTAAAT AATTGGAGGA
Paravaejovis schwenkmeyeri 8821 TAA--AA-TT TATAAAATTA GGTAGTA-AA GAAATTTCCG AAACCTAAAG AATTTGGCGG TATTTTAAAT AATTGGAGGA
Paravaejovis spinigerus 5282 TAA--AA-TT TATAAAATTA GGTAGTA-GA GAAATTTCTG AAACCTAAAG AATTTGGCGG TATTTTAAAT AATTGGAGGA
Paravaejovis spinigerus 6317 TAA--AA-TT TATAAAATTA GGTAGTA-AA GAAAATTCTG AAACCTAAAG AATTTGGCGG TATTTTAAAT AATTGGAGGA
Paravaejovis spinigerus 7015 TTA--AA-TT TATAAAATTA GGTAGTA-AA GAAATTTCTG AAACCTAAAG AATTTGGCGG TATTTTAAAT AATTGGAGGA
Paravaejovis spinigerus 7176 TAA--AA-TT TATAAAATTA GGTAGTA-AA GAAATTTCTG AAACCTAAAG AATTTGGCGG TATTTTAAAT AATTGGAGGA
Paravaejovis spinigerus 9970 TAA--AA-TT TATAAAATTA GGTAGTA-AA GAAATTTCTG AAACCTAAAG AATTTGGCGG TATTTTAAAT AATTGGAGGA
Paravaejovis waeringi 4431 TAA--AA-TT TATAAAATTA GGTAGTA-AA GAAATTTCTG AAACCTAAAG AATTTGGCGG TATTTTAAAT AATTGGAGGA
Paravaejovis waeringi 4433 TAA--AA-TT TATAAAATTA GGTAGTA-AA GAAATTTCTG AAACCTAAAG AATTTGGCGG TATTTTAAAT AATTGGAGGA
Paravaejovis waeringi 7119 TAA--AA-TT TATAAAATTA GGTAGTA-AA GAAATTTCTG AAACCTAAAG AATTTGGCGG TATTTTAAAT AATTGGAGGA
Syntropis macrura 3146 TAA--AA-TT TATAAAATTA GGTAGTA-AA GGAATTTCTG AAACCTAAAG AATTTGGCGG TATTTTAAAT AATTGGAGGA
Syntropis macrura 8709 TAA--AA-TT TATAAAATTA GGTAGTA-AA GGAATTTCTG AAACCTAAAG AATTTGGCGG TATTTTAAAT AATTGGAGGA
Syntropis williamsi 8706 TAA--AA-TT TATAAAATTA GGTAGTA-AA GGAATTTCTG AAACCTAAAG AATTTGGCGG TATTTTAAAT AATTGGAGGA
Syntropis williamsi 8707 TAA--AA-TT TATAAAATTA GGTAGTA-AA GGAATTTCTG AAACCTAAAG AATTTGGCGG TATTTTAAAT AATTGGAGGA
Syntropis williamsi 8826 TAA--AA-TT TATAAAATTA GGTAGTA-AA GGAATTTCTG AAACCTAAAG AATTTGGCGG TATTTTAAAT AATTGGAGGA
Thorellius cisnerosi 2018 TAA--AA-TT TATAAAATTA GGTAGTA-AA GAAATTTCTG AAACCTAAAG AATTTGGCGG TATTTTAAAT AATTGGAGGA
Thorellius cisnerosi 5269 TAA--AA-TT TATAAAATTA GGTAGTA-AA GAAATTTCTG AAACCTAAAG AATTTGGCGG TATTTTAAAT AATTGGAGGA
Thorellius cristimanus 5323 TAA--AA-TC TATAAAATTA GGTAGTA-AA GAAATTTCCG AAACCTAAAG AATTTGGCGG TATTTTAAAT AATTGGAGGA
Thorellius cristimanus 5325 TAA--AA-TC TATAAAATTA GGTAGTA-AA GAAATTTCCG AAACCTAAAG AATTTGGCGG TATTTTAAAT AATTGGAGGA
Thorellius cristimanus 5328 TAA--AA-TC TATAAAATTA GGTAGTA-AA GAAATTTCCG AAACCTAAAG AATTTGGCGG TATTTTAAAT AATTGGAGGA
Thorellius cristimanus 6551 TAA--AA-TT TATAAAATTA GGTAGTA-AA GGAATTTCTG AAACCTAAAG AATTTGGCGG TATTTTAAAT AATTGGAGGA
Thorellius intrepidus 5309 TAA--AA-CT TATAAAATTA GGTAGTA-AA GGAATTTCTG AAACCTAAAG AATTTGGCGG TATTTTAAAT AATTGGAGGA
Thorellius intrepidus 6377 TAA--AA-CT TATAAAATTA GGTAGTA-AA GGAATTTCTG AAACCTAAAG AATTTGGCGG TATTTTAAAT AATTGGAGGA
Thorellius intrepidus 6379 TAA--AA-TT TATAAAATTA GGTAGTA-AA GGAATTTCTG AAACCTAAAG AATTTGGCGG TATTTTAAAT AATTGGAGGA
Vizcaino viscainensis 3174 TAA--AA-TT TATAAAATTA GGTAGTA-AA GAAATTTCTG AAACCTAAAG AATTTGGCGG TATTTTAAAT AATTGGAGGA
Vizcaino viscainensis 8809 TAA--AA-TT TATAAAATTA GGTAGTA-AA GAAATTTCTG AAACCTAAAG AATTTGGCGG TATTTTAAAT AATTGGAGGA
90 100 110 120 130 140 150 160
Franckeus kochi 5363 ACCTGTTATG TAATTGACAA TCCGCAACA- TATCTTACCT AAATTTTATT TGTATATCGT CGTTTTT--G ATTATATTTA
Pseudouroctonus glimmei 2688 ACCTGTTATT TAATTGATAT TCCACAACA- TATCTTATCT AAATTTTGTT TGTATATCGT TGTTCAT--G ATGATATTTT
Serradigitus minutis 1674 ACCTGTTATT TGATTGACAA TCCACAACA- AATCTTACCT AAATTTTATT TGTATACCGT CG-TTTT--G ATAATATTTA
Serradigitus sp. 6370 ACCTGTTATA TAATTGACAA TCCACAACA- TATCTAACCT AAATTTTGTT TGTATATCGT CG-TTTT--G ATAATATTTA
Smeringurus grandis 8690 ACCTGTTATA TAATTGATAA CCCACAACA- TATCTTACCA AATTACAGTT TGTATACCAT CG-TTAAAAG ACAATATTTA
Stahnkeus deserticola 5032 ACCTGTTATA TAATTGACAA TCCACAACA- TATCTTACCT AAATTTTATT TGTATATCGT CG-TTTT--G ATAATATTTA
Uroctonites giulianii 3204 ACCTATTATG TAATTGATAA TCCACAACA- TATCTTTCCT AAATTTTGTT TGTATATCGT TG-TTTTAAG ATAATATTTA
Vaejovis carolinianus 1576 ACCTGTTATA TAATTGACAA TCCACAACA- TATCTTACCT AAATTTTATT TGTATATCGT CGTTTTT--G ATTATATTTA
Vaejovis intermedius 2141A ACCTGTTATA TAATTGACAA TCCACAACA- TATCTTACCT AAATTTTATT TGTATATCGT CGTTTTT--G ATTATATTTA
Vaejovis lapidicola 1814 ACCTGTTATT AAATTGACAT TTCACAAAA- TATCTCACCT AAATTTTATT TGTATATCGT TG-TTTG--T GACATTATCT
Vaejovis mexicanus 1825 ACCTGTTATT TAATTGATAC TACACATTT- AATTTCTCCT AAAATTTGTT TGTATATCGT TG-TTTTCAG ATAATATTAA
Vaejovis pequeno 6308 ACCTGTTATA TAATTGACAA TCCACAGCA- TATCTTACCT AAATTTTATT TGTATATCGT CG-TTTT--G ATAATATTTA
Vaejovis rossmani 2027 ACCTGTTATA TAATTGACAA TACACAACA- TATCTTTCCT AATTTTTGTT TGTATATCGT TG-TTTTTAG ATAATATTTA
Vaejovis sp. 3711 ACCTGTTATT TAATTGACAT TACACATTT- AATTTTTCCC AAAATTTGTT TGTATATCGT TG-TTTTCAG ATAATATTTT
Vaejovis sp. 5327 ACCTGTTATT TAATTGACAT TACACATTT- AATTTTTCCC AAAATTTGTT TGTATATCGT TG-TTTTCAG ATAATATTTT
Wernerius spicatus 8968 ACCTGTTATA TAATTGACAA CCCACATCA- AATCTTACCT AAATTTTATT TGTATATCGT CG-TTTT--G ATAATATTTA
Chihuahuanus bilineatus 5306 ACCTGTTATT TAATTGACAA CCCACAACA- TATCTTACCT AAATTTTATT TGTATATCGT CG-TTTT--G ATAATATTAA
Chihuahuanus bilineatus 6507 ACCTGTTATT TAATTGACAA CCCACAACG- TATCTTACCT AAATTTTATT TGTATATCGT CG-TTTT--G ATAATATTTA
Chihuahuanus bilineatus 6594 ACCTGTTATT TAATTGACAA CCCACAACA- TATCTCACCT AAATTTTATT TGTATATCGT CG-TTTT--G ATAATATTTA
Chihuahuanus cazieri 7163 ACCTGTTATT TAATTGACAA CCCGCAACA- AATCTTACCT AAATTTTATT TGTATATCGT CGTTTTT--G ATAATATTTC
Chihuahuanus cazieri 7179 ACCTGTTATT TAATTGACAA CCCACAACA- AATCTTACCT AAATTTTATT TGTATATCGT CGTTTTT--G ATAATATTTC
Chihuahuanus coahuilae 5353 ACCTGTTATT TAATTGACAA TCCACAACA- TATCTTACCT AAATTTTATT TGTATATCGT CG-TTTA--G ATAATACTTA
Chihuahuanus coahuilae 6600 ACCTGTTATT TAATTGACAA TCCACAGCA- TATCTTACCT AAATTTTATT TGTATATCGT CG-TTTA--G ATAATACTTA
Chihuahuanus coahuilae 7095 ACCTGTTATT TAATTGACAA TCCACAACG- TATCTAACCT AAATTTTATT TGTATATCGT CG-TTTA--G ATAATACTTA
Chihuahuanus crassimanus 2972 ACCTGTTATT TAGTTGACAA CCCACAACA- AATCTTACCT AAATTTTATT TGTATATCGT CGTTTTT--G ATAATGTTTA
Chihuahuanus crassimanus 5365 ACCTGTTATT TAATTGACAA CCCACAACA- AATCTTACCT AAATTTTATT TGTATATCGT CGTTTTT--G ATAATATTTA
Chihuahuanus crassimanus 7100 ACCTGTTATT TAATTGACAA CCCACAACA- AATCTTACCT AAATTTTATT TGTATATCGT CGTTTTT--G ATAATATTTA
Chihuahuanus glabrimanus 6558 ACCTGTTATT TAATTGACAA TCCACAACA- TATCTTTCCT AAATTTTGTT TGTATATCGT CG-TTTT--G ATAATATTTA
Chihuahuanus glabrimanus 6610 ACCTGTTATT TAATTGACAA CCCACAACA- CATCTTTCCT AAATTTTATT TGTATATCGC CG-TTTT--G GAAATATTTT

Chihuahuanus glabrimanus 6611 ACCTGTTATT TAATTGACAA CCCACAACA- CATCTTTCCT AAATTTTATT TGTATATCAT CG-TTTT--G ATAATATTTT
Chihuahuanus globosus 5281 ACCTGTTATT TAATTGACAA TCCACAACA- TATCTTTCCT AAATTTTATT TGTATATCGT CG-TTTT--G ATAATATTTA
Chihuahuanus globosus 6447 ACCTGTTATT TAATTGACAA TCCACAACA- TATCTCACCT AAATTTTATT TGTATATCGT CG-TTTT--G ATAATATTTA
Chihuahuanus globosus 6459 ACCTGTTATT TAATTGACAA TCCACAACA- TATCTTTCCT AAATTTTATT TGTATATCGT CG-TTTT--G ATAATATTTA
Chihuahuanus globosus 8926 ACCTGTTATT TAATTGACAA TCCACAACG- TATCTTTCCT AAATTTTATT TGTATATCGT CG-TTTT--G ATAATATTTA
Chihuahuanus kovariki 5299 ACCTGTTATT TAATTGACAA TCCACAACA- TATCTTTCCT AAATTTTATT TGTATATCGT CG-TTTT--G ATAATATTTA
Chihuahuanus kovariki 5305 ACCTGTTATT TAATTGACAG TCCACAACA- CATCTTTCCT AAATTTTATT TGTATATCGT CG-TTTT--G ATAATATTTA
Chihuahuanus russelli 2971 ACCTGTTATT TAATTGACAC TCCACAACA- TATCTTACCT AGATTTTATT TGTATATCGT CG-TTTT--G ATAATACTTA
Chihuahuanus russelli 7017 ACCTGTTATT TAATTGACAA TCCGCAGCA- TATCTTACCT AAATTTTATT TGTATATCGT CG-TTTT--G ATAATACTTA
Chihuahuanus russelli 7266 ACCTGTTATT TAATTGACAA TCCACAACA- TATCTTACCT AGATTTTATT TGTATATCGT CG-TTTT--G ATAATACTTA
Kochius barbatus 8803 ACCTGTTATT TAATTGACAA TCCACATCA- CATCTTTCCT AAATTTTATT TGTATATCGT CG-TTAT--G ATAATATTTA
Kochius bruneus 3153 ACCTGTTATT TAATTGACAA TCCACATCA- CATCTTTCCT AAATTTTATT TGTATATCGT CG-TTAT--G ATAATATTTA
Kochius bruneus 3154 ACCTGTTATT TAATTGACAA TCCACATCA- CATCTTTCCT AAATTTTATT TGTATATCGT CG-TTAT--G ATAATATTTA
Kochius bruneus 4555 ACCTGTTATT TAATTGACAA TCCCCATCA- CATCTTTCCT AAATTTTATT TGTATATCGT CG-TTAT--G ATAATATTTA
Kochius cerralvensis 8779 ACCTGTTATT TAATTGACAA TCCACATCA- CATCTTTCCT AAATTTTATT TGTATATCGT CG-TTAT--G ATAATATTTT
Kochius hirsuticauda 5049 ACCTGTTATT TAATTGACAA TCCACATCA- TATCTTTCCT AAATTTTATT TGTATATCGT CG-TTAG--G ATAATATTGA
Kochius hirsuticauda 7199 ACCTGTTATT TAATTGACAA CCCACATCA- TATCTTTCCT AAATTTTATT TGTATATCGT CG-TTAG--G ATAATATTGA
Kochius hirsuticauda 8819 ACCTGTTATT TAATTGACAA TCCACATCA- TATCTTTCCT AAATTTTATT TGTATATCGT CG-TTGG--G ATAATATTGA
Kochius insularis 8801 ACCTGTTATT TAATTGACAA TCCACATCA- AATCTTTCCT AAATTTTATT TGTATATCGT CG-TTAT--G ATAATATTTA
Kochius loretoensis 4554 ACCTGTTATT TAATTGACAA CCCACATCA- GATCTTTCCT AAATTTTATT TGTATATCGT CG-TTAT--G ATAATATTTA
Kochius magdalensis 3155 ACCTGTTATT TAATTGACAA CCCACATCA- AATCTTTCCT AAATTTTATT TGTATATCGT CG-TTAT--G ATAATATTTA
Kochius magdalensis 4552 ACCTGTTATT TAATTGACAA CCCACATCA- AATCTTTCCT AAATTTTATT TGTATATCGT CG-TTAT--G ATAATATTTA
Kochius magdalensis 8796 ACCTGTTATT TAATTGACAA CCCACATCA- AATCTTTCCT AAATTTTATT TGTATATCGT CG-TTAT--G ATAATATTTA
Kochius punctipalpi 1679 ACCTGTTATT TAATTGACAA CCCACATCA- TATCTTTCCT AAATTTTATT TGTATATCGT CG-TTAA--G ATAATATTTA
Kochius punctipalpi 3157 ACCTGTTATT TAATTGACAA CCCACATCA- TATCTTTCCT AAATTTTATT TGTATATCGT CG-TTAA--G ATAATATTTA
Kochius punctipalpi 8843 ACCTGTTATT TAATTGACAA CCCACATCA- TATCTTCCCT AAATTTTATT TGTATATCGT CG-TTAA--G ATAATATTTA
Kochius sonorae 6301 ACCTGTTATT TAATTGACAA TCCACATCA- TATCTTTCCT AGATTTTATT TGTATATCGT CG-TTTG--G ATAATATTTA
Kochius sonorae 6304 ACCTGTTATT TAATTGACAA TTCACATCA- TATCTTTCCT AGATTTTATT TGTATATCGT CG-TTTG--G ATAATATTTA
Kochius sonorae 9974 ACCTGTTATT TAATTGACAA TCCACATCA- TATCTTTCCT AGATTTTATT TGTATATCGT CG-TTTG--G ATAATATTTA
Kochius villosus 3477 ACCTGTTATT TAATTGACAA TCCACATCG- CATCTTTCCT AAATTTTATT TGTATATCGT CG-TTAT--G ATAATATTTA
Kochius villosus 4544 ACCTGTTATT TAATTGACAA TCCACATCAG CATCTTTCCT AAATTTTATT TGTATATCGT CG-TTAT--G ATAATATTTA
Konetontli acapulco 9520 ACCTGTTATT TAATTGACAC TCCACAACA- TATCTTTCCT AAATTTTATT TGTATATCGT CG-TTTT--G ATAATATTTA
Konetontli chamelaensis 7675 ACCTGTTATT TAATTGATAA TCCACAACA- TATCTTACCT AAATTTTATT TGTATATCGT CG-TCTT--G ACAATATTTA
Konetontli nayarit 4725 ACCTGTTATT TAATTGATAT TCCACAACA- TATCTCACCT AAATTTTATT TGTATATCGT CG-TTTT--G ATAATATTTA
Konetontli pattersoni 3149 ACCTGTTATT TAATTGACAT TCCACAACA- TATCTTACCT AAATTTTATT TGTATATCGT CG-TTTT--G ATAATATTCA
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Kuarapu purhepecha 9517 ACCTGTTATT TAATTGATAG TCCACAGCA- TATCTTTCCT AGATTTTATT TGTATATCAT CG-TTTT--G ATAATATTTA
Maaykuyak vittatus 3180 ACCTGTTATT TAATTGACAA TCCACAACA- TATCTTTCCT GAATTTTATT TGTATATCGT CG-TTTT--G ATAATATTTA
Maaykuyak vittatus 4442 ACCTGTTATT TAATTGACAA TCCACAACA- TATCTTTCCT AAATTTTATT TGTATATCGT CG-TTTT--G ATAATATTTA
Maaykuyak waueri 2973 ACCTGTTATT TAATTGACAA TCCACAACA- AATCTTTCCT AAATTTTATT TGTATATCGT CG-TTTT--G ATAATATTTA
Maaykuyak waueri 6544 ACCTGTTATT TAATTGACAA TCCACAACA- AATCTTTCCT AAATTTTATT TGTATATCGT CG-TTTT--G ATAATATTTA
Mesomexovis atenango 2023 ACCTGTTATT TAATTGACAA TCCACAACA- TATCTTTCCT AAATTTTATT TGTATATCGT CG-TTTT--G ATAATATTTA
Mesomexovis atenango 7058 ACCTGTTATT TAATTGACAA TCCACAACA- TATCTTTCCT AAATTTTATT TGTATATCGT CG-TTTT--G ATAATATTTA
Mesomexovis atenango 9982 ACCTGTTATT TAATTGACAA TCCACAACA- TATCTTTCCT AAATTTTATT TGTATATCGT CG-TTTT--G ATAATATTTA
Mesomexovis oaxaca 2031 ACCTGTTATT TAATTGACAA TCCACAACA- TATCTTTCCT AAATTTTATT TGTATATCGT CG-TTTT--G ATAATATTTA
Mesomexovis oaxaca 3718 ACCTGTTATT TAATTGACAA TCCACAACA- TATCTTCCCT AAATTTTATT TGTATATCGT CG-TTTT--G ATAATATTTA
Mesomexovis oaxaca 6602 ACCTGTTATT TAATTGACAA TCCACGACA- TATCTTCCCT AAATTTTATT TGTATATCGT CG-TTTT--G ATAATATTTA
Mesomexovis occidentalis 3118 ACCTGTTATT TAATTGACAA TCCACAACA- TATCTTTCCT AAATTTTATT TGTATATCGT CG-TTTT--G ATAATATTTA
Mesomexovis occidentalis 6559 ACCTGTTATT TAATTGACAA CCCACAACA- TATCTTTCCT AAGTTAAATT TGTATATCGT CG-TTTT--G ATAATATTTA
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Mesomexovis punctatus 2080 ACCTGTTATC TAATTGACAA TCCACAACA- TATCTTACCT AAATTTTATT TGTATATCGT CG-TTTT--G ATAATATTTA
Mesomexovis punctatus 2241 ACCTGTTATT AAATTGACAA TCCACAACA- TATCTTACCT AAATTTTATT TGTATATCGT CG-TTTC--G ATAATATTTA
Mesomexovis spadix 2950 ACCTGTTATT TAATTGACAA TCCACATCA- TATCTTTCCT AAATTTTATT TGTATATCGT CG-TTTT--G ATAATATTTA
Mesomexovis spadix 5280 ACCTGTTATT TAATTGACAA TCCACATCA- TATCTTTCCT AAATTTTATT TGTATATCGT CG-TTTT--G ATAATATTTA
Mesomexovis spadix 6373 ACCTGTTATT TAATTGACAA TCCACATCA- TATCTTTCCT AAATTTTATT TGTATATCGT CG-TTTT--G ATAATATTTA
Mesomexovis subcristatus 2049 ACCTGTTATT TAATTGACAA CCCACAACA- TATCTTACCT AAATTTTATT TGTATATCGT CG-TTTT--G ATAATATTTA
Mesomexovis subcristatus 2084 ACCTGTTATT TAATTGACAA CCCACAACA- TATCTCACCT AAATTTTATT TGTATATCGT CG-TTTT--G ATAATATTTA
Mesomexovis subcristatus 2086 ACCTGTTATT TAATTGACAA CCCACAACA- TATCTCACCT AAATTTTATT TGTATATCGT CG-TTTT--G ATAATATTTA
Mesomexovis variegatus 5185 ACCTGTTATT TAATTGACAA TCCACATCA- TATCTCTCCT AAATTTTATT TGTATATCGT CG-TTTT--G ATAATATTTA
Mesomexovis variegatus 6536 ACCTGTTATT TAATTGACAA TCCACAACA- TATCTTTCCT AAATTTTATT TGTATATCGT CG-TTTT--G ATAATATTTA
Mesomexovis variegatus 7068 ACCTGTTATT TAATTGACAA TCCACAACA- TATCTCTCCT AAATTTTATT TGTATATCGT CG-TTTT--G ATAATATTTA
Paravaejovis coloradensis 1688 ACCTGTTATT TAATTGACAA TCCACAACA- TATCTTACCT AGATTTTATT TGTATATCGT CG-TTTT--G ATAATATTTA
Paravaejovis coloradensis 3226 ACCTGTTATT TAATTGACAA TCCACAACA- TATCTTACCT AGATTTTATT TGTATATCGT CG-TTTT--G ATAATATTTA
Paravaejovis coloradensis 5029 ACCTGTTATT TAATTGACAA TCCACAACA- TATCTTACCT AGATTTTATT TGTATATCGT CG-TTTT--G ATAATATTTA
Paravaejovis confusus 4450 ACCTGTTATT TAATTGACAA TCCACAACA- TATCTTACCT AAATTTTATT TGTATATCGT CG-TTTT--G ATAATATTTA
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Paravaejovis confusus 8517 ACCTGTTATT TAATTGACAA TCCACAGCA- TATCTTACCT AAATTTTATT TGTATATCGT CG-TTTT--G ATAATATTTA
Paravaejovis diazi 3165 ACCTGTTATT TAATTGACAA CCCACAACA- CATCTTACCT AAATTTTATT TGTATATCGT CG-TTTT--G ATAATATTTA
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Paravaejovis diazi 3482 ACCTGTTATT TAATTGACAA CCCACAACA- CATCTTACCT AAATTTTATT TGTATATCGT CG-TTTT--G ATAATATTTT
Paravaejovis diazi 4436 ACCTGTTATT TAATTGACAA CCCACAACA- CATCTTACCT AAATTTTATT TGTATATCGT CG-TTTT--G ATAATATTTA
Paravaejovis diazi 8839 ACCTGTTATT TAATTGACAA CCCACAACA- CATCTTACCT AAATTTTATT TGTATATCGT CG-TTTT--G ATAATATTTA
Paravaejovis eusthenura 1689 ACCTGTTATT TAATTGATAA TCCACAATA- TATCTTACCT AAATTTTGTT TGTATATCGT CG-TTTC--G ATAATATTTA
Paravaejovis eusthenura 3168 ACCTATTATT TAATTGATAA TCCACAATA- TATCTTACCT AAATTTTGTT TGTATATCGT CG-TTTT--G AAAATATTTA
Paravaejovis eusthenura 4448 ACCTGTTATT TAATTGATAA TCCACAATA- TATCTTACCT AAATTTTGTT TGTATATCGT CG-TTTT--G ATAATATTTA
Paravaejovis gravicaudus 3163 ACCTGTTATT TAATTGACAA TCCACAACA- TATCTTACCT AAATTTTATT TGTATATCGT CG-TTTT--G ATAATATTTA
Paravaejovis gravicaudus 8783 ACCTGTTATT TAATTGACAA TCCACAACA- CATCTTACCT AAATTTTATT TGTATATCGT CG-TTTT--G ATAATATTTA
Paravaejovis gravicaudus 8793 ACCTGTTATT TAATTGACAA TCCACAACA- TATCTTACCT AAATTTTATT TGTATATCGT CG-TTTT--G ATAATATTTA
Paravaejovis hoffmanni 3166 ACCTGTTACT TAATTGACAA TCCACAACA- TATCTTGCCT AAATTTTATT TGTATATCGT CG-TTTT--G ATAATATTTA
Paravaejovis hoffmanni 5096 ACCTGTTACT TAATTGACAA CCCACAACA- TATCTTACCT AAATTTTATT TGTATATCGT CG-TTTT--G ATAATATTTA
Paravaejovis hoffmanni 8797 ACCTGTTACT TAATTGACAA CCCACAACA- CATCTTACCT AAATTTTATT TGTATATCGT CG-TTTT--G ATAATATTTG
Paravaejovis hoffmanni 8812 ACCTGTTACT TAATTGACAA TCCACAACA- TATCTTGCCT AAATTTTATT TGTATATCGT CG-TTTT--G ATAATATTTA
Paravaejovis pumilis 3137 ACCTATTATT TAATTGATAA TCCACAACA- TATCTTACCT AGATTTTATT TGTATATCGT CG-TTTT--G ATAATATTAA
Paravaejovis pumilis 3476 ACCTGTTATT TAATTGATAA TCCACAATA- TATCTTACCT AGATTTTATT TGTATATCGT CG-TTTT--G ATAATATTAA
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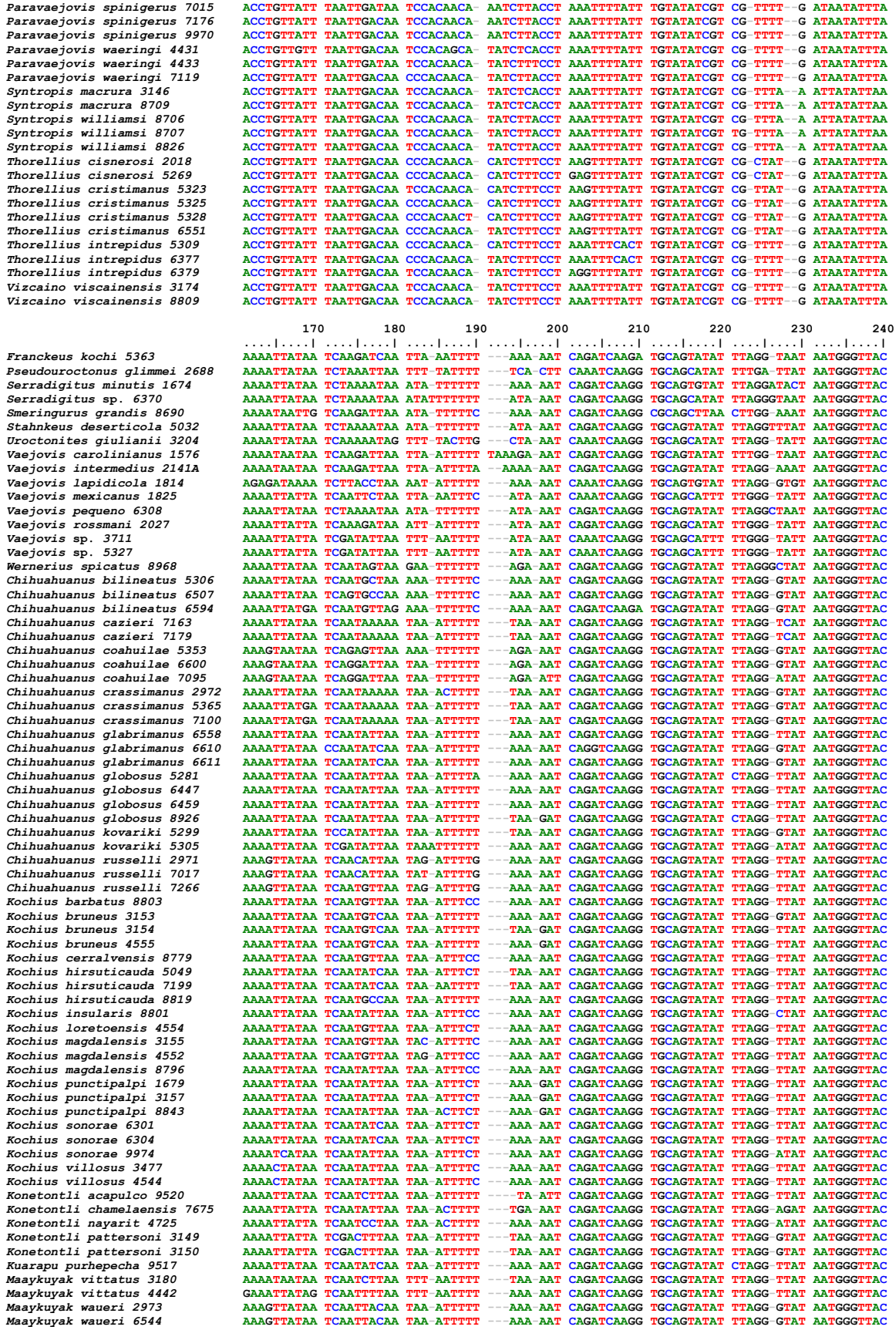
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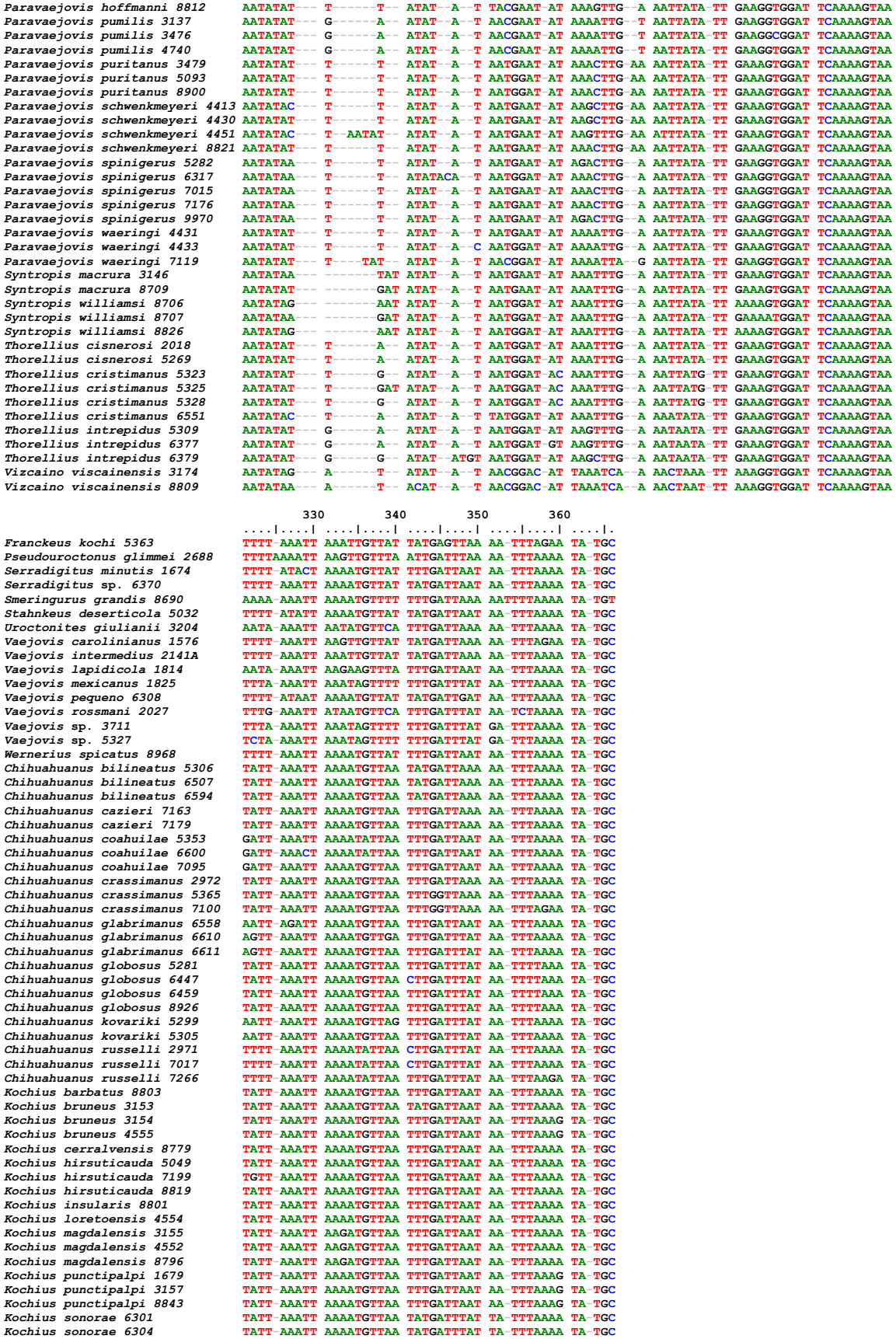
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Paravaejovis waeringi 4431
Paravaejovis waeringi 4433
Paravaejovis waeringi 7119
Syntropis macrura 3146
Syntropis macrura 8709
Syntropis williamsi 8706
Syntropis williamsi 8707
Syntropis williamsi 8826
Thorellius cisnerosi 2018
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Thorellius cristimanus 5323
Thorellius cristimanus 5325
Thorellius cristimanus 5328
Thorellius cristimanus 6551
Thorellius intrepidus 5309
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Vizcaino viscainensis 3174
Vizcaino viscainensis 8809
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Pseudouroctonus glimmei 2688
Serradigitus minutis 1674
Serradigitus sp. 6370
Smeringurus grandis 8690
Stahnkeus deserticola 5032
Uroctonites giulianii 3204
Vaejovis carolinianus 1576
Vaejovis intermedius 2141A
Vaejovis lapidicola 1814
Vaejovis mexicanus 1825
Vaejovis pequeno 6308
Vaejovis rossmani 2027
Vaejovis sp. 3711
Vaejovis sp. 5327
Wernerius spicatus 8968
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Chihuahuanus bilineatus 6507
Chihuahuanus bilineatus 6594
Chihuahuanus cazieri 7163
Chihuahuanus cazieri 7179
Chihuahuanus coahuilae 5353
Chihuahuanus coahuilae 6600
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Chihuahuanus glabrimanus 6558
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Chihuahuanus glabrimanus 6611
Chihuahuanus globosus 5281
Chihuahuanus globosus 6447
Chihuahuanus globosus 6459
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Chihuahuanus kovariki 5305
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Chihuahuanus russelli 7017
Chihuahuanus russelli 7266
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Kochius bruneus 3153
Kochius bruneus 3154
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Kochius hirsuticauda 8819
Kochius insularis 8801
Kochius loretoensis 4554
Kochius magdalensis 3155
Kochius magdalensis 4552
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Kochius punctipalpi 1679
Kochius punctipalpi 3157
Kochius punctipalpi 8843
Kochius sonorae 6301
Kochius sonorae 6304

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Paravaejovis spinigerus 5282      AATT-AAATT AAAAAGTTAA TTTGATTAAT AA-TTTAAAA TA-TGC
Paravaejovis spinigerus 6317      AATT-AAATT AAAAAGTTAA TTTGATTAAT AA-TTTAAAA TA-TGC
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Thorellius intrepidus 6377        TATT-AAATT AAAATGTTAA TTTGATTAAT AA-TTTAAAA TA-TGC
Thorellius intrepidus 6379        TATT-AAATT AAAATGTTAA TTTGATTAAT AA-TTTAAAA TA-TGC
Vizcaino viscainensis 3174        AGTT-AAATT AAAATGTTAA CTTGATTTAT AA-TTTAAAA TA-TGC
Vizcaino viscainensis 8809        AGTT-AAATT AAAATGTTAA TTTGATTTAT AA-TTTAAAA TA-TGC
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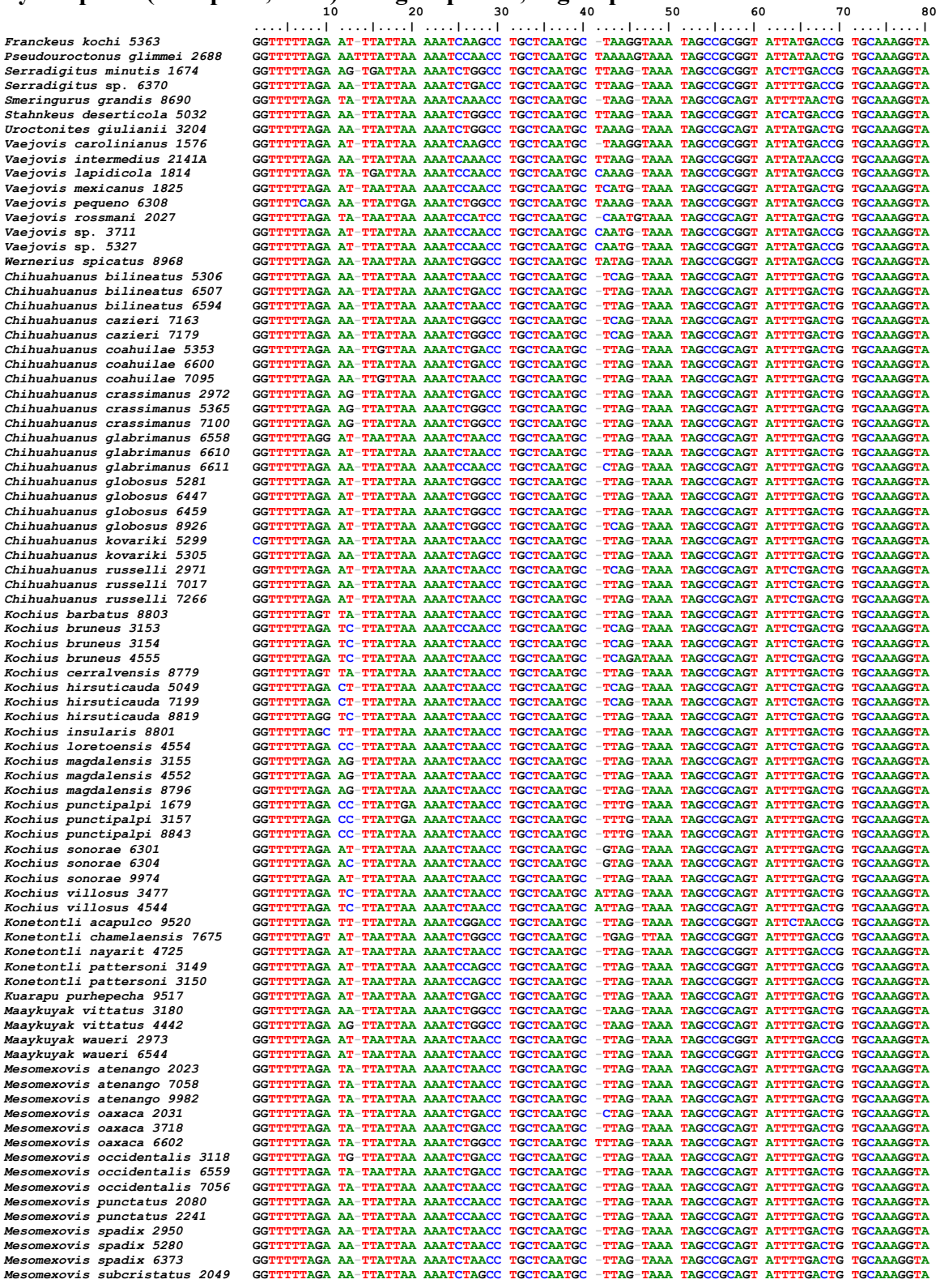
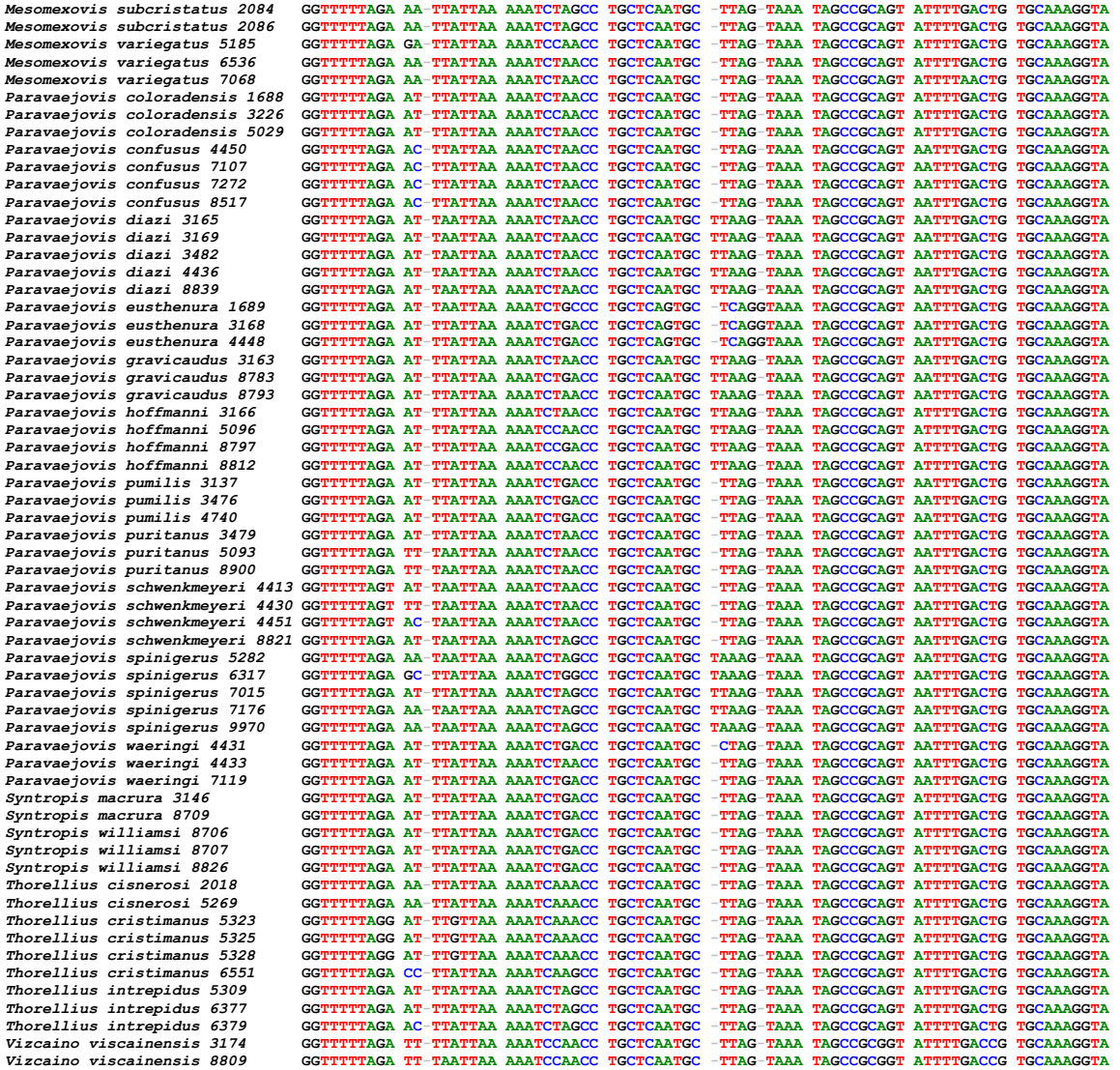
Appendix 7

Alignment of the rDNA 16S genomic partition for cladistic analysis of the subfamily Syntropinae (Kraepelin, 1905). Outgroup 1–16, Ingroup 17–146.

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Mesomexovis variegatus 6536 GGTTTTTAGA AA-TTATTAA AAATCTAACC TGCTCAATGC -TTAG-TAAA TAGCCGCAGT ATTTTGACTG TGCAAAGGTA
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Paravaejovis coloradensis 5029 GGTTTTTAGA AT-TTATTAA AAATCTAACC TGCTCAATGC -TTAG-TAAA TAGCCGCAGT ATTTTGACTG TGCAAAGGTA
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Paravaejovis confusus 7107 GGTTTTTAGA AC-TTATTAA AAATCTAACC TGCTCAATGC -TTAG-TAAA TAGCCGCAGT AATTTGACTG TGCAAAGGTA
Paravaejovis confusus 7272 GGTTTTTAGA AC-TTATTAA AAATCTAACC TGCTCAATGC -TTAG-TAAA TAGCCGCAGT AATTTGACTG TGCAAAGGTA
Paravaejovis confusus 8517 GGTTTTTAGA AC-TTATTAA AAATCTAACC TGCTCAATGC -TTAG-TAAA TAGCCGCAGT AATTTGACTG TGCAAAGGTA
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Paravaejovis gravicaudus 8783 GGTTTTTAGA AT-TTATTAA AAATCTGACC TGCTCAATGC TTAAG-TAAA TAGCCGCAGT AATTTGACTG TGCAAAGGTA
Paravaejovis gravicaudus 8793 GGTTTTTAGA AT-TTATTAA AAATCTAACC TGCTCAATGC TAAAG-TAAA TAGCCGCAGT AATTTGACTG TGCAAAGGTA
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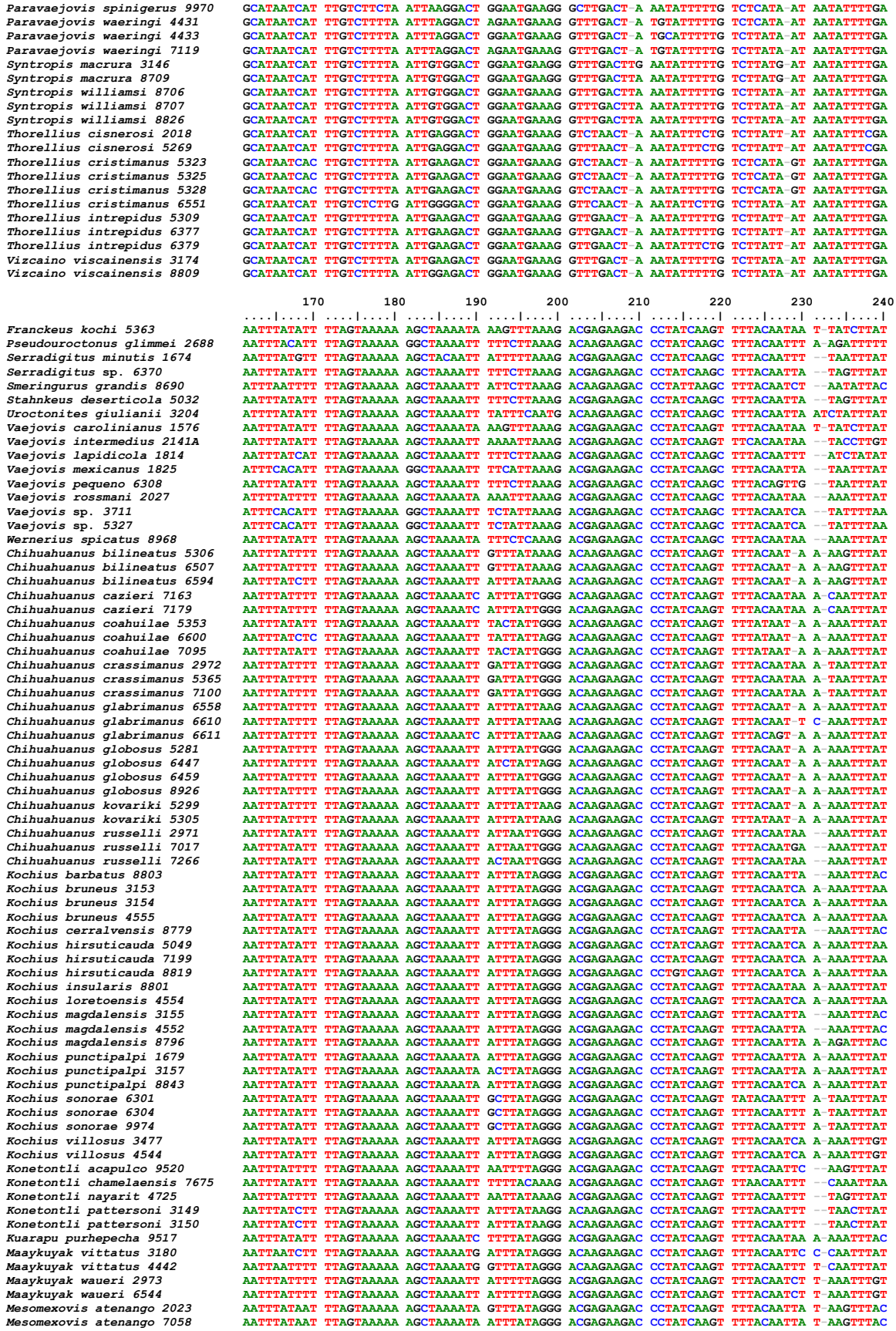
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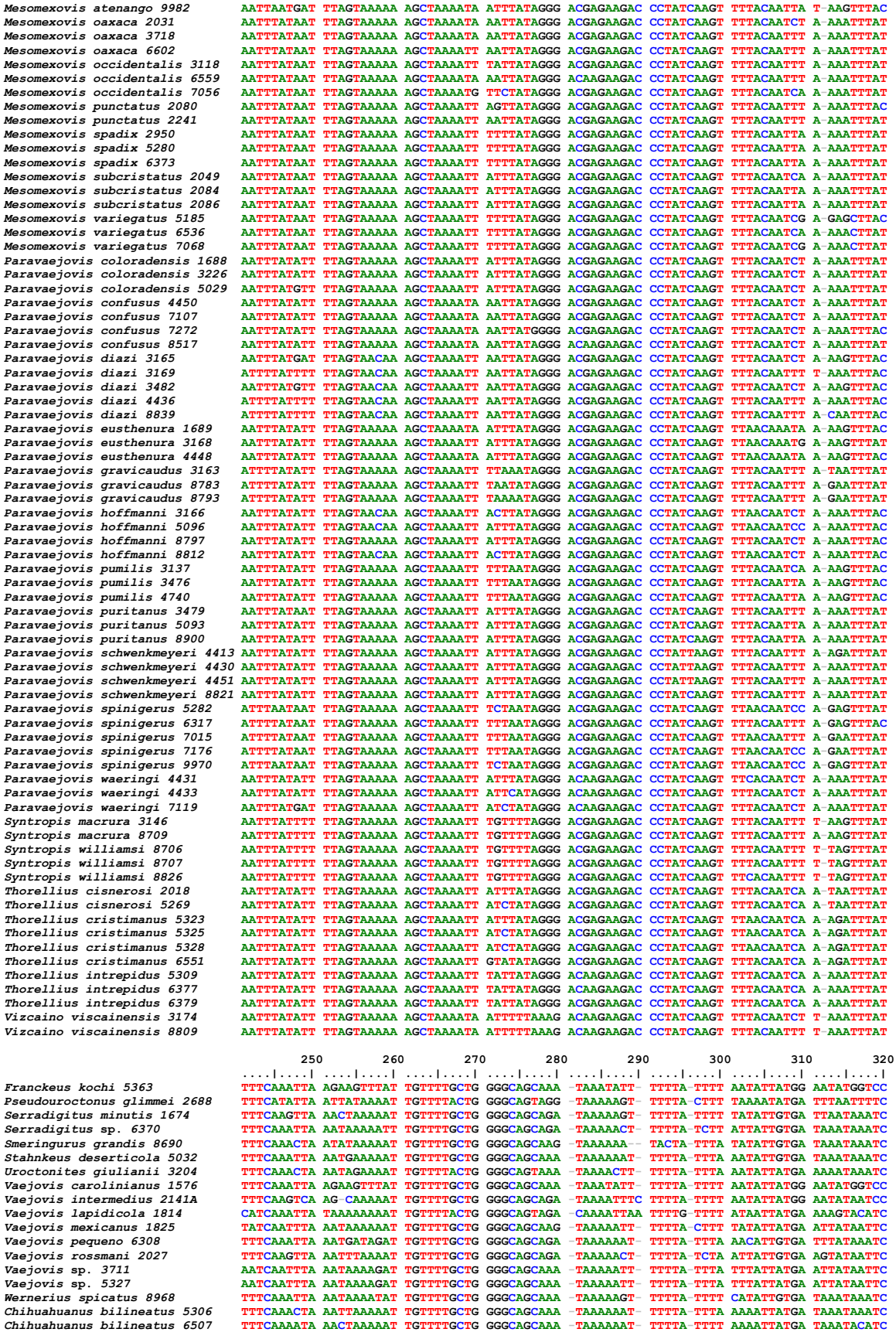
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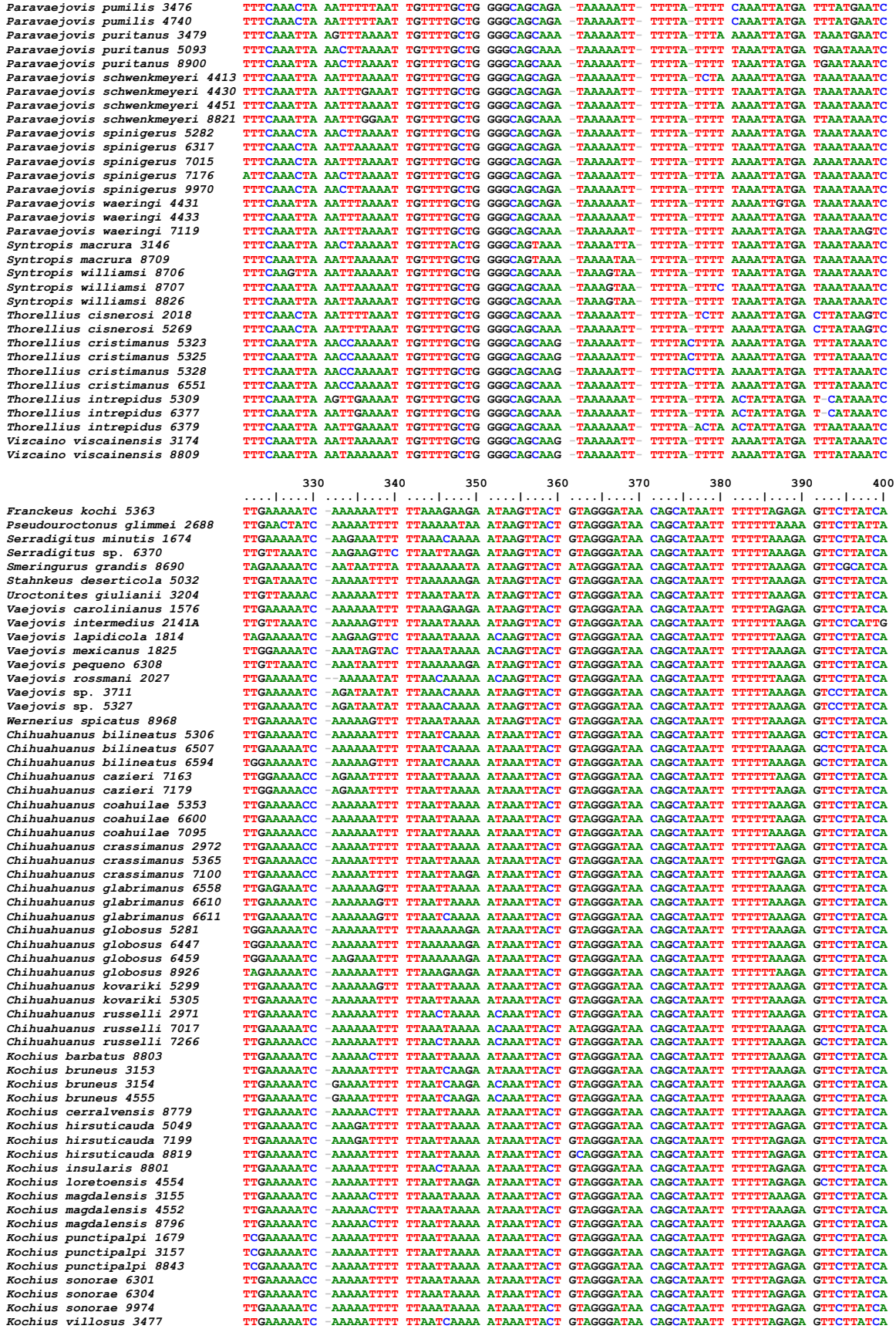
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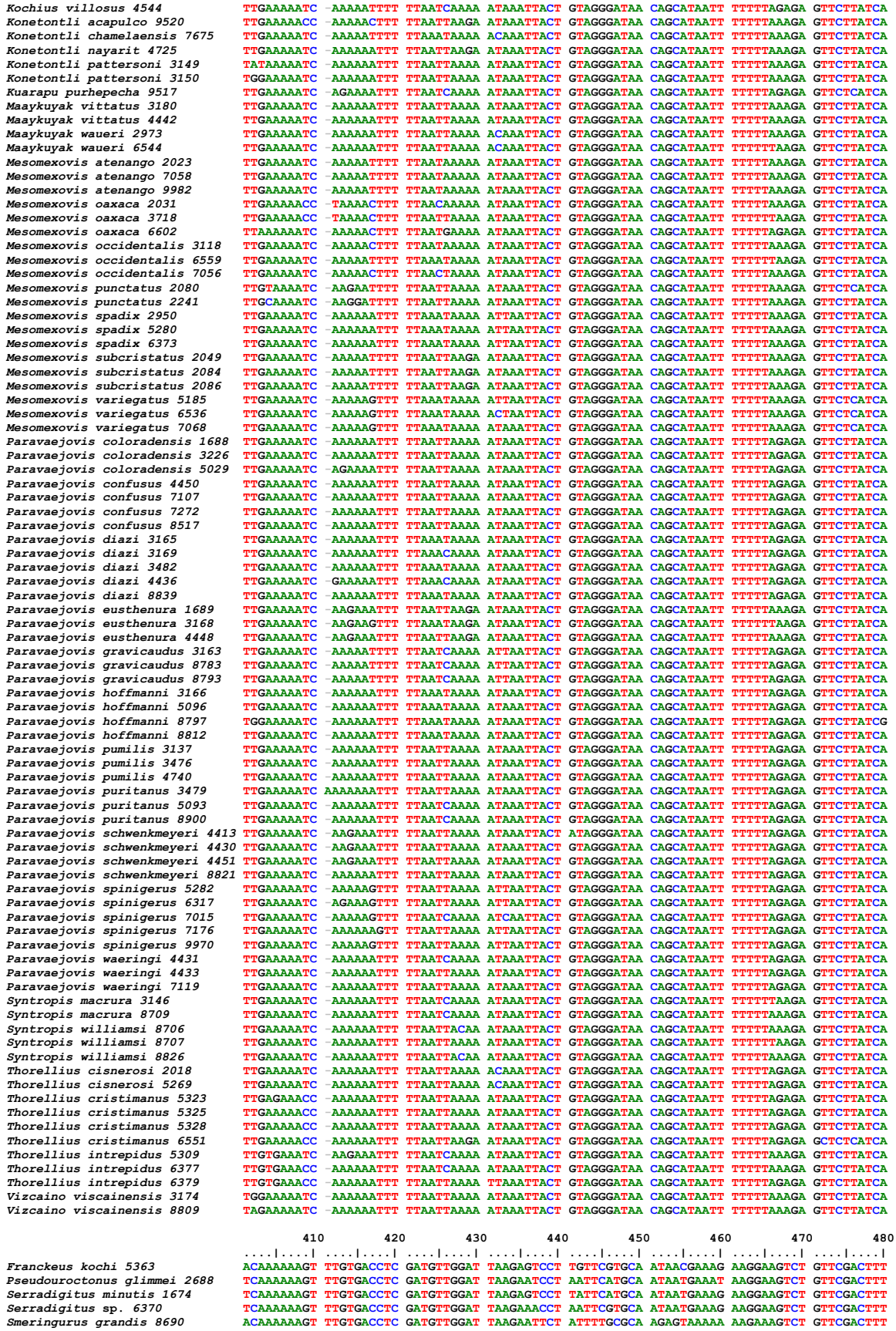
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Paravaejovis waeringi 7119
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Syntropis macrura 8709
Syntropis williamsi 8706
Syntropis williamsi 8707
Syntropis williamsi 8826
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Serradigitus minutis 1674
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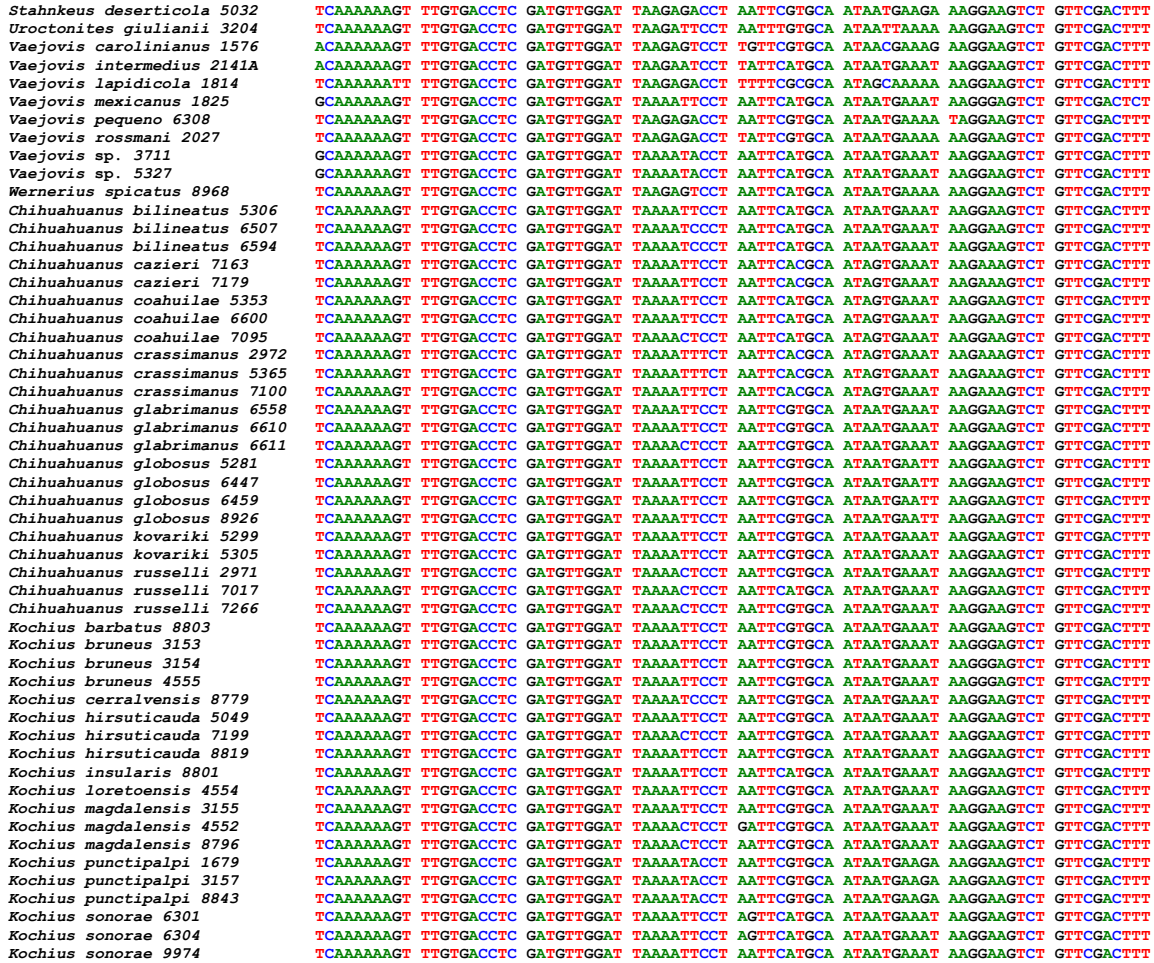
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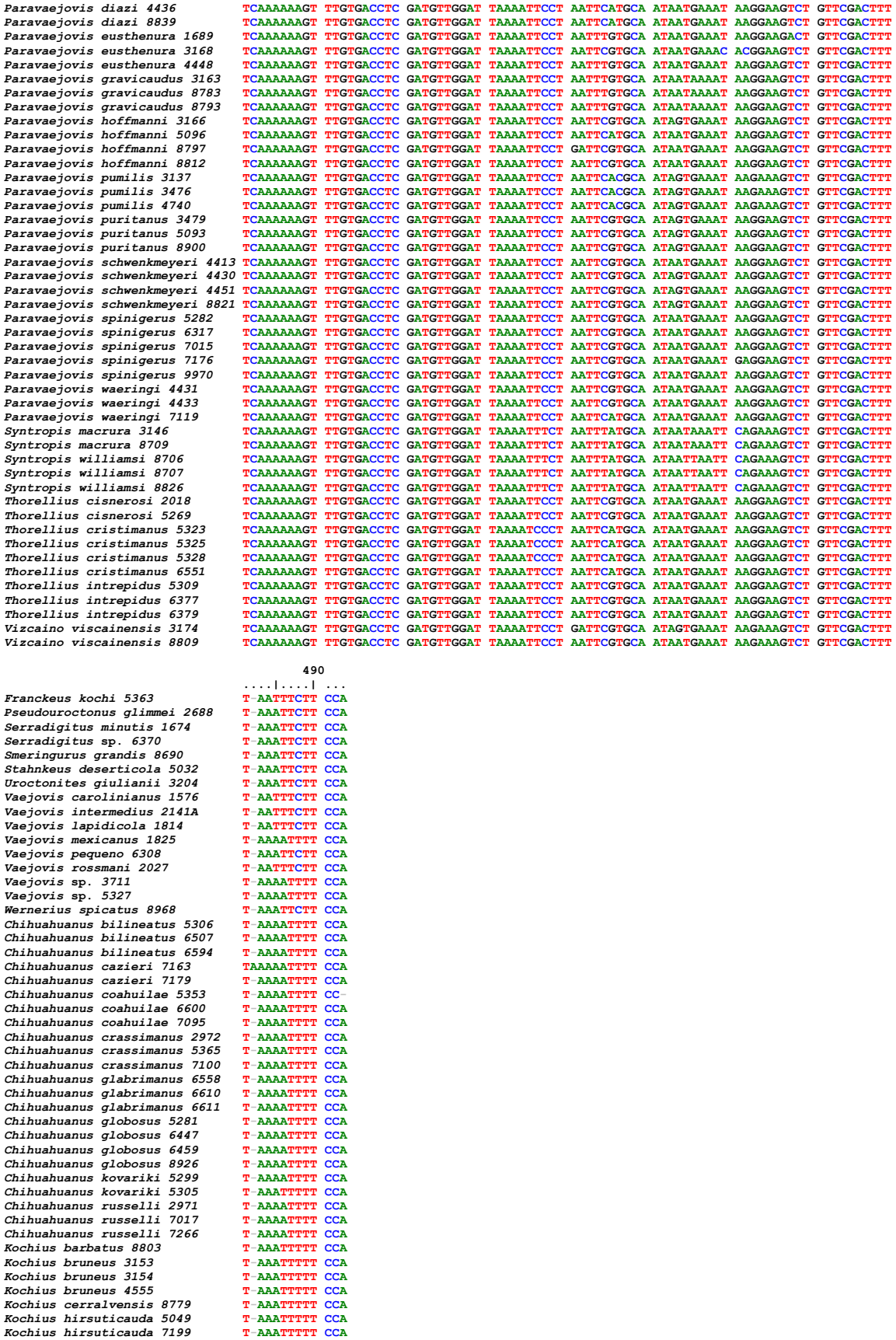
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Smeringurus grandis 8690 T-AAATTCTT CCA
Stahnkeus deserticola 5032 T-AAATTCTT CCA
Uroctonites giulianii 3204 T-AAATTCTT CCA
Vaejovis carolinianus 1576 T-AATTTCTT CCA
Vaejovis intermedius 2141A T-AATTTCTT CCA
Vaejovis lapidicola 1814 T-AATTTCTT CCA
Vaejovis mexicanus 1825 T-AAAATTTT CCA
Vaejovis pequeno 6308 T-AAATTCTT CCA
Vaejovis rossmani 2027 T-AATTTCTT CCA
Vaejovis sp. 3711 T-AAAATTTT CCA
Vaejovis sp. 5327 T-AAAATTTT CCA
Wernerius spicatus 8968 T-AAATTCTT CCA
Chihuahuanus bilineatus 5306 T-AAAATTTT CCA
Chihuahuanus bilineatus 6507 T-AAAATTTT CCA
Chihuahuanus bilineatus 6594 T-AAAATTTT CCA
Chihuahuanus cazieri 7163 TAAAATTTT CCA
Chihuahuanus cazieri 7179 T-AAAATTTT CCA
Chihuahuanus coahuilae 5353 T-AAAATTTT CC-
Chihuahuanus coahuilae 6600 T-AAAATTTT CCA
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Chihuahuanus crassimanus 2972 T-AAAATTTT CCA
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Chihuahuanus globosus 8926 T-AAAATTTT CCA
Chihuahuanus kovariki 5299 T-AAAATTTT CCA
Chihuahuanus kovariki 5305 T-AAATTTTT CCA
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Chihuahuanus russelli 7017 T-AAAATTTT CCA
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Kochius bruneus 3154 T-AAATTTTT CCA
Kochius bruneus 4555 T-AAATTTTT CCA
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Kochius hirsuticauda 7199 T-AAATTTTT CCA

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Kochius loretoensis 4554        T-AAATTTTT CCA
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Kochius punctipalpi 8843        T-AAAATTTT CCA
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Kochius sonorae 6304            T-AAAATTTT CCA
Kochius sonorae 9974            T-AAAATTTT CCA
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Kochius villosus 4544           T-AAAATTTT CCA
Konetontli acapulco 9520        T-AAAATTTT CCA
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Konetontli nayarit 4725         T-AAATTTTT CCA
Konetontli pattersoni 3149      T-AAATTTTT CCA
Konetontli pattersoni 3150      T-AAATTTTT CCA
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Maaykuyak vittatus 3180         T-AAAATTTT CCA
Maaykuyak vittatus 4442         T-AAAATTTT CCA
Maaykuyak waueri 2973           T-AAACTTTT CCA
Maaykuyak waueri 6544           T-AAACTTTT CCA
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Mesomexovis spadix 6373         T-AAAATTTT CCA
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Paravaejovis schwenkmeyeri 4430 T-AAAATTTT CCA
Paravaejovis schwenkmeyeri 4451 T-TAAATTTT CCA
Paravaejovis schwenkmeyeri 8821 T-AAAATTTT CCA
Paravaejovis spinigerus 5282    T-AAAATTTT CCA
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Paravaejovis spinigerus 7015    T-AAAATTTT CCA
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Paravaejovis spinigerus 9970    T-AAAATTTT CCA
Paravaejovis waeringi 4431      T-AAAATTTT CCA
Paravaejovis waeringi 4433      T-AAAATTTT CCA
Paravaejovis waeringi 7119      T-AAAATTTT CCA
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Syntropis macrura 8709          T-AAATTTTT CCA
Syntropis williamsi 8706        T-AAATTTTT CCA
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Syntropis williamsi 8826        T-AAATTTTT CCA
Thorellius cisnerosi 2018       T-AAAATTTT CCA
Thorellius cisnerosi 5269       T-AAAATTTT CCA
Thorellius cristimanus 5323     T-AAAATTTT CCA
Thorellius cristimanus 5325     T-AAAATTTT CCA
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Thorellius cristimanus 6551     T-AAAATTTT CCA
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Thorellius intrepidus 6377      T-AAAATTTT CCA
Thorellius intrepidus 6379      T-AAAATTTT CCA
Vizcaino viscainensis 3174      T-AAATTTTT CCA
Vizcaino viscainensis 8809      T-AAAATTTT CCA
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Appendix 8

Alignment of the rDNA 18S genomic partition for cladistic analysis of the subfamily Syntropinae (Kraepelin, 1905). Outgroup 1–16, Ingroup 17–146.

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                                10        20        30        40        50        60        70        80
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Pseudouroctonus glimmei 2688    TCATATGCTT GTCTCAAAGA TTAAGCCATG CATGTCTAAG TACAAGCCAA AATAAGGTGA AACCGCGAAT GGCTCATTAA
Serradigitus minutis 1674       TCATATGCTT GTCTCAAAGA TTAAGCCATG CATGTCTAAG TACAAGCCAA AATAAGGTGA AACCGCGAAT GGCTCATTAA
Serradigitus sp. 6370           TCATATGCTT GTCTCAAAGA TTAAGCCATG CATGTCTAAG TACAAGCCAA AATAAGGTGA AACCGCGAAT GGCTCATTAA
Smeringurus grandis 8690        TCATATGCTT GTCTCAAAGA TTAAGCCATG CATGTCTAAG TACAAGCCGA AATAAGGTGA AACCGCGAAT GGCTCATTAA
Stahnkeus deserticola 5032      TCATATGCTT GTCTCAAAGA TTAAGCCATG CATGTCTAAG TACAAGCCGA AATAAGGTGA AACCGCGAAT GGCTCATTAA
Uroctonites giulianii 3204      TCATATGCTT GTCTCAAAGA TTAAGCCATG CATGTCTAAG TACAAGCCAA AATAAGGTGA AACCGCGAAT GGCTCATTAA
Vaejovis carolinianus 1576      TCATATGCTT GTCTCAAAGA TTAAGCCATG CATGTCTAAG TACAAGCCAA AATAAGGTGA AACCGCGAAT GGCTCATTAA
Vaejovis intermedius 2141A      TCATATGCTT GTCTCAAAGA TTAAGCCATG CATGTCTAAG TACAAGCCAA AATAAGGTGA AACCGCGAAT GGCTCATTAA
Vaejovis lapidicola 1814        TCATATGCTT GTCTCAAAGA TTAAGCCATG CATGTCTAAG TACAAGCCAA AATAAGGTGA AACCGCGAAT GGCTCATTAA
Vaejovis mexicanus 1825         TCATATGCTT GTCTCAAAGA TTAAGCCATG CATGTCTAAG TACAAGCCAA AATAAGGTGA AACCGCGAAT GGCTCATTAA
Vaejovis pequeno 6308           TCATATGCTT GTCTCAAAGA TTAAGCCATG CATGTCTAAG TACAAGCCAA AATAAGGTGA AACCGCGAAT GGCTCATTAA
Vaejovis rossmani 2027          TCATATGCTT GTCTCAAAGA TTAAGCCATG CATGTCTAAG TACAAGCCAA AATAAGGTGA AACCGCGAAT GGCTCATTAA
Vaejovis sp. 3711               TCATATGCTT GTCTCAAAGA TTAAGCCATG CATGTCTAAG TACAAGCCAA AATAAGGTGA AACCGCGAAT GGCTCATTAA
Vaejovis sp. 5327               TCATATGCTT GTCTCAAAGA TTAAGCCATG CATGTCTAAG TACAAGCCAA AATAAGGTGA AACCGCGAAT GGCTCATTAA
Wernerius spicatus 8968         TCATATGCTT GTCTCAAAGA TTAAGCCATG CATGTCTAAG TACAAGCCGA AATAAGGTGA AACCGCGAAT GGCTCATTAA
Chihuahuanus bilineatus 5306    TCATATGCTT GTCTCAAAGA TTAAGCCATG CATGTCTAAG TACAAGCCGA AATAAGGTGA AACCGCGAAT GGCTCATTAA
Chihuahuanus bilineatus 6507    TCATATGCTT GTCTCAAAGA TTAAGCCATG CATGTCTAAG TACAAGCCGA AATAAGGTGA AACCGCGAAT GGCTCATTAA
Chihuahuanus bilineatus 6594    TCATATGCTT GTCTCAAAGA TTAAGCCATG CATGTCTAAG TACAAGCCGA AATAAGGTGA AACCGCGAAT GGCTCATTAA
Chihuahuanus cazieri 7163       TCATATGCTT GTCTCAAAGA TTAAGCCATG CATGTCTAAG TACAAGCCAA AATAAGGTGA AACCGCGAAT GGCTCATTAA
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Chihuahuanus coahuilae 5353     TCATATGCTT GTCTCAAAGA TTAAGCCATG CATGTCTAAG TACAAGCCAA AATAAGGTGA AACCGCGAAT GGCTCATTAA
Chihuahuanus coahuilae 6600     TCATATGCTT GTCTCAAAGA TTAAGCCATG CATGTCTAAG TACAAGCCAA AATAAGGTGA AACCGCGAAT GGCTCATTAA
Chihuahuanus coahuilae 7095     TCATATGCTT GTCTCAAAGA TTAAGCCATG CATGTCTAAG TACAAGCCAA AATAAGGTGA AACCGCGAAT GGCTCATTAA
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Chihuahuanus crassimanus 5365   TCATATGCTT GTCTCAAAGA TTAAGCCATG CATGTCTAAG TACAAGCCAA AATAAGGTGA AACCGCGAAT GGCTCATTAA
Chihuahuanus crassimanus 7100   TCATATGCTT GTCTCAAAGA TTAAGCCATG CATGTCTAAG TACAAGCCAA AATAAGGTGA AACCGCGAAT GGCTCATTAA
Chihuahuanus glabrimanus 6558   TCATATGCTT GTCTCAAAGA TTAAGCCATG CATGTCTAAG TACAAGCCAA AATAAGGTGA AACCGCGAAT GGCTCATTAA
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Chihuahuanus globosus 6459      TCATATGCTT GTCTCAAAGA TTAAGCCATG CATGTCTAAG TACAAGCCAA AATAAGGTGA AACCGCGAAT GGCTCATTAA
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Kochius cerralvensis 8779       TCATATGCTT GTCTCAAAGA TTAAGCCATG CATGTCTAAG TACAAGCCAA AATAAGGTGA AACCGCGAAT GGCTCATTAA
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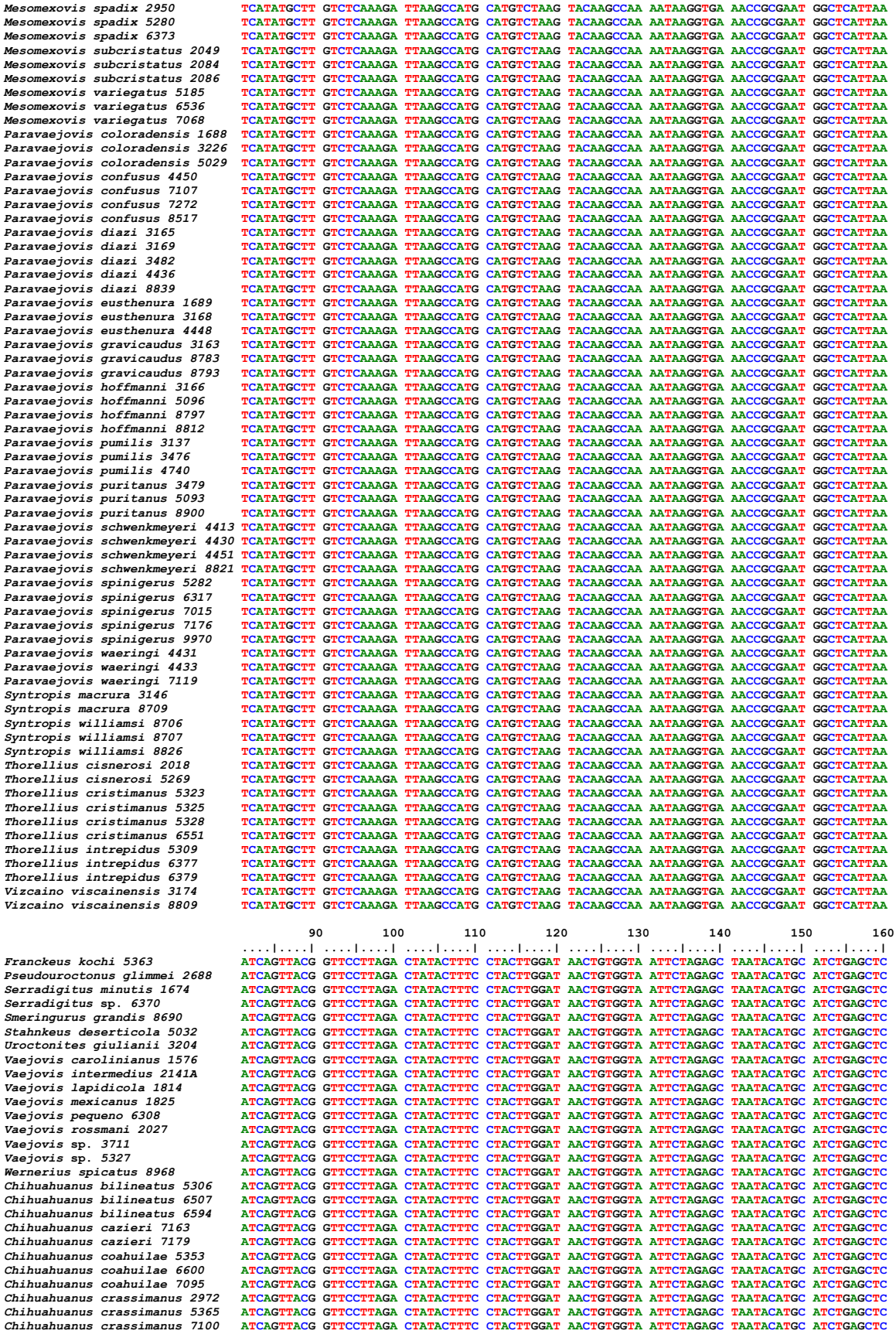
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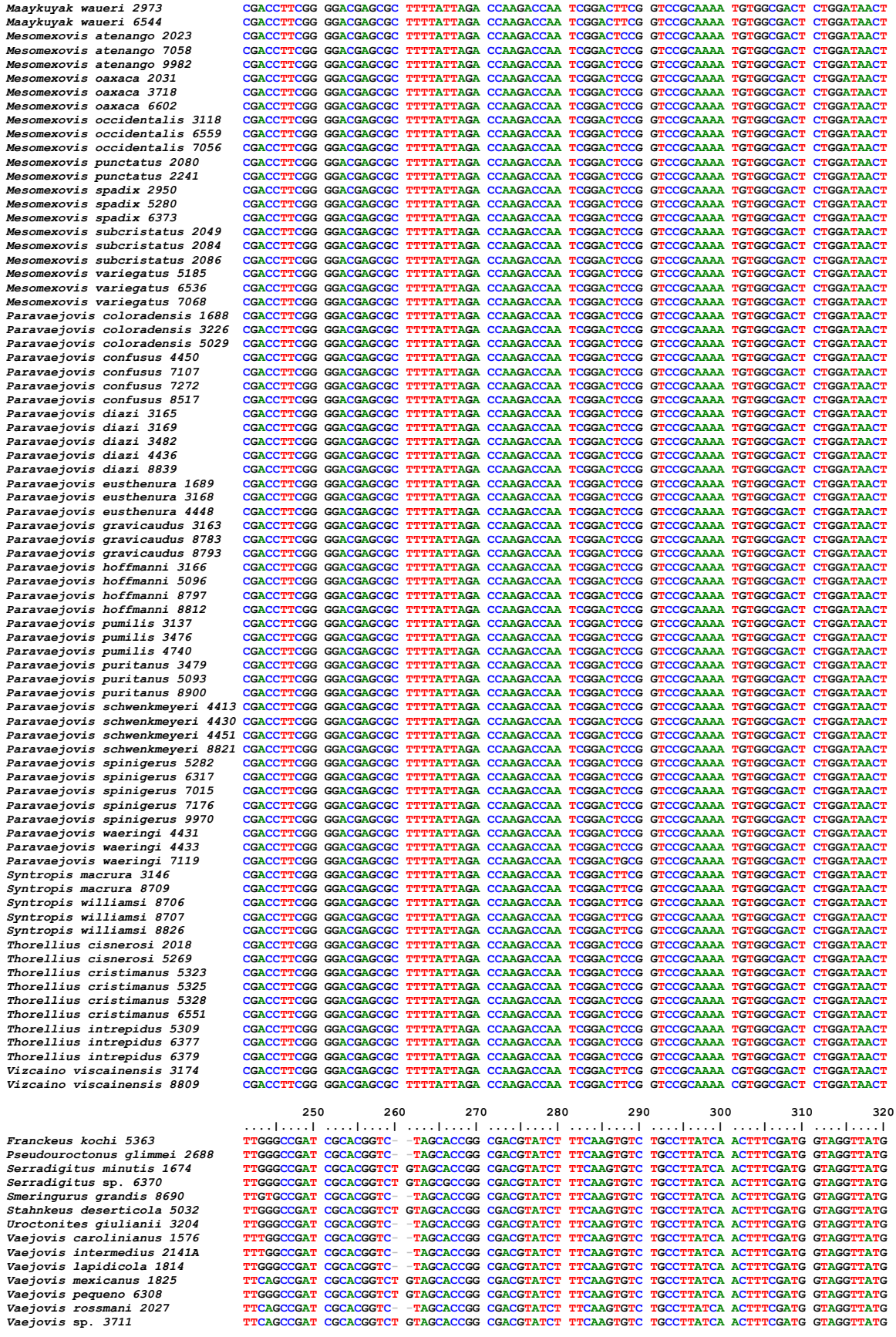
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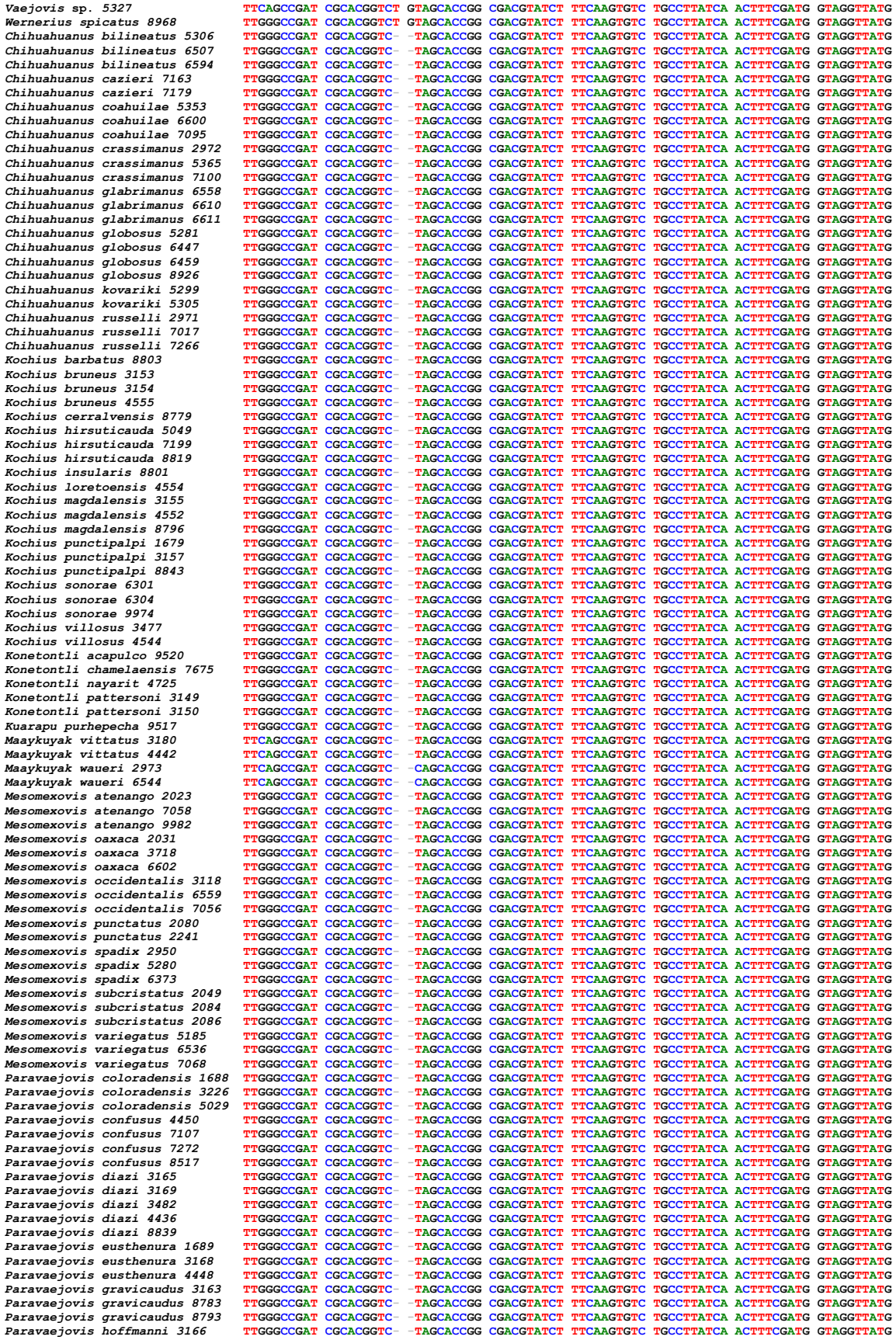
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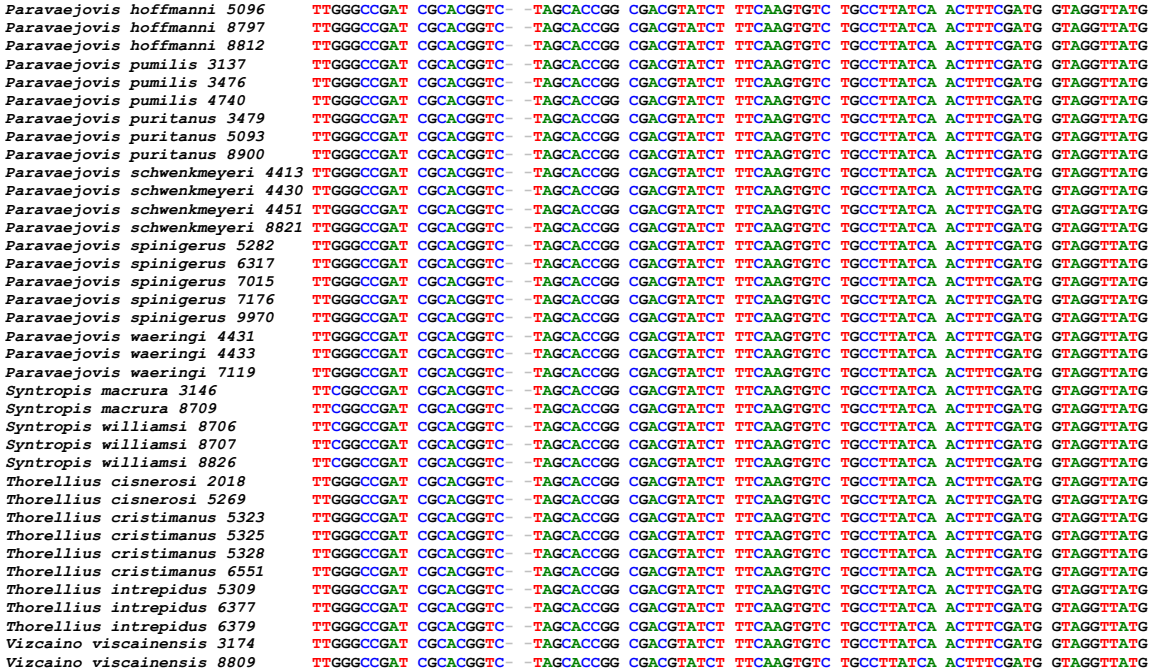
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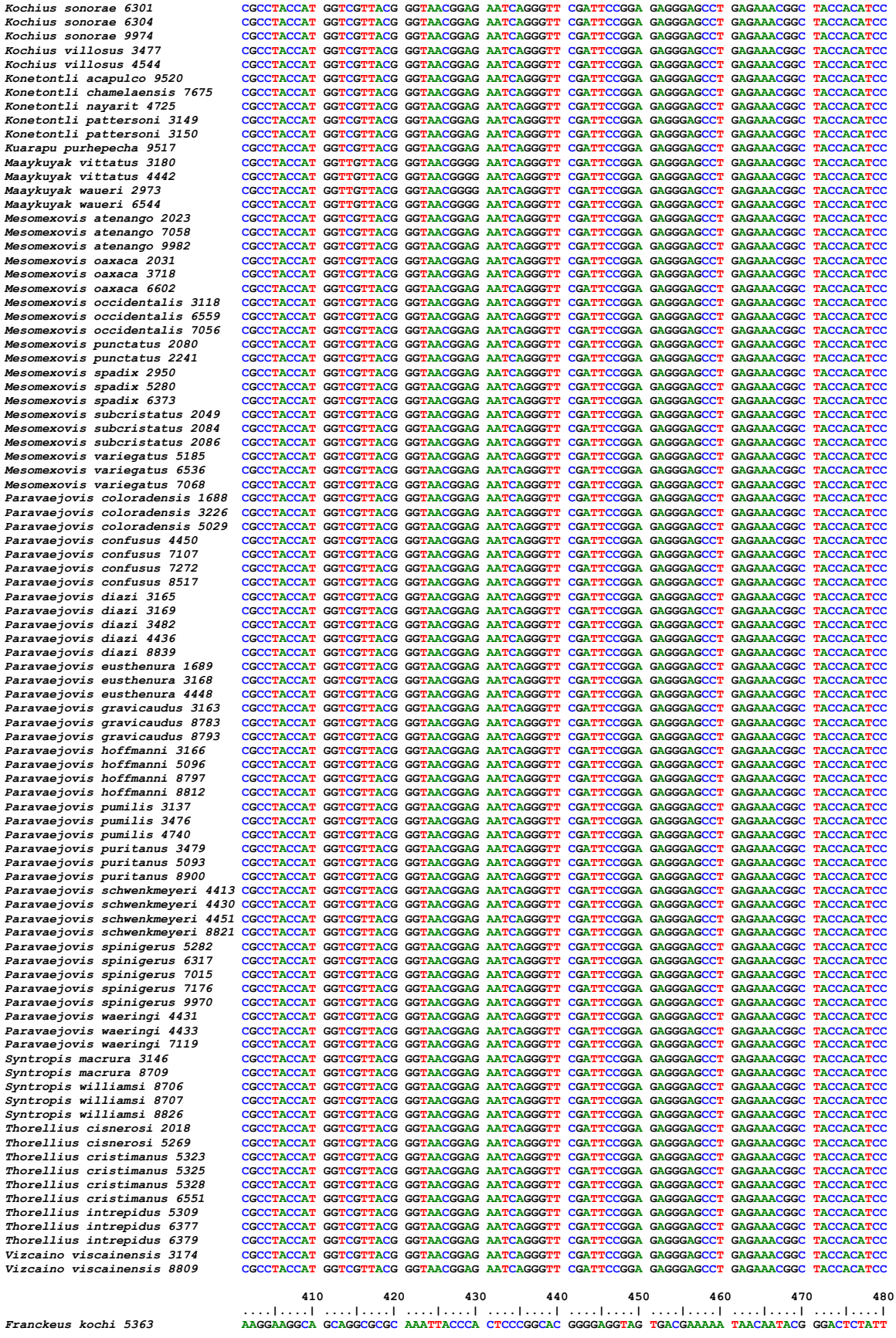
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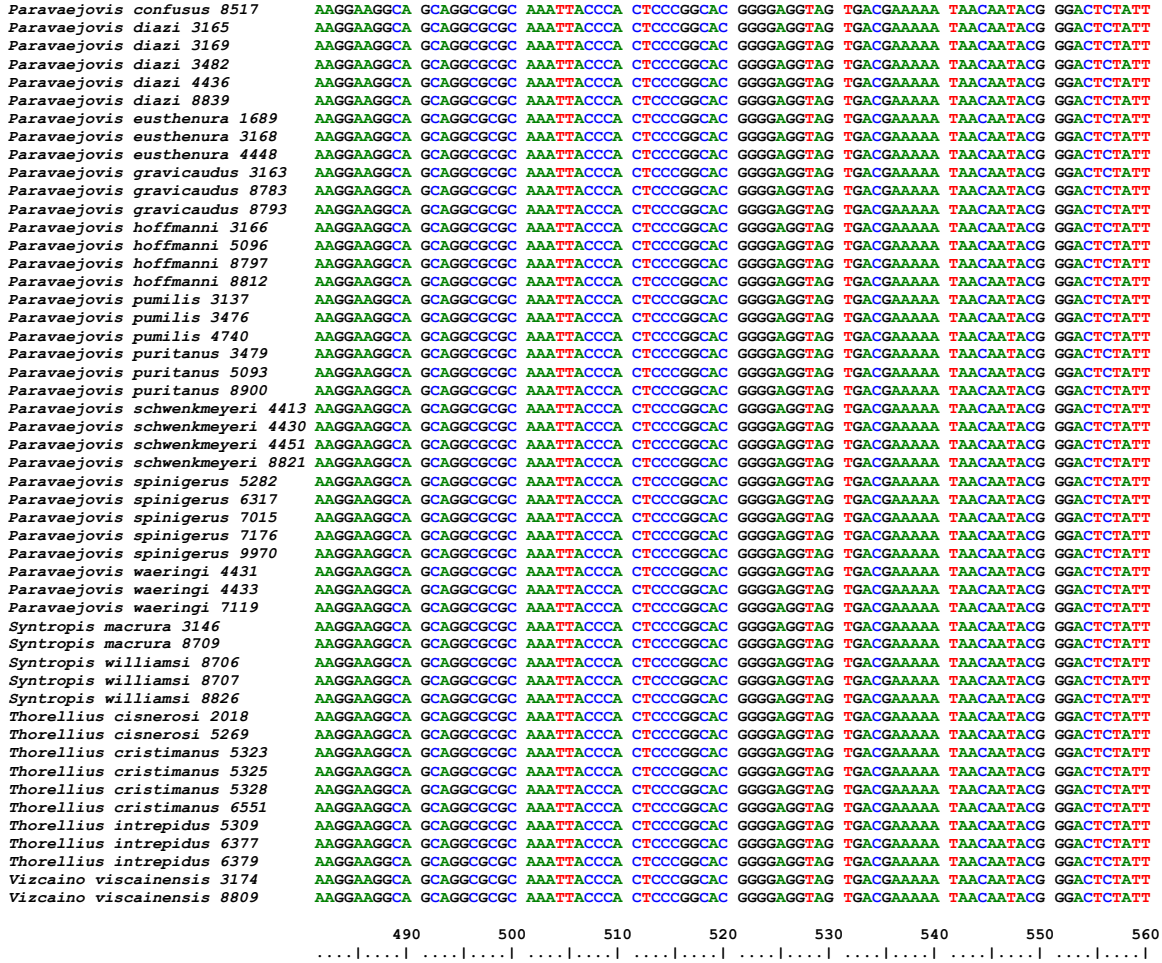
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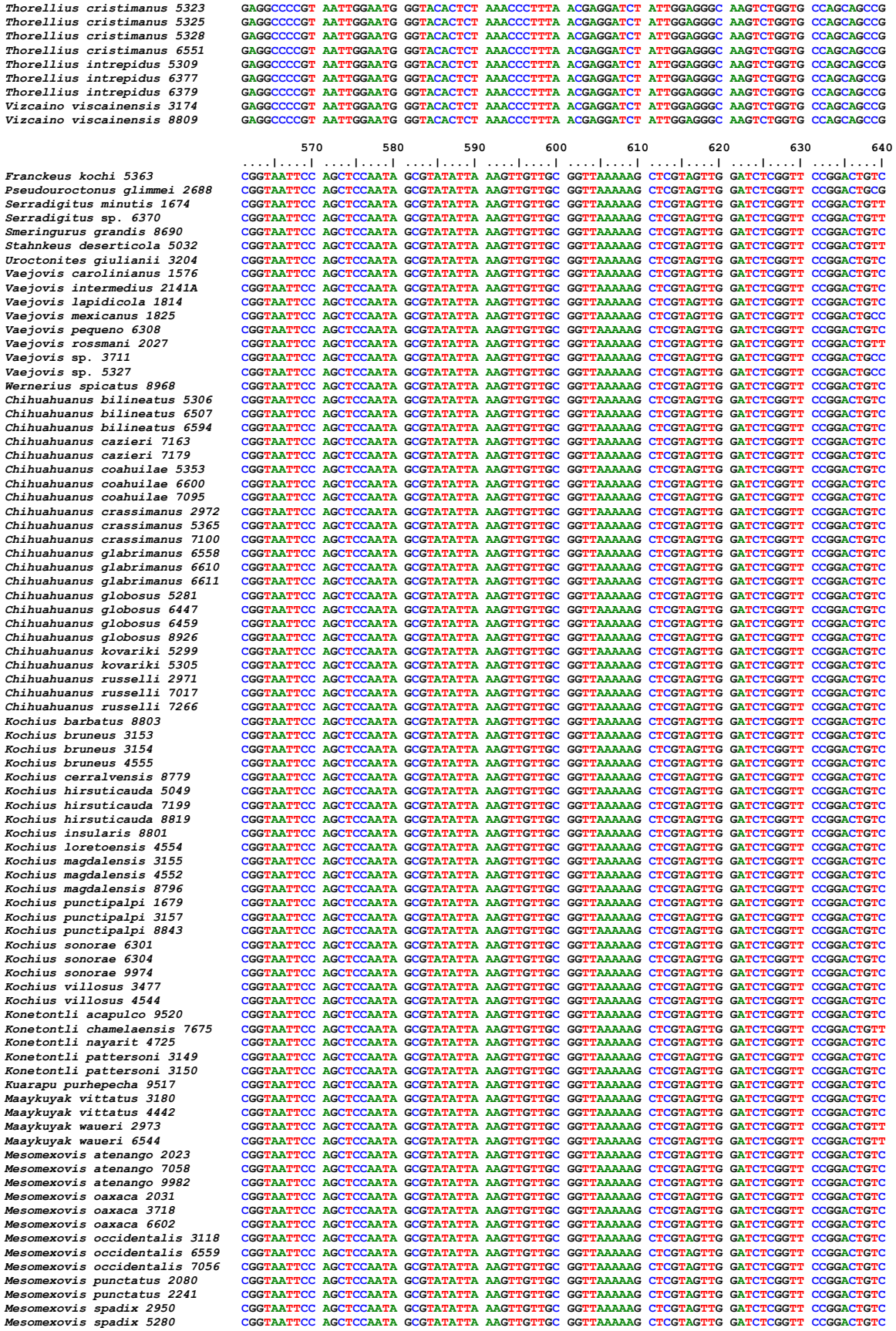
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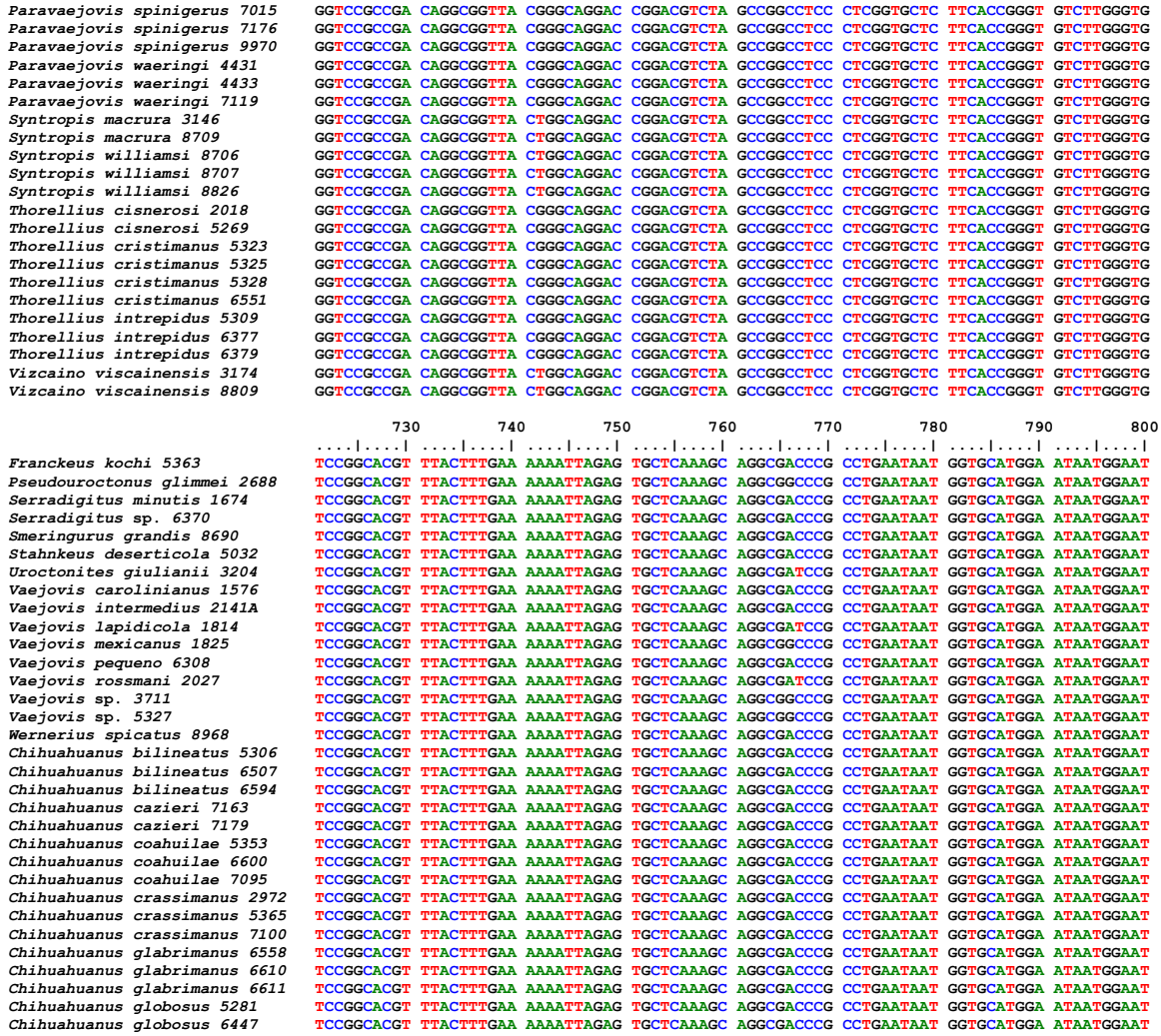
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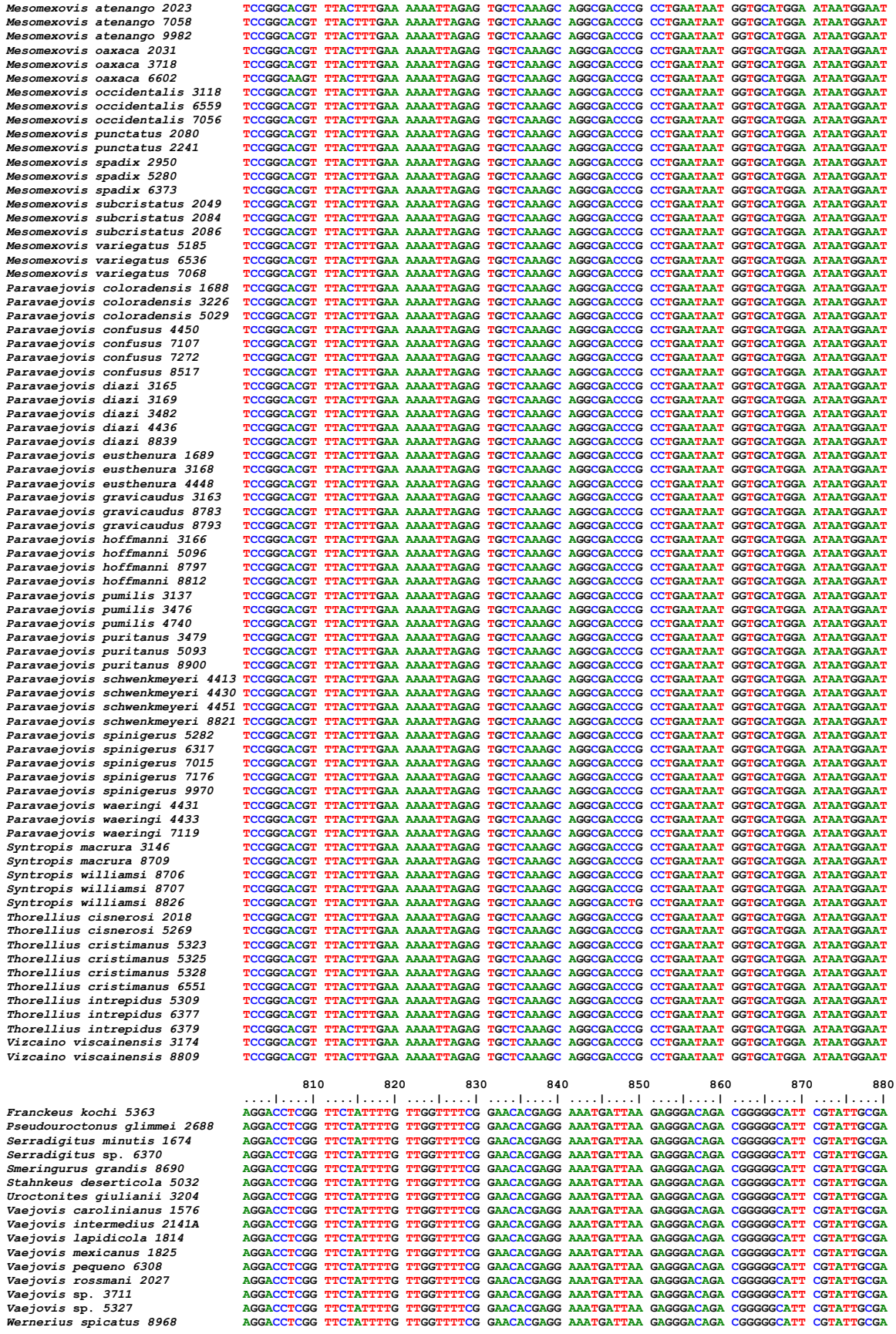
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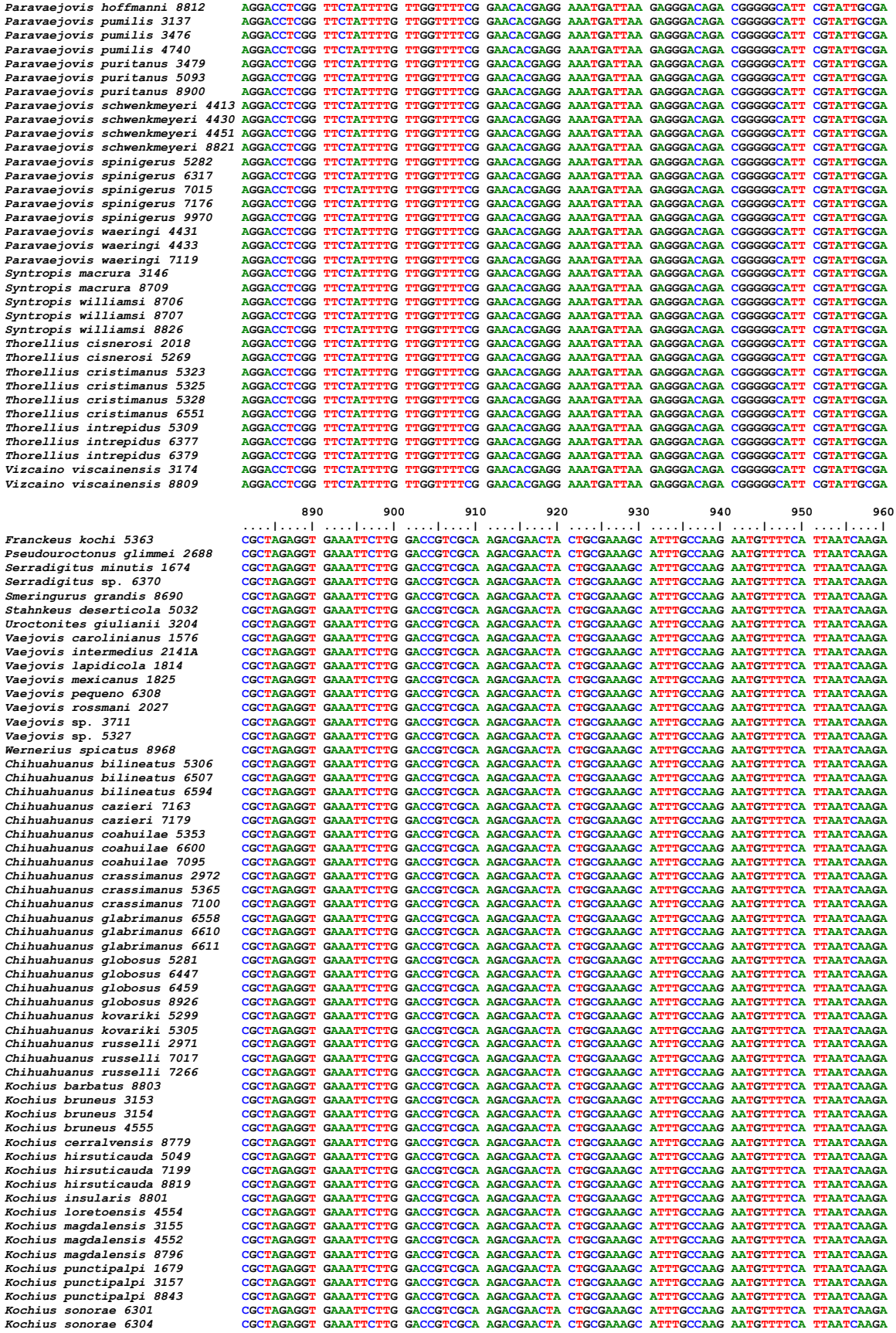
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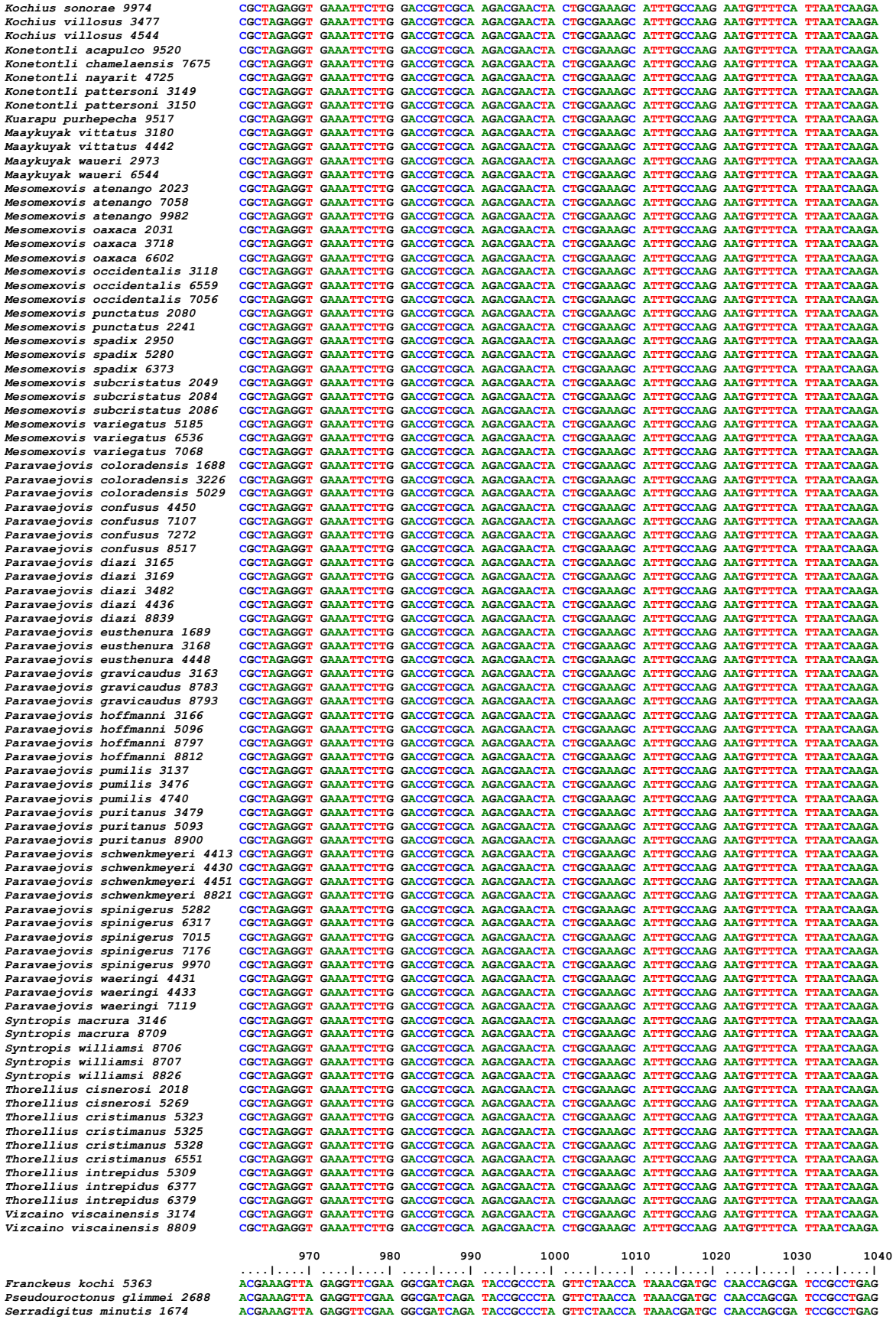
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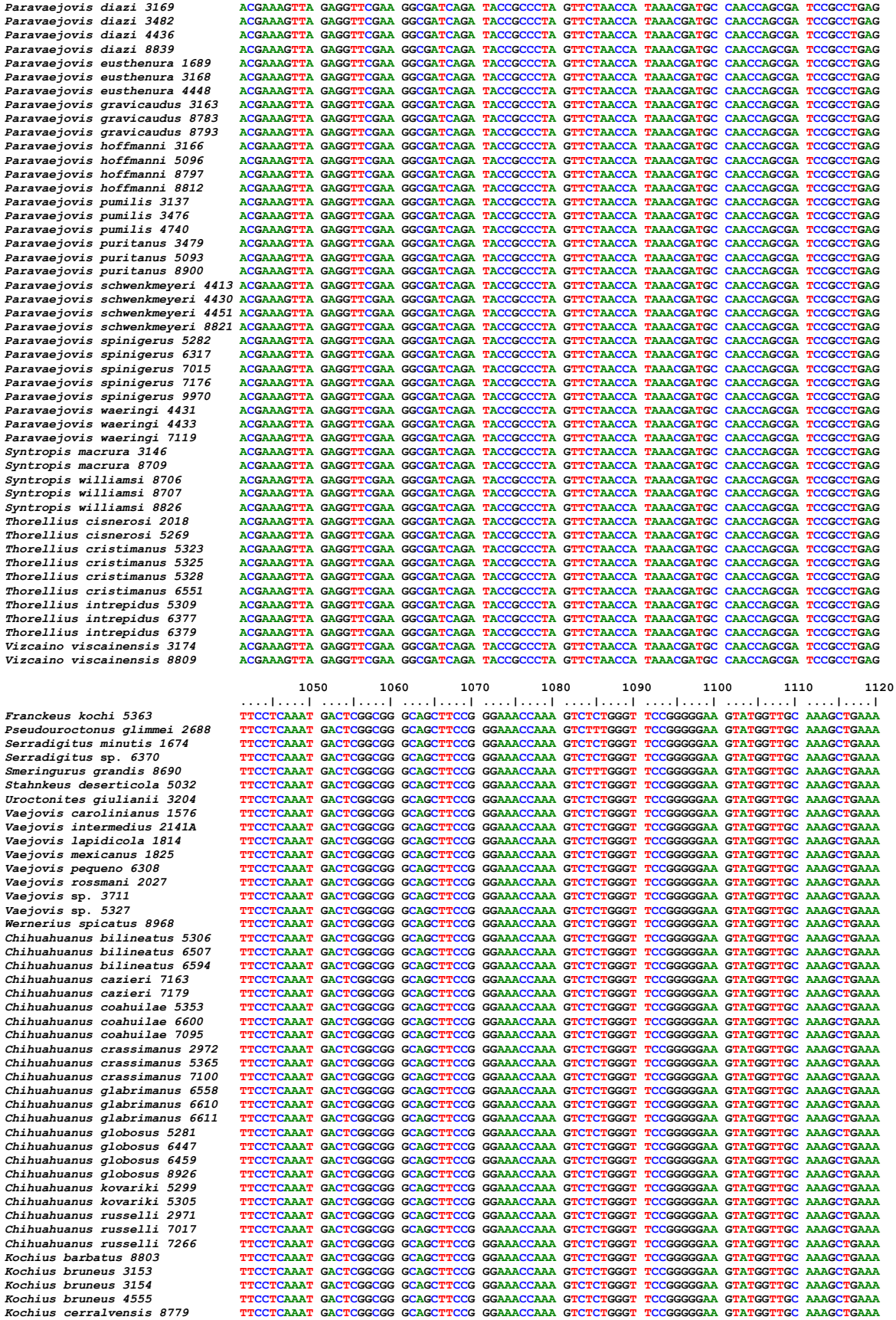
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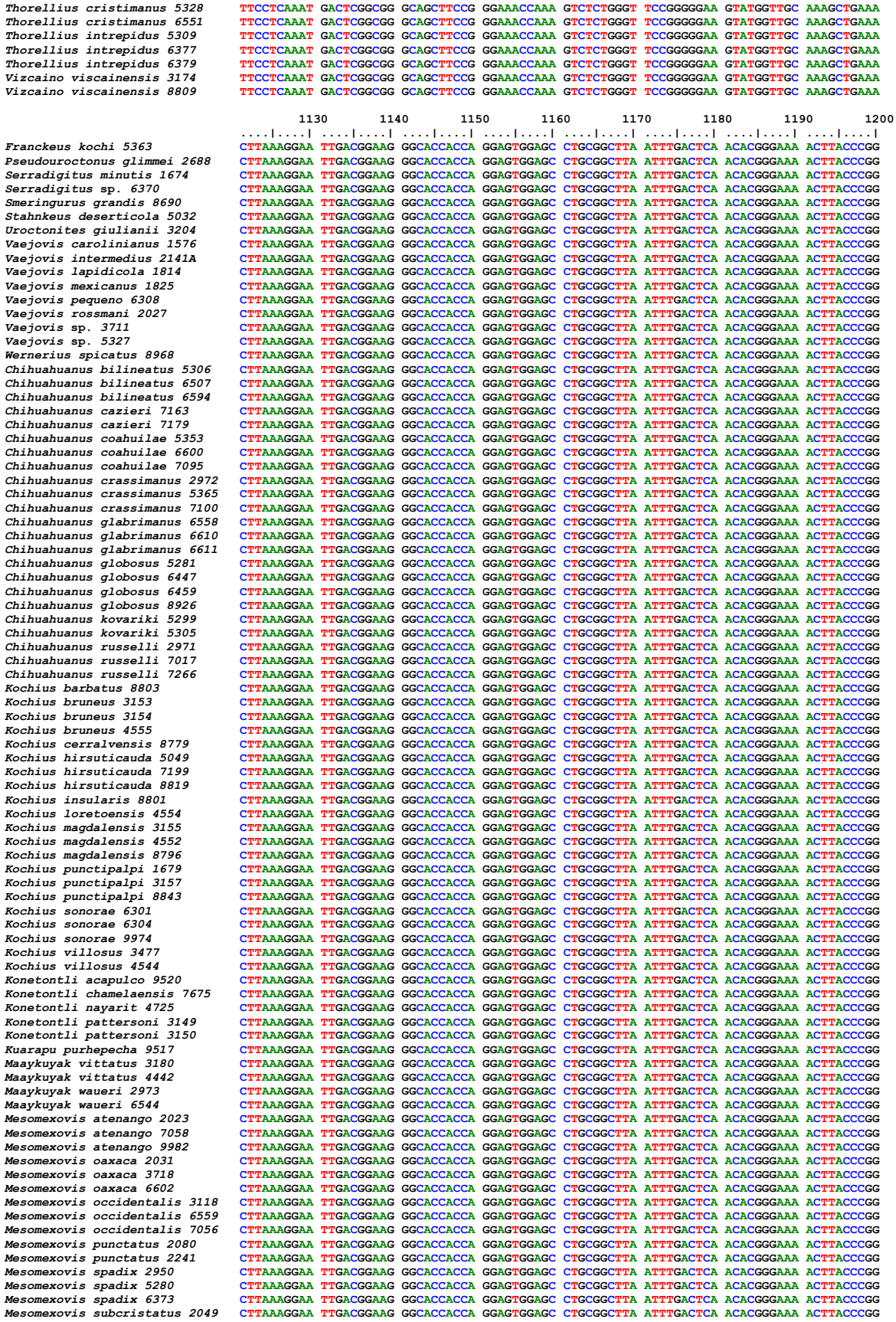
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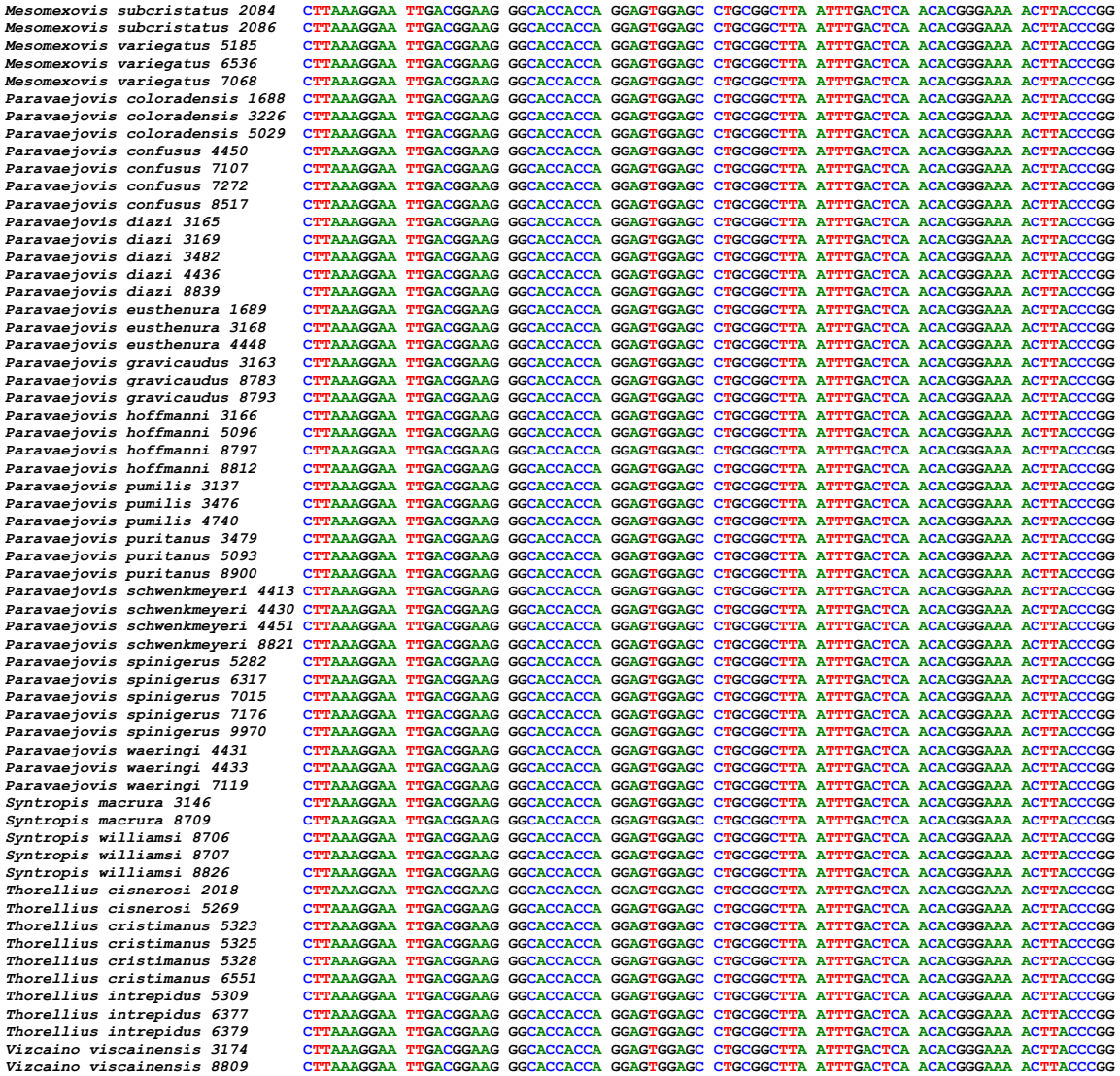
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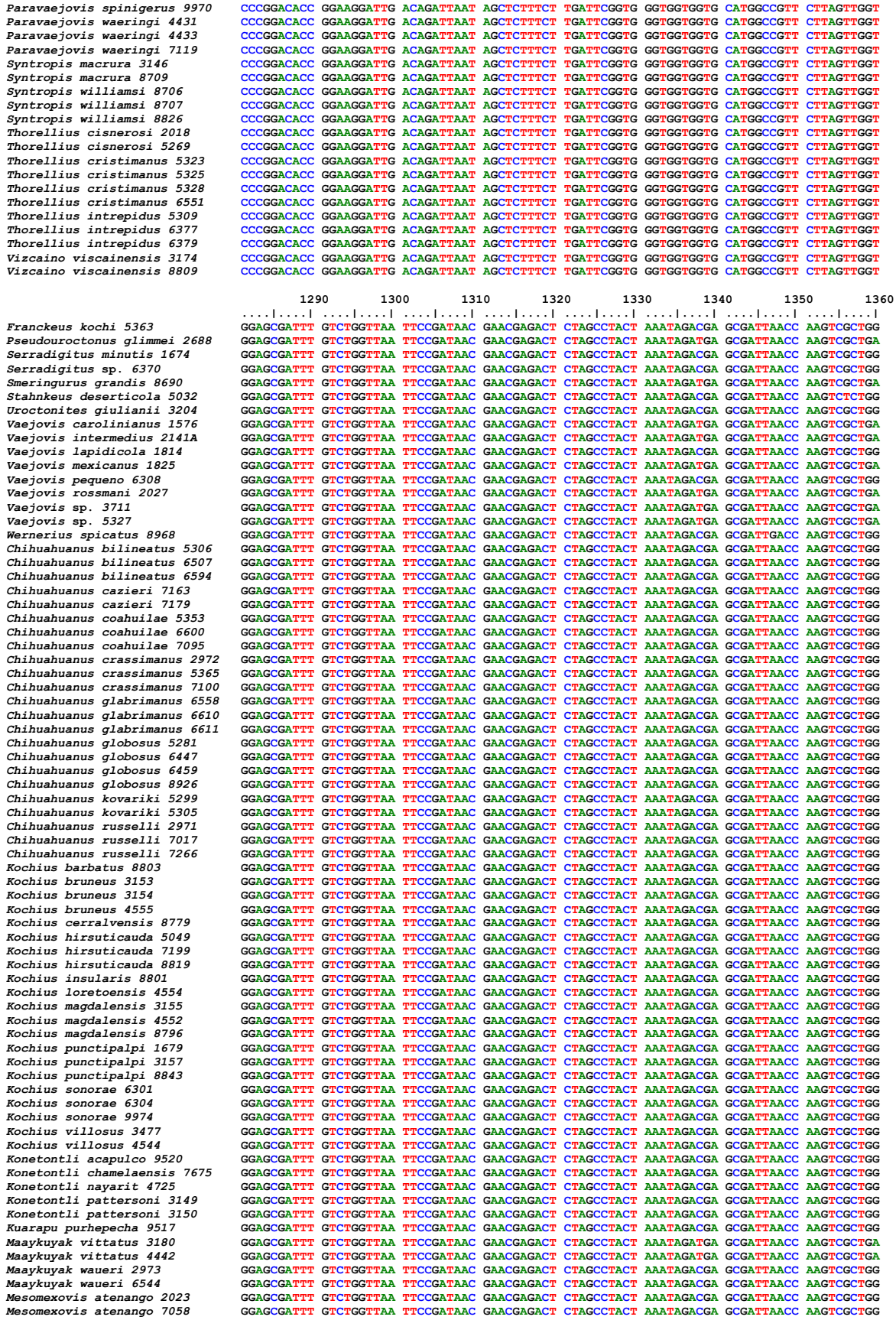
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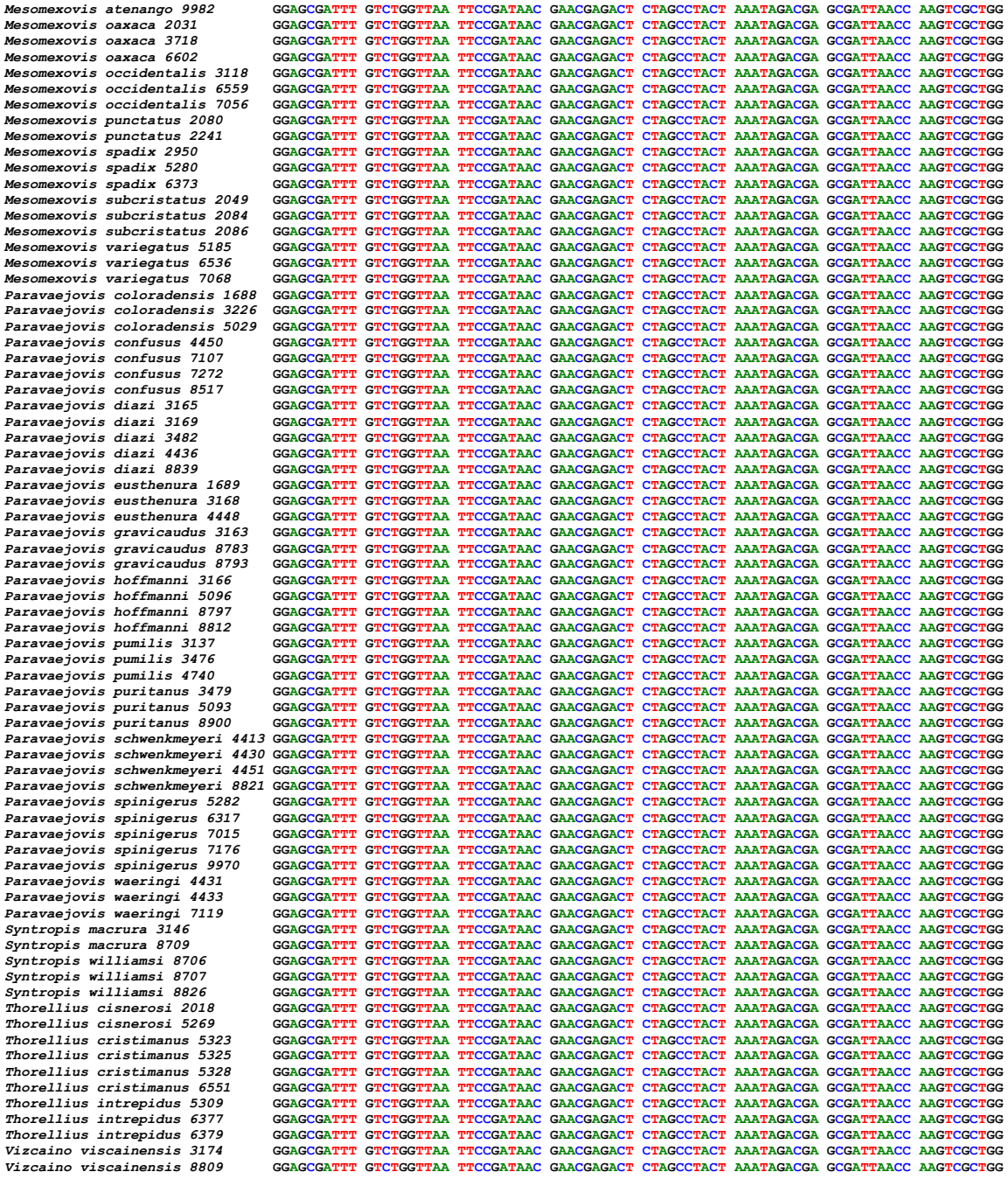
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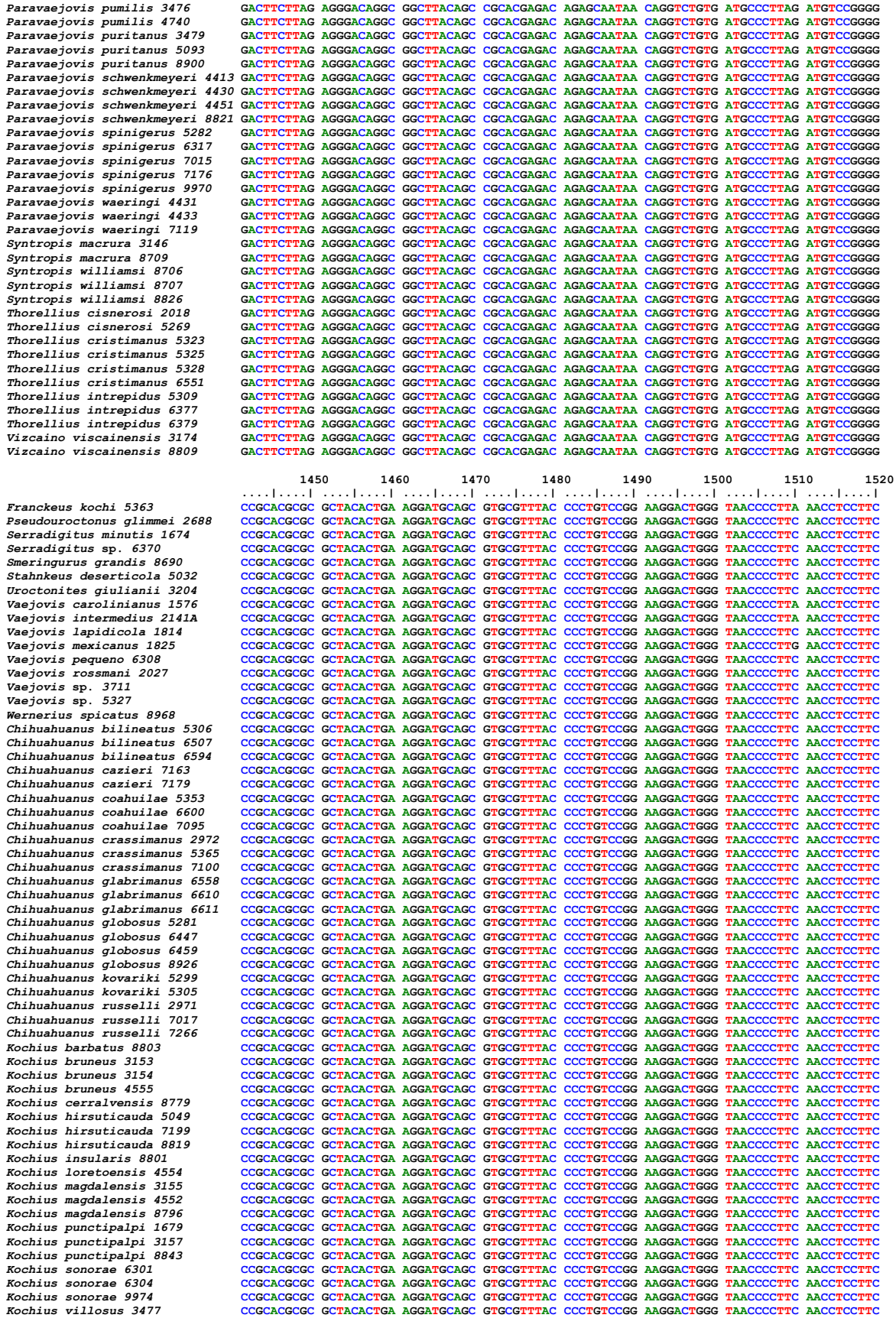
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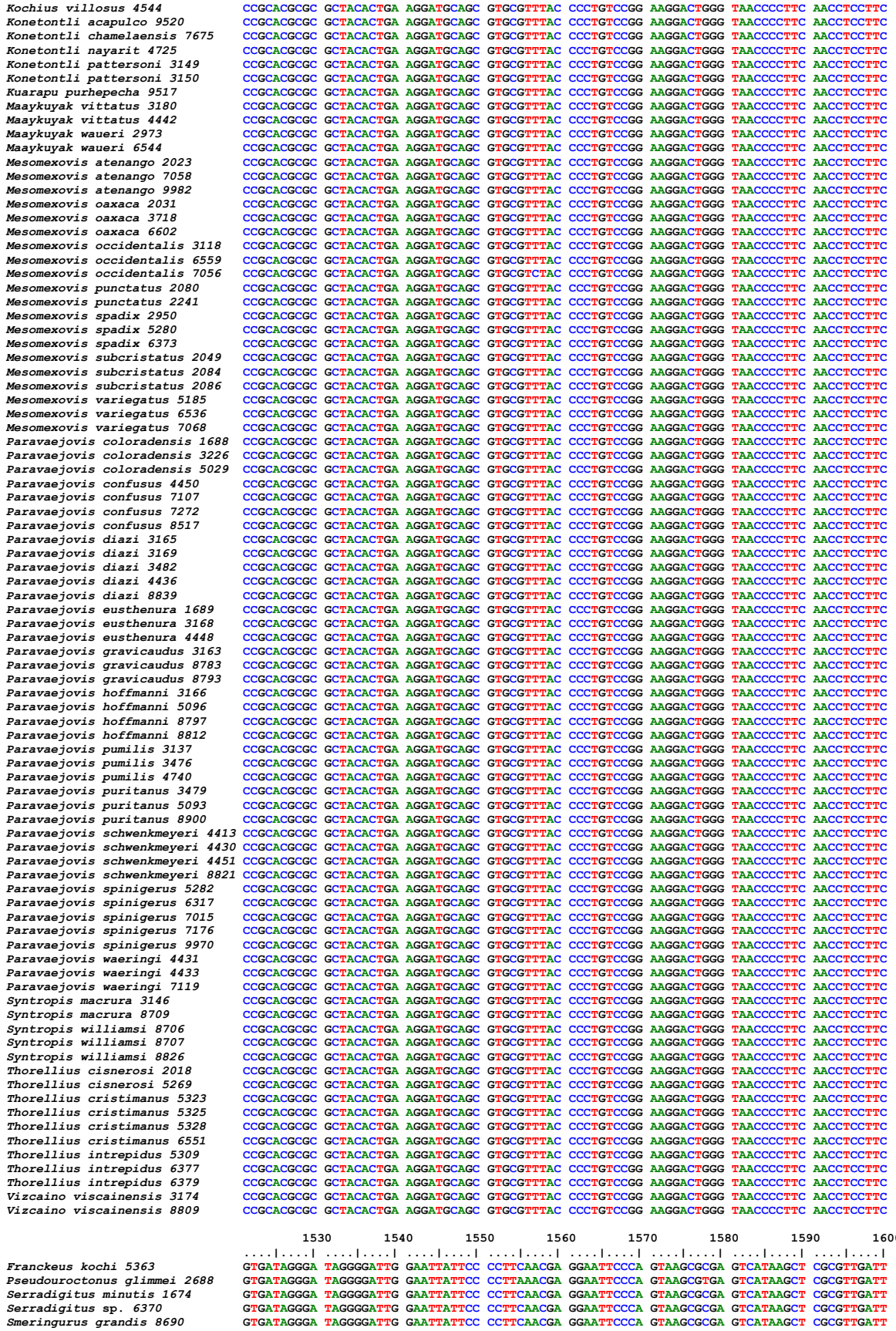
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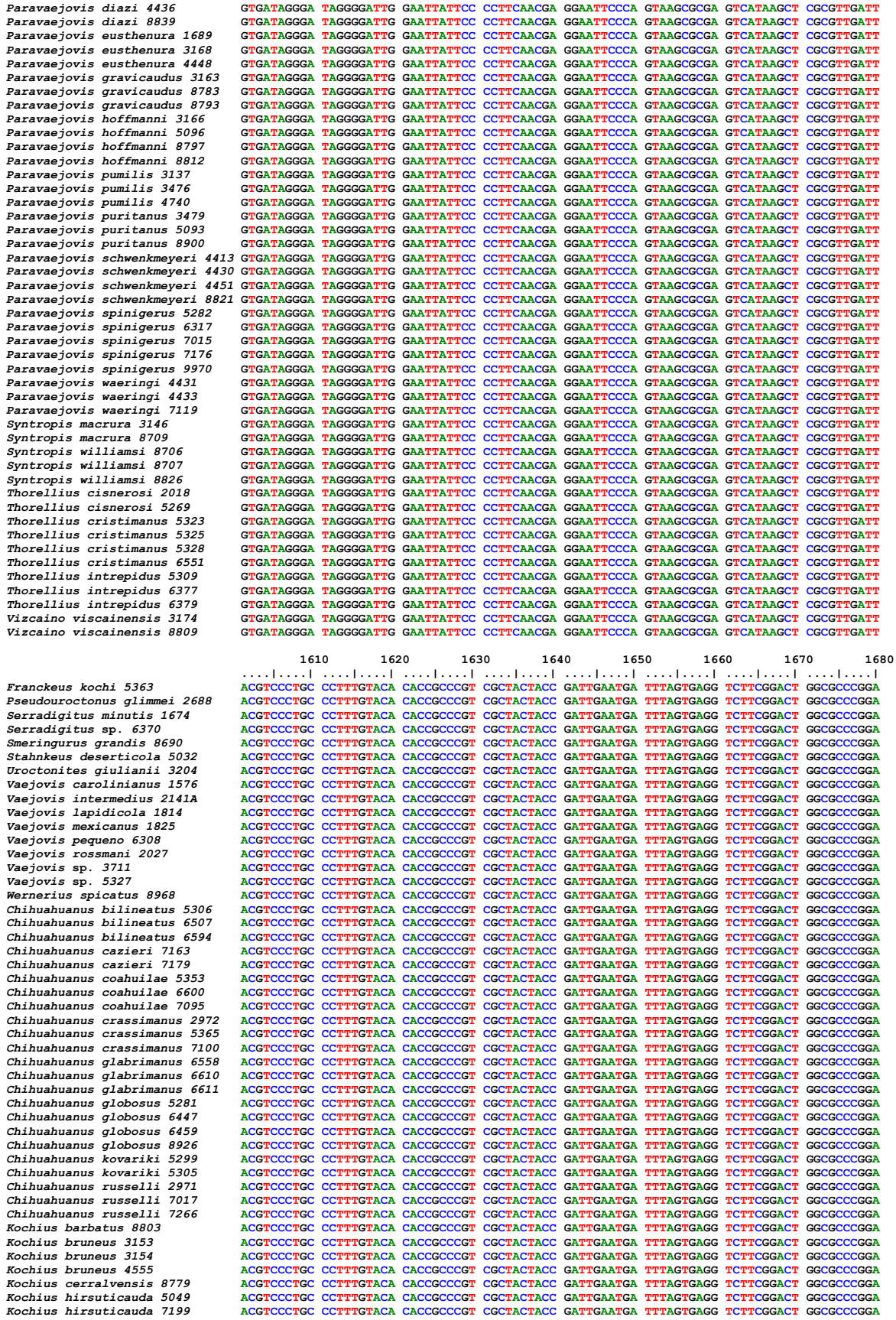
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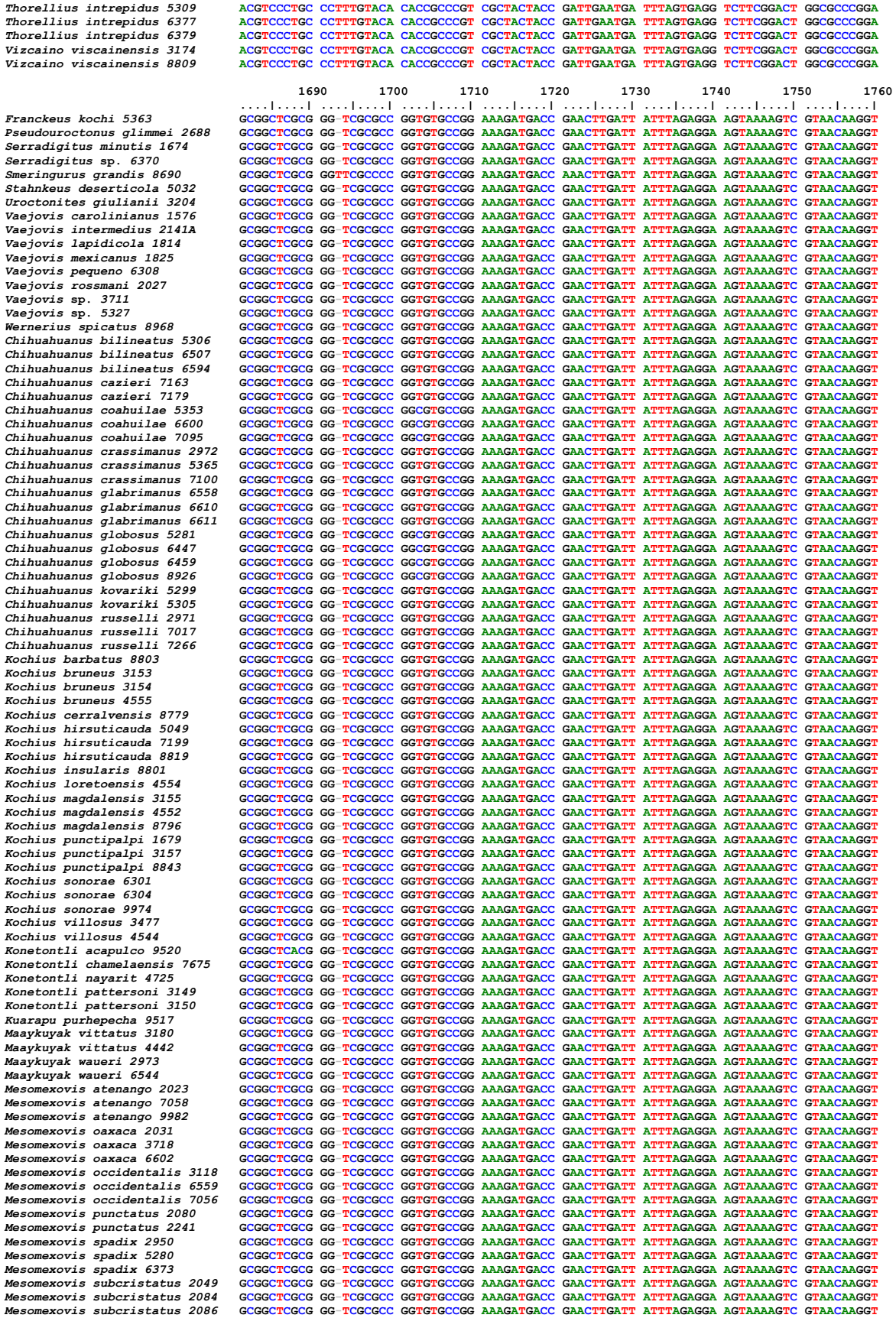
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Konetontli chamelaensis 7675 GCGGCTCGCG GGTCGCGCC GGTGTGCCGG AAAGATGACC GAACTTGATT ATTTAGAGGA AGTAAAAGTC GTAACAAGGT
Konetontli nayarit 4725 GCGGCTCGCG GGTCGCGCC GGTGTGCCGG AAAGATGACC GAACTTGATT ATTTAGAGGA AGTAAAAGTC GTAACAAGGT
Konetontli pattersoni 3149 GCGGCTCGCG GGTCGCGCC GGTGTGCCGG AAAGATGACC GAACTTGATT ATTTAGAGGA AGTAAAAGTC GTAACAAGGT
Konetontli pattersoni 3150 GCGGCTCGCG GGTCGCGCC GGTGTGCCGG AAAGATGACC GAACTTGATT ATTTAGAGGA AGTAAAAGTC GTAACAAGGT
Kuarapu purhepecha 9517 GCGGCTCGCG GGTCGCGCC GGTGTGCCGG AAAGATGACC GAACTTGATT ATTTAGAGGA AGTAAAAGTC GTAACAAGGT
Maaykuyak vittatus 3180 GCGGCTCGCG GGTCGCGCC GGTGTGCCGG AAAGATGACC GAACTTGATT ATTTAGAGGA AGTAAAAGTC GTAACAAGGT
Maaykuyak vittatus 4442 GCGGCTCGCG GGTCGCGCC GGTGTGCCGG AAAGATGACC GAACTTGATT ATTTAGAGGA AGTAAAAGTC GTAACAAGGT
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Mesomexovis atenango 7058 GCGGCTCGCG GGTCGCGCC GGTGTGCCGG AAAGATGACC GAACTTGATT ATTTAGAGGA AGTAAAAGTC GTAACAAGGT
Mesomexovis atenango 9982 GCGGCTCGCG GGTCGCGCC GGTGTGCCGG AAAGATGACC GAACTTGATT ATTTAGAGGA AGTAAAAGTC GTAACAAGGT
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Mesomexovis oaxaca 3718 GCGGCTCGCG GGTCGCGCC GGTGTGCCGG AAAGATGACC GAACTTGATT ATTTAGAGGA AGTAAAAGTC GTAACAAGGT
Mesomexovis oaxaca 6602 GCGGCTCGCG GGTCGCGCC GGTGTGCCGG AAAGATGACC GAACTTGATT ATTTAGAGGA AGTAAAAGTC GTAACAAGGT
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Mesomexovis spadix 5280 GCGGCTCGCG GGTCGCGCC GGTGTGCCGG AAAGATGACC GAACTTGATT ATTTAGAGGA AGTAAAAGTC GTAACAAGGT
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Mesomexovis subcristatus 2049 GCGGCTCGCG GGTCGCGCC GGTGTGCCGG AAAGATGACC GAACTTGATT ATTTAGAGGA AGTAAAAGTC GTAACAAGGT
Mesomexovis subcristatus 2084 GCGGCTCGCG GGTCGCGCC GGTGTGCCGG AAAGATGACC GAACTTGATT ATTTAGAGGA AGTAAAAGTC GTAACAAGGT
Mesomexovis subcristatus 2086 GCGGCTCGCG GGTCGCGCC GGTGTGCCGG AAAGATGACC GAACTTGATT ATTTAGAGGA AGTAAAAGTC GTAACAAGGT

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Mesomexovis variegatus 6536     GCGGCTCGCG GG-TCGCGCC GGTGTGCCGG AAAGATGACC GAACTTGATT ATTTAGAGGA AGTAAAAGTC GTAACAAGGT
Mesomexovis variegatus 7068     GCGGCTCGCG GG-TCGCGCC GGTGTGCCGG AAAGATGACC GAACTTGATT ATTTAGAGGA AGTAAAAGTC GTAACAAGGT
Paravaejovis coloradensis 1688  GCGGCTCGCG GG-TCGCGCC GGTGTGCCGG AAAGATGACC GAACTTGATT ATTTAGAGGA AGTAAAAGTC GTAACAAGGT
Paravaejovis coloradensis 3226  GCGGCTCGCG GG-TCGCGCC GGTGTGCCGG AAAGATGACC GAACTTGATT ATTTAGAGGA AGTAAAAGTC GTAACAAGGT
Paravaejovis coloradensis 5029  GCGGCTCGCG GG-TCGCGCC GGTGTGCCGG AAAGATGACC GAACTTGATT ATTTAGAGGA AGTAAAAGTC GTAACAAGGT
Paravaejovis confusus 4450      GCGGCTCGCG GG-TCGCGCC GGTGTGCCGG AAAGATGACC GAACTTGATT ATTTAGAGGA AGTAAAAGTC GTAACAAGGT
Paravaejovis confusus 7107      GCGGCTCGCG GG-TCGCGCC GGTGTGCCGG AAAGATGACC GAACTTGATT ATTTAGAGGA AGTAAAAGTC GTAACAAGGT
Paravaejovis confusus 7272      GCGGCTCGCG GG-TCGCGCC GGTGTGCCGG AAAGATGACC GAACTTGATT ATTTAGAGGA AGTAAAAGTC GTAACAAGGT
Paravaejovis confusus 8517      GCGGCTCGCG GG-TCGCGCC GGTGTGCCGG AAAGATGACC GAACTTGATT ATTTAGAGGA AGTAAAAGTC GTAACAAGGT
Paravaejovis diazi 3165         GCGGCTCGCG GG-TCGCGCC GGTGTGCCGG AAAGATGACC GAACTTGATT ATTTAGAGGA AGTAAAAGTC GTAACAAGGT
Paravaejovis diazi 3169         GCGGCTCGCG GG-TCGCGCC GGTGTGCCGG AAAGATGACC GAACTTGATT ATTTAGAGGA AGTAAAAGTC GTAACAAGGT
Paravaejovis diazi 3482         GCGGCTCGCG GG-TCGCGCC GGTGTGCCGG AAAGATGACC GAACTTGATT ATTTAGAGGA AGTAAAAGTC GTAACAAGGT
Paravaejovis diazi 4436         GCGGCTCGCG GG-TCGCGCC GGTGTGCCGG AAAGATGACC GAACTTGATT ATTTAGAGGA AGTAAAAGTC GTAACAAGGT
Paravaejovis diazi 8839         GCGGCTCGCG GG-TCGCGCC GGTGTGCCGG AAAGATGACC GAACTTGATT ATTTAGAGGA AGTAAAAGTC GTAACAAGGT
Paravaejovis eusthenura 1689    GCGGCTCGCG GG-TCGCGCC GGTGTGCCGG AAAGATGACC GAACTTGATT ATTTAGAGGA AGTAAAAGTC GTAACAAGGT
Paravaejovis eusthenura 3168    GCGGCTCGCG GG-TCGCGCC GGTGTGCCGG AAAGATGACC GAACTTGATT ATTTAGAGGA AGTAAAAGTC GTAACAAGGT
Paravaejovis eusthenura 4448    GCGGCTCGCG GG-TCGCGCC GGTGTGCCGG AAAGATGACC GAACTTGATT ATTTAGAGGA AGTAAAAGTC GTAACAAGGT
Paravaejovis gravicaudus 3163   GCGGCTCGCG GG-TCGCGCC GGTGTGCCGG AAAGATGACC GAACTTGATT ATTTAGAGGA AGTAAAAGTC GTAACAAGGT
Paravaejovis gravicaudus 8783   GCGGCTCGCG GG-TCGCGCC GGTGTGCCGG AAAGATGACC GAACTTGATT ATTTAGAGGA AGTAAAAGTC GTAACAAGGT
Paravaejovis gravicaudus 8793   GCGGCTCGCG GG-TCGCGCC GGTGTGCCGG AAAGATGACC GAACTTGATT ATTTAGAGGA AGTAAAAGTC GTAACAAGGT
Paravaejovis hoffmanni 3166     GCGGCTCGCG GG-TCGCGCC GGTGTGCCGG AAAGATGACC GAACTTGATT ATTTAGAGGA AGTAAAAGTC GTAACAAGGT
Paravaejovis hoffmanni 5096     GCGGCTCGCG GG-TCGCGCC GGTGTGCCGG AAAGATGACC GAACTTGATT ATTTAGAGGA AGTAAAAGTC GTAACAAGGT
Paravaejovis hoffmanni 8797     GCGGCTCGCG GG-TCGCGCC GGTGTGCCGG AAAGATGACC GAACTTGATT ATTTAGAGGA AGTAAAAGTC GTAACAAGGT
Paravaejovis hoffmanni 8812     GCGGCTCGCG GG-TCGCGCC GGTGTGCCGG AAAGATGACC GAACTTGATT ATTTAGAGGA AGTAAAAGTC GTAACAAGGT
Paravaejovis pumilis 3137       GCGGCTCGCG GG-TCGCGCC GGTGTGCCGG AAAGATGACC GAACTTGATT ATTTAGAGGA AGTAAAAGTC GTAACAAGGT
Paravaejovis pumilis 3476       GCGGCTCGCG GG-TCGCGCC GGTGTGCCGG AAAGATGACC GAACTTGATT ATTTAGAGGA AGTAAAAGTC GTAACAAGGT
Paravaejovis pumilis 4740       GCGGCTCGCG GG-TCGCGCC GGTGTGCCGG AAAGATGACC GAACTTGATT ATTTAGAGGA AGTAAAAGTC GTAACAAGGT
Paravaejovis puritanus 3479     GCGGCTCGCG GG-TCGCGCC GGTGTGCCGG AAAGATGACC GAACTTGATT ATTTAGAGGA AGTAAAAGTC GTAACAAGGT
Paravaejovis puritanus 5093     GCGGCTCGCG GG-TCGCGCC GGTGTGCCGG AAAGATGACC GAACTTGATT ATTTAGAGGA AGTAAAAGTC GTAACAAGGT
Paravaejovis puritanus 8900     GCGGCTCGCG GG-TCGCGCC GGTGTGCCGG AAAGATGACC GAACTTGATT ATTTAGAGGA AGTAAAAGTC GTAACAAGGT
Paravaejovis schwenkmeyeri 4413 GCGGCTCGCG GG-TCGCGCC GGTGTGCCGG AAAGATGACC GAACTTGATT ATTTAGAGGA AGTAAAAGTC GTAACAAGGT
Paravaejovis schwenkmeyeri 4430 GCGGCTCGCG GG-TCGCGCC GGTGTGCCGG AAAGATGACC GAACTTGATT ATTTAGAGGA AGTAAAAGTC GTAACAAGGT
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Paravaejovis schwenkmeyeri 8821 GCGGCTCGCG GG-TCGCGCC GGTGTGCCGG AAAGATGACC GAACTTGATT ATTTAGAGGA AGTAAAAGTC GTAACAAGGT
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Paravaejovis spinigerus 6317    GCGGCTCGCG GG-TCGCGCC GGTGTGCCGG AAAGATGACC GAACTTGATT ATTTAGAGGA AGTAAAAGTC GTAACAAGGT
Paravaejovis spinigerus 7015    GCGGCTCGCG GG-TCGCGCC GGTGTGCCGG AAAGATGACC GAACTTGATT ATTTAGAGGA AGTAAAAGTC GTAACAAGGT
Paravaejovis spinigerus 7176    GCGGCTCGCG GG-TCGCGCC GGTGTGCCGG AAAGATGACC GAACTTGATT ATTTAGAGGA AGTAAAAGTC GTAACAAGGT
Paravaejovis spinigerus 9970    GCGGCTCGCG GG-TCGCGCC GGTGTGCCGG AAAGATGACC GAACTTGATT ATTTAGAGGA AGTAAAAGTC GTAACAAGGT
Paravaejovis waeringi 4431      GCGGCTCGCG GG-TCGCGCC GGTGTGCCGG AAAGATGACC GAACTTGATT ATTTAGAGGA AGTAAAAGTC GTAACAAGGT
Paravaejovis waeringi 4433      GCGGCTCGCG GG-TCGCGCC GGTGTGCCGG AAAGATGACC GAACTTGATT ATTTAGAGGA AGTAAAAGTC GTAACAAGGT
Paravaejovis waeringi 7119      GCGGCTCGCG GG-TCGCGCC GGTGTGCCGG AAAGATGACC GAACTTGATT ATTTAGAGGA AGTAAAAGTC GTAACAAGGT
Syntropis macrura 3146          GCGGCTCGCG GG-TCGCGCC GGTGTGCCGG AAAGATGACC GAACTTGATT ATTTAGAGGA AGTAAAAGTC GTAACAAGGT
Syntropis macrura 8709          GCGGCTCGCG GG-TCGCGCC GGTGTGCCGG AAAGATGACC GAACTTGATT ATTTAGAGGA AGTAAAAGTC GTAACAAGGT
Syntropis williamsi 8706        GCGGCTCGCG GG-TCGCGCC GGTGTGCCGG AAAGATGACC GAACTTGATT ATTTAGAGGA AGTAAAAGTC GTAACAAGGT
Syntropis williamsi 8707        GCGGCTCGCG GG-TCGCGCC GGTGTGCCGG AAAGATGACC GAACTTGATT ATTTAGAGGA AGTAAAAGTC GTAACAAGGT
Syntropis williamsi 8826        GCGGCTCGCG GG-TCGCGCC GGTGTGCCGG AAAGATGACC GAACTTGATT ATTTAGAGGA AGTAAAAGTC GTAACAAGGT
Thorellius cisnerosi 2018       GCGGCTCGCG GG-TCGCGCC GGTGTGCCGG AAAGATGACC GAACTTGATT ATTTAGAGGA AGTAAAAGTC GTAACAAGGT
Thorellius cisnerosi 5269       GCGGCTCGCG GG-TCGCGCC GGTGTGCCGG AAAGATGACC GAACTTGATT ATTTAGAGGA AGTAAAAGTC GTAACAAGGT
Thorellius cristimanus 5323     GCGGCTCGCG GG-TCGCGCC GGTGTGCCGG AAAGATGACC GAACTTGATT ATTTAGAGGA AGTAAAAGTC GTAACAAGGT
Thorellius cristimanus 5325     GCGGCTCGCG GG-TCGCGCC GGTGTGCCGG AAAGATGACC GAACTTGATT ATTTAGAGGA AGTAAAAGTC GTAACAAGGT
Thorellius cristimanus 5328     GCGGCTCGCG GG-TCGCGCC GGTGTGCCGG AAAGATGACC GAACTTGATT ATTTAGAGGA AGTAAAAGTC GTAACAAGGT
Thorellius cristimanus 6551     GCGGCTCGCG GG-TCGCGCC GGTGTGCCGG AAAGATGACC GAACTTGATT ATTTAGAGGA AGTAAAAGTC GTAACAAGGT
Thorellius intrepidus 5309      GCGGCTCGCG GG-TCGCGCC GGTGTGCCGG AAAGATGACC GAACTTGATT ATTTAGAGGA AGTAAAAGTC GTAACAAGGT
Thorellius intrepidus 6377      GCGGCTCGCG GG-TCGCGCC GGTGTGCCGG AAAGATGACC GAACTTGATT ATTTAGAGGA AGTAAAAGTC GTAACAAGGT
Thorellius intrepidus 6379      GCGGCTCGCG GG-TCGCGCC GGTGTGCCGG AAAGATGACC GAACTTGATT ATTTAGAGGA AGTAAAAGTC GTAACAAGGT
Vizcaino viscainensis 3174      GCGGCTCGCG GG-TCGCGCC GGTGTGCCGG AAAGATGACC GAACTTGATT ATTTAGAGGA AGTAAAAGTC GTAACAAGGT
Vizcaino viscainensis 8809      GCGGCTCGCG GG-TCGCGCC GGTGTGCCGG AAAGATGACC GAACTTGATT ATTTAGAGGA AGTAAAAGTC GTAACAAGGT

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Franckeus kochi 5363            TTCC
Pseudouroctonus glimmei 2688    TTCC
Serradigitus minutis 1674       TTCC
Serradigitus sp. 6370           TTCC
Smeringurus grandis 8690        TTCC
Stahnkeus deserticola 5032      TTCC
Uroctonites giulianii 3204      TTCC
Vaejovis carolinianus 1576      TTCC
Vaejovis intermedius 2141A      TTCC
Vaejovis lapidicola 1814        TTCC
Vaejovis mexicanus 1825         TTCC
Vaejovis pequeno 6308           TTCC
Vaejovis rossmani 2027          TTCC
Vaejovis sp. 3711               TTCC
Vaejovis sp. 5327               TTCC
Wernerius spicatus 8968         TTCC
Chihuahuanus bilineatus 5306    TTCC
Chihuahuanus bilineatus 6507    TTCC
Chihuahuanus bilineatus 6594    TTCC
Chihuahuanus cazieri 7163       TTCC
Chihuahuanus cazieri 7179       TTCC
Chihuahuanus coahuilae 5353     TTCC
Chihuahuanus coahuilae 6600     TTCC
Chihuahuanus coahuilae 7095     TTCC
Chihuahuanus crassimanus 2972   TTCC
Chihuahuanus crassimanus 5365   TTCC
Chihuahuanus crassimanus 7100   TTCC
Chihuahuanus glabrimanus 6558   TTCC
Chihuahuanus glabrimanus 6610   TTCC
Chihuahuanus glabrimanus 6611   TTCC
Chihuahuanus globosus 5281      TTCC
Chihuahuanus globosus 6447      TTCC
Chihuahuanus globosus 6459      TTCC
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Chihuahuanus globosus 8926      TTCC
Chihuahuanus kovariki 5299      TTCC
Chihuahuanus kovariki 5305      TTCC
Chihuahuanus russelli 2971      TTCC
Chihuahuanus russelli 7017      TTCC
Chihuahuanus russelli 7266      TTCC
Kochius barbatus 8803           TTCC
Kochius bruneus 3153            TTCC
Kochius bruneus 3154            TTCC
Kochius bruneus 4555            TTCC
Kochius cerralvensis 8779       TTCC
Kochius hirsuticauda 5049       TTCC
Kochius hirsuticauda 7199       TTCC
Kochius hirsuticauda 8819       TTCC
Kochius insularis 8801          TTCC
Kochius loretoensis 4554        TTCC
Kochius magdalensis 3155        TTCC
Kochius magdalensis 4552        TTCC
Kochius magdalensis 8796        TTCC
Kochius punctipalpi 1679        TTCC
Kochius punctipalpi 3157        TTCC
Kochius punctipalpi 8843        TTCC
Kochius sonorae 6301            TTCC
Kochius sonorae 6304            TTCC
Kochius sonorae 9974            TTCC
Kochius villosus 3477           TTCC
Kochius villosus 4544           TTCC
Konetontli acapulco 9520        TTCC
Konetontli chamelaensis 7675    TTCC
Konetontli nayarit 4725         TTCC
Konetontli pattersoni 3149      TTCC
Konetontli pattersoni 3150      TTCC
Kuarapu purhepecha 9517         TTCC
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Maaykuyak vittatus 4442         TTCC
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Maaykuyak waueri 6544           TTCC
Mesomexovis atenango 2023       TTCC
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Mesomexovis subcristatus 2086   TTCC
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Mesomexovis variegatus 6536     TTCC
Mesomexovis variegatus 7068     TTCC
Paravaejovis coloradensis 1688  TTCC
Paravaejovis coloradensis 3226  TTCC
Paravaejovis coloradensis 5029  TTCC
Paravaejovis confusus 4450      TTCC
Paravaejovis confusus 7107      TTCC
Paravaejovis confusus 7272      TTCC
Paravaejovis confusus 8517      TTCC
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Paravaejovis eusthenura 1689    TTCC
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Paravaejovis eusthenura 4448    TTCC
Paravaejovis gravicaudus 3163   TTCC
Paravaejovis gravicaudus 8783   TTCC
Paravaejovis gravicaudus 8793   TTCC
Paravaejovis hoffmanni 3166     TTCC
Paravaejovis hoffmanni 5096     TTCC
Paravaejovis hoffmanni 8797     TTCC
Paravaejovis hoffmanni 8812     TTCC
Paravaejovis pumilis 3137       TTCC
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Paravaejovis pumilis 4740       TTCC
Paravaejovis puritanus 3479     TTCC
Paravaejovis puritanus 5093     TTCC
Paravaejovis puritanus 8900     TTCC
Paravaejovis schwenkmeyeri 4413 TTCC
Paravaejovis schwenkmeyeri 4430 TTCC
Paravaejovis schwenkmeyeri 4451 TTCC
Paravaejovis schwenkmeyeri 8821 TTCC
Paravaejovis spinigerus 5282    TTCC
Paravaejovis spinigerus 6317    TTCC
Paravaejovis spinigerus 7015    TTCC
Paravaejovis spinigerus 7176    TTCC
Paravaejovis spinigerus 9970    TTCC
Paravaejovis waeringi 4431      TTCC
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Paravaejovis waeringi 4433      TTCC
Paravaejovis waeringi 7119      TTCC
Syntropis macrura 3146          TTCC
Syntropis macrura 8709          TTCC
Syntropis williamsi 8706        TTCC
Syntropis williamsi 8707        TTCC
Syntropis williamsi 8826        TTCC
Thorellius cisnerosi 2018       TTCC
Thorellius cisnerosi 5269       TTCC
Thorellius cristimanus 5323     TTCC
Thorellius cristimanus 5325     TTCC
Thorellius cristimanus 5328     TTCC
Thorellius cristimanus 6551     TTCC
Thorellius intrepidus 5309      TTCC
Thorellius intrepidus 6377      TTCC
Thorellius intrepidus 6379      TTCC
Vizcaino viscainensis 3174      TTCC
Vizcaino viscainensis 8809      TTCC
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Appendix 9

Alignment of the rDNA 28S genomic partition for cladistic analysis of the subfamily Syntropinae (Kraepelin, 1905). Outgroup 1–16, Ingroup 17–146.

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                                10        20        30        40        50        60        70        80
                        ....|....| ....|....| ....|....| ....|....| ....|....| ....|....| ....|....| ....|....|
Franckeus kochi 5363    CCAAGGAGTC TAACATGTGC GCGAGTCGTC GGGTCTTGAA TAGGCCCGCA GGCGCAATGA AAGTGAAGGG CGACCGAGTC
Pseudouroctonus glimmei 2688 CCAAGGAGTC TAACATGTGC GCGAGTCGTC GGGTCTTGAA TAGGCCCGCA GGCGCAATGA AAGTGAAGGA CAACCAAGTT
Serradigitus minutis 1674 CCAAGGAGTC TAACATGTGC GCGAGTCGTC GGGTCTTGAA TAGGCCCGCA GGCGAAATGA AAGTGAAGGG CGACCGAGTC
Serradigitus sp. 6370   CCAAGGAGTC TAACATGTGC GCGAGTCGTC GGGTCTTGAA TAGGCCCGCA GGCGAAATGA AAGTGAAGGA CGACCGAGTC
Smeringurus grandis 8690 CCAAGGAGTC TAACATGTGC GCGAGTCGTC GGGTCTTGAA TAGGCCCGCA GGCGAAATGA AAGTGAAGGG CGACCGAGCC
Stahnkeus desertícola 5032 CCAAGGAGTC TAACATGTGC GCGAGTCGTC GGGTCTTGAA TAGGCCCGCA GGCGAAATGA AAGTGAAGGG CGACCGAGTC
Uroctonites giulianii 3204 CCAAGGAGTC TAACATGTGC GCGAGTCGTC GGGTCTTGAA TAGGCCCGCA GGCGCAATGA AAGTGAAGGG CGACCTTGTC
Vaejovis carolinianus 1576 CCAAGGAGTC TAACATGTGC GCGAGTCGTC GGGTCTTGAA TAGGCCCGCA GGCGCAATGA AAGTGAAGGG CGACCGAGTT
Vaejovis intermedius 2141A CCAAGGAGTC TAACATGTGC GCGAGTCGTC GGGTCTTGAA TAGGCCCGCA GGCGCAATGA AAGTGAAGGG CGACCGAGTT
Vaejovis lapidicola 1814 CCAAGGAGTC TAACATGTGC GCGAGTCGTC GGGTCTTGAA TAGGCCCGCA GGCGCAATGA AAGTGAAGGG CGACCCCGTT
Vaejovis mexicanus 1825 CCAAGGAGTC TAACATGTGC GCGAGTCGTC GGGTCTTGTT TAGGCCCGCA GGCGAAATGA AAGTGAAGGA CGACCCAGTC
Vaejovis pequeno 6308   CCAAGGAGTC TAACATGTGC GCGAGTCGTC GGGTCTTGAG TAGGCCCGCA GGCGAAATGA AAGTGAAGGG CGACCGAGTC
Vaejovis rossmani 2027  CCAAGGAGTC TAACATGTGC GCGAGTCGTC GGGTCTTGAA TAGGCCCGCA GGCGAAATGA AAGTGAAGGA CGATT-----
Vaejovis sp. 3711       CCAAGGAGTC TAACATGTGC GCGAGTCGTC GGGTCTTGTT TAGGCCCGCA GGCGAAATGA AAGTGAAGGG CGACCTAGTC
Vaejovis sp. 5327       CCAAGGAGTC TAACATGTGC GCGAGTCGTC GGGTCTTGTT TAGGCCCGCA GGCGAAATGA AAGTGAAGGG CGACCTAGTC
Wernerius spicatus 8968 CCAAGGAGTC TAACATGTGC GCGAGTCGTC GGGTCTTGGA CAGGCCCGCA GGCGCAATGA AAGTGAAGGG CGACCGAGTC
Chihuahuanus bilineatus 5306 CCAAGGAGTC TAACATGTGC GCGAGTCGTC GGGTCTTGAA TAGGCCCGCA GGCGAAATGA AAGTGAAGGG CGACCCAGTC
Chihuahuanus bilineatus 6507 CCAAGGAGTC TAACATGTGC GCGAGTCGTC GGGTCTTGAA TAGGCCCGCA GGCGAAATGA AAGTGAAGGG CGACCCAGTC
Chihuahuanus bilineatus 6594 CCAAGGAGTC TAACATGTGC GCGAGTCGTC GGGTCTTGAG TAGGCCCGCA GGCGAAATGA AAGTGAAGGG CGACCCAGTC
Chihuahuanus cazieri 7163 CCAAGGAGTC TAACATGTGC GCGAGTCGTC GGGTCTTGAA TAGGCCCGCA GGCGAAATGA AAGTGAAGGG CGACCCAGTC
Chihuahuanus cazieri 7179 CCAAGGAGTC TAACATGTGC GCGAGTCGTC GGGTCTTGAA TAGGCCCGCA GGCGAAATGA AAGTGAAGGG CGACCCAGTC
Chihuahuanus coahuilae 5353 CCAAGGAGTC TAACATGTGC GCGAGTCGTC GGGTCTTGAA CAGGCCCGCA GGCGAAATGA AAGTGAAGGG CGACCCAGTC
Chihuahuanus coahuilae 6600 CCAAGGAGTC TAACATGTGC GCGAGTCGTC GGGTCTTGAA CAGGCCCGCA GGCGAAATGA AAGTGAAGGG CGACCCAGTC
Chihuahuanus coahuilae 7095 CCAAGGAGTC TAACATGTGC GCGAGTCGTC GGGTCTTGAA CAGGCCCGCA GGCGAAATGA AAGTGAAGGG CGACCCAGTC
Chihuahuanus crassimanus 2972 CCAAGGAGTC TAACATGTGC GCGAGTCGTC GGGTCTTGAA TAGGCCCGCA GGCGAAATGA AAGTGAAGGG CGACCCAGTC
Chihuahuanus crassimanus 5365 CCAAGGAGTC TAACATGTGC GCGAGTCGTC GGGTCTTGAA TAGGCCCGCA GGCGAAATGA AAGTGAAGGG CGACCCAGTC
Chihuahuanus crassimanus 7100 CCAAGGAGTC TAACATGTGC GCGAGTCGTC GGGTCTTGAA TAGGCCCGCA GGCGAAATGA AAGTGAAGGG CGACCCAGTC
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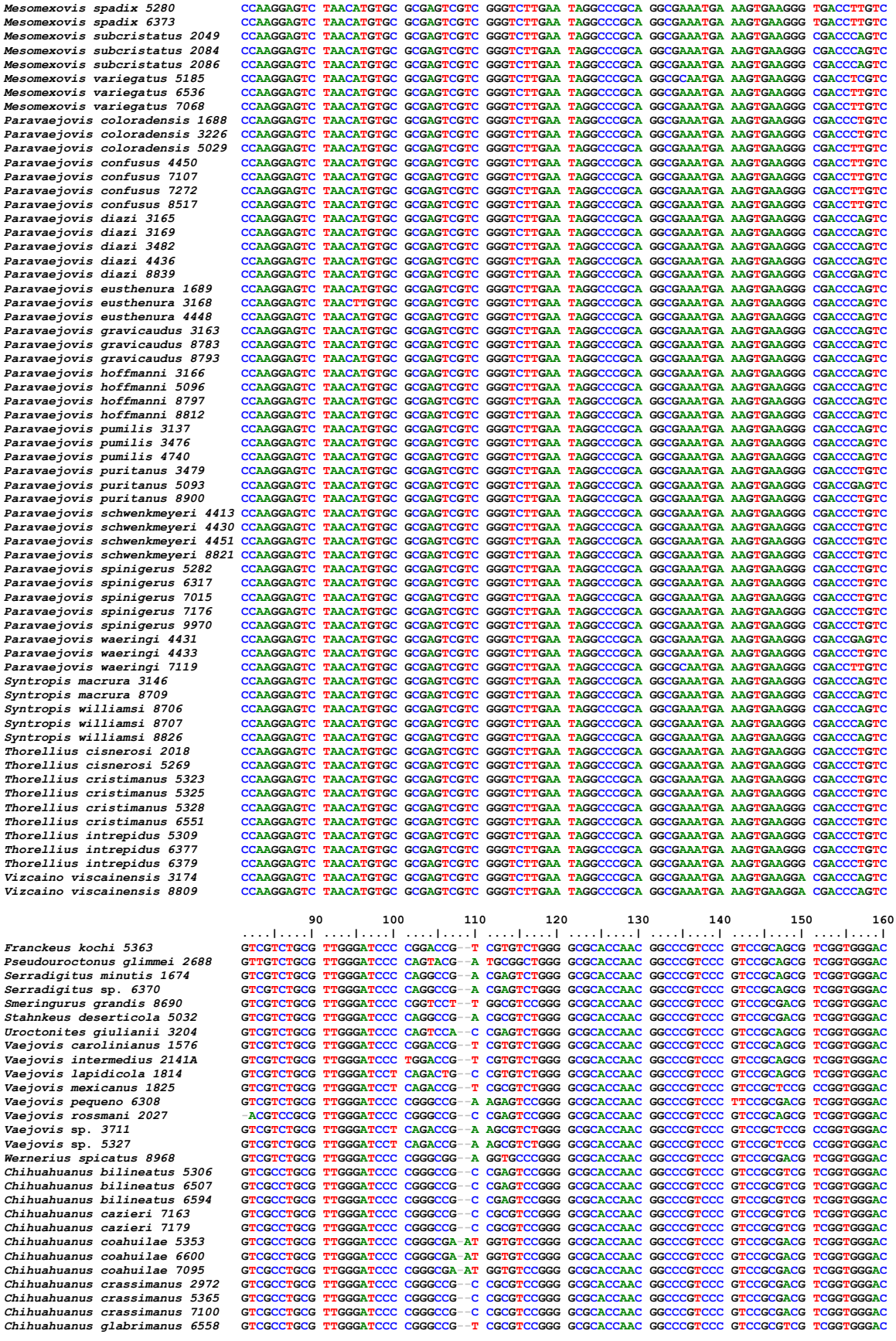
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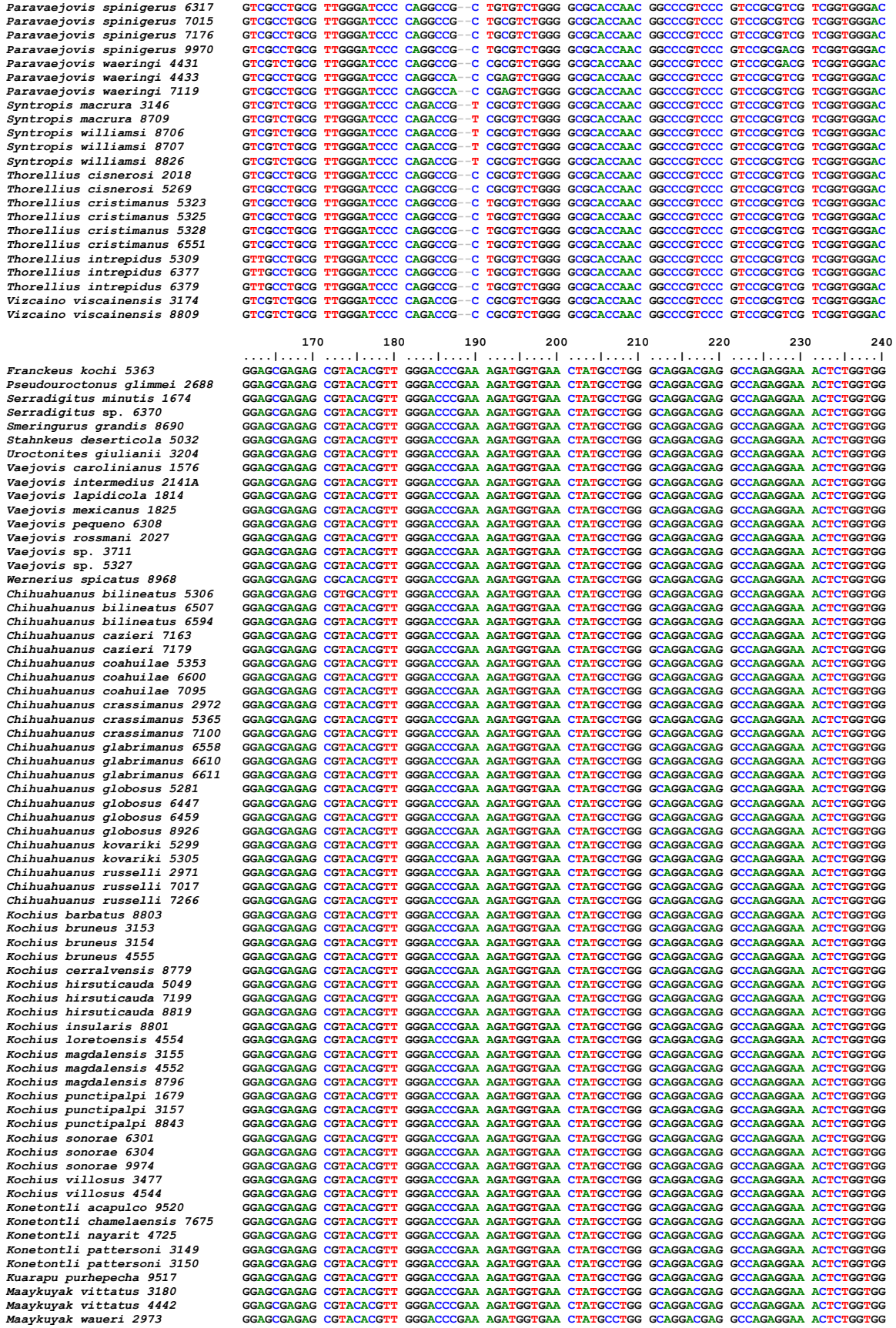
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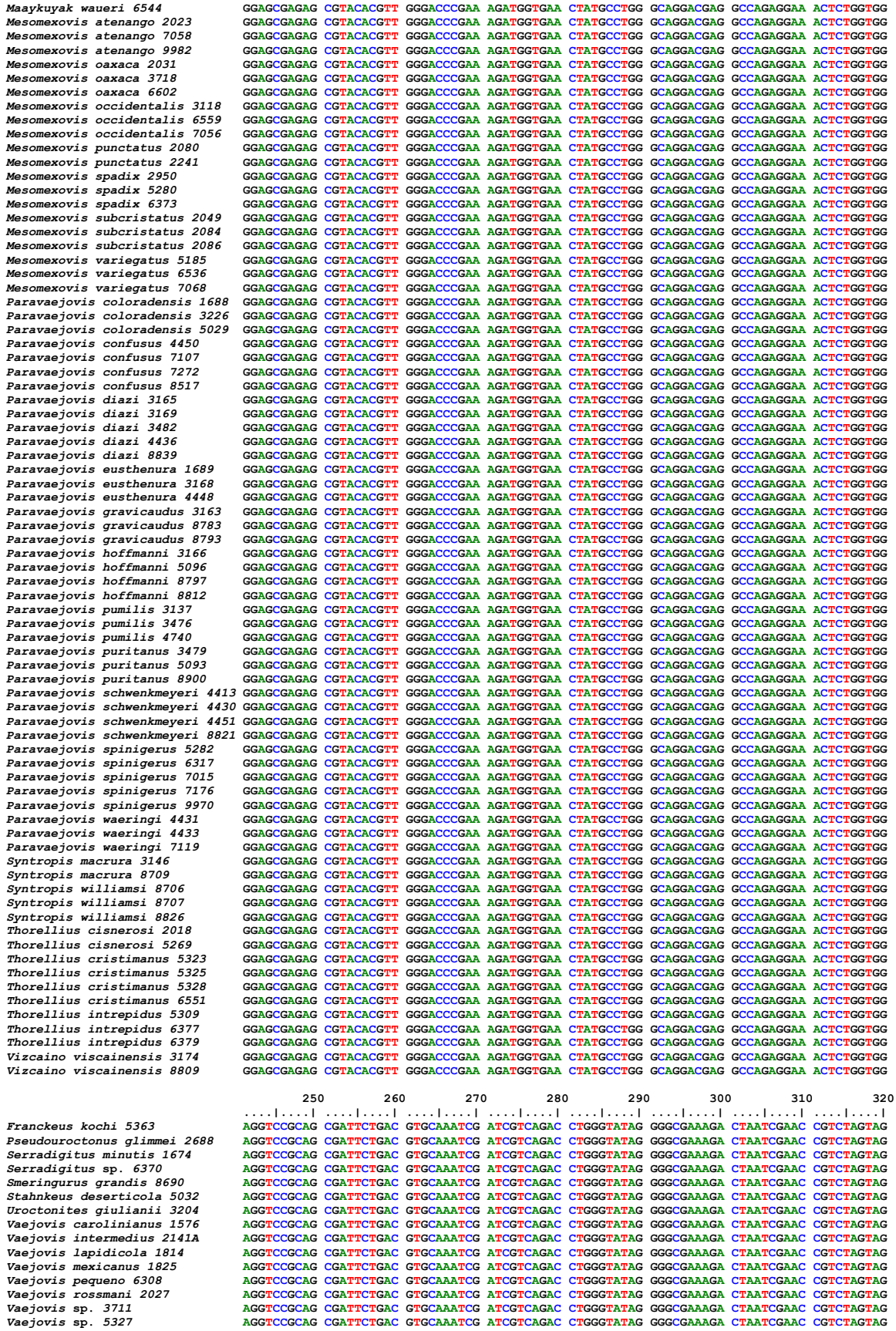
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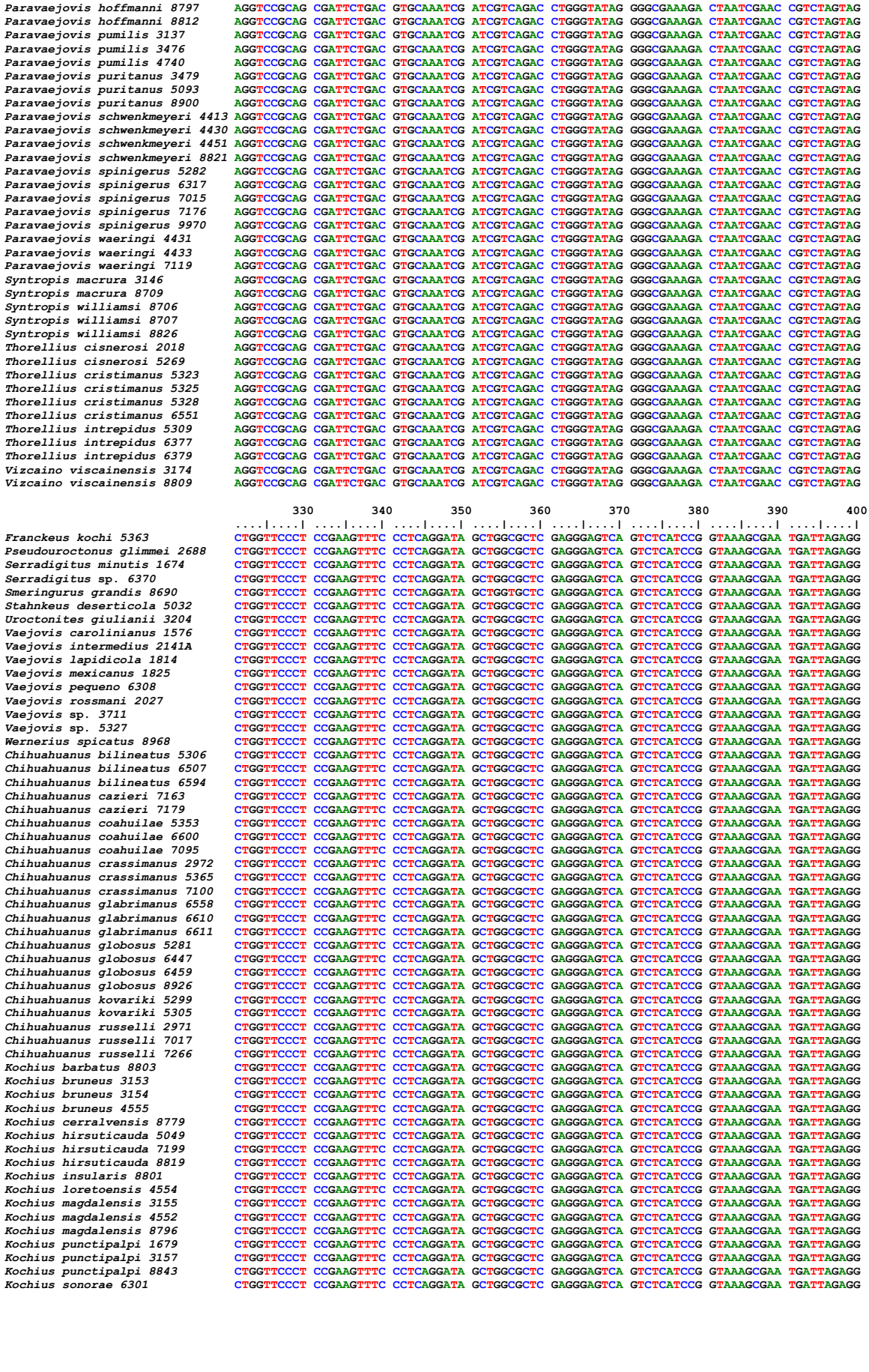
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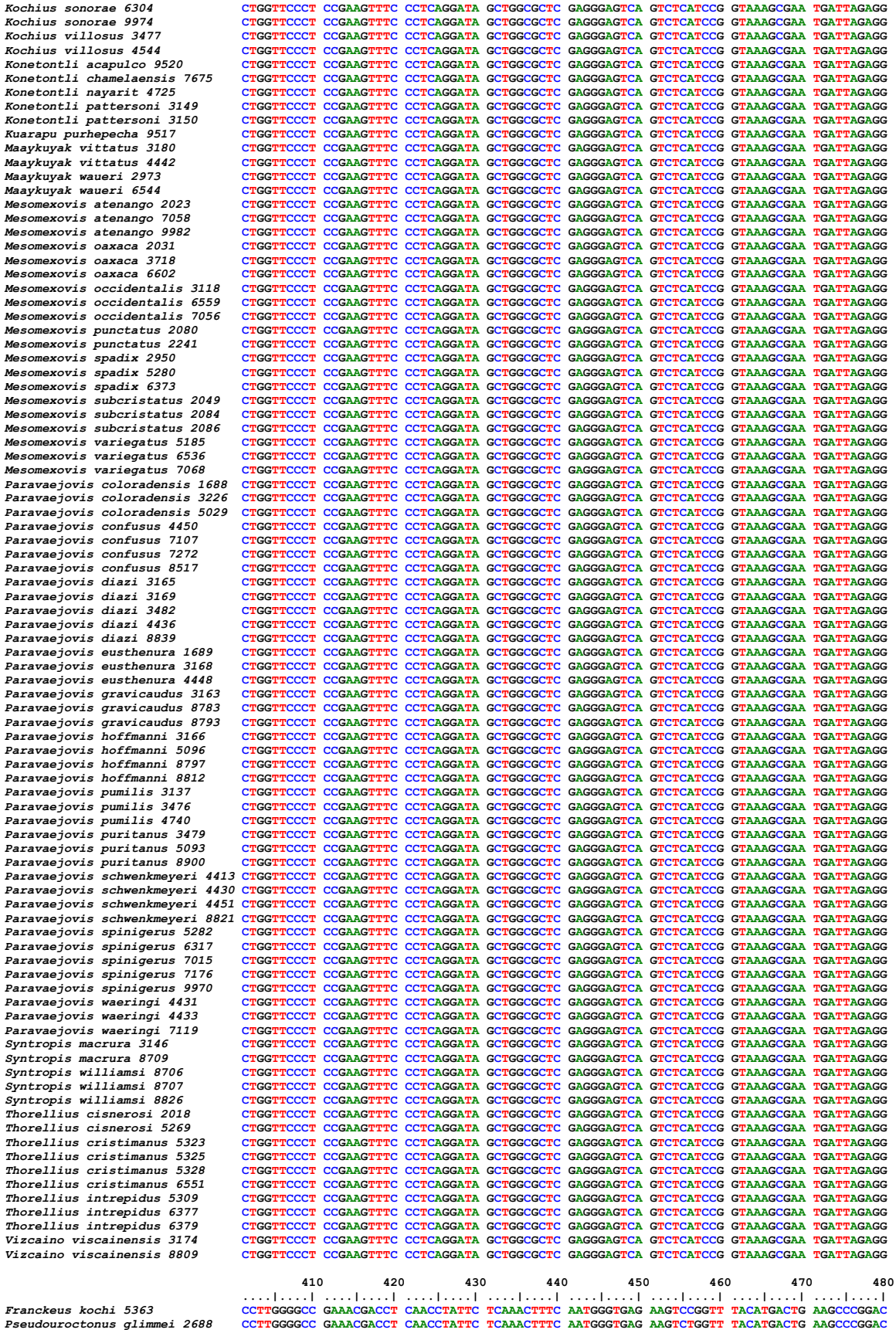
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Paravaejovis hoffmanni 8797        --AATTCT-- CAGGATGCGA GTGCCCAGTG GGCCACTTTT
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Paravaejovis puritanus 3479        --AATTCT-- CAGGATGCGA GTGCCCAGTG GGCCACTTTT
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Paravaejovis spinigerus 6317       --AATTCT-- CAGGATGCGA GTGCCCAGTG GGCCACTTTT
Paravaejovis spinigerus 7015       --AATTCT-- CAGGATGCGA GTGCCCAGTG GGCCACTTTT
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Paravaejovis spinigerus 9970       --AATTCT-- CAGGATGCGA GTGCCCAGTG GGCCACTTTT
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Paravaejovis waeringi 4433         --AATTCT-- CAGGATGCGA GTGCCCAGTG GGCCACTTTT
Paravaejovis waeringi 7119         --AATTCT-- CAGGATGCGA GTGCCCAGTG GGCCACTTTT
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Syntropis williamsi 8706           --AATTCT-- CAGGATGCGA GTGCCCAGTG GGCCACTTTT
Syntropis williamsi 8707           --AATTCT-- CAGGATGCGA GTGCCCAGTG GGCCACTTTT
Syntropis williamsi 8826           --AATTCT-- CAGGATGCGA GTGCCCAGTG GGCCACTTTT
Thorellius cisnerosi 2018          --AATTCT-- CAGGATGCGA GTGCCCAGTG GGCCACTTTT
Thorellius cisnerosi 5269          --AATTCT-- CAGGATGCGA GTGCCCAGTG GGCCACTTTT
Thorellius cristimanus 5323        --AATTCT-- CAGGATGCGA GTGCCCAGTG GGCCACTTTT
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Thorellius cristimanus 5325     --AATTCT-- CAGGATGCGA GTGCCCAGTG GGCCACTTTT
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Thorellius cristimanus 6551     --AATTCT-- CAGGATGCGA GTGCCCAGTG GGCCACTTTT
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Thorellius intrepidus 6377      --AATTCT-- CAGGATGCGA GTGCCCAGTG GGCCACTTTT
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Vizcaino viscainensis 3174      --AATTCT-- CAGGATGCGA GTGCCCAGTG GGCCACTTTT
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Appendix 10

Sequences of the DNA COI genomic partition for cladistic analysis of the subfamily Syntropinae (Kraepelin, 1905). Outgroup 1–16, Ingroup 17–146.

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                                10        20        30        40        50        60        70        80
                        ....|....| ....|....| ....|....| ....|....| ....|....| ....|....| ....|....| ....|....|
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Pseudouroctonus glimmei 2688 TACTATGTAT TTGATTTTAG GGGGTTGAGC TTCTATAGTA GGAACAGCTT TGAGAATAAT AATTCGTGTA GAGATTGGAA
Serradigitus minutis 1674 GACTATATAT TTGATTTTAG GTGGTTGAGC TTCTATGGTG GGAACAGCTT TAAGATTGAT GATTCGTGCT GAAATTGGAA
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Vaejovis lapidicola 1814 GACTATATAT TTAATTCTTG GTGGTTGGGC TTCAATGGTC GGTACCGCTT TGAGAATAAT AATTCGTGCT GAAATTGGGA
Vaejovis mexicanus 1825 TACTATATAT TTGATTTTAG GAGGATGAGC GTCTATAGTA GGAACAGCTT TGAGTTTAAT AATTCGAGCT GAAATTGGTA
Vaejovis pequeno 6308   GACTATATAT TTAATTTTAG GTGGATGGGC TTCTATAGTT GGTACGGCTT TGAGATTAAT AATTCGTGCT GAAATTGGGA
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Vaejovis sp. 3711       AACTATATAT TTAATTTTGG GAGGTTGAGC CTCTATAGTA GGAACGGCTT TGAGTTTGAT AATTCGGGCT GAAATTGGTA
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Wernerius spicatus 8968 AACTATATAT TTAATTTTAG GTGGTTGAGC TTCAATAGTT GGAACAGCTT TGAGATTAAT AATTCGTATT GAGATTGGAA
Chihuahuanus bilineatus 5306 AACTATATAT TTGATTTTAG GAGGTTGAGC TTCAATAGTA GGGACTGCTT TAAGATTAAT AATTCGGGTT GAGATTGGAA
Chihuahuanus bilineatus 6507 AACTATATAT TTAATTTTAG GAGGTTGAGC TTCAATAGTG GGGACTGCTT TAAGATTAAT AATTCGAGTT GAGATTGGAA
Chihuahuanus bilineatus 6594 AACTATATAT TTAATTTAAT GAGGTTGAGC TTCTATAGTA GGAACTGCCT TAAGATTGAT AATTCGGGTT GATATTGGAA
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Chihuahuanus cazieri 7179 AACCATATAT TTAATTTTAG GAGGATGAGC CTCAATAGTT GGAACTGCTT TGAGATTAAT AATTCGGGCT GAAATTGGGA
Chihuahuanus coahuilae 5353 GACAATGTAT TTGATTTTAG GAGGTTGAGC TTCAATGGTT GGGACTGCTC TAAGATTAAT AATTCGAGCT GAAATTGGAA
Chihuahuanus coahuilae 6600 GACTATGTAT TTAATTTTAG GAGGTTGAGC TTCAATGGTT GGAACTGCTC TTAGATTAAT AATTCGAGCT GAAATTGGAA
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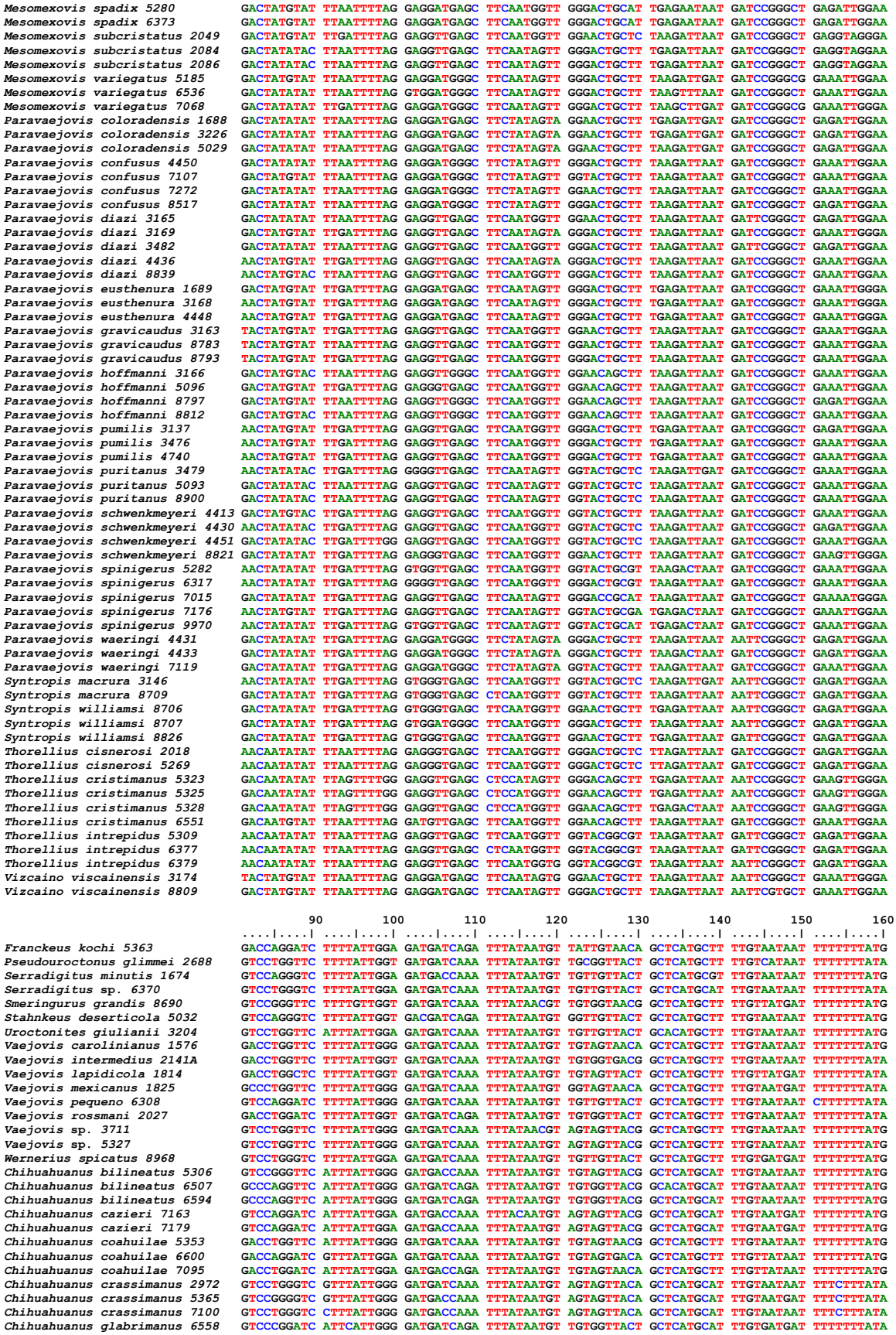
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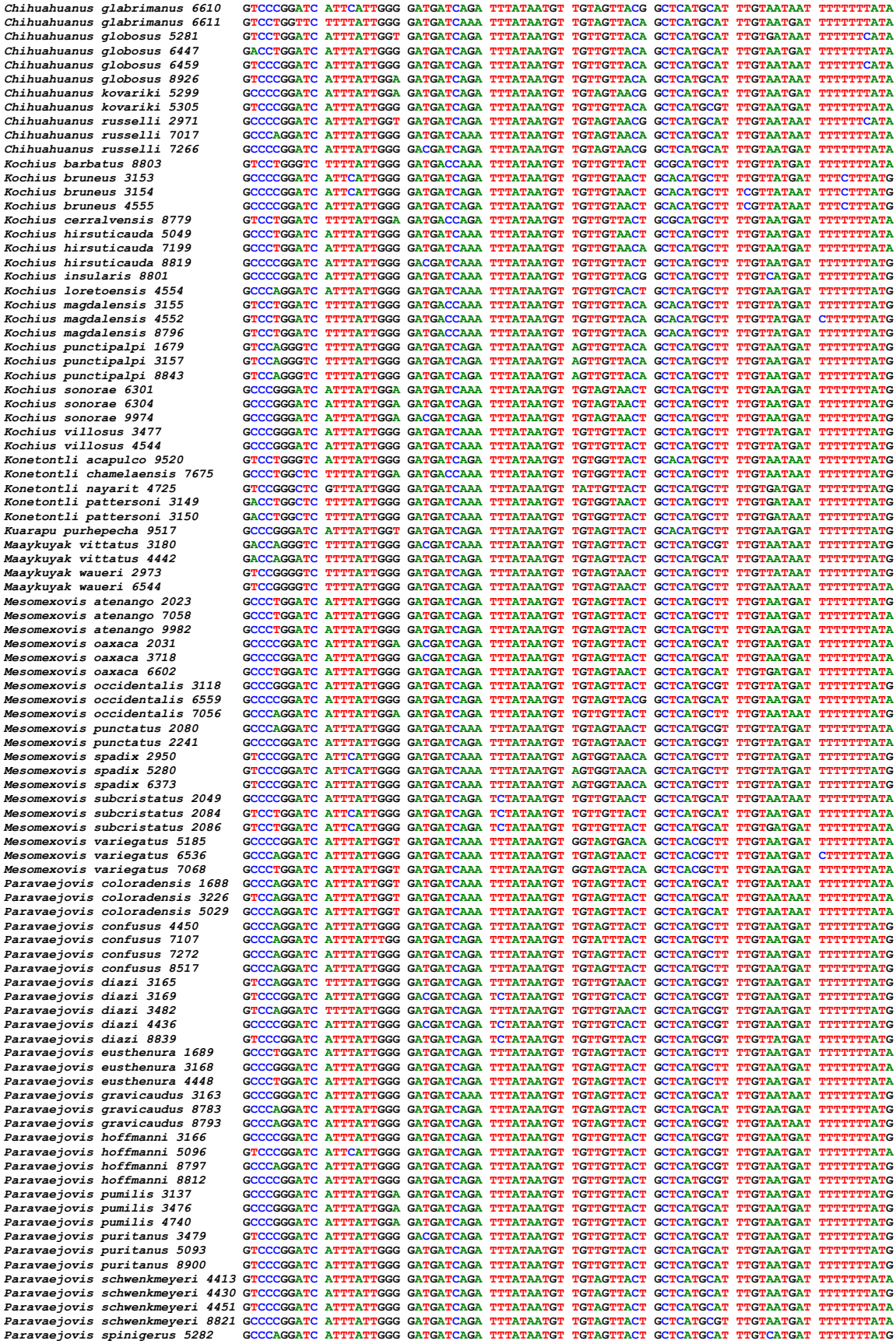
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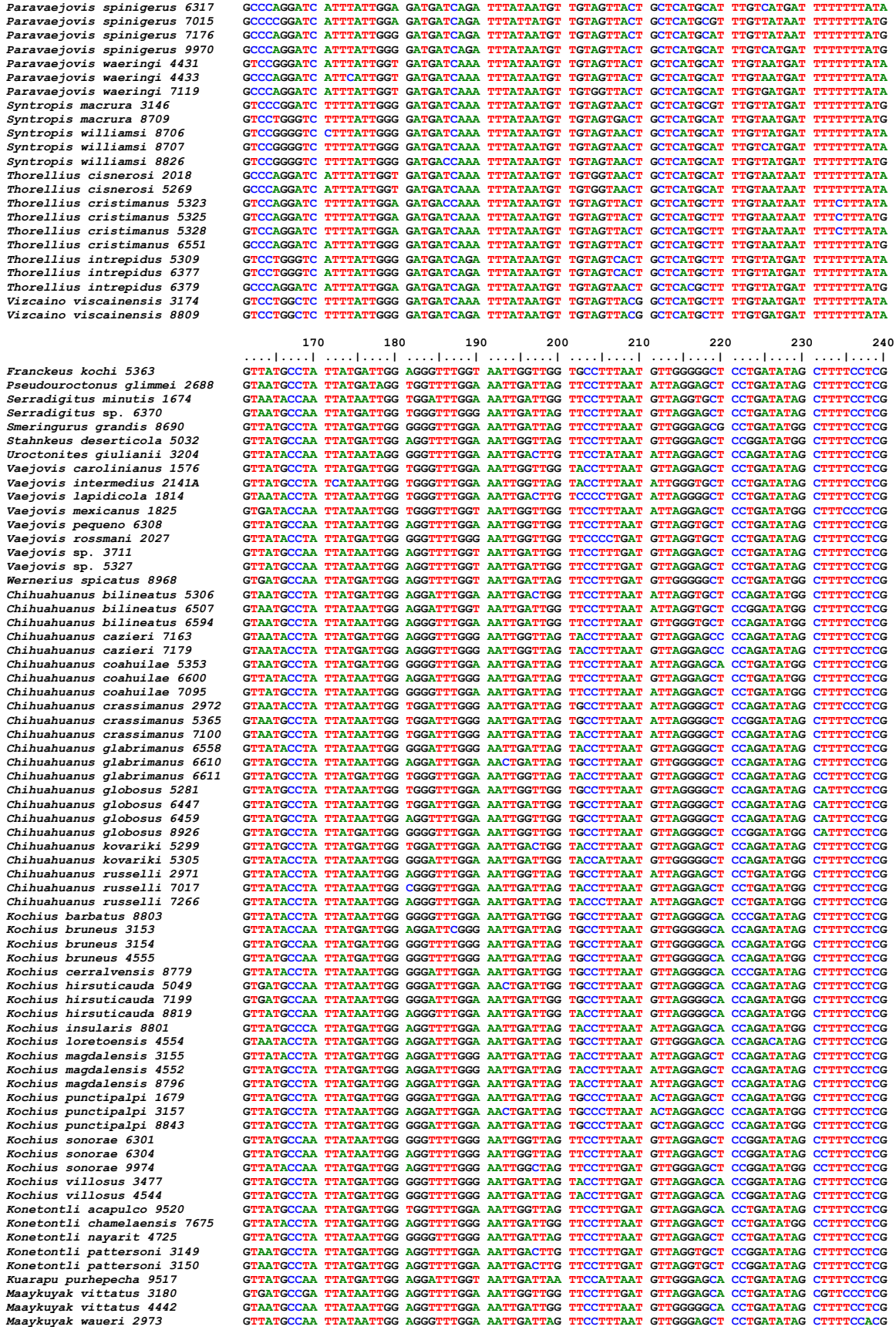
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Thorellius cristimanus 6551 GCCCAGGATC ATTTATTGGG GATGATCAAA TTTATAATGT TGTAGTTACT GCTCATGCTT TTGTAATAAT TTTTTTTATG
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Vizcaino viscainensis 3174 GTCCTGGCTC TTTTATTGGG GATGATCAAA TTTATAATGT TGTAGTTACG GCTCATGCTT TTGTAATGAT TTTTTTTATA
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170 180 190 200 210 220 230 240
Franckeus kochi 5363 GTTATGCCTA TTATGATTGG AGGGTTTGGT AATTGGTTGG TGCCTTTAAT GTTGGGGGCT CCTGATATAG CTTTTCCTCG
Pseudouroctonus glimmei 2688 GTAATGCCTA TTATGATAGG TGGTTTTGGA AATTGATTAG TTCCTTTAAT ATTAGGAGCT CCTGATATAG CTTTTCCTCG
Serradigitus minutis 1674 GTAATACCAA TTATAATTGG TGGATTTGGA AATTGATTGG TTCCTTTAAT GTTAGGTGCT CCTGATATAG CTTTTCCTCG
Serradigitus sp. 6370 GTAATGCCAA TTATGATTGG TGGGTTTGGG AATTGATTAG TTCCTTTAAT GTTAGGAGCT CCTGATATAG CTTTTCCTCG
Smeringurus grandis 8690 GTTATGCCTA TTATGATTGG GGGGTTTGGA AATTGATTAG TTCCTTTAAT GTTGGGAGCG CCTGATATGG CTTTTCCTCG
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Uroctonites giulianii 3204 GTTATACCAA TTATAATAGG GGGTTTTGGA AATTGACTTG TTCCTATAAT ATTAGGAGCT CCAGATATAG CTTTTCCTCG
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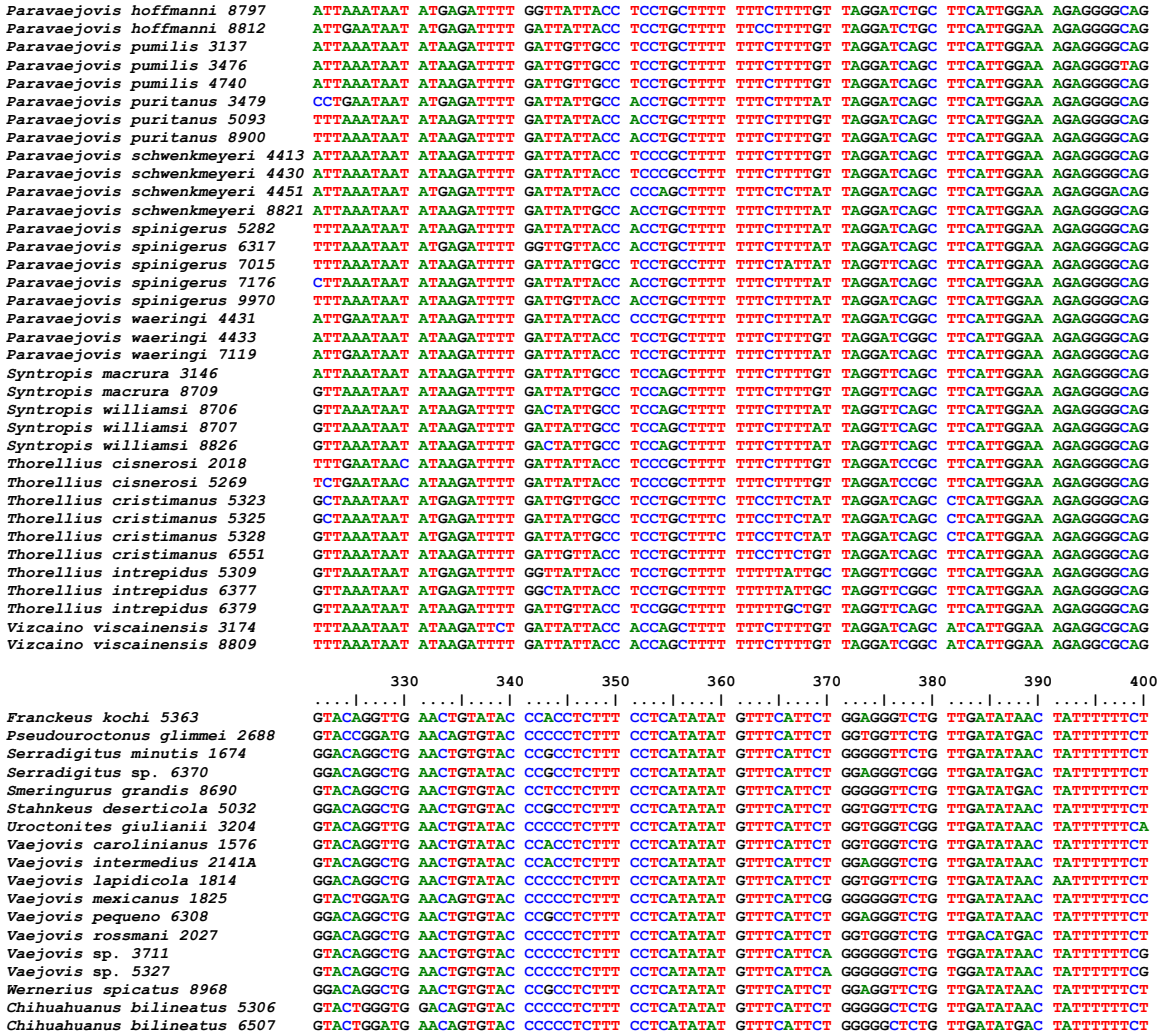
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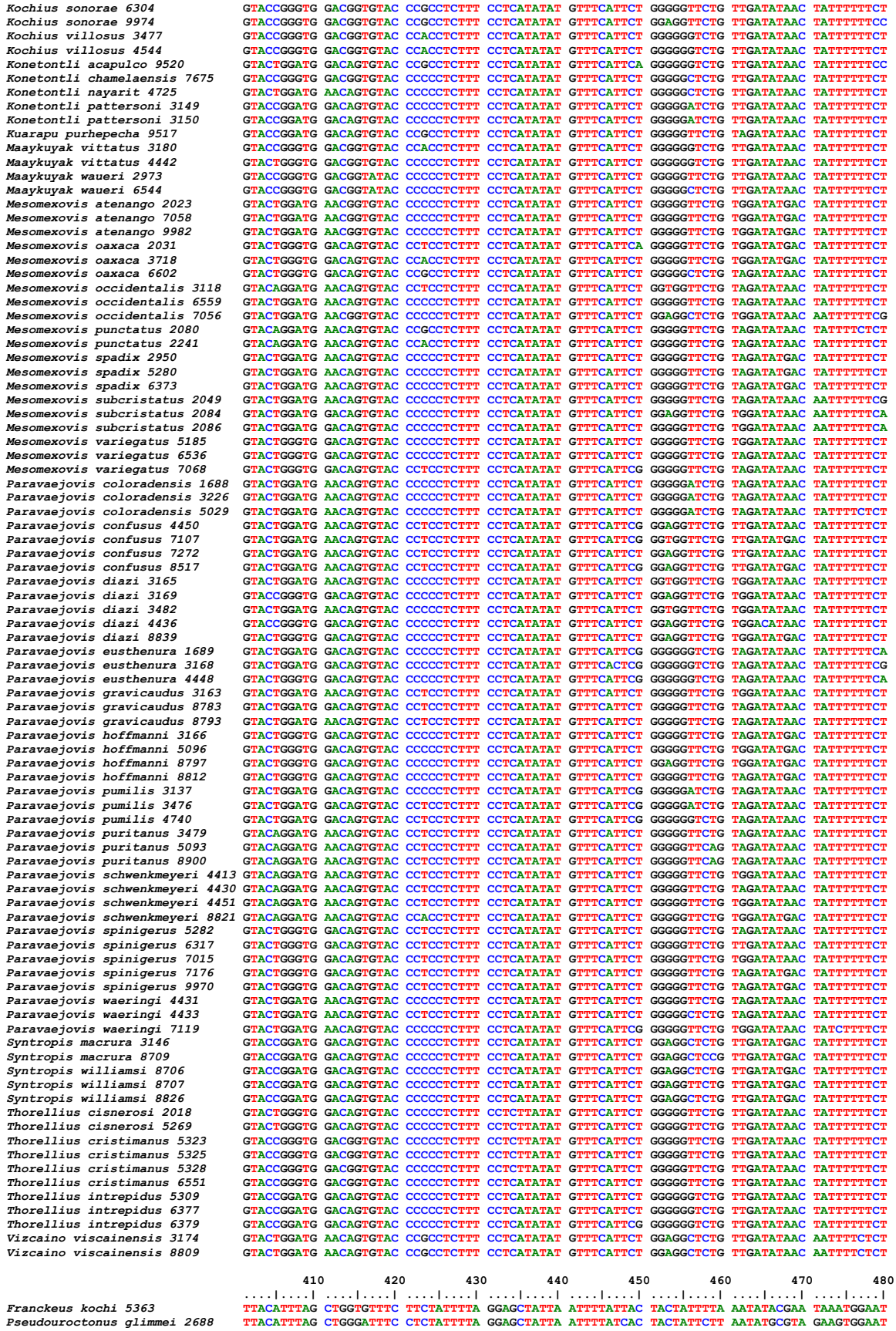
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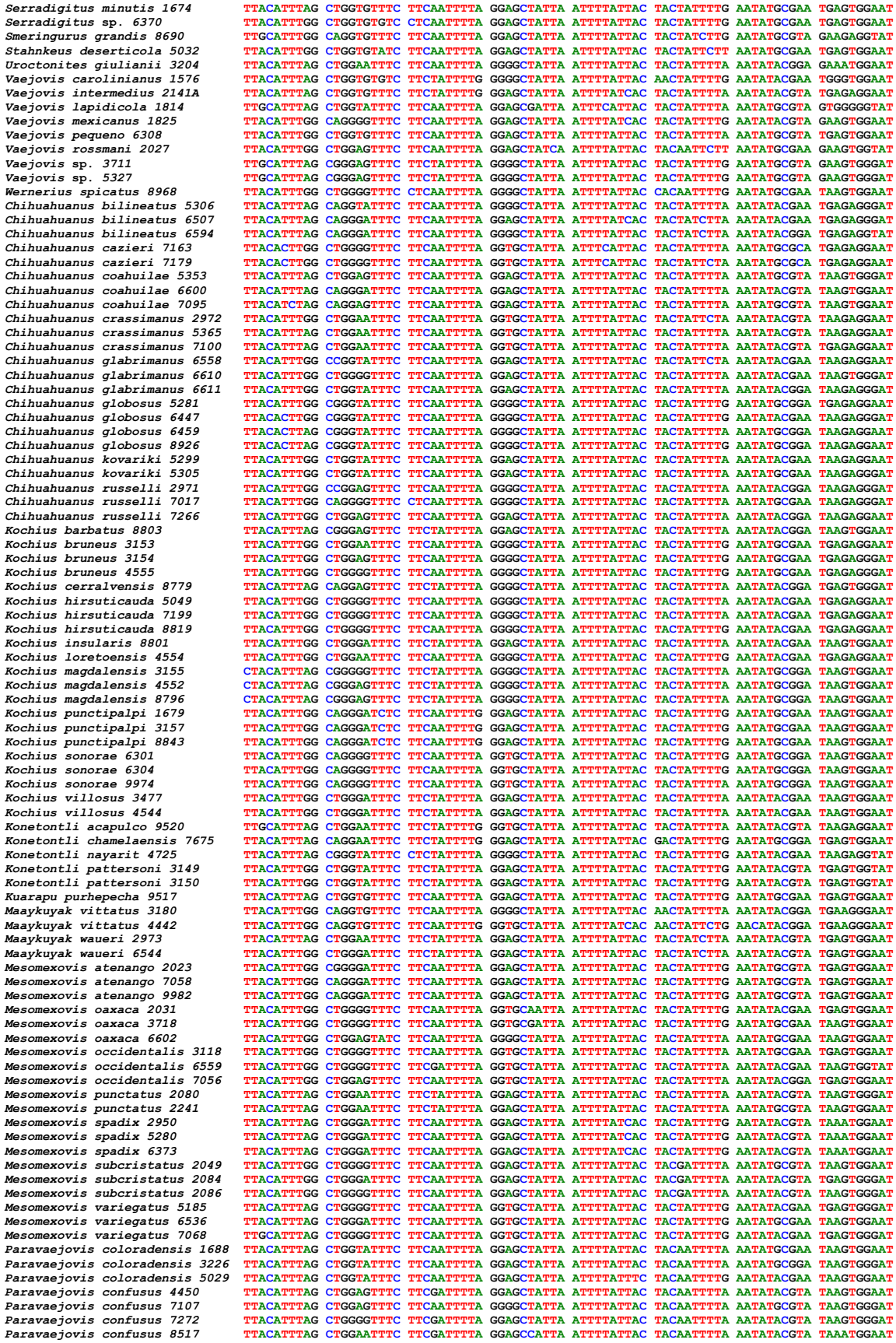
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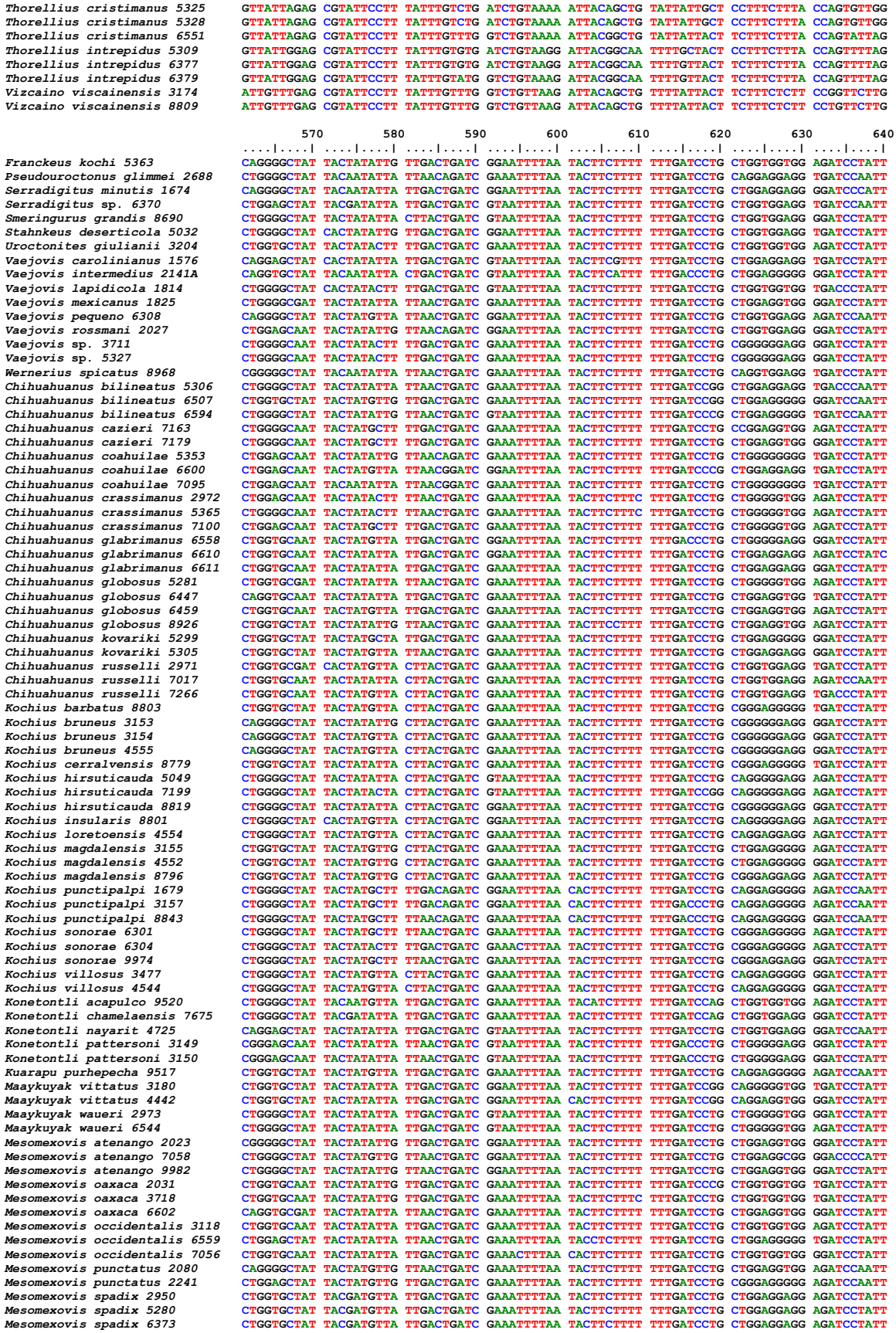
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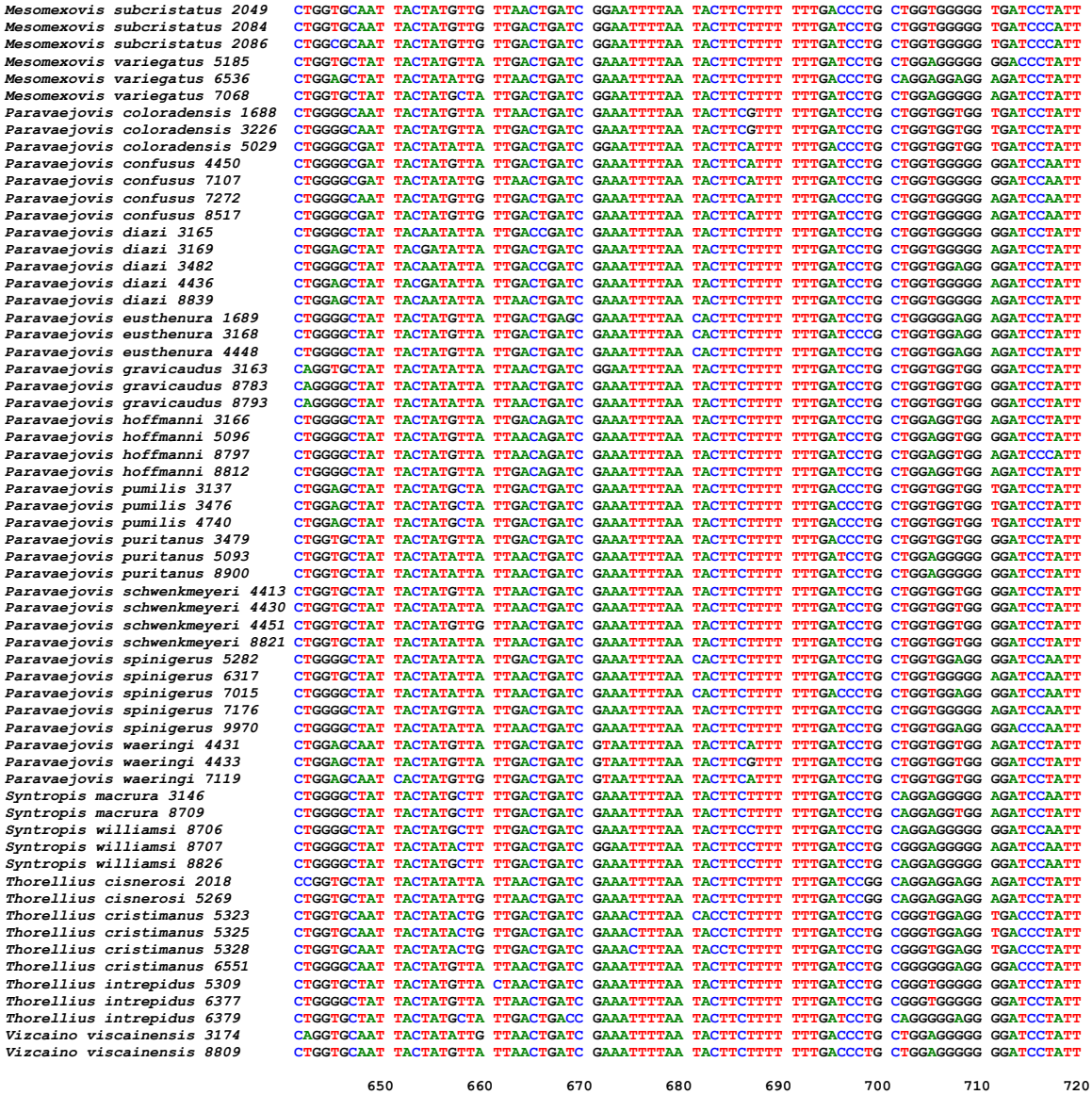
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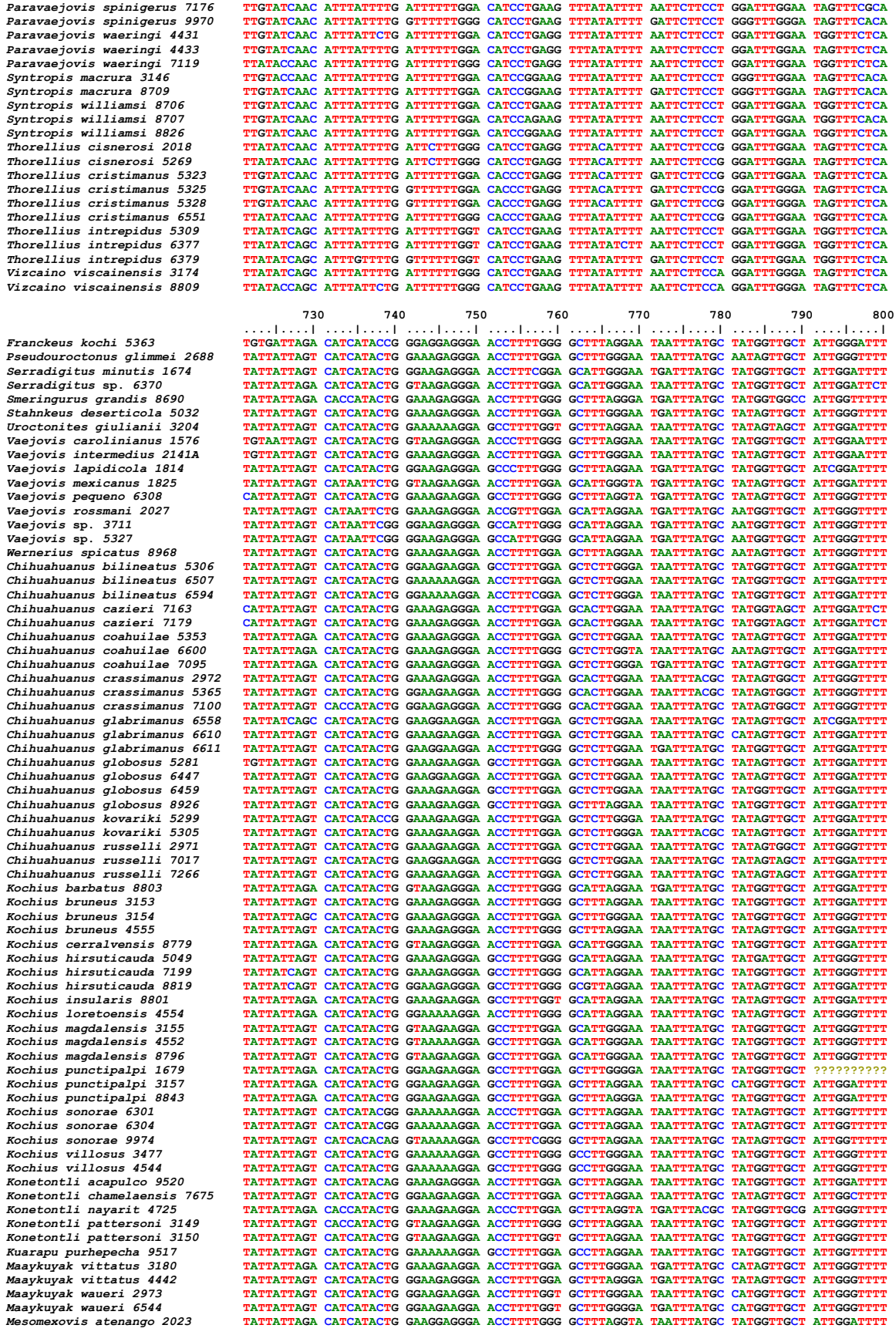
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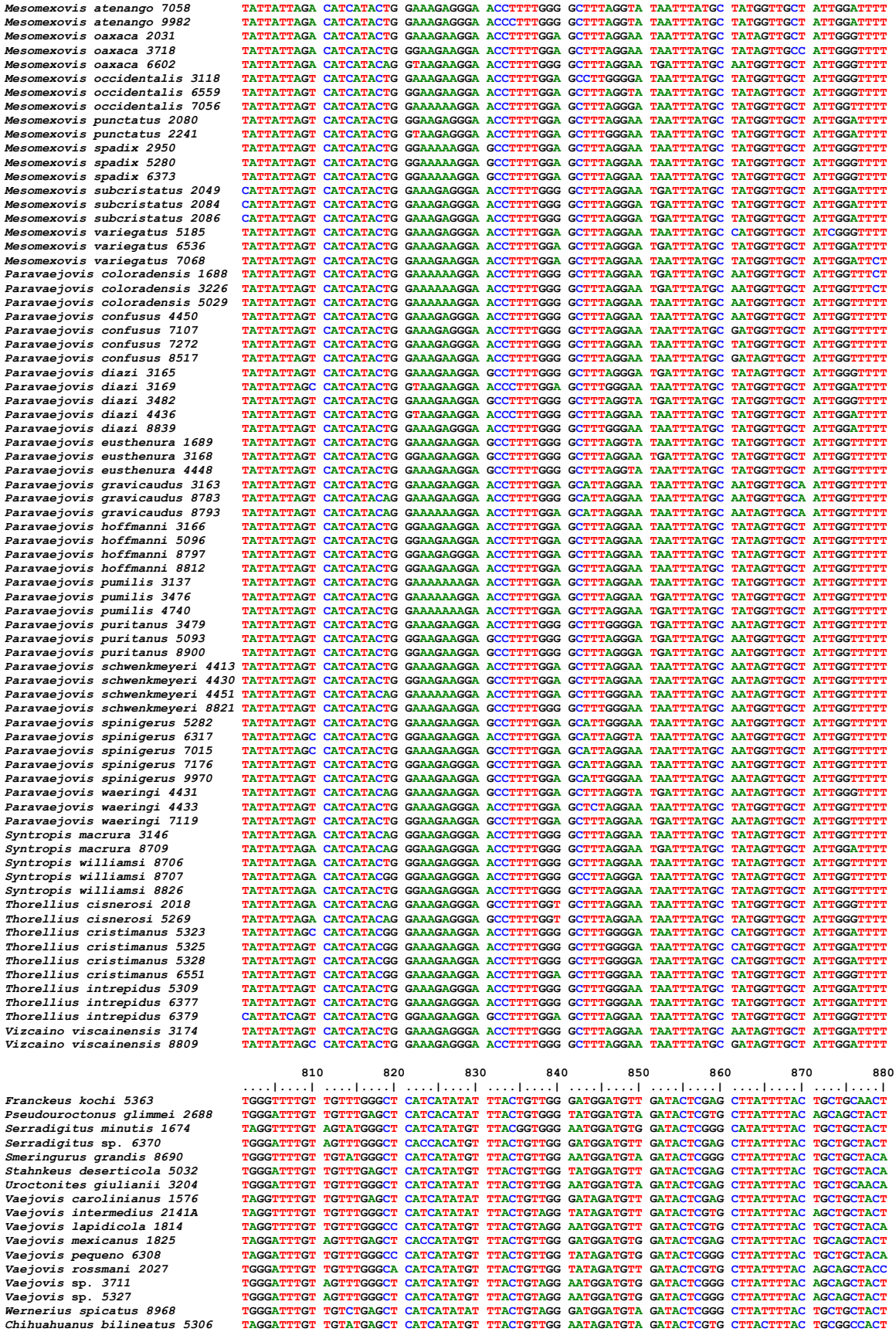
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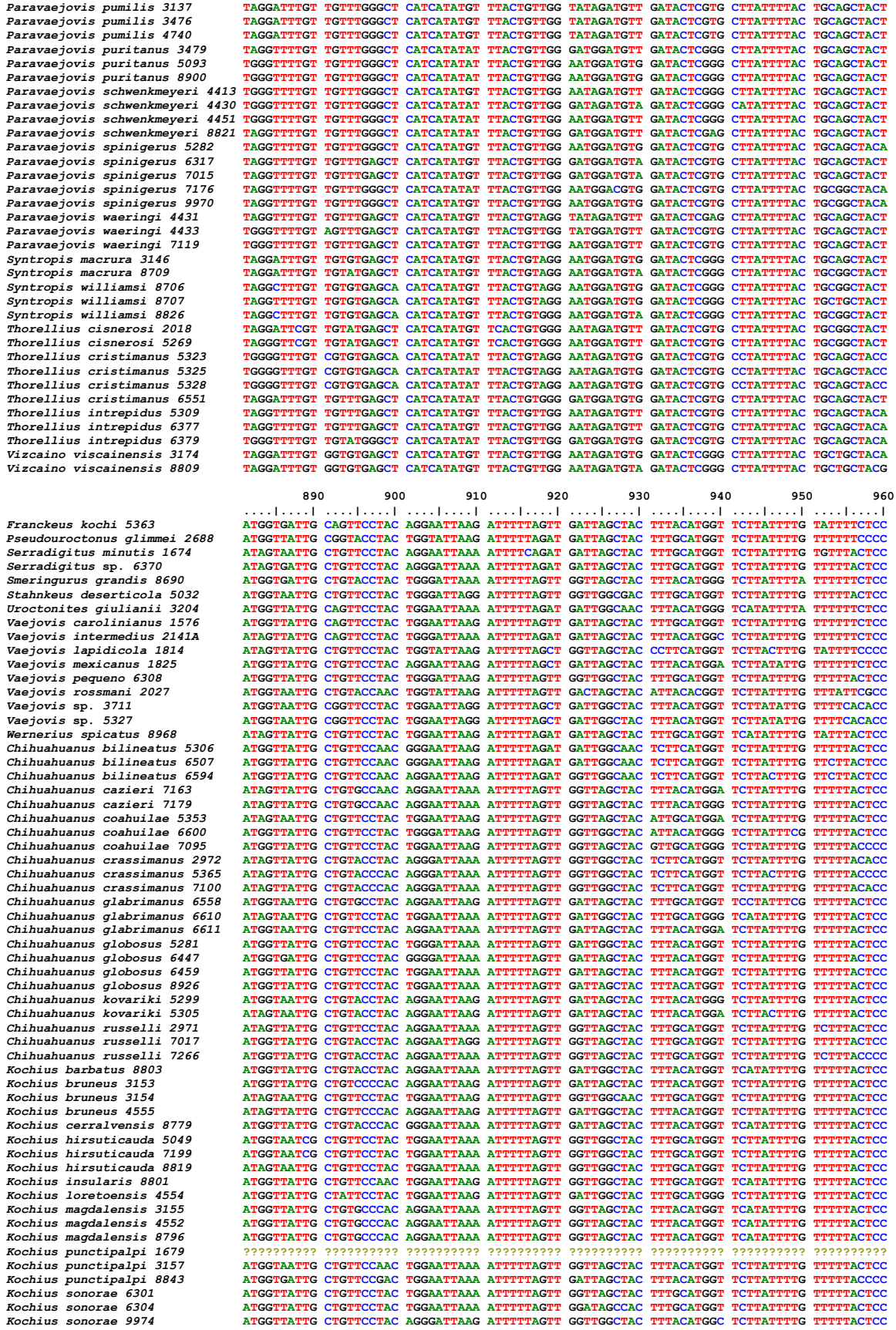
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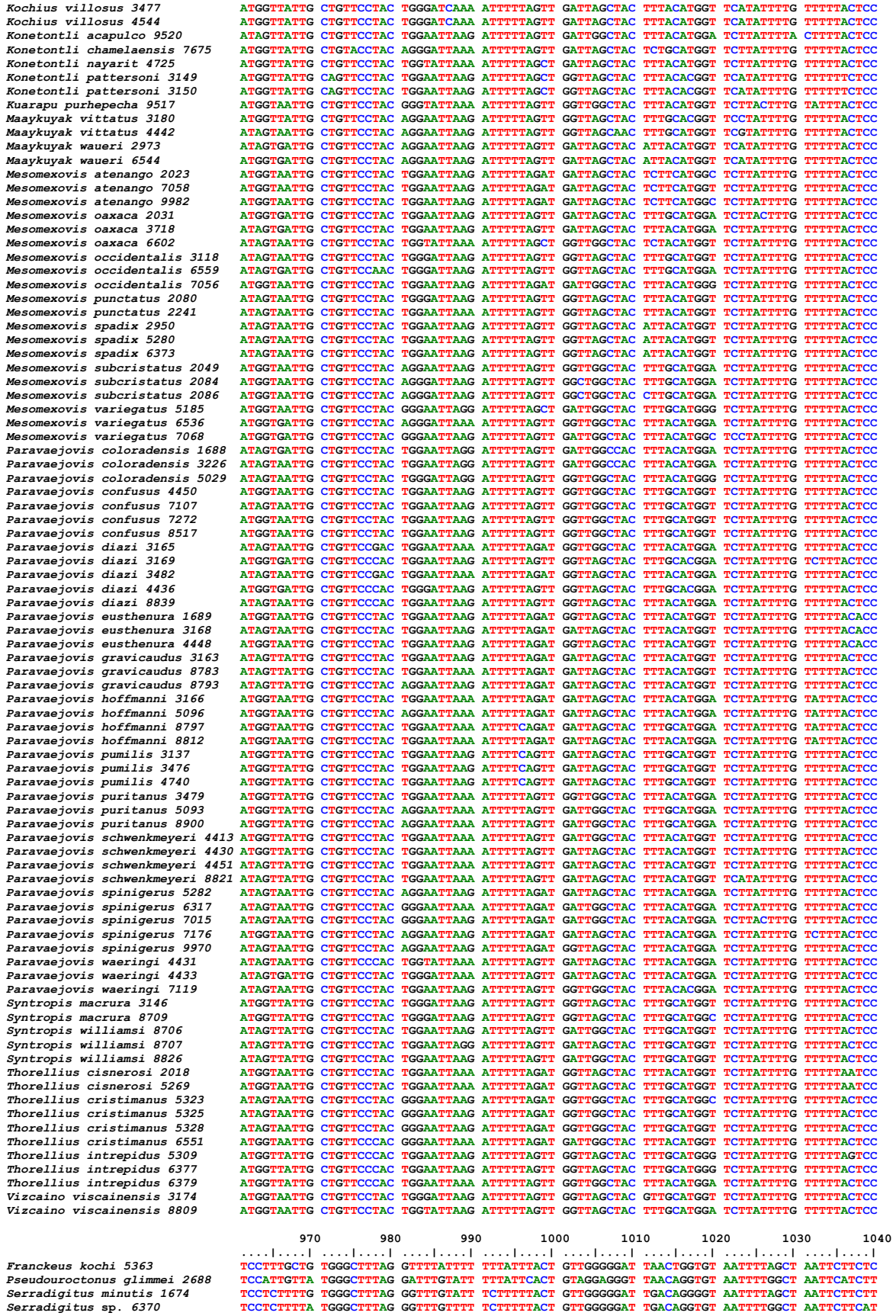
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Kochius barbatus 8803             ACCTTTATTG TGGGCTTTAG GATTTGTATT TTTGTTCACT GTAGGAGGTT TAACAGGAGT AATTTTAGCT AATTCATCTC
Kochius bruneus 3153              CCCTTTGTTA TGGGCTTTAG GCTTTGTATT TTTATTTACT GTAGGGGGTT TAACAGGGGT AATTTTGGCT AATTCTTCTT
Kochius bruneus 3154              TCCTCTTTTA TGGGCTTTAG GATTTGTTTT TTTGTTTACT GTTGGAGGAT TAACTGGTGT AATTTTAGCT AATTCTTCTT
Kochius bruneus 4555              TCCTTTGTTA TGGGCTTTAG GTTTTGTATT TTTATTCACT GGAGGGGGTT TAACAGGAGT AATTTTGGCT AATTCTTCCT
Kochius cerralvensis 8779         TCCTTTATTG TGGGCTTTAG GATTTGTATT TTTGTTCACT GTAGGAGGTT TAACAGGAGT AATTTTAGCT AATTCATCTC
Kochius hirsuticauda 5049         TCCTTTATTA TGAGCTTTAG GTTTTGTATT TTTGTTTACT GTTGGAGGAT TAACAGGGGT AATTTTGGCT AATTCTTCTT
Kochius hirsuticauda 7199         TCCTTTATTG TGAGCTTTAG GTTTTGTATT TTTGTTTACT GTTGGGGGAT TAACAGGAGT AATTTTGGCT AATTCTTCTT
Kochius hirsuticauda 8819         TCCTTTATTA TGAGCTTTGG GGTTTGTATT TTTATTTACT GTTGGTGGAT TGACGGGGGT AATTTTGGCT AATTCTTCTT
Kochius insularis 8801            TCCTTTGTTG TGGGCTTTAG GTTTTGTCTT TTTGTTTACT GTTGGGGGTT TAACAGGGGT AATTTTAGCT AATTCTTCTT
Kochius loretoensis 4554          TCCTTTGTTA TGAGCTTTAG GTTTTGTATT TTTATTTACT GTTGGGGGAC TGACTGGAGT GATTTTAGCT AATTCTTCTT
Kochius magdalensis 3155          CCCTTTATTG TGGGCTTTAG GGTTTGTATT TTTGTTCACT GTAGGAGGAT TGACAGGAGT AATCTTGGCT AATTCATCTT
Kochius magdalensis 4552          CCCCTTATTG TGGGCTTTAG GGTTTGTATT TTTGTTCACT GTAGGGGGAT TGACAGGAGT AATCTTGGCT AATTCATCTT
Kochius magdalensis 8796          CCCATTATTG TGGGCTTTAG GGTTTGTATT TTTGTTCACT GTAGGGGGAT TGACAGGAGT AATTTTGGCT AATTCATCTT
Kochius punctipalpi 1679          ?????????? ?????????? ?????????? ?????????? ?????????? ?????????? ?????????? ??????????
Kochius punctipalpi 3157          CCCTTTATTG TGGGCTTTAG GATTTGTGTT TTTATTTACT GTAGGAGGTT TAACAGGTGT AATTTTGGCT AATTCTTCTT
Kochius punctipalpi 8843          ACCTTTGTTG TGGGCTTTGG GATTTGTATT TTTATTTACT GTAGGAGGTT TAACAGGTGT AATTTTGGCT AATTCTTCTT
Kochius sonorae 6301              TCCTTTATTA TGAGCTTTAG GCTTTGTTTT TTTGTTTACT GTAGGAGGTT TAACGGGAGT AATTTTGGCT AATTCTTCAT
Kochius sonorae 6304              TCCTTTATTA TGAGCTTTAG GTTTTGTTTT CTTGTTTACT GTAGGAGGTT TAACGGGAGT AATTTTGGCT AATTCTTCTT
Kochius sonorae 9974              GCCTTTATTG TGAGCTTTAG GTTTTGTTTT TTTGTTTACT GTAGGGGGTT TGACGGGAGT AATTTTGGCT AATTCTTCTT
Kochius villosus 3477             TCCTTTGTTG TGAGCTTTAG GTTTTGTATT TTTGTTTACT GTTGGGGGAT TAACAGGGGT AATTTTGGCT AATTCTTCTT
Kochius villosus 4544             TCCTTTGTTG TGAGCTTTAG GTTTTGTATT TTTGTTTACT GTTGGGGGAT TAACAGGGGT AATTTTGGCT AATTCTTCTT
Konetontli acapulco 9520          TCCTTTATTA TGGGCATTAG GATTTGTTTT TTTATTTACT GTGGGTGGAT TGACTGGAGT AATTTTAGCT AATTCTTCTT
Konetontli chamelaensis 7675      TCCTTTGTTG TGAGCTTTGG GGTTTGTTTT TTTATTTACT GTTGGAGGGT TAACAGGAGT AATTTTAGCA AATTCTTCTT
Konetontli nayarit 4725           TCCTTTATTG TGAGCTTTAG GTTTTGTATT TTTATTTACT GTGGGAGGCT TGACTGGGGT TATTTTAGCT AATTCTTCTT
Konetontli pattersoni 3149        TCCTTTATTA TGAGCTTTAG GATTTGTATT TTTATTCACT GTAGGAGGAT TAACAGGAGT AATTTTAGCT AACTCCTCTT
Konetontli pattersoni 3150        TCCTTTATTA TGAGCTCTAG GATTTGTATT TTTGTTCACT GTAGGGGGAT TAACAGGAGT AATTTTAGCT AATTCCTCTT
Kuarapu purhepecha 9517           TCCTTTATTA TGAGCTTTAG GGTTTGTTTT TTTATTTACT GTGGGAGGTT TAACTGGAGT AATTTTAGCT AATTCTTCTT
Maaykuyak vittatus 3180           CCCTTTATTA TGAGCTTTAG GTTTTGTATT TTTATTTACT GTAGGAGGAT TGACTGGGGT AATTTTGGCT AATTCTTCTT
Maaykuyak vittatus 4442           TCCTTTATTA TGAGCTTTAG GTTTTGTATT TTTATTTACT GTAGGAGGAT TAACGGGAGT GATTTTAGCT AATTCTTCTT
Maaykuyak waueri 2973             TCCTTTGTTA TGAGCTTTAG GATTTGTTTT TTTATTTACT GTAGGAGGAT TAACTGGGGT TATTCTAGCT AATTCTTCTT
Maaykuyak waueri 6544             CCCTTTATTA TGAGCTTTAG GATTTGTTTT TTTATTTACT GTAGGAGGAC TAACTGGGGT TATTCTAGCT AATTCTTCTT
Mesomexovis atenango 2023         ACCTTTGTTA TGGGCTTTGG GATTTGTATT TTTATTTACT GTAGGAGGAT TAACTGGTGT AATTTTGGCT AATTCTTCTT
Mesomexovis atenango 7058         CCCTTTGTTG TGGGCTTTGG GATTTGTATT TTTATTTACT GTAGGAGGAT TAACTGGTGT AATTTTGGCT AATTCTTCTT
Mesomexovis atenango 9982         TCCTTTGTTG TGGGCTTTGG GATTTGTATT TTTATTTACT GTAGGAGGAT TAACTGGTGT AATTTTGGCT AATTCTTCTT
Mesomexovis oaxaca 2031           CCCTTTATTG TGGGCTTTAG GATTTGTATT TTTATTTACT GTGGGAGGTT TAACGGGAGT AATTTTAGCT AATTCTTCTT
Mesomexovis oaxaca 3718           ACCTTTATTA TGGGCTTTAG GGTTTGTATT TTTATTCACT GTAGGGGGTT TAACAGGAGT AATTTTAGCT AATTCTTCTC
Mesomexovis oaxaca 6602           ACCTTTGTTA TGGGCTTTAG GATTTGTTTT TTTATTTACT GTGGGTGGTT TAACGGGAGT GATTTTGGCT AATTCTTCTT
Mesomexovis occidentalis 3118     ACCTTTGTTA TGAGCTTTGG GATTTGTATT TTTATTCACT GTTGGTGGAT TAACAGGGGT AATTTTAGCT AATTCTTCAT
Mesomexovis occidentalis 6559     TCCACTTTTA TGGGCTTTAG GATTTGTATT TTTATTTACT GTTGGAGGAT TAACTGGGGT AATTTTAGCT AACTCTTCTT
Mesomexovis occidentalis 7056     ACCTTTATTG TGAGCTTTAG GATTTGTGTT TTTATTCACT GTAGGGGGAT TAACAGGAGT AATTTTAGCT AATTCTTCTT
Mesomexovis punctatus 2080        TCCTTTGTTG TGGGCTTTGG GATTTGTATT TTTATTCACT GTAGGAGGTT TAACTGGAGT AATTTTAGCT AATTCTTCTT
Mesomexovis punctatus 2241        TCCTTTGTTA TGAGCTTTGG GATTTGTATT TTTATTTACT GTAGGAGGAT TAACTGGAGT AATTTTAGCT AATTCTTCTT
Mesomexovis spadix 2950           ACCTTTGTTG TGGGCTTTAG GGTTTGTATT TTTATTTACT GGTGGGGGAT TAACTGGAGT AATTTTAGCT AATTTTTCTT
Mesomexovis spadix 5280           ACCTTTGTTG TGGGCTTTAG GGTTTGTGTT TTTATTTACT GTTGGGGGAT TAACTGGAGT AATTTTAGCT AATTCTTCTT
Mesomexovis spadix 6373           ACCTTTGTTG TGGGCTTTAG GGTTTGTATT TTTATTTACT GTTGGGGGAT TAACTGGAGT AATTTTAGCT AATTCTTCTT
Mesomexovis subcristatus 2049     ACCTTTATTG TGAGCTTTAG GTTTTGTATT TTTATTTACT GTGGGGGGAT TAACGGGAGT AATCTTGGCT AATTCTTCTT
Mesomexovis subcristatus 2084     ACCTTTATTA TGGGCTTTAG GCTTTGTATT TTTGTTTACT GTGGGGGGAT TAACGGGGGT AATTTTGGCT AATTCTTCTT
Mesomexovis subcristatus 2086     CCCTTTATTA TGGGCTTTGG GCTTTGTATT TTTGTTTACT GTGGGGGGAT TAACGGGGGT AATTTTGGCT AATTCTTCTT
Mesomexovis variegatus 5185       TCCTTTATTA TGGGCTTTAG GATTTGTGTT TTTATTTACT GTTGGGGGAT TAACTGGAGT AATTTTAGCT AATTCTTCTT
Mesomexovis variegatus 6536       TCCCTTGTTG TGGGCTTTAG GATTTGTATT TTTATTTACT GTTGGAGGAT TAACTGGGGT AATTTTGGCT AATTCTTCTT
Mesomexovis variegatus 7068       TCCTTTGTTA TGGGCTTTAG GGTTTGTTTT TTTATTTACT GTTGGAGGAT TAACTGGGGT AATTTTAGCT AATTCTTCTC
Paravaejovis coloradensis 1688    ACCTTTATTA TGGGCTTTGG GATTTGTATT TTTGTTTACT GTTGGAGGAT TGACTGGAGT AATTTTGGCT AATTCTTCTT
Paravaejovis coloradensis 3226    ACCTTTATTA TGGGCTTTGG GATTTGTATT TTTGTTTACT GTTGGAGGAT TGACTGGAGT AATTTTGGCT AATTCTTCTT
Paravaejovis coloradensis 5029    GCCTTTATTA TGGGCTTTGG GATTTGTATT TTTGTTTACT GTTGGAGGAT TGACTGGAGT AATTTTGGCT AATTCCTCTT
Paravaejovis confusus 4450        TCCATTATTA TGAGCCTTAG GATTTGTGTT TTTATTTACT GTTGGAGGTT TAACGGGAGT AATTTTAGCT AATTCTTCTT
Paravaejovis confusus 7107        TCCGTTATTA TGAGCCTTAG GATTTGTATT TTTATTTACT GTTGGAGGGT TAACTGGAGT AATTTTAGCT AATTCTTCTT
Paravaejovis confusus 7272        TCCATTATTA TGAGCCTTAG GGTTTGTATT TTTATTTACT GTTGGGGGGT TAACGGGAGT AATTTTAGCT AATTCTTCTT
Paravaejovis confusus 8517        TCCGTTATTA TGAGCCTTGG GATTTGTATT TTTATTTACT GTTGGAGGGT TAACGGGAGT AATTTTAGCT AATTCTTCTT
Paravaejovis diazi 3165           TCCTCTTTTA TGAGCTTTAG GGTTTGTATT TTTGTTTACT GTAGGGGGAT TAACGGGAGT GATTTTAGCT AATTCTTCCT
Paravaejovis diazi 3169           TCCCTTGTTA TGGGCTTTAG GTTTTGTATT TTTATTTACT GTGGGAGGAT TAACGGGGGT AATTTTAGCT AATTCTTCTT
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Paravaejovis diazi 3482          TCCTCTTTTA TGAGCTTTAG GGTTTGTATT TTTGTTTACT GTAGGTGGAT TAACGGGAGT GATTTTAGCT AATTCTTCCT
Paravaejovis diazi 4436          TCCTTTGTTG TGGGCTTTAG GTTTTGTATT TTTATTTACT GTGGGAGGAT TAACGGGGGT AATCTTAGCT AATTCTTCTT
Paravaejovis diazi 8839          TCCTTTATTA TGGGCTCTAG GTTTTGTTTT TTTGTTTACT GTAGGAGGAT TAACAGGGGT AATTTTGGCT AATTCTTCTT
Paravaejovis eusthenura 1689     TCCTTTATTA TGAGCTTTAG GATTTGTATT TTTATTTACT GTAGGAGGAT TAACGGGGGT AATTTTAGCT AATTCTTCCT
Paravaejovis eusthenura 3168     TCCTTTGTTA TGAGCTTTAG GTTTTGTATT TTTATTTACT GTAGGGGGAT TAACTGGGGT AATTTTAGCT AATTCTTCTT
Paravaejovis eusthenura 4448     TCCTTTATTA TGAGCTTTAG GATTTGTATT TTTATTTACT GTAGGAGGAT TAACGGGGGT AATTTTAGCT AATTCTTCCT
Paravaejovis gravicaudus 3163    TCCTTTATTA TGGGCTTTGG GATTTGTATT TTTATTTACT GTAGGAGGGT TAACTGGAGT GATTTTAGCA AATTCTTCTT
Paravaejovis gravicaudus 8783    TCCTTTATTA TGGGCTTTAG GATTTGTGTT TTTGTTTACT GTAGGAGGAT TAACTGGAGT AATTTTAGCG AATTCTTCTT
Paravaejovis gravicaudus 8793    TCCTTTATTG TGGGCTTTAG GATTTGTGTT TTTATTTACT GTAGGAGGAT TAACTGGGGT AATTTTAGCA AATTCTTCTT
Paravaejovis hoffmanni 3166      TCCTTTATTA TGGGCTTTAG GATTTGTATT TTTGTTCACT GTAGGGGGGT TGACAGGGGT AATTTTAGCT AATTCTTCTT
Paravaejovis hoffmanni 5096      TCCTTTATTG TGGGCTTTGG GATTTGTATT TTTGTTCACT GTAGGAGGAT TAACAGGGGT AATTTTAGCT AATTCTTCTT
Paravaejovis hoffmanni 8797      TCCTTTATTA TGAGCTTTAG GATTTGTATT TTTGTTTACT GTAGGAGGGT TAACAGGAGT AATTTTAGCT AATTCTTCTT
Paravaejovis hoffmanni 8812      TCCTTTATTA TGGGCTTTAG GATTTGTATT TTTGTTCACT GTAGGGGGGT TGACAGGGGT AATTTTAGCT AATTCTTCTT
Paravaejovis pumilis 3137        TCCTTTGTTG TGGGCTTTGG GATTTGTGTT TTTGTTTACT GTGGGGGGGT TAACAGGAGT AATTTTAGCT AATTCTTCTT
Paravaejovis pumilis 3476        TCCTTTGTTG TGGGCTTTGG GATTTGTGTT TTTGTTTACT GTGGGGGGGT TAACAGGAGT AATTTTAGCT AATTCTTCTT
Paravaejovis pumilis 4740        TCCTTTGTTG TGGGCTTTGG GATTTGTGTT TTTGTTTACT GTGGGGGGGT TAACAGGAGT AATTTTAGCT AATTCTTCCT
Paravaejovis puritanus 3479      CCCTTTGTTA TGGGCTTTGG GATTTGTATT TTTGTTTACT GTAGGGGGAT TAACAGGAGT AATTTTAGCT AATTCTTCTT
Paravaejovis puritanus 5093      CCCTTTGTTA TGGGCTTTAG GGTTTGTATT TTTGTTTACT GTAGGTGGAT TAACAGGAGT AATTTTAGCT AATTCTTCTT
Paravaejovis puritanus 8900      CCCTTTGTTA TGGGCTTTAG GGTTTGTATT TTTGTTTACT GTAGGTGGAT TAACAGGAGT AATTTTAGCT AATTCTTCTT
Paravaejovis schwenkmeyeri 4413  TCCTTTGTTA TGGGCTTTAG GATTTGTATT TTTGTTTACT GTAGGTGGAT TGACTGGGGT AATTTTAGCT AATTCTTCTT
Paravaejovis schwenkmeyeri 4430  TCCTTTATTA TGAGCTTTAG GATTTGTATT TTTGTTTACT GTAGGTGGAT TGACTGGGGT AATTTTAGCT AATTCTTCTT
Paravaejovis schwenkmeyeri 4451  TCCTTTGTTA TGGGCTTTAG GATTTGTATT TTTGTTTACT GTAGGTGGAT TAACTGGGGT GATTTTAGCT AATTCTTCTT
Paravaejovis schwenkmeyeri 8821  TCCTTTGTTA TGAGCTTTAG GATTTGTGTT TTTATTTACT GTAGGGGGAT TAACTGGAGT TATTTTAGCT AATTCTTCTT
Paravaejovis spinigerus 5282     ACCTTTGTTA TGAGCTTTAG GATTTGTATT TTTGTTTACT GTAGGTGGAT TGACGGGGGT AATTTTGGCT AATTCTTCTT
Paravaejovis spinigerus 6317     ACCTTTATTA TGGGCTTTGG GTTTTGTATT TTTATTTACT GTAGGGGGAT TAACAGGAGT AATTTTGGCT AATTCTTCTT
Paravaejovis spinigerus 7015     TCCTTTACTA TGAGCTTTAG GGTTTGTATT TTTGTTTACT GTAGGGGGAT TAACAGGGGT AATTTTGGCT AATTCTTCTT
Paravaejovis spinigerus 7176     ACCTTTATTG TGAGCTTTAG GATTTGTATT TTTGTTTACT GTAGGGGGAT TAACAGGAGT AATTTTAGCT AATTCTTCTC
Paravaejovis spinigerus 9970     ACCTTTGTTA TGAGCTTTAG GATTTGTATT TTTATTTACC GTAGGTGGAT TGACGGGGGT AATTTTGGCT AATTCTTCTT
Paravaejovis waeringi 4431       TCCTTTATTA TGGGCTTTAG GATTTGTATT TTTATTTACT GTAGGAGGGT TAACTGGAGT AATTTTGGCT AATTCTTCTT
Paravaejovis waeringi 4433       ACCTTTATTG TGGGCTTTAG GATTTGTATT TTTATTTACT GTAGGAGGAT TAACTGGAGT GATTTTGGCT AATTCTTCTT
Paravaejovis waeringi 7119       TCCTTTATTG TGGGCTTTAG GATTTGTATT TTTATTTACT GTAGGGGGAT TAACTGGAGT AATTTTGGCT AATTCTTCTT
Syntropis macrura 3146           TCCTTTATTA TGGGCTTTAG GATTTGTCTT TTTGTTTACT GTAGGTGGAT TAACAGGAGT AATTTTAGCT AATTCTTCTT
Syntropis macrura 8709           TCCTTTATTA TGGGCTTTAG GATTTGTCTT TTTATTTACT GTAGGTGGAT TAACAGGAGT AATTTTAGCT AATTCTTCTT
Syntropis williamsi 8706         CCCTTTGTTA TGAGCTTTAG GATTTGTCTT TTTGTTTACT GTGGGTGGGT TAACGGGAGT GATTTTAGCT AATTCTTCTT
Syntropis williamsi 8707         TCCTTTATTA TGAGCTTTAG GATTTGTCTT TTTATTTACT GTAGGTGGGT TAACGGGAGT AATTTTAGCT AATTCTTCTT
Syntropis williamsi 8826         CCCTTTGTTA TGAGCTTTAG GCTTTGTCTT TTTATTTACT GTGGGTGGGT TAACGGGAGT GATTTTAGCT AATTCTTCTT
Thorellius cisnerosi 2018        TCCTTTGTTA TGAGCTTTAG GTTTTGTGTT TTTGTTTACT GTAGGGGGGT TGACAGGAGT AATTTTAGCT AATTCTTCTT
Thorellius cisnerosi 5269        TCCTTTGTTA TGAGCTTTAG GTTTTGTGTT TTTATTTACT GTGGGGGGGT TGACGGGAGT AATTTTAGCT AATTCTTCTT
Thorellius cristimanus 5323      TCCTTTATTG TGAGCTTTGG GGTTTGTATT TTTATTTACT GTAGGAGGGT TAACAGGGGT AATTTTAGCC AATTCCTCTT
Thorellius cristimanus 5325      TCCTTTATTG TGAGCTTTGG GGTTTGTATT TTTATTTACT GTAGGAGGGT TAACAGGGGT AATTTTAGCC AATTCCTCTT
Thorellius cristimanus 5328      TCCTTTATTG TGAGCTTTGG GGTTTGTATT TTTATTTACT GTAGGAGGGT TAACAGGGGT AATTTTAGCC AATTCCTCTT
Thorellius cristimanus 6551      TCCTTTGTTA TGAGCTTTAG GATTTGTATT TTTATTTACT GTAGGGGGAT TAACGGGGGT AATTTTGGCT AATTCTTCTT
Thorellius intrepidus 5309       ACCTTTATTG TGAGCTTTAG GGTTTGTATT TTTGTTTACT GTGGGAGGAT TAACAGGGGT AATTTTGGCT AATTCTTCTT
Thorellius intrepidus 6377       ACCTTTATTG TGAGCTTTAG GATTTGTATT TTTATTTACT GTGGGAGGAT TAACAGGAGT AATTTTGGCC AATTCTTCTT
Thorellius intrepidus 6379       CCCTCTATTG TGGGCTTTGG GATTTGTATT TTTATTCACT GTAGGGGGAT TAACAGGAGT AATTTTGGCT AATTCTTCTT
Vizcaino viscainensis 3174       TCCTTTATTA TGAGCTTTAG GTTTCGTGTT TTTATTTACT GTGGGTGGAT TAACTGGTGT AATTTTAGCT AATTCTTCTT
Vizcaino viscainensis 8809       TCCTTTATTA TGAGCTTTAG GCTTCGTATT TTTATTTACT GTGGGTGGAT TAACTGGTGT AATTTTGGCT AATTCTTCTT

                                          1050       1060       1070
                                 ....|....| ....|....| ....|....| ....|...
Franckeus kochi 5363             TTGATGTAGT TCTTCATGAT ACATATTATG TTGTTGCT
Pseudouroctonus glimmei 2688     TAGATATTGT TCTTCATGAT ACTTATTATG TTGTTGCT
Serradigitus minutis 1674        TAGATATTGT TCTTCATGAT ACTTATTATG TTGTAGCT
Serradigitus sp. 6370            TAGATATTGT TCTTCATGAT ACTTATTATG TTGTAGCT
Smeringurus grandis 8690         TAGATATTGT TCTTCATGAT ACTTATTATG TAGTTGCA
Stahnkeus desertícola 5032       TGGATATTGT TCTTCATGAT ACTTATTATG TTGTAGCT
Uroctonites giulianii 3204       TTGATATTGT TTTACATGAT ACATATTATG TTGTGGCT
Vaejovis carolinianus 1576       TTGATGTAGT ACTTCATGAT ACATATTATG TTGTTGCT
Vaejovis intermedius 2141A       TTGATGTTGT TCTTCATGAT ACTTATTATG TTGTCGCT
Vaejovis lapidicola 1814         TAGATATTGT TCTTCATGAT ACTTACTATG TTGTTGCT
Vaejovis mexicanus 1825          TGGATATTGT GTTGCATGAT ACTTATTATG TTGTAGCA
Vaejovis pequeno 6308            TGGATATTGT TCTTCATGAT ACTTATTATG TTGTGGCT
Vaejovis rossmani 2027           TGGATATTGT TCTTCATGAT ACTTATTATG TTGTAGCT
Vaejovis sp. 3711                TGGACATTGT TTTGCATGAT ACATATTATG TTGTGGCT
Vaejovis sp. 5327                TGGACATTGT TTTGCATGAT ACATATTATG TTGTGGCT
Wernerius spicatus 8968          TAGATATTGT TCTTCATGAT ACTTATTATG TTGTAGCT
Chihuahuanus bilineatus 5306     TAGATATTGT TTTGCATGAT ACTTATTATG TTGTTGCT
Chihuahuanus bilineatus 6507     TAGATATTGT TTTACATGAT ACTTATTATG TTGTTGCT
Chihuahuanus bilineatus 6594     TAGATATTGT TTTGCATGAT ACTTATTATG TTGTTGCT
Chihuahuanus cazieri 7163        TGGATATTGT TTTGCATGAT ACTTATTATG TTGTTGCT
Chihuahuanus cazieri 7179        TGGATATTGT TTTGCATGAT ACTTATTATG TTGTTGCT
Chihuahuanus coahuilae 5353      TAGATATTGT TTTACATGAT ACTTATTATG TTGTAGCT
Chihuahuanus coahuilae 6600      TAGATATTGT TTTACATGAT ACTTATTATG TTGTAGCT
Chihuahuanus coahuilae 7095      TAGATATTGT TTTACATGAC ACTTATTATG TCGTAGCT
Chihuahuanus crassimanus 2972    TAGATATTGT ATTACATGAT ACTTATTATG TTGTTGCT
Chihuahuanus crassimanus 5365    TAGATATTGT TTTACACGAT ACTTATTATG TTGTTGCC
Chihuahuanus crassimanus 7100    TAGATATTGT TTTACATGAT ACTTATTATG TTGTTGCT
Chihuahuanus glabrimanus 6558    TAGATATTGT TTTACATGAT ACTTATTATG TTGTTGCA
Chihuahuanus glabrimanus 6610    TGGATGTTGT TCTGCATGAT ACTTATTATG TTGTTGCA
Chihuahuanus glabrimanus 6611    TGGATATTGT TTTACATGAT ACTTATTATG TTGTTGCT
Chihuahuanus globosus 5281       TAGATATTGT TTTACATGAT ACGTACTATG TTGTTGCT
Chihuahuanus globosus 6447       TGGATATTGT TTTACATGAT ACCTATTATG TTGTTGCC
Chihuahuanus globosus 6459       TAGATATTGT TTTACATGAT ACTTATTATG TTGTTGCT
Chihuahuanus globosus 8926       TAGACATTGT TTTACATGAT ACTTATTATG TTGTTGCC
Chihuahuanus kovariki 5299       TGGACATTGT TTTACATGAT ACTTATTATG TTGTTGCA
Chihuahuanus kovariki 5305       TGGACATTGT TTTACATGAT ACTTATTATG TTGTTGCA
Chihuahuanus russelli 2971       TAGATATTGT GTTACATGAC ACTTATTATG TTGTTGCT
Chihuahuanus russelli 7017       TAGATATTGT GTTGCATGAT ACTTATTATG TTGTTGCT
Chihuahuanus russelli 7266       TAGATATTGT GTTGCATGAC ACTTATTATG TTGTTGCT
Kochius barbatus 8803            TTGATATTGT TTTACATGAT ACTTATTATG TTGTTGCC
Kochius bruneus 3153             TAGATATTGT TTTGCATGAT ACTTATTATG TTGTTGCT
Kochius bruneus 3154             TAGATATTGT TCTTCATGAT ACGTATTATG TTGTGGCT
Kochius bruneus 4555             TGGATATTGT TTTGCATGAC ACTTATTATG TTGTTGCT
Kochius cerralvensis 8779        TTGATATTGT TTTGCATGAT ACTTACTATG TTGTTGCC
Kochius hirsuticauda 5049        TGGATATCGT TTTACATGAT ACTTATTATG TTGTTGCT
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Kochius hirsuticauda 7199        TGGATATTGT TTTACATGAT ACCTATTATG TTGTTGCT
Kochius hirsuticauda 8819        TAGATATTGT TTTGCATGAT ACTTATTATG TTGTTGCT
Kochius insularis 8801           TGGATATTGT TTTACACGAT ACTTATTATG TTGTTGCT
Kochius loretoensis 4554         TAGATATTGT TTTGCATGAT ACTTATTATG TTGTTGCT
Kochius magdalensis 3155         TGGATATTGT TTTGCATGAT ACTTATTATG TTGTTGCC
Kochius magdalensis 4552         TGGATATTGT TTTGCATGAT ACTTATTATG TTGTTGCC
Kochius magdalensis 8796         TGGATATTGT TTTACATGAT ACTTATTATG TTGTTGCC
Kochius punctipalpi 1679         ?????????? ?????????? ?????????? ????????
Kochius punctipalpi 3157         TGGATATTGT TTTACATGAT ACATATTATG TTGTTGCT
Kochius punctipalpi 8843         TGGATATTGT TTTACATGAC ACATATTATG TTGTTGCT
Kochius sonorae 6301             TAGATGTTGT TTTACATGAT ACTTATTATG TTGTTGCC
Kochius sonorae 6304             TAGATATTGT TTTACATGAT ACTTATTATG TTGTTGCC
Kochius sonorae 9974             TGGATATTGT TTTACATGAT ACTTATTATG TTGTTGCT
Kochius villosus 3477            TAGATATTGT TTTACATGAT ACTTATTATG TTGTTGCT
Kochius villosus 4544            TAGATATTGT TTTACATGAT ACTTATTATG TTGTTGCT
Konetontli acapulco 9520         TAGATATTGT TTTGCATGAT ACATATTATG TGGTTGCT
Konetontli chamelaensis 7675     TAGATATTGT TTTGCATGAT ACTTATTATG TTGTTGCT
Konetontli nayarit 4725          TGGATATTGT TTTACATGAT ACTTATTATG TTGTTGCT
Konetontli pattersoni 3149       TGGATATTGT ATTACACGAT ACTTATTATG TAGTAGCT
Konetontli pattersoni 3150       TGGATATTGT ATTACATGAT ACTTATTATG TAGTAGCT
Kuarapu purhepecha 9517          TAGATATTGT TTTACATGAT ACTTATTATG TTGTTGCT
Maaykuyak vittatus 3180          TAAATATTGT TTTGCATGAA ACTTATTATG TTGTTGCT
Maaykuyak vittatus 4442          TAGATATTGT TTTACATGAT ACTTATTATG TTGTTGCT
Maaykuyak waueri 2973            TGGATATTGT TTTGCATGAT ACTTATTATG TTGTAGCT
Maaykuyak waueri 6544            TGGATATTAT TTTACATGAT ACTTATTATG TTGTAGCT
Mesomexovis atenango 2023        TGGATAATGT TATACATGAT ACTTACCATG TAGTTGCT
Mesomexovis atenango 7058        TGGATATTGT TCTTCATGAT ACTTATTATG TTGTTGCT
Mesomexovis atenango 9982        TGGATATTGT TCTTCATGAT ACTTATTATG TTGTTGCT
Mesomexovis oaxaca 2031          TAGATATTGT TTTGCATGAT ACTTACTATG TAGTTGCT
Mesomexovis oaxaca 3718          TAGATATTGT TTTACATGAT ACTTATTATG TAGTTGCT
Mesomexovis oaxaca 6602          TAGATATTGT TTTGCATGAT ACCTATTATG TAGTTGCT
Mesomexovis occidentalis 3118    TAGATATTGT TTTACATGAT ACTTATTATG TGGTTGCT
Mesomexovis occidentalis 6559    TGGATATTGT TCTGCATGAT ACTTATTATG TAGTTGCA
Mesomexovis occidentalis 7056    TAGATATTGT TTTACATGAT ACTTATTATG TAGTTGCT
Mesomexovis punctatus 2080       TAGATATTGT TTTGCATGAT ACTTATTATG TTGTTGCT
Mesomexovis punctatus 2241       TAGATATTGT TTTACATGAT ACTTATTATG TTGTTGCT
Mesomexovis spadix 2950          TGGATATCGT TCTTCATGAA ACTTACTATG TTGTTGCT
Mesomexovis spadix 5280          TGGATATTGT TTTTCATGAA ACTTACTAAG TTGTTGCT
Mesomexovis spadix 6373          TGGATATCGT TCTTCAAGAT ACTTACTATG TTGTTGCT
Mesomexovis subcristatus 2049    TGGATATTGT TTTACATGAT ACTTATTATG TTGTAGCT
Mesomexovis subcristatus 2084    TGGATATTGT TTTACATGAT ACTTATTATG TTGTAGCT
Mesomexovis subcristatus 2086    TGGATATTGT TTTACATGAT ACTTATTATG TTGTAGCT
Mesomexovis variegatus 5185      TAGATATTGT TCTTCATGAT ACTTATTATG TTGTTGCT
Mesomexovis variegatus 6536      TAGATATTGT TCTTCATGAT ACTTATTATG TTGTTGCT
Mesomexovis variegatus 7068      TAGATATTGT TCTTCATGAT ACTTATTATG TTGTTGCT
Paravaejovis coloradensis 1688   TAGATATTGT TTTACATGAT ACTTATTATG TTGTTGCT
Paravaejovis coloradensis 3226   TAGATATTGT TTTACATGAT ACTTATTATG TTGTTGCT
Paravaejovis coloradensis 5029   TGGATATTGT TTTACATGAT ACTTATTATG TTGTTGCT
Paravaejovis confusus 4450       TAGATATTGT TTTACATGAT ACTTATTATG TGGTTGCT
Paravaejovis confusus 7107       TAGATATTGT TTTACATGAT ACTTATTATG TGGTTGCT
Paravaejovis confusus 7272       TAGATATTGT TTTACATGAT ACTTATTATG TAGTTGCT
Paravaejovis confusus 8517       TAGATATTGT TTTACATGAT ACTTATTATG TGGTTGCT
Paravaejovis diazi 3165          TGGATATTGT TTTACATGAT ACTTATTATG TTGTTGCT
Paravaejovis diazi 3169          TGGATATTGT TTTACATGAT ACTTATTATG TTGTTGCC
Paravaejovis diazi 3482          TGGATATTGT TTTACATGAT ACTTATTATG TTGTTGCC
Paravaejovis diazi 4436          TAGATATTGT TTTACATGAT ACTTATTATG TTGTTGCC
Paravaejovis diazi 8839          TAGACATTGT TTTGCATGAT ACTTATTATG TTGTTGCT
Paravaejovis eusthenura 1689     TAGATATTGT TTTACATGAT ACTTATTATG TTGTAGCT
Paravaejovis eusthenura 3168     TAGATATTGT TTTACATGAT ACTTATTATG TTGTAGCT
Paravaejovis eusthenura 4448     TAGATATTGT TTTACATGAT ACTTATTATG TTGTAGCT
Paravaejovis gravicaudus 3163    TAGATATTGT TCTACATGAT ACTTATTATG TTGTTGCT
Paravaejovis gravicaudus 8783    TAGATATTGT TTTACATGAT ACCTATTATG TTGTTGCT
Paravaejovis gravicaudus 8793    TAGATATTGT TTTACATGAT ACTTATTATG TTGTTGCT
Paravaejovis hoffmanni 3166      TAGATATTGT TTTACATGAT ACGTATTATG TTGTTGCT
Paravaejovis hoffmanni 5096      TAGATATTGT TTTGCATGAT ACATATTATG TTGTTGCT
Paravaejovis hoffmanni 8797      TAGATATTGT TTTACATGAT ACATATTATG TTGTTGCT
Paravaejovis hoffmanni 8812      TAGATATTGT TTTACATGAT ACGTATTATG TTGTTGCT
Paravaejovis pumilis 3137        TAGATATTGT TTTGCACGAT ACTTATTATG TTGTTGCT
Paravaejovis pumilis 3476        TAGATATTGT TTTGCACGAT ACTTATTATG TTGTTGCT
Paravaejovis pumilis 4740        TAGATATTGT TTTGCACGAT ACTTATTATG TTGTTGCT
Paravaejovis puritanus 3479      TAGATATTGT TTTGCATGAT ACTTATTATG TTGTTGCT
Paravaejovis puritanus 5093      TAGATATTGT TTTACATGAT ACTTATTATG TTGTTGCT
Paravaejovis puritanus 8900      TAGATATTGT TTTACATGAT ACTTATTATG TTGTTGCT
Paravaejovis schwenkmeyeri 4413  TAGATATTGT TTTACATGAC ACTTATTATG TTGTTGCT
Paravaejovis schwenkmeyeri 4430  TAGATATTGT TTTACATGAT ACTTATTATG TTGTTGCT
Paravaejovis schwenkmeyeri 4451  TAGATATTGT TTTACATGAT ACTTATTATG TTGTTGCT
Paravaejovis schwenkmeyeri 8821  TAGATATTGT TTTACATGAT ACTTATTATG TTGTTGCT
Paravaejovis spinigerus 5282     TGGATATTGT TTTGCATGAT ACTTATTATG TTGTTGCT
Paravaejovis spinigerus 6317     TAGATATTGT TTTACATGAT ACTTATTATG TTGTTGCT
Paravaejovis spinigerus 7015     TAGATATTGT TTTGCATGAT ACTTATTATG TTGTTGCT
Paravaejovis spinigerus 7176     TGGATATTGT TTTGCATGAT ACTTATTATG TTGTTGCT
Paravaejovis spinigerus 9970     TGGATATTGT TTTGCATGAT ACTTATTATG TTGTTGCT
Paravaejovis waeringi 4431       TGGATATTGT TTTGCATGAT ACTTATTATG TTGTTGCT
Paravaejovis waeringi 4433       TGGATATTGT TTTACATGAT ACTTATTATG TTGTTGCT
Paravaejovis waeringi 7119       TGGATATTGT TCTACATGAT ACTTATTATG TTGTTGCT
Syntropis macrura 3146           TGGATATTGT GTTACATGAT ACTTATTATG TTGTGGCT
Syntropis macrura 8709           TGGACATTGT ATTACATGAC ACTTATTATG TTGTGGCT
Syntropis williamsi 8706         TAGATATTGT ATTGCATGAT ACTTATTATG TTGTGGCT
Syntropis williamsi 8707         TGGATATTGT GTTGCATGAT ACTTATTATG TTGTGGCT
Syntropis williamsi 8826         TAGATATTGT ATTGCATGAT ACTTATTATG TTGTGGCT
Thorellius cisnerosi 2018        TAGATATTGT TTTACATGAT ACTTATTATG TAGTAGCT
Thorellius cisnerosi 5269        TGGATATTGT TTTACATGAT ACTTATTATG TAGTTGCT
Thorellius cristimanus 5323      TAGATATTGT TTTGCATGAT ACTTATTATG TAGTTGCC
Thorellius cristimanus 5325      TAGATATTGT TTTGCATGAT ACTTATTATG TAGTTGCC
Thorellius cristimanus 5328      TAGATATTGT TTTGCATGAT ACTTATTATG TAGTTGCC
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Thorellius cristimanus 6551     TAGATATTGT TTTGCATGAT ACTTATTATG TGGTTGCT
Thorellius intrepidus 5309      TAGATATTGT TTTGCATGAT ACTTATTATG TCGTTGCA
Thorellius intrepidus 6377      TAGATATTGT TTTGCATGAT ACTTATTACG TCGTTGCA
Thorellius intrepidus 6379      TAGATATTGT TTTGCATGAT ACTTATTATG TTGTTGCA
Vizcaino viscainensis 3174      TAGATATTGT TTTACACGAT ACTTATTATG TAGTTGCT
Vizcaino viscainensis 8809      TAGATATTGT TTTACATGAT ACTTATTATG TAGTTGCT
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Appendix 11

List of unambiguous synapomorphies of selected clades for the preferred hypothesis of relationship among 64 species of syntropinoid scorpions analyzed with IW, *k*=15. Node numbers and terminal names refer to figure 10. Character transformation is denoted by listing ancestral and derived states separated by an arrow '→'. The number of molecular apomorphies is also provided

***Pseudouroctonus glimmei* 2688:** Char. 3: 0.400 → 0.000; Char. 4: 0.250 → 0.000; Char. 6: 0.095 → 0.000; Char. 11: 0.060 → 0.000; Char. 12: 1.000 → 0.500; Char. 20: 1.000 → 0.500; Char. 21: 1.298 → 0.947; Char. 22: 0.400 → 0.000; Char. 23: 0.400 → 0.000; Char. 24: 0.500 → 0.000; Char. 25: 2.000 → 0.000; Char. 30: 0.285 → 0.000; Char. 34: 0.571 → 0.285; Char. 35: 0.333 → 0.000; Char. 37: 0.333 → 0.000; Char. 38: 0.333 → 0.000; Char. 39: 0.500 → 0.333; Char. 44: 2.000 → 0.000; Char. 48: 4 → 1; Char. 64: 2 → 1; Char. 67: 0 → 2; Char. 76: 1 → 0; Char. 120: 0 → 1; Char. 131: 0 → 1; Char. 147: 0 → 1; Char. 163: 2 → 1; Char. 221: 0 → 1; Char. 239: 0 → 1; Char. 244: 0 → 1; and 119 molecular apomorphies.
***Uroctonites giulianii* 3204:** Char. 0: 0.320 → 0.000; Char. 1: 0.260–0.347 → 0.000–0.086; Char. 16: 0.000 → 2.000; Char. 20: 1.000 → 2.000; Char. 28: 0.333 → 0.999; Char. 30: 0.285 → 0.571; Char. 34: 0.571 → 0.857; Char. 35: 0.333 → 0.999; Char. 36: 0.000 → 0.500; Char. 38: 0.333 → 0.666; Char. 63: 0 → 3; Char. 65: 1 → 0; Char. 66: 1 → 2; Char. 71: 1 → 0; Char. 79: 1 → 0; Char. 85: 1 → 2; Char. 86: 0 → 2; Char. 114: 1 → 0; Char. 124: 1 → 0; Char. 125: 1 → 0; Char. 134: 1 → 0; Char. 136: 0 → 1; Char. 138: 2 → 0 Char. 139: 1 → 0 Char. 148: 1 → 0; Char. 149: 1 → 2; Char. 157: 1 → 0; Char. 181: 2 → 1; Char. 185: 1 → 2; Char. 192: 1 → 0; Char. 224: 2 → 1; and 118 molecular apomorphies.
***Vaejovis mexicanus* 1825:** Char. 0: 0.480 → 0.880 ;Char. 1: 0.521 → 0.782–0.869; Char. 5: 0.250 → 0.500; Char. 11: 0.060–0.121 → 0.000; Char. 17: 0.666 → 0.000; Char. 20: 1.000 → 1.500; Char. 22: 0.400 → 0.000; Char. 23: 0.400 → 0.000; Char. 31: 0.250 → 0.000; Char. 37: 0.333 → 0.000; Char. 39: 0.500 → 0.333; Char. 42: 0.285 → 0.571; Char. 43: 0.333 → 0.999; Char. 47: 0 → 2; Char. 49: 0 → 2; Char. 52: 0 → 3; Char. 53: 2 → 0; Char. 54: 0 → 3; Char. 55: 0 → 2; Char. 56: 0 → 2; Char. 57: 0 → 1; Char. 58: 0 → 2; Char. 59: 0 → 2; Char. 60: 0 → 3; Char. 62: 0 → 4; Char. 63: 0 → 3; Char. 67: 0 → 2 Char. 68: 1 → 2; Char. 88: 1 → 2; Char. 89: 1 → 2; Char. 90: 1 → 2; Char. 91: 0 → 2; Char. 176: 0 → 1; Char. 221: 0 → 1; and 62 molecular apomorphies.
***Vaejovis rossmani* 2027:** Char. 3: 0.400 → 0.000; Char. 25: 2.000 → 0.000; Char. 28: 0.333 → 0.999; Char. 45: 2 → 0; Char. 46: 1 → 0; Char. 48: 4 → 0; Char. 50: 4 → 0; Char. 128: 0 → 1; Char. 163: 2 → 1; Char. 171: 0 → 1; Char. 212: 1 → 2; Char. 241: 0 → 2; and 93 molecular apomorphies.
***Vaejovis lapidicola* 1814:** Char. 2: 0.000 → 0.500; Char. 21: 1.298 → 0.947; Char. 38: 0.333 → 0.000; Char. 39: 0.500 → 0.333; Char. 43: 0.333 → 0.000; Char. 49: 0 → 2; Char. 244: 0 → 1; and 144 molecular apomorphies.
***Vaejovis intermedius* 2141A:** Char. 3: 0.400 → 1.200; Char. 4: 0.250 → 1.000; Char. 5: 0.500 → 1.750; Char. 6: 0.190–0.380 → 1.523; Char. 7: 1.200 → 2.000; Char. 8: 0.750–1.250 → 2.000; Char. 9: 0.857–1.428 → 2.000; Char. 10: 0.545–0.909 → 2.000; Char. 11: 0.303–0.363 → 2.000; Char. 26: 0.285–0.571 → 0.857; Char. 29: 0.000–0.400 → 0.800; Char. 35: 0.666 →

0.999; Char. 37: 0.333–0.666 → 1.333; Char. 46: 1 → 2; Char. 50: 2 → 1; Char. 146: 1 → 2; Char. 168: 0 → 1; Char. 244: 0 → 1; and 59 molecular apomorphies.
***Franckeus kochi* 5363:** Char. 22: 0.400–0.800 → 1.200; Char. 74: 1 → 2; Char. 172: 0 → 1; Char. 173: 0 → 1; Char. 183: 2 → 3; and 47 molecular apomorphies.
***Vaejovis carolinianus* 1576:** Char. 0: 1.120 → 0.480; Char. 1: 1.043 → 0.521; Char. 5: 0.500 → 0.250; Char. 6: 0.190–0.380 → 0.095; Char. 7: 1.200 → 0.800; Char. 8: 0.750 → 0.250; Char. 9: 0.857 → 0.285; Char. 10: 0.545 → 0.181; Char. 11: 0.303 → 0.060; Char. 12: 1.500 → 1.000; Char. 13: 0.727 → 0.363; Char. 14: 0.727 → 0.363; Char. 15: 0.800 → 0.400; Char. 16: 2.000 → 0.000; Char. 17: 1.333 → 0.000; Char. 18: 1.333 → 0.000; Char. 19: 0.800 → 0.000; Char. 20: 1.500 → 2.000; Char. 21: 1.649 → 2.000; Char. 31: 0.500–0.750 → 0.000; Char. 35: 0.666 → 0.333; Char. 36: 0.500 → 0.000; Char. 39: 0.666 → 0.333; Char. 42: 0.285 → 0.000; Char. 43: 0.666 → 0.000; Char. 85: 0 → 1; Char. 88: 0 → 1; Char. 89: 0 → 1; Char. 90: 0 → 1; Char. 112: 0 → 1; Char. 113: 0 → 1; Char. 116: 0 → 1; Char. 121: 1 → 0; Char. 160: 1 → 0; Char. 174: 1 → 0; Char. 175: 1 → 0; Char. 189: 0 → 1; Char. 192: 2 → 1; Char. 193: 1 → 2; Char. 194: 2 → 3; Char. 212: 0 → 1; Char. 213: 1 → 2; Char. 215: 0 → 1; Char. 216: 1 → 2; Char. 217: 1 → 2; Char. 230: 0 → 1; Char. 231: 0 → 1; Char. 238: 0 → 1; Char. 241: 2 → 3; Char. 242: 0 → 1; Char. 243: 0 → 2; Char. 249: 0 → 1; and 38 molecular apomorphies.
***Serradigitus minutis* 1674:** Char. 6: 0.190–0.285 → 0.380; Char. 7: 0.800 → 1.200; Char. 11: 0.181 → 0.303; Char. 16: 0.000 → 1.000; Char. 36: 0.000 → 0.500; Char. 47: 3 → 0; Char. 81: 1 → 0; Char. 95: 1 → 0; Char. 120: 1 → 0; Char. 141: 0 → 1; Char. 145: 0 → 1; Char. 170: 1 → 0; Char. 184: 0 → 1; Char. 189: 2 → 0; Char. 190: 0 → 1; Char. 197: 2 → 4; Char. 198: 3 → 5; Char. 204: 0 → 1; Char. 219: 2 → 1; and 65 molecular apomorphies.
***Stahnkeus deserticola* 5032:** Char. 0: 0.480–0.560 → 1.280–1.440; Char. 1: 0.521–0.608 → 1.217; Char. 3: 0.400 → 0.000; Char. 6: 0.190 → 0.095; Char. 11: 0.060–0.181 → 0.000; Char. 34: 0.285–0.571 → 0.000; Char. 39: 0.333–0.500 → 0.666; Char. 47: 3 → 2; Char. 55: 0 → 1; Char. 57: 0 → 2; Char. 58: 0 → 3; Char. 60: 0 → 2; Char. 62: 0 → 3; Char. 63: 0 → 2; Char. 65: 1 → 2; Char. 68: 1 → 2; Char. 85: 0 → 1; Char. 149: 1 → 0; Char. 170: 1 → 0; Char. 180: 0 → 1; Char. 181: 2 → 4; Char. 182: 1 → 0; Char. 184: 0 → 1; Char. 189: 2 → 0; Char. 190: 0 → 1; Char. 191: 1 → 2; Char. 194: 1 → 0; Char. 197: 2 → 5; Char. 204: 0 → 1; Char. 229: 0 → 1; and 34 molecular apomorphies.
***Serradigitus* sp. 6370:** Char. 4: 0.250 → 0.500; Char. 6: 0.190–0.285 → 0.095; Char. 20: 1.500 → 1.000; Char. 23: 0.400 → 0.000; Char. 42: 0.285 → 0.571; Char. 110: 1 → 0; Char. 165: 1 → 0; Char. 166: 1 → 0; Char. 228: 1 → 0; Char. 232: 0 → 1; Char. 233: 0 → 1; and 45 molecular apomorphies.
***Vaejovis pequeno* 6308:** Char. 9: 0.571 → 0.285; Char. 21: 1.298 → 0.947; Char. 203: 1 → 0; Char. 226: 0 → 1; Char. 240: 0 → 1; Char. 243: 0 → 2; and 49 molecular apomorphies.
***Wernerius spicatus* 8968:** Char. 0: 0.480–0.560 → 0.320; Char. 1: 0.521–0.608 → 0.347; Char. 9: 0.571 → 0.285; Char. 21: 1.298 → 2.000; Char. 28: 0.333 → 0.666; Char. 31: 0.500 → 0.250; Char. 34: 0.571 → 0.857; Char. 38: 0.333 → 0.666; Char. 58: 0 → 4; Char. 60: 0 → 3; Char. 61: 1 → 2; Char. 63: 0 → 1; Char. 71: 1 → 0; Char. 74: 1 → 2; Char. 80: 0 → 1; Char. 82: 0 → 1; Char. 91: 0 → 1; Char. 96: 0 → 1; Char. 121: 1 → 0; Char. 122: 0 → 1; Char. 125: 1 → 2; Char. 202: 1 → 0; Char. 219: 2 → 1; and 76 molecular apomorphies.
***Konetontli chamelaensis* 7675:** Char. 0: 0.400 → 0.160–0.240; Char. 1: 0.434 → 0.260; Char. 4: 0.250 → 0.000; Char. 39: 0.500 → 0.333; Char. 50: 1 → 0; Char. 78: 1 → 0; Char. 179: 2 → 1; Char. 186: 0 → 1; Char. 194: 3 → 2; Char. 215: 0 → 1; and 68 molecular apomorphies.

***Konetontli nayarit* 4725:** Char. 7: 0.800 → 0.000; Char. 8: 0.500 → 0.250; Char. 9: 0.571 → 0.285; Char. 21: 0.947 → 0.596; Char. 31: 0.750 → 0.500; Char. 51: 0 → 2; Char. 66: 1 → 2; Char. 121: 1 → 0; Char. 123: 0 → 1; Char. 146: 1 → 0; Char. 236: 0 → 1; Char. 240: 0 → 1; 78 molecular apomorphies.
***Konetontli acapulco* 9520:** Char. 21: 1.298 → 1.649; Char. 47: 0 → 2; Char. 48: 0 → 3; Char. 51: 0 → 2; Char. 58: 0 → 4; Char. 60: 0 → 3; Char. 66: 1 → 2; Char. 94: 1 → 2; Char. 99: 0 → 1; Char. 100: 1 → 0; Char. 109: 1 → 0; Char. 110: 1 → 0; Char. 111: 1 → 0; Char. 194: 3 → 0; and 75 molecular apomorphies.
***Kuarapu purhepecha* 9517:** Char. 21: 1.298 → 0.947; Char. 43: 0.333 → 0.000; Char. 46: 12 → 0; Char. 51: 1 → 0; Char. 61: 1 → 0; Char. 78: 1 → 0; Char. 149: 1 → 0; Char. 160: 1 → 0; Char. 165: 0 → 1; Char. 166: 0 → 1; Char. 169: 0 → 1; Char. 170: 1 → 0; Char. 186: 0 → 1; Char. 197: 2 → 3; Char. 198: 3 → 4; Char. 219: 2 → 3; Char. 234: 0 → 1; Char. 235: 0 → 1; Char. 236: 0 → 1; Char. 237: 2 → 1; Char. 238: 0 → 1; Char. 240: 0 → 1; Char. 241: 0 → 3; Char. 246: 1 → 0; Char. 248: 0 → 1; Char. 250: 0 → 1; and 75 molecular apomorphies.
***Kochius cerralvensis* 8779:** Char. 0: 0.880 → 0.800; Char. 6: 0.190 → 0.285; Char. 12: 1.000 → 0.500; Char. 21: 1.298 → 0.947; Char. 48: 0 → 1; Char. 117: 0 → 1; Char. 167: 0 → 1; and 19 molecular apomorphies.
***Kochius barbatus* 8803:** Char. 1: 0.869 → 0.956; Char. 4: 0.250 → 0.000; Char. 15: 0.400 → 0.600; Char. 62: 3 → 4; Char. 225: 0 → 1; and 11 molecular apomorphies.
***Kochius insularis* 8801:** Char. 0: 0.800 → 0.880; Char. 6: 0.095 → 0.190; Char. 20: 1.000 → 0.500; Char. 210: 0 → 1; Char. 219: 2 → 0; and 40 molecular apomorphies.
***Kochius loretoensis* 4554:** Char. 1: 0.782 → 0.869; Char. 5: 0.250 → 0.000; Char. 87: 0 → 1; Char. 115: 1 → 2; Char. 179: 1 → 2; Char. 192: 1 → 0; Char. 214: 0 → 1; Char. 225: 0 → 1; Char. 250: 0 → 1; and 53 molecular apomorphies.
***Paravaejovis hoffmanni* 8797:** Char. 6: 0.476–0.571 → 0.666; Char. 22: 0.800 → 1.200; Char. 28: 0.666 → 0.999; Char. 30: 0.857 → 1.142; Char. 35: 0.666 → 0.999; Char. 40: 0.500 → 1.500; Char. 41: 0.400 → 0.800; Char. 98: 2 → 1; Char. 167: 1 → 0; Char. 172: 0 → 1; Char. 207: 0 → 1; Char. 237: 2 → 0; Char. 244: 0 → 1; Char. 246: 1 → 0; and 27 molecular apomorphies.
Node 147: Char. 0: 0.400 → 0.320; Char. 1: 0.434 → 0.260–0.347; Char. 17: 0.666 → 0.000; Char. 31: 0.250 → 0.000; Char. 32: 0.285–0.571 → 0.000; Char. 42: 0.285 → 0.000; Char. 47: 0 → 3; Char. 49: 0 → 1; Char. 52: 0 → 2; Char. 54: 0 → 3; Char. 55: 0 → 1; Char. 56: 0 → 1; Char. 57: 0 → 1; Char. 70: 2 → 0; Char. 77: 2 → 0; Char. 80: 0 → 1; Char. 82: 0 → 1; Char. 90: 1 → 2; Char. 113: 1 → 2; Char. 140: 2 → 1; Char. 159: 2 → 1; Char. 161: 0 → 1; Char. 165: 0 → 1; Char. 202: 1 → 0; Char. 219: 2 → 1; Char. 228: 1 → 0; Char. 247: 0 → 1; and 21 molecular apomorphies.
Node 148: Char. 5: 0.500 → 0.250; Char. 9: 0.571 → 0.285; Char. 10: 0.363 → 0.181; Char. 15: 0.600 → 0.400; Char. 50: 2 → 4; Char. 121: 1 → 0; Char. 191: 1 → 0; Char. 212: 0 → 1; Char. 226: 0 → 1; Char. 248: 0 → 1; and 10 molecular apomorphies.
Node 149: Char. 0: 0.480–0.560 → 0.400; Char. 1: 0.521–0.608 → 0.434; Char. 31: 0.500 → 0.250; Char. 35: 0.666 → 0.333; Char. 74: 1 → 2; Char. 85: 0 → 1; Char. 86: 2 → 0; Char. 89: 0 → 1; Char. 90: 0 → 1; Char. 143: 0 → 1; Char. 197: 2 → 0; Char. 198: 2 → 1; Char. 224: 1 → 2; and 9 molecular apomorphies.
Node 150: Char. 0: 1.120 → 0.480–0.560; Char. 1: 1.043–1.217 → 0.521–0.608; Char. 7: 1.200 → 0.800; Char. 8: 0.750–1.250 → 0.250–0.500; Char. 9: 0.857–1.428 → 0.571; Char. 10: 0.545–0.909 → 0.363; Char. 11: 0.303–0.363 → 0.060–0.181; Char. 12: 1.500–2.000 → 1.000; Char.

13: 0.727–1.090 → 0.363–0.545; Char. 14: 0.727 → 0.363–0.545; Char. 15: 0.800–2.000 → 0.600; Char. 16: 2.000 → 0.000; Char. 17: 1.333 → 0.666; Char. 18: 1.333 → 0.000–0.666; Char. 19: 0.800 → 0.000–0.400; Char. 39: 0.666–1.000 → 0.500; Char. 43: 0.666 → 0.333; Char. 88: 0 → 1; Char. 112: 0 → 1; Char. 113: 0 → 1; Char. 149: 0 → 1; Char. 174: 1 → 0; Char. 175: 1 → 0; and 13 molecular apomorphies.

Node 152: Char. 0: 0.400 → 0.480; Char. 1: 0.434 → 0.521; Char. 12: 1.000 → 0.500; Char. 28: 0.333 → 0.000; Char. 169: 0 → 1; Char. 240: 0 → 1; and 55 molecular apomorphies.

Node 153: Char. 21: 1.298 → 1.649; Char. 223: 0 → 2; Char. 230: 0 → 1; Char. 231: 0 → 1; Char. 234: 0 → 1; Char. 235: 0 → 1; Char. 236: 0 → 1; Char. 237: 2 → 1; Char. 242: 0 → 2; Char. 249: 0 → 1; and 20 molecular apomorphies.

Node 154: Char. 65: 1 → 2; Char. 66: 1 → 2; Char. 94: 1 → 2; Char. 108: 1 → 0; Char. 109: 1 → 0; Char. 110: 1 → 0; Char. 120: 0 → 1; Char. 122: 0 → 1; Char. 141: 0 → 1; Char. 158: 0 → 1; Char. 160: 1 → 0; Char. 210: 0 → 1; Char. 219: 2 → 3; Char. 227: 1 → 0; Char. 242: 2 → 1; and 59 molecular apomorphies.

Node 155: Char. 20: 1.000 → 1.500; Char. 21: 1.298 → 1.649; Char. 23: 0.400 → 0.800; Char. 34: 0.571 → 1.428; Char. 38: 0.333 → 0.666; Char. 61: 1 → 0; Char. 68: 1 → 2; Char. 76: 1 → 0; Char. 197: 2 → 1; Char. 240: 0 → 1; Char. 241: 0 → 2; and 40 molecular apomorphies.

Node 156: Char. 214: 0 → 1; Char. 218: 1 → 2; Char. 226: 0 → 1; Char. 232: 0 → 1; Char. 234: 0 → 1; Char. 235: 0 → 1; Char. 236: 0 → 1; Char. 248: 0 → 1; Char. 250: 0 → 1; and 27 molecular apomorphies.

Node 157: Char. 107: 1 → 0; Char. 108: 1 → 0; Char. 109: 1 → 0; and 29 molecular apomorphies.

Node 158: Char. 2: 0.000 → 0.500; Char. 35: 0.666 → 0.333; Char. 61: 1 → 0; Char. 66: 1 → 2; Char. 69: 2 → 1; Char. 72: 1 → 0; Char. 77: 1 → 2; Char. 89: 0 → 1; Char. 90: 0 → 1; Char. 143: 0 → 1; Char. 168: 1 → 0; Char. 237: 2 → 1; Char. 250: 0 → 1; and 6 molecular apomorphies.

Node 159: Char. 151: 0 → 1; Char. 186: 0 → 1; Char. 236: 0 → 1; and 17 molecular apomorphies.

Node 160: Char. 20: 1.000 → 1.500; Char. 43: 0.333 → 0.000; Char. 47: 0 → 3; Char. 120: 0 → 1; Char. 165: 0 → 1; Char. 203: 0 → 1; and 26 molecular apomorphies.

Node 161: Char. 130: 0 → 1; Char. 131: 0 → 1; Char. 132: 1 → 0; Char. 134: 1 → 0; Char. 136: 0 → 1; Char. 138: 2 → 3; Char. 168: 0 → 1; Char. 188: 0 → 1; and 12 molecular apomorphies.

Node 162: Char. 61: 1 → 2; Char. 66: 1 → 2; Char. 107: 0 → 2; Char. 185: 1 → 0; Char. 186: 0 → 1; Char. 197: 2 → 3; Char. 198: 3 → 4; Char. 205: 0 → 1; Char. 206: 0 → 1; Char. 207: 0 → 1; Char. 222: 0 → 1; Char. 223: 0 → 1; Char. 225: 0 → 1; and 50 molecular apomorphies.

Node 163: Char. 21: 1.298 → 0.947; Char. 47: 0 → 3; Char. 48: 0 → 3; Char. 160: 1 → 0; Char. 190: 0 → 1; Char. 191: 1 → 2; Char. 244: 0 → 1; and 13 molecular apomorphies.

Node 164: Char. 0: 0.480–0.560 → 0.720–0.800; Char. 1: 0.521–0.608 → 0.695–0.782; Char. 175: 0 → 1; Char. 198: 2 → 3; Char. 221: 0 → 1; and 4 molecular apomorphies.

Node 165: Char. 41: 0.000 → 0.400; Char. 50: 2 → 1; Char. 72: 1 → 0; Char. 107: 1 → 0; Char. 127: 0 → 1; and 26 molecular apomorphies.

Node 166: Char. 46: 1 → 2; Char. 48: 3 → 4; Char. 51: 1 → 2; Char. 169: 0 → 1; Char. 217: 1 → 0; and 10 molecular apomorphies.

Node 167: Char. 0: 0.720–0.800 → 1.440; Char. 1: 0.695–0.782 → 1.652; Char. 6: 0.190–0.285 → 0.476; Char. 10: 0.363 → 0.545–0.727; Char. 11: 0.181 → 0.424; Char. 13: 0.363 → 0.545; Char. 14: 0.363 → 0.727; Char. 15: 0.600 → 0.800; Char. 21: 0.947 → 0.596; Char. 23: 0.400 →

0.000; Char. 34: 0.571 → 0.857; Char. 43: 0.333 → 0.666; Char. 67: 0 → 2; Char. 68: 1 → 2; Char. 81: 1 → 0; Char. 83: 1 → 0; Char. 84: 1 → 0; Char. 88: 1 → 0; Char. 102: 1 → 2; Char. 103: 1 → 0; Char. 112: 1 → 0; Char. 113: 1 → 0; Char. 114: 1 → 0; Char. 115: 1 → 0; Char. 132: 0 → 1; Char. 133: 0 → 1; Char. 144: 0 → 2; Char. 149: 1 → 0; Char. 152: 1 → 2; Char. 153: 1 → 2; Char. 162: 2 → 0; Char. 163: 2 → 0; Char. 165: 0 → 1; Char. 172: 0 → 1; Char. 173: 0 → 1; Char. 181: 2 → 3; Char. 182: 1 → 0; Char. 203: 0 → 1; Char. 208: 1 → 0; Char. 209: 1 → 0; Char. 211: 1 → 0; Char. 224: 1 → 0; Char. 228: 1 → 0; and 53 molecular apomorphies.

Node 169: 11 molecular apomorphies.

Node 170: Char. 88: 1 → 0; Char. 203: 0 → 1; Char. 221: 0 → 1; and 55 molecular apomorphies.

Node 171: Char. 6: 0.190–0.380 → 0.476; Char. 8: 0.500 → 0.750; Char. 9: 0.571 → 0.857; Char. 10: 0.363 → 0.545; Char. 11: 0.181 → 0.242; Char. 15: 0.600 → 0.800; Char. 18: 0.000–0.666 → 1.333; Char. 19: 0.000–0.400 → 0.800; Char. 30: 0.285 → 0.571; Char. 34: 0.571 → 1.142; Char. 50: 1 → 0; Char. 78: 1 → 0; Char. 112: 1 → 0; Char. 113: 1 → 2; Char. 115: 1 → 0; Char. 119: 0 → 2; Char. 218: 1 → 0; Char. 224: 1 → 2; and 12 molecular apomorphies.

Node 172: Char. 7: 0.800 → 1.200; Char. 28: 0.333 → 0.666; Char. 31: 0.500 → 0.750; Char. 51: 1 → 0; Char. 61: 1 → 0; Char. 171: 0 → 1; Char. 194: 1 → 3; Char. 237: 2 → 1; Char. 250: 0 → 1; and 4 molecular apomorphies.

Node 173: Char. 66: 1 → 2; Char. 68: 1 → 0; Char. 69: 2 → 3; Char. 97: 1 → 0; Char. 98: 1 → 0; Char. 106: 0 → 1; Char. 109: 1 → 0; Char. 110: 1 → 0; Char. 111: 1 → 0; Char. 146: 1 → 2; Char. 163: 2 → 1; Char. 168: 1 → 0; Char. 179: 2 → 1; Char. 186: 0 → 1; Char. 192: 2 → 1; Char. 227: 1 → 0; Char. 229: 0 → 1; Char. 232: 0 → 1; Char. 236: 0 → 1; and 46 molecular apomorphies.

Node 174: Char. 0: 0.480–0.560 → 0.400; Char. 1: 0.521–0.608 → 0.434; Char. 3: 0.400 → 0.000; Char. 11: 0.181 → 0.121; Char. 12: 1.000 → 0.500; Char. 15: 0.600 → 0.400; Char. 40: 0.500 → 0.000; Char. 41: 0.400 → 0.000; Char. 107: 0 → 1; Char. 120: 0 → 1; Char. 235: 0 → 1; Char. 242: 0 → 1; Char. 243: 0 → 2; and 18 molecular apomorphies.

Node 175: Char. 5: 0.500 → 0.250; Char. 38: 0.333 → 0.000; Char. 89: 0 → 1; Char. 90: 0 → 1; Char. 122: 0 → 1; Char. 141: 0 → 1; Char. 143: 0 → 1; Char. 145: 0 → 1; Char. 159: 2 → 1; Char. 163: 2 → 3; Char. 197: 2 → 1; and 1 molecular apomorphy.

Node 176: Char. 7: 1.200 → 0.800; Char. 11: 0.121 → 0.060; Char. 21: 1.298 → 0.947; Char. 47: 0 → 3; Char. 48: 0 → 4; Char. 192: 2 → 1; and 16 molecular apomorphies.

Node 177: Char. 89: 1 → 2; Char. 106: 0 → 1; Char. 176: 0 → 1; Char. 241: 0 → 2; and 52 molecular apomorphies.

Node 178: Char. 50: 1 → 0; Char. 69: 2 → 0; Char. 78: 1 → 0; Char. 192: 2 → 1; Char. 194: 2 → 3; Char. 196: 1 → 0; Char. 232: 0 → 1; Char. 234: 0 → 1; and 42 molecular apomorphies.

Node 179: Char. 49: 3 → 0; Char. 54: 2 → 0; Char. 109: 1 → 2; Char. 193: 1 → 2; Char. 236: 0 → 1; Char. 237: 2 → 1; Char. 238: 0 → 1; Char. 245: 1 → 0; Char. 246: 1 → 0; Char. 250: 0 → 1; and 16 molecular apomorphies.

Node 180: Char. 0: 0.800 → 0.720; Char. 6: 0.285 → 0.380–0.476; Char. 65: 1 → 2; Char. 66: 1 → 2; Char. 81: 1 → 0; Char. 88: 1 → 0; and 4 molecular apomorphies.

Node 181: Char. 34: 0.857 → 1.142; Char. 119: 0 → 1; Char. 194: 1 → 2; and 11 molecular apomorphies.

Node 182: Char. 48: 0 → 4; Char. 54: 0 → 2; Char. 171: 0 → 1; and 5 molecular apomorphies.

Node 183: Char. 39: 0.500 → 0.666; Char. 51: 1 → 2; Char. 61: 1 → 2; Char. 112: 1 → 0; Char. 113: 1 → 0; Char. 115: 1 → 0; and 4 molecular apomorphies.
Node 184: Char. 9: 0.571 → 0.285 and 11 molecular apomorphies.
Node 186: Char. 52: 3 → 2; Char. 59: 2 → 1; and 40 molecular apomorphies.
Node 187: Char. 49: 3 → 2; Char. 58: 4 → 3; Char. 60: 3 → 2; Char. 144: 0 → 1; Char. 236: 0 → 1; Char. 238: 0 → 1; and 42 molecular apomorphies.
Node 188: Char. 46: 2 → 1; Char. 48: 4 → 3; Char. 50: 1 → 2; Char. 51: 2 → 1; Char. 53: 3 → 2; Char. 61: 2 → 1; Char. 62: 0 → 4; Char. 63: 4 → 2; Char. 89: 0 → 1; Char. 90: 0 → 1; Char. 91: 0 → 1; Char. 169: 0 → 1; Char. 228: 1 → 0; and 10 molecular apomorphies.
Node 190: 33 molecular apomorphies.
Node 192: 54 molecular apomorphies.
Node 193: Char. 69: 2 → 3; Char. 101: 0 → 1; Char. 104: 1 → 0; Char. 105: 1 → 0; Char. 106: 0 → 1; Char. 146: 1 → 0; Char. 159: 2 → 1; Char. 162: 2 → 1; Char. 174: 0 → 1; Char. 193: 1 → 2; and 4 molecular apomorphies.
Node 194: Char. 5: 0.750 → 1.000; Char. 10: 0.363 → 0.545; Char. 11: 0.181–0.303 → 0.484; Char. 36: 0.500 → 1.000; Char. 74: 1 → 2; and 14 molecular apomorphies.
Node 195: Char. 4: 0.250–0.500 → 0.750; Char. 5: 0.500 → 0.750; Char. 23: 0.400 → 1.200; Char. 31: 0.500–0.750 → 1.000; Char. 244: 0 → 1; and 10 molecular apomorphies.
Node 199: Char. 107: 0 → 2; Char. 152: 1 → 2; Char. 206: 0 → 1; Char. 207: 0 → 1; and 47 molecular apomorphies.
Node 200: Char. 61: 2 → 1; Char. 63: 4 → 3; Char. 65: 2 → 1; Char. 66: 2 → 1; Char. 109: 1 → 2; Char. 177: 0 → 1; and 11 molecular apomorphies.
Node 202: Char. 15: 0.600 → 0.400; Char. 174: 0 → 1; and 45 molecular apomorphies.
Node 203: Char. 74: 1 → 2; Char. 107: 0 → 1; Char. 183: 2 → 3; Char. 203: 0 → 1; and 54 molecular apomorphies.
Node 204: Char. 4: 0.250 → 0.500–0.750; Char. 5: 0.500 → 0.750; Char. 6: 0.285 → 0.476; Char. 11: 0.181 → 0.242; Char. 88: 1 → 0; Char. 208: 1 → 0; and 9 molecular apomorphies.
Node 207: Char. 5: 0.750 → 0.500; Char. 15: 0.600 → 0.400; Char. 30: 0.571 → 0.285; Char. 37: 0.666 → 0.333; Char. 93: 0 → 1; Char. 146: 2 → 0; and 43 molecular apomorphies.

Node 208: Char. 0: 0.880–1.040 → 1.120; Char. 17: 0.000 → 0.666; Char. 41: 0.400 → 0.000; Char. 121: 1 → 0; Char. 193: 1 → 2; Char. 194: 1 → 2; Char. 234: 0 → 1; Char. 241: 0 → 3; and 18 molecular apomorphies.
Node 209: Char. 0: 0.800 → 0.880–1.040; Char. 1: 0.695–0.782 → 0.869; Char. 8: 0.250 → 0.750; Char. 9: 0.285 → 0.857; Char. 10: 0.363 → 0.545–0.727; Char. 11: 0.242 → 0.303–0.424; Char. 29: 0.400 → 0.800; Char. 31: 0.500 → 0.750; Char. 32: 0.571 → 0.857–1.142; Char. 34: 0.571–0.857 → 1.142; Char. 65: 1 → 2; Char. 98: 1 → 2; Char. 108: 1 → 0; Char. 109: 1 → 0; Char. 110: 1 → 0; Char. 113: 0 → 2; Char. 146: 1 → 2; Char. 237: 2 → 1; Char. 246: 1 → 0; Char. 250: 0 → 1; and 3 molecular apomorphies.
Node 211: Char. 95: 1 → 0; Char. 193: 1 → 2; Char. 238: 0 → 1; and 11 molecular apomorphies.
Node 212: Char. 31: 1.000–1.250 → 1.750; Char. 62: 0 → 4; Char. 74: 1 → 2; Char. 76: 0 → 1; Char. 112: 0 → 2; Char. 115: 0 → 2; Char. 179: 1 → 2; Char. 183: 2 → 3; Char. 212: 0 → 1; Char. 213: 1 → 2; Char. 214: 0 → 1; Char. 216: 0 → 2; Char. 217: 1 → 2; Char. 218: 1 → 2; Char. 231: 0 → 1; and 14 molecular apomorphies.

Node 213: Char. 30: 0.571 → 0.857; Char. 31: 0.750 → 1.000–1.250; and 6 molecular apomorphies.
Node 215: Char. 45: 0 → 2; Char. 47: 0 → 3; Char. 48: 0 → 4; Char. 49: 0 → 3; Char. 54: 0 → 2; Char. 98: 2 → 1; Char. 107: 0 → 2; Char. 108: 0 → 2; Char. 109: 0 → 1; Char. 110: 0 → 1; Char. 146: 2 → 1; Char. 241: 0 → 3; Char. 248: 0 → 1; and 1 molecular apomorphy.
Node 216: Char. 93: 0 → 1; Char. 95: 1 → 0 ;Char. 146: 2 → 0; Char. 220: 1 → 0; and 34 molecular apomorphies.
Node 217: Char. 15: 0.600 → 0.800; Char. 69: 2 → 3; Char. 162: 2 → 0; Char. 210: 0 → 1; and 10 molecular apomorphies.
Node 218: Char. 81: 1 → 0; Char. 110: 0 → 2; Char. 113: 2 → 0; Char. 192: 2 → 3; and 48 molecular apomorphies.
Node 221: Char. 45: 0 → 2; Char. 48: 0 → 4; Char. 49: 0 → 3; Char. 69: 2 → 3; Char. 89: 0 → 2; Char. 90: 0 → 2; Char. 112: 0 → 2; Char. 115: 0 → 2; Char. 171: 0 → 1; Char. 179: 1 → 2; Char. 216: 0 → 1; Char. 226: 0 → 1; Char. 231: 0 → 1; Char. 235: 0 → 1; Char. 236: 0 → 1; Char. 238: 0 → 1; Char. 240: 0 → 1; and 25 molecular apomorphies.
Node 222: Char. 5: 0.500 → 0.250; Char. 15: 0.600 → 0.400; Char. 23: 0.400 → 0.000; Char. 34: 0.571 → 0.285; Char. 38: 0.333 → 0.000; Char. 39: 0.500 → 0.333; Char. 74: 1 → 2; and 7 molecular apomorphies.
Node 223: Char. 47: 2 → 3; Char. 50: 2 → 3; Char. 51: 1 → 2; Char. 61: 1 → 2; Char. 69: 2 → 3; Char. 84: 1 → 0; Char. 88: 1 → 0; Char. 92: 0 → 1; Char. 93: 0 → 1; Char. 94: 1 → 0; Char. 95: 1 → 0; Char. 96: 0 → 1; Char. 97: 1 → 0; Char. 98: 1 → 0; Char. 99: 0 → 1; Char. 100: 1 → 0; Char. 101: 0 → 1; Char. 102: 1 → 0; Char. 110: 1 → 0; Char. 111: 1 → 0; Char. 121: 1 → 0; Char. 140: 2 → 0; Char. 146: 1 → 0; Char. 159: 2 → 0; Char. 162: 2 → 0; Char. 224: 1 → 0; Char. 245: 0 → 1; and 44 molecular apomorphies.
Node 224: Char. 0: 0.800–0.880 → 1.040; Char. 1: 0.782–0.869 → 1.130–1.217; Char. 20: 1.000 → 1.500; Char. 48: 0 → 4; Char. 112: 1 → 0; Char. 113: 1 → 0; Char. 115: 1 → 0; Char. 208: 1 → 0; Char. 209: 1 → 0; Char. 216: 0 → 1; Char. 221: 1 → 2; and 6 molecular apomorphies.
Node 225: Char. 10: 0.363 → 0.181; Char. 28: 0.333 → 0.000; Char. 35: 0.333 → 0.000; Char. 39: 0.333 → 0.166; Char. 41: 0.400 → 0.000; Char. 47: 0 → 2; and 10 molecular apomorphies.
Node 227: Char. 56: 0 → 2; Char. 72: 0 → 4; Char. 73: 0 → 3; Char. 247: 1 → 0; and 16 molecular apomorphies.
Node 228: Char. 2: 0.000 → 0.500; Char. 3: 0.000–0.400 → 0.800; Char. 4: 0.250 → 0.500; Char. 5: 0.250 → 0.750; Char. 43: 0.333 → 0.999; Char. 54: 0 → 1; Char. 55: 0 → 2; Char. 89: 0 → 3; Char. 120: 0 → 1; Char. 167: 0 → 1; Char. 172: 0 → 1; Char. 173: 0 → 1; Char. 212: 0 → 1; Char. 226: 0 → 1; Char. 228: 1 → 0; Char. 230: 0 → 1; Char. 231: 0 → 1; Char. 235: 0 → 2; Char. 236: 0 → 2; Char. 237: 2 → 1; Char. 246: 1 → 0; Char. 248: 0 → 2; and 7 molecular apomorphies.
Node 231: Char. 63: 0 → 2; Char. 174: 1 → 2; Char. 175: 1 → 2; Char. 196: 1 → 0; Char. 215: 0 → 1; Char. 241: 0 → 3; and 31 molecular apomorphies.
Node 232: Char. 37: 0.000 → 0.333 and 26 molecular apomorphies.
Node 234: Char. 172: 0 → 1; Char. 173: 0 → 1; and 12 molecular apomorphies.
Node 233:27 molecular apomorphies.
Node 235: Char. 22: 0.400 → 0.000; Char. 31: 0.500 → 0.000; Char. 34: 0.285 → 0.000; Char. 37: 0.333 → 0.000; Char. 42: 0.571 → 0.000; Char. 64: 12 → 0; Char. 67: 0 → 1; Char. 72: 0 → 4; Char. 73: 0 → 3; Char. 82: 0 → 1; Char. 85: 0 → 1; Char. 87: 1 → 0; Char. 89: 0 → 2; Char.

91: 0 → 1; Char. 140: 2 → 3; Char. 143: 0 → 2; Char. 145: 0 → 2; Char. 171: 0 → 1; Char. 195: 0 → 1; Char. 200: 1 → 0; Char. 224: 1 → 2; and 5 molecular apomorphies.
Node 236:30 molecular apomorphies.
Node 237: Char. 226: 0 → 1; Char. 248: 0 → 1; and 6 molecular apomorphies.
Node 238:9 molecular apomorphies.
Node 239: Char. 168: 1 → 0; Char. 183: 2 → 3; Char. 228: 1 → 0; and 10 molecular apomorphies.
Node 240: Char. 6: 0.190 → 0.095; Char. 11: 0.121 → 0.060; Char. 48: 0 → 1; Char. 117: 0 → 1; Char. 174: 1 → 0; Char. 175: 1 → 0; Char. 177: 1 → 0; Char. 192: 3 → 1; and 3 molecular apomorphies.
Node 243:12 molecular apomorphies.
Node 244: Char. 192: 1 → 2; and 12 molecular apomorphies.
Node 246:15 molecular apomorphies.
Node 248: Char. 167: 0 → 1; Char. 174: 1 → 2; Char. 175: 1 → 2; Char. 192: 3 → 2; Char. 225: 0 → 1; Char. 245: 0 → 1; and 46 molecular apomorphies.
Node 250: Char. 193: 1 → 2; Char. 246: 1 → 0; Char. 250: 0 → 1; and 37 molecular apomorphies.
Node 251: Char. 48: 1 → 0; Char. 87: 0 → 1; Char. 226: 0 → 1; Char. 248: 0 → 1; and 48 molecular apomorphies.
Node 254: Char. 37: 0.666–0.999 → 0.333 and 9 molecular apomorphies.
Node 255: Char. 10: 0.363 → 0.181; Char. 22: 0.800 → 0.400; Char. 29: 0.400 → 0.000; Char. 30: 0.571–0.857 → 1.142; Char. 35: 0.666 → 0.999; Char. 39: 0.666 → 0.500; Char. 73: 0 → 2; Char. 107: 0 → 2; Char. 176: 12 → 0; Char. 194: 1 → 0; and 8 molecular apomorphies.
Node 256: Char. 190: 0 → 1; Char. 204: 0 → 1; and 12 molecular apomorphies.
Node 261: Char. 89: 3 → 1; Char. 172: 0 → 1; Char. 174: 0 → 1; Char. 199: 1 → 0; Char. 239: 0 → 2; and 11 molecular apomorphies.
Node 262: Char. 4: 0.250–0.500 → 0.750; Char. 5: 0.500 → 1.000; Char. 12: 1.000 → 0.500; Char. 47: 3 → 0; Char. 49: 3 → 0; Char. 54: 2 → 0; Char. 84: 1 → 0; Char. 152: 1 → 2; Char. 167: 0 → 1; Char. 190: 1 → 0; and 5 molecular apomorphies.
Node 263: Char. 11: 0.181 → 0.363; Char. 29: 0.400 → 0.800–1.200; Char. 31: 0.500–0.750 → 1.000; Char. 32: 0.571 → 0.857–1.142; Char. 98: 1 → 2; Char. 108: 1 → 0; and 3 molecular apomorphies.
Node 264: Char. 89: 0 → 3; Char. 90: 0 → 12; Char. 109: 1 → 2; Char. 110: 1 → 2; Char. 113: 0 → 2; Char. 239: 1 → 0; and 5 molecular apomorphies.
Node 268: Char. 146: 1 → 2 and 39 molecular apomorphies.
Node 269: Char. 9: 0.285 → 0.571; Char. 11: 0.363 → 0.484; Char. 107: 0 → 2; Char. 108: 0 → 2; and 10 molecular apomorphies.
Node 270: Char. 46: 2 → 0; Char. 50: 1 → 0; Char. 51: 2 → 0; Char. 52: 3 → 0; Char. 53: 3 → 0; Char. 58: 4 → 0; Char. 59: 2 → 0; Char. 60: 3 → 0; Char. 61: 2 → 0; Char. 63: 4 → 0; Char. 78: 1 → 0; Char. 175: 1 → 0; and 2 molecular apomorphies.
Node 272: Char. 162: 2 → 0; Char. 241: 0 → 2; Char. 245: 1 → 0; and 24 molecular apomorphies.
Node 273: Char. 0: 0.880 → 1.440; Char. 1: 0.695–0.782 → 1.217–1.304; Char. 8: 0.250 → 0.500; Char. 9: 0.285 → 0.857; Char. 10: 0.363 → 0.545; Char. 17: 0.000 → 0.666; Char. 18: 0.000 → 0.666; Char. 20: 1.000 → 1.500; Char. 22: 0.800 → 1.600; Char. 23: 0.400 → 0.800; Char. 27: 0.000 → 1.000; Char. 28: 0.666 → 0.999; Char. 35: 0.666 → 1.333; Char. 36: 0.500 →

1.000; Char. 65: 1 → 2; Char. 94: 1 → 2; Char. 95: 1 → 0; Char. 109: 2 → 0; Char. 110: 2 → 0; Char. 146: 1 → 2; Char. 209: 1 → 0; Char. 237: 2 → 1; Char. 244: 0 → 1; Char. 246: 1 → 0; Char. 247: 1 → 0; and 8 molecular apomorphies.
Node 275: Char. 89: 3 → 1; Char. 90: 2 → 0; Char. 113: 2 → 0; Char. 199: 1 → 0; and 10 molecular apomorphies.
Node 277: Char. 66: 1 → 2; Char. 68: 1 → 0; Char. 84: 0 → 1; Char. 89: 3 → 2; Char. 90: 2 → 1; Char. 97: 1 → 0; Char. 98: 2 → 1; Char. 114: 1 → 0; Char. 140: 2 → 1; Char. 149: 1 → 2; Char. 154: 0 → 1; Char. 156: 0 → 1; Char. 158: 1 → 2; Char. 159: 2 → 1; Char. 160: 1 → 0; Char. 162: 2 → 1; Char. 163: 2 → 3; Char. 179: 2 → 1; Char. 187: 0 → 1; Char. 192: 3 → 1; Char. 193: 1 → 2; Char. 197: 2 → 0; Char. 198: 3 → 0; Char. 201: 0 → 1; Char. 204: 1 → 0; Char. 206: 0 → 1; Char. 207: 0 → 1; Char. 219: 2 → 0; Char. 221: 1 → 0; Char. 239: 0 → 2; and 47 molecular apomorphies.
Node 279: Char. 49: 3 → 0; Char. 107: 0 → 1; Char. 112: 0 → 2; Char. 120: 0 → 1; Char. 169: 0 → 1; Char. 235: 0 → 1; Char. 236: 0 → 1; Char. 237: 2 → 1; Char. 238: 0 → 1; Char. 241: 0 → 2; Char. 244: 0 → 1; Char. 245: 1 → 0; Char. 246: 1 → 0; Char. 250: 0 → 1; and 10 molecular apomorphies.
Node 284: Char. 46: 2 → 0; Char. 50: 1 → 0; Char. 108: 1 → 2; Char. 174: 0 → 1; and 4 molecular apomorphies.
Node 286: Char. 183: 2 → 3; Char. 192: 3 → 2; and 13 molecular apomorphies.
Node 290: Char. 245: 1 → 0; and 7 molecular apomorphies.

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DISCLAIMER

The new genera and species name presented herein are not intended to formally establish new taxonomic names.