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**Herpetology of Sierra Nevada de Santa Marta, Colombia: A  
biogeographical analysis**

**Bernal-Carlo, Amanda, Ph.D.**

**City University of New York, 1991**

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A

**HERPETOLOGY OF SIERRA NEVADA DE SANTA MARTA,  
COLOMBIA:  
A BIOGEOGRAPHICAL ANALYSIS**

**by**

**AMANDA BERNAL-CARLO**

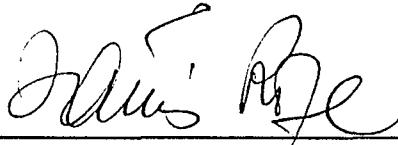
A disertation submitted to the Graduate Faculty in Biology  
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## ABSTRACT

**HERPETOLOGY OF THE  
SIERRA NEVADA DE SANTA MARTA, COLOMBIA;  
A ZOOGEOGRAPHICAL ANALYSIS**

by

**Amanda Bernal-Carlo****Adviser: Janis Roze**

Sierra Nevada de Santa Marta is a unique South American coastal mountain range isolated from the Colombian Andes, with a maximum altitude of 5775 m (the second highest point in South America after the Aconcagua). Geologically, the Sierra Nevada de Santa Marta is a block of metamorphic rocks in which predominate gneisses and amphibolites. A major uplift of Santa Marta took place at the end of the Pleistocene. This late regional uplift reflects only two major stages of glaciation, or only one with two or three main stages of retreat.

A comprehensive study of SNSM herpetofauna revealed a total of 132 species represented by 20 genera and 46 species of amphibians and 63 genera and 86 species of reptiles. About 43 species (32.5 %) have ranges restricted to the mountain: 26 amphibians (including an endemic genus, *Geobatrachus*), 12 lizards, and 5 snakes. In the Andean forest, paramo and superparamo, 100% of the species are endemic. *Atelopus* has 10 endemic species, *Eleutherodactylus* has 9, and *Atractus* has 2.

Reptiles, with 70 species, predominate in the lowlands, while amphibians, with 26 species, predominate in the highlands. Diversity is relatively high with an average of 1 or 2 species per genus, and endemism is higher among amphibians than among reptiles. There is an inverse relationship between the number of species of avifauna and herpetofauna and the increasing altitude both in SNSM and in Colombian Andes. This inverse relationship is more accentuated in the SNSM than in the Andes. In SNSM, there are fewer species of amphibians and reptiles in the Andean forest than in the paramo. This suggests a herpetofaunal ecological vacuum in the Andean forest of SNSM that might have originated due to the rapid elevation of the massif or to the temporally variable climatological and ecological conditions. They made the intermediate zone of the Andean forest less favorable to the process of adaptation and speciation.

Simpson's Index of similarity shows a very close (100%) relationship between the superparamo and the paramo, with cloud forest occupying an intermediate position between high mountain habitats and both low montane wet forest and xerophytic scrub forest (29.75%). The actual composition of the herpetofauna of Sierra Nevada de Santa Marta is the result of many historical and environmental factors that have provided the arena for the processes of speciation. Most of the species occurring in the highlands have narrow ranges of distribution, and the species of *Atelopus*, *Eleutherodactylus*, *Anolis* and *Anadia* have undergone a successful adaptive radiation. *Atelopus* in particular presents the most specialized forms occupying the paramos and superparamos which are faunistically speaking depauperate areas. *Atelopus carrikeri* is the highest living frog in Santa Marta and probably in the whole of the South American Andes. It has been found at an altitude of 4950 m, along small streams produced by melting snow.

The relatively high degree of endemism of Sierra Nevada de Santa Marta indicates that its herpetofauna has developed in situ by vicariant processes.

To

The original dwellers and guardians of the  
Sierra Nevada de Santa Marta,  
the Kogi Indians, their sister tribes and their noble ancestors,  
the Tayronas -- in gratitude for having lived in harmony with  
the "center of the world."

"If we `civilized,` with our knowledge and  
wisdom, are able to understand and  
respect one of the most valuable cultures  
of the American continent, then we can  
surely take adequate measures to protect  
the `centre of the world` -- this mythical  
land as old as history itself.

Juan Mayr

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## **INTRODUCTION**

The most conspicuous topographic feature of north-western Colombia is the Sierra Nevada de Santa Marta, a range of about 16,000 sq. km that rises abruptly to above 5500 m above sea level at a distance of only 42 km from the Caribbean (Map 1). The highest point of this range, the twin summits of Pico Bolívar and Pico Colón rise to 5775 m the highest mountain in Colombia.

The Sierra Nevada de Santa Marta is a triangular block in which each side is about 120 km long. It is separated from the Andes westward by the broad plains of the Magdalena valley, and to the east and southwest by a long valley that separates it from the Serranía de Perijá, or Black Andes. This valley is drained by the Río Cesar, which is a tributary of the Rio Magdalena on the southwest, and the Rio Ranchería that flows into the sea in the northeast. The origins of these streams are close together, and the gap between them is less than 305 m. (Taylor, 1931; Adams 1973).

It is justified to treat the Sierra Nevada de Santa Marta as a "continental island" (Vuilleumier, F. 1970; Duellman, 1979; Simpson, B. 1979); its island-like nature is enhanced by the fact that this snow-capped massif extends from the tropical lowlands into the troposphere, while being situated so close to the sea. Sierra de Santa Marta is the highest coastal mountain formation in the world that has "created" and sustained a special environment.

For the purpose of the present work, I considered the geographic boundaries of the Sierra Nevada de Santa Marta as follows: On the north and northwest the Atlantic Ocean; on the northeast the Rio Ranchería; on the east and southeast Rio César; at the west along the railway from Fundación to Santa Marta and the western border of Ciénaga Grande (See Map 2).

## **I. GENERAL ASPECTS OF THE SIERRA NEVADA DE SANTA MARTA**

### **1. Geology**

According to Gansser (1955, 1973), the Sierra Nevada de Santa Marta is a block of predominantly Pre-Cambrian meta-morphic rocks. The oldest rocks of the Sierra consist of banded hornblende plagioclase gneisses, granodiorite augen gneisses, pink al-

kali-feldspar gneisses and hornblende biotite schists, with all intermediate types (Tschanz et al., 1969; Arias Tauta, 1984). Intercalated are more basic horizons of amphibolites, magnetite hornblendites and magnetite pyroxenites. Associated are thin layers of olivine marbles, wollastonite marbles and garnet magnetite rocks. The metamorphics are discordantly cut by red quartz porphyrites and porphyrites related to the Triassic Giron group. The presence of these Pre-Cambrian metamorphics has been confirmed by several authors. Banded gneisses from the northwest corner of the massif (Dibulla gneisses) gave a Rb- Sr isochron of 1400 my. These gneisses are by far the oldest metamorphic rocks in the Andes orogen. Tschanz et al. (1969) estimated the minimum age for the gneisses from the area around Buritaca to be 11 my., based on radiometric analysis.

Gansser (1955, 1973) also suggested that Santa Marta is more closely related geologically to the Cordillera Central than to any other branch of the Andes. The Central Cordillera ends northwards in the depression produced by the Cauca and Magdalena valleys, while its last extension reaches the El Banco, close to the Santa Marta fault system. Similar sedimentary cover and several additional geological features indicate geological relatedness of both systems.

Gansser (1973) also recognized that the Sierra Nevada de Santa Marta exposes a much more complicated structure than the Cordillera Central. He observed that the morphology of the Sierra with its high peaks is the result of a very recent uplift that rejuvenated the large faults bordering the massif on the west and north. The upward movements took place during the Late Pliocene Early-Pleistocene. This late regional uplift is reflected in the presence of only two main stages of glaciation, probably of Würm age (Gansser 1955) or only one glaciation period with three main stages of retreat. No moraines older than Wisconsin/Wurm have been found (Bartels, 1984). It has been also suggested that in Sierra Nevada de Santa Marta it is possible to differentiate three glacial stages: a recent one called Bolivarian stage; the advance of the main glaciation Wisconsin/Würm represented by the largest size moraines known in the Sierra (Mamancanaca stage, which is the oldest occurring approximately 21000- 14000 y.b.p.); and the Adurimeina glacial stage. In the same manner, the latter two glacial stages that have occurred in Cordillera de Mérida in Venezuela and the one known as Drift I for the Sierra del Cocuy in Cordillera Oriental of Colombia have been interpreted as a pre-Mamancanaca

glaciation stage in Sierra Nevada de Santa Marta; while the later glacial stage in Mérida belonged to the pleniglacial of Würm age that corresponded to the to the Mamancanca in Sierra Nevada de Santa Marta and to the Drift II of Sierra del Cocuy (Gansser, 1955, Raasveldt, 1957; Schubert, 1980 and Bartels, 1984).

## 2. Climate

It is not easy to define the climate of Sierra Nevada de Santa Marta, since in fact several climatic gradients are present along the massif, determined by the relationship between altitude, temperature, precipitation, position, and the trade winds.

### 2.1 Temperature

In tropical mountains air temperature decreases at an average of about 6 C per 100 m elevation (Sarmiento, 1986). Van der Hammen (1984) found that mean annual air temperatures as deduced from the soil temperatures in the Buritaca-La Cumbre transect, are as follows:

Altitude m.	Temperature °C
0	27
600	24
1700	18
2700	12
3400	8
3800	6
4300	3

The mean monthly temperatures are very regular throughout the year with oscillations of less than 2.5°C. They are even slightly higher in the dry months and somewhat lower during the rainy season (Pérez-Preciado, 1984).

The surrounding lowlands have the typical high temperature of tropical latitudes. In the north coastal area the average annual temperature of 21°C is moderated by sea breezes and trade-winds. During most of the year the temperature on the west and south sides of the Sierra de Santa Marta is higher (28°C). Ascending the mountain, the temperature decreases gradually. At 1,000 m, the average temperature is 18-22°C; above 2500 m, the values oscillate annually between 10-14°C. At higher altitudes, around 3500 m, the temperature shows a considerable decrease. The annual range of temperature is be-

tween 5-10 C, but with greater daily oscillations reaching values below zero at night and about 15 C at noon. Also, the temperature is influenced by local conditions.

## 2.2 Rainfall

Data on rainfall registered at different meteorological stations in Sierra are summarized in Table 1.

In general, it has been observed that the northern slopes of the Sierra Nevada de Santa Marta from the Río Piedras eastward to Dibulla are very humid with higher rainfall than on the other sides of the mountain on the lowland level (See Alto de Mira: fig. 1a, Palomino, fig. 1h, Buritaca: fig. 1b, Parque Nacional Tayrona: fig. 1i, and Dibulla: fig. 1c).

Table 1. Annual rainfall registered at different localities of Sierra Nevada de Santa Marta \*

LOCALITY	ORIENTATION	ALTITUDE m..	RAINFALL mm/year
Santa Marta	NW	4	311.7
La Ye	W	20	721.5
S. Sebastián Ráb.	SSE	2000	1380.1
Dibulla	NNW	5	1420.5
Las Pavas	SSW	150	1476.0
Guachaca	N	45	1530.0
Pq. Tayrona	NW	30	1566.9
Buritaca	N	30	2047.
O Palomino	N	30	2428.0
San Lorenzo	NW	2200	2582.
O Minca	NW	600	2844.0
Alto de Mira	NW	1080	4158.0

This condition is due to the fact that the mountain ridge intercepts the winds blowing from the Caribbean and condenses the moisture they contain. The lowlands on the western slopes have more or less the same rainy season as the highlands, except that the rainfall is slightly lower. The adjacent Guajira Peninsula is a desert, with a very short rainy season and very low total rainfall.

At San Lorenzo, 2200 m on the northwestern side, humidity is higher because winds condense more moisture. The winds from the Magdalena basin discharge their moisture further to the south producing abundant rainfall. This is the case of Minca and Alto de Mira where rainfall is very high. Rainfall decreases noticeably between the Sierra Nevada de Santa Marta and the Serranía de Perijá. In the valleys of Rio Ranchería

and Río Cesar, where the penetration of moisture carried by winds from the Magdalena basin is prevented by dry winds, blowing in opposite directions that come from the Guajira desert. Therefore, the eastern slope of the Sierra Nevada de Santa Marta is less humid than the southwestern one (compare Valledupar, San Sebastián de Rábago and Las Pavas in figure 1).

The pattern of rainfall throughout the year in the Sierra Nevada de Santa Marta is more or less the same for the different altitudinal zones and the adjacent lowlands. The main dry season (locally called "summer") extends from December to March or April. There is also a shorter dry season or "veranillo" in July and early August. The remaining months constitute the rainy season (locally called "winter"). In the semi-arid belt of the northwest the wet season coincides with a general decrease in the strength of the trade-winds which, blow with a regular force during the dry season (Adams, 1973).

Figure 2 shows the number of days of rainfall per month, at the different localities. It can be deduced that the amount of rainfall is determined by the concentration of rainfall per day and not by the number of rainy days (compare any of the given localities with Alto de Mira: fig. 1a, the station with the highest rainfall).

### 3. Vegetation

The study of the vegetation of Sierra Nevada de Santa Marta is still deficient. This is due in part to the difficulties in getting to most higher environments of the Sierra. Data have been reported by Cuatrecasas (1986); Espina and Giacometro (1932); Seifriz (1934,1937); Guhl, (1950); Lozano (1984); Rangel et. al. (1982); Van der Hammen (1984); Cleef and Rangel (1984). Some of these works are included in the Buritaca-La Cumbre transect (Van der Hammen and Ruíz, 1984). The present analysis is based mostly on the observations of these authors and to a lesser degree on my own observations.

In the coastal region of the Sierra Nevada de Santa Marta there is a rapid change of plant formation, from dry deciduous and arid succulent shrubs to humid evergreen seasonal forest. The causes of this change of vegetation are, according to Herrmann (1970):

- 1.- Divergence in the horizontal currents of the trade wind system as a re-

sult of the different friction coefficients over the sea and land. These divergences produce a downward movement of the upper air layers of the atmosphere over the coastal region, preventing the formation of rainfall.

2.- Divergence of the horizontal currents and descending movement of the air after having passed the coastal mountains.

3.- Divergence of the horizontal currents and stabilization of the air masses in connection with the cyclic daily movement in the coastal region.

4.- Dry katabatic winds of Fohn type that are formed during the dry season in the valleys of Rio Piedras and Rio Manzanares. Due to the elevated deficit in saturation and high wind velocity, they produce potentially high evapotranspiration.

Several distinct ecological zones can be defined in the Sierra Nevada de Santa Marta by climatic, vegetational and altitudinal factors. These zones are equivalent to the ones found in the northern Andes (Cuatrecasas, 1958; Adams, 1973; Rangel et al. 1983). However, due to climatic factors, topography and influence of the surrounding lowlands, the altitudinal limits for each belt or zone may vary on different slopes. I used the limits established by most authors who have described the vegetation and ecology of the mountain (Figure 3). These zones include:

**3.1 Lowland Xerophytic scrub forest:** Sea level- 250 m in the west side and from sea level- 500 m in the east side. In the lowlands around the massif, except in the north, extending up to 100 m in the northwest west and south, and to 250 m in the southwest. This forest consists of dry vegetation, is rich in Cactaceae and is characterized by the following species: High stratum (2-6 m): *Pereskia colombiana*, *Lemaireocereus griseus*, *Melocactus amoenus*, *Thevetia nitida*. Lower stratum: *Jatropha gossypifolia*, and other less dominant species such as *Croton sp*, *Lantana armata*, *Sida rhombifolia*, *Opuntia wentiana*, and many grasses.

**3.2 Tropical moist forest:** 1-1000 m. (not shown in Fig. 3) Present between Guachaca and Palomino (Cleef and Rangel, 1984). Its species composition is unknown. It can be said that this type of forest consists of trees of 25-35 m height. There is an abundance of palms and tree ferns, epiphytes, bromeliads and vines. Litter covers about 60%.

**3.3 Low montane wet forest:** 0-600 m in the west and 100-1000 m in the east. Present between Minca-Cabananas de San Lorenzo and the Parque Nacional Tayrona (Rangel et. al., 1983). Between 100-500 m it presents characteristic species such as *Ficus macrocyce*, *Bursera simaruba*, *Triplaris americana*, *Hura crepitans* and *Guazuma ulmifolia*. Herbaceous vegetation and brushes: *Adiantum sp*, *Picramia sp*, etc. Between 500 and 900 m the plant community is composed of woody species: *Persea sp*, *Zygia longifolia*, *Poulsenia armata*, *Vismia baccifera*, *Ficus macrocyce*, *Nectandra sp*, *Cedrela sp*, *Saurauia laevigata*, *Ficus velutina* and *Sapium sp*. Herbaceous plants: *Potomorphe pelata*, *Psychotria limonensis*, *Croton sp*, *Calathea insignis*, *Piper grande*, *Costus sp*, and *Piper angustum*. Climbing plants are also abundant: *Cissus vitifolia*, *Mikania leiostachya*, *Wulffia baccata*, *Entada sp*, *Rodospatha latifolia*. There is also a high diversity of Bryophytes.

**3.4 Cloud Forest:** 700-1800 m in the west and 1000-2,300 m in the eastern slope. It is a broad belt completely encircling the mountain. On the northern and north-western slopes cloud forests are exposed to the influence of the trade-winds that at these altitudes cause persistent mist and rain, producing a maximum rainfall of about 3500-4500 mm/yr (Van der Hammen, 1984). In some areas between 1,000-1,500 m the forest is especially luxuriant, with a denser canopy formed by trees more than 35 m tall, such as *Dictyocaron schultizii*, *Ossaea quinquinervia*, *Chrysophyllum auratum*, *Ficus apollinaris*, *Calathola costaricensis*, *Ladenbergia sp*. *Ficus macrocyce* and *Cecropia sp*. Herbaceous plants include: *Stromanthe portearia*, *Selaginella sp*, *Asplundia sp.*, and *Asplenium radicans*. Dominant epiphytes are: *Clusia odorata*, *Norantea sp.*, *Tillandsia complanata*, *Tillandsia cordifolium* and *Columnnea aureonitens*. Cryptogams are very common. At 1700 m the community is characterized by species of trees different from those of the community described above, but the physiognomy of both communities is similar. The trees at 1700 m belong to the following species: *Tovomita wedelliana*, *Gustavia speciosa*, *Graffienrieda santamartensis*, *Lozania mutisiana*, *Sloanea sp.*, and *Persea caerulea*.

**3.5- Andean Forest:** 2300-3200 m in the west and 2300-3400 m in the east. Annual mean temperatures between 8 to 13 C. (Van der Hammen, 1984). Characteristic of this belt are trees of about 8-15 m. height. Usually two plants strata are distinguished. First, the upper canopy that includes species such as *Macleania rupestris*, *Oreopanax*

*fontquerianum*, *Weimannia pinnata*, *Clusia multiflora*, *Diplostegium rosmarinifolium*, *Ternstroemia camelliaefolia*, *Schefflera sp*, *Palicourea abbreviata*, *Miconia sp.*, *Chaetolepis santamartensis*, *Hesperomeles lanuginosa* etc. The second level is formed by trees of lower height and by some herbaceous plants with dominant species such as *Macleania rupestris* and *Muehlenbeckia thamnifolia*, *Chusquea sp.* Bryophytes, also abundant, are *Campilopus sharpii*, *Herbertus acanthelius* and *Prionodon luteo-virens*. This type of forest is found in the northern side of Sierra Nevada de Santa Marta, where atmospheric humidity is very high. At 2700-2900 m in the Buritaca transect, the condensation of the atmospheric humidity is at its highest point and therefore, rainfall is also high. This explains the abundance of bryophytes in this community (Herrmann. 1984; Van der Hammen, 1984 and Cleef and Rangel, 1984).

**3.6- Páramo:** 3300-4400 m on the northern side and between 3300-4500 m on the southern side. Not all the paramos in the Sierra Nevada de Santa Marta are the same. Those of the northern side are exposed to constant daily rainfall (annual rainfall of 1800 mm at 4000 m.) and tend to be more humid than those of the south. The latter are protected against the influence of the trade winds, and therefore are rather xerophytic; the rainfall is less than 1000 mm at an altitude of 4000 m (Cleef and Rangel, 1984). The vegetation on the northern paramos is very little known. Some data have been offered by Seifríz (1934, 1937); Robins et. al (1974) published some data for the paramo of Rio Frio. The best available data are those obtained by Rangel et. al. (1982) and by Cleef and Rangel (1984). The páramo vegetation of the southern side is better known. In general one may say that above treeline (about 3400 m) the vegetation is composed of low herbaceous plants, with some woody bushes, cushion plants and grasses, forming the typical "pajonal". The dominant species are: *Calamagrostis sp.*, *Castilleja fissifolia*, *Pernettya prostrata*, *Agrostis toluensis*, *Hieracium avilae*, *Ranunculus spaniophyllus*, and *Gnaphalium antennarioides*, *Acaena cylindristachya*, *Azorella jullianii*. The presence of *Azorella jullianii* is interesting because it is registered for the first time for Colombia; it was previously known only from Serranía de Mérida, Venezuela. On the southern side, along rock shelters there are patches of high Andean forests with *Libanothamus glossophyllus*, *Symplocos nivalis*, *Rapanea dependes*, *Sericotheca argentea*, *Aragoa kogiorum*, *Weinmannia sp*, and *Lachemilla polylepis*. *Polylepis* (Rosaceae) is absent in Sierra Nevada de Santa Marta but its ecological analogue is *Lachemilla polylepis*, a species

known from Cordillera Oriental de Colombia, Sierra Nevada de Mérida (Venezuela) and Páramo de Chirripo (Costa Rica). In general, it seems that the páramos of Santa Marta tend to be poor in number of species as well as in number of individuals per species if compared to the paramos of the Andes. The influence of the Kogi indians and colonos (grazing, burning) is evident at the lower limits.

**3.7- Superparamo:** The landscape of the superpáramo (4500 m -snow limit) is characterized by sparse vegetation formed by species of *Lupinus*, *Cotopaxia* (this species is found only in Ecuador (Mathias and Constance, 1976) and Sierra Nevada de Santa Marta (Cleef and Rangel, 1984)); *Draba*, *Cerastium*, *Raouliopsis*, *Plantago*, *Agrostis* and other genera.

#### **4.- History of past expeditions.**

Alexander von Humboldt was one of the first explorers who mentioned the presence of the isolated mountain of the Sierra Nevada de Santa Marta on the northern coast of Colombia. However, the first biological studies were not undertaken until the late 1800's when the richness of fauna and flora of the massif was first revealed by Frederick Simmons, who visited it in 1878. He was the first explorer of this mountain. During a period of three and a half years he made considerable collections of birds in different parts of the Sierra, from the surrounding lowlands of Santa Marta up to an altitude of 4200 m. He made interesting descriptive observations in his paper "On the Sierra Nevada de Santa Marta and its Watershed".

In 1898 the Society of Ornithologists of Boston, Massachusetts, organized an expedition to the Sierra Nevada de Santa Marta under the leadership of W.W. Brown. After six and a half months collecting he brought back a thousand bird skins and about 350 mammals, as well as a few amphibians and reptiles. The expedition worked in Bonda, Pueblo Viejo, San Antonio, San Miguel, and Paramo de Macotama. Unfortunately, however, the material collected by this expedition was labelled only "Santa Marta" and, consequently, is of little value for establishing altitudinal limits of distribution.

In the same year, another expedition consisting of H. H. Smith, his wife, and two assistants visited Santa Marta. They made their first headquarters at Bonda. Smith's main effort was confined to botanical and entomological collecting. All vertebrates were col-

lected by native hunters employed by him. In consequence there is a considerable collection of specimens labelled "Bonda," which in many cases came from places far from that town and from different altitudes. Smith also collected at Valparaíso, El Líbano, Cerro Quemado de San Lorenzo, Río Manzanares Valley, from Mamatoco upward to the Matagiro valley and the northwest slopes of San Lorenzo, between 600 and 2500 m. Obviously, these two collections may be used only when supported by the additional data obtained by other explorers.

In 1911, M. A. Carriker Jr., arrived in the Santa Marta region to study principally its bird fauna. During four months, he collected on the western slopes of San Lorenzo at the Hacienda Cincinnati, Mamatoco, La Tigrera and Minca. In 1912, he and his wife returned to Santa Marta. In 1913 they participated in the expedition sent by the University of Michigan to the Sierra de Santa Marta. The director of this expedition was Alexander Ruthven. They collected at the Cincinnati Coffee Company, at an elevation of 1380 m, and on the summit of the Cerro San Lorenzo, at an elevation of 2,580 m. They also explored the region around Fundación, from the lowlands up to 600 m, on the extreme western end of the range. Collecting was carried out at this place for fourteen days, followed by trips to Santa Marta, Gaira and the Salamanca coast near the Ciénaga. The primary objective of this expedition was to collect amphibians and reptiles as well as to carry out ecological studies. The material represents about 93 species and was deposited in the University of Michigan Museum of Zoology.

During the last twenty years, other aspects of the Sierra such as its Paleocology have been studied by Van der Hammen (1984) and Arias Tauta (1984); its climate by Van der Hammen (1984), and Pérez Preciado (1984). Its vegetation has been defined by Cleef et. al. (1984) and Rangel and Jaramillo (1984). Larger number of animals and plants from the Sierra Nevada de Santa Marta has been incorporated in the collections of different museums and herbaria in the U.S. as well as in those of Colombia, thanks to the efforts of several explorers and collectors. Particularly important are the contributions of Duellman, (1979); Medem (1968); Ruíz- Carranza, (1976); and Lynch and Ruíz (1985). These herpetological collections form the basis of the present study.

In 1980 I visited the Sierra for the first time as a student of Universidad Nacional de Colombia. In 1989, I went there for the second time with an expedition organized by Fundacion Pro Sierra Nevada de Santa Marta, for the purpose of collecting in some re-

gions that had not been visited before: La Tagua, Cano la Danta, Rio Guachaca, Julepia, Kuskunguena, Alto de Mira, and San Lorenzo.

## **II. MATERIALS AND METHODS**

The data base for the analysis of Santa Marta herpetofauna comes from my two field trips as well as the examination of more than 2000 specimens from this region deposited in different museums and institutions in the U.S. and in Colombia. In order to bring the systematic accounts of amphibians and reptiles up to date, I visited the following museums that have extensive collections from Sierra Nevada de Santa Marta: Academy of Natural Sciences, Philadelphia (ANSP), American Museum of Natural History (AMNH); Carnegie Museum, Pittsburg (CM); Instituto de Ciencias Naturales (ICN); Instituto Nacional de Recursos Naturales (INDERENA), Instituto Nacional de Salud, Bogotá (INS), Museo de La Salle, Bogotá (MLS); Museum of Comparative Zoology, (MCZ); Museum of Zoology, University of Michigan (UMMZ).

I examined virtually all the available specimens and, whenever possible, the type specimens of species recorded for Santa Marta. Species identifications were made using taxonomic keys, comparison with other museum specimens, consultation with experts in various herpetological groups, and literature descriptions.

The species, as defined by Mayr and Ashlock (1991), is the unit of analysis of the present study. For the systematic accounts I defined species and subspecies, where applicable. Some of the currently recognized subspecies might turn out to be allospecies of a larger taxonomic unit.

For systematics the validity of each species was assessed, based on the morphological and anatomical data obtained following accepted procedures in systematic herpetology. The systematic accounts of species and subspecies, where applicable, are presented including diagnosis, descriptions, measurements, proportions and natural history notes for each species. For each species and subspecies are given original descriptions and references only for Sierra Nevada de Santa Marta. For the herpetofaunal analysis only the species unit was taken into consideration, even though some information could be gained by evaluating also the subspecies, especially in terms of ecological

and altitudinal distribution. While phylogenetic data are still incomplete, they are sufficient to postulate some hypothesis about the possible origin of the herpetofauna of Sierra Nevada.

Some parts of the Sierra Nevada de Santa Marta are quite inaccessible and for that reason the knowledge of its herpetofauna is still incomplete. Map 2 offers every reliable locality where collections of amphibians and/or reptiles has been made. A list of locality records is given in Appendix 1.

Each species was tabulated for altitudinal ranges and habitats occupied. The habitats considered here are: xerophytic scrub forest, low montane wet forest, cloud forest, Andean forest, paramo and superparamo. These habitats were described earlier. Other habitats of minor importance such as marshes, savannas, swampy areas, banana belt, and wood flood rain forest are also mentioned.

In order to establish the patterns of distribution of the herpetofauna in the Sierra Nevada de Santa Marta, I described and documented the distribution of each species within their respective physiographic regions. The degree of faunal resemblance among the different altitudinal habitats as well as the faunal resemblance between some physiographic regions and that of the Sierra de Santa Marta was analyzed using the Simpson's Index  $(C/N) \times 100$ , where C = number of species shared in common between two faunas, and N = number of species in the smaller of the two faunas (Simpson, 1960). The usual approach takes into consideration the presence or absence of taxa and with the degrees of phylogenetic relationships among them. Because this index uses the number of species of the smaller of the two samples, it minimizes the effect of differences between N1 and N2, of importance for Santa Marta as it constitutes comparatively the smaller of the two samples.

If for instance, comparison is of the fauna of a smaller with that of a larger area, the zoogeographic relationships are more clearly indicated if it is possible to eliminate the tendency of larger areas to have larger faunas simply because the areas are larger. This index tends to stress the most nearly similar parts of the two faunas. The idea here is that life zones that have most taxa in common are most closely related. On the other hand, given the conditions of the present analysis Simpson's index offers an additional advantage that it is not necessary to know the exact number of species of amphibians and reptiles for large areas as the Andes since SNSM contains smaller number of species for

all the regions including the Andes of Mérida. These analyses and the knowledge of the physiography and environment of the different areas considered allow for a general interpretation of the kind and effectiveness of barriers to herpetofaunal dispersal. I compared my results with those obtained by different authors in the same region, applied to different taxa such as amphibians and reptiles, birds, mammals and butterflies, (e.g. Todd and Carriker, 1922; Vuilleumier, 1977; Duellman, 1979; Allen, 1904; Adams, 1973).

Endemism among herpetofaunal taxa was analyzed by a combination of literature review and comparative study of museum specimens. The study of endemic species combined with the measurements of environmental diversity, such as area, habitat, and altitudinal range, allow for the assessment of the degree of isolation, timing, and rate of speciation.

### III. RESULTS

#### 1. Systematics

##### 1.1 Composition of the herpetofauna

Appendix II lists the species and subspecies of amphibians and reptiles that form the data base for the present study. The species are arranged i) in groups (salamanders, frogs, lizards, snakes, turtles, crocodiles), ii) phylogenetically by families and iii) alphabetically by genus and species. Those species assigned by letters are new descriptions and have yet to be named.

##### 1.2 Identification of the species

###### Key to the orders and suborders of amphibians and reptiles

- |                                                                                                 |                                                  |
|-------------------------------------------------------------------------------------------------|--------------------------------------------------|
| 1. Skin covered with scales; extremities, when present, have claws.....(Reptiles) .....         | 4                                                |
| 1' Skin without external scales; extremities, when present, without claws.....(Amphibians)..... | 2                                                |
| 2. Extremities absent.....                                                                      | Order Gymnophiona, genus <i>Caecilia</i> (p. 18) |
| 2' Extremities present.....                                                                     | 3                                                |
| 3. No tail; hind limbs much longer than forelimbs .....                                         | Order Anura (p. 20)                              |
| 3' Tail present; forelimbs and hindlimbs of equal size.. .....                                  | Order Caudata, genus <i>Bolitoglossa</i> (p. 19) |
| 4. Limbs present.....                                                                           | 5                                                |
| 4' Limbs absent.....                                                                            | 7                                                |
| 5. Body encased in a bony shell.....                                                            | order Testudines (p. 172)                        |
| 5' Body not encased in a bony shell.....                                                        | 6                                                |
| 6. Hind feet webbed; anal opening longitudinal.....                                             | order Crocodilia (p. 157)                        |
| 6' Hind feet not webbed; anal opening transversal .....                                         | suborder Sauria (p. 83)                          |

7. Rectangular scales around the body; eye reduced to an indistinct spot ..... genus *Amphisbaena*  
 7' Scales not rectangular, usually roundish; eye distinct ..... suborder *Serpentes* (p. 122)

**A. Amphibians**  
**Key to the genera of frogs (order Anura)**

1. Only four toes ..... genus *Geobatrachus* (p. 37 )  
 1' Five toes ..... 2
2. Fingers with expanded discs ..... 11  
 2' Fingers without expanded discs ..... 3
3. Ventral skin smooth ..... 4  
 3' Ventral skin granular ..... 8
4. Tympanum distinct ..... 5  
 4' Tympanum invisible ..... 6
5. No inguinal black gland; toes free .....genus *Leptodactylus* (p. 39 )  
 5' Large black inguinal gland present surrounded by red spot; toes webbed at base ..... *Pleurodema* (p. 45)
6. Snout narrow and pointed; without vomerine teeth.....7  
 6' Snout wide and rounded; with vomerine teeth.....genus *Atelopos* (p. 48)
7. Posterior portion of prevomer present; venter light,without axillary pale spots .....  
 ..... genus *Relictovomer* (p. 82)  
 7' Posterior portion of prevomer absent; venter dark, with light axillary spots  
 ..... genus *Chiasmocleis* (p. 81)
8. Large protuberance or "horn" on upper eyelid .....genus *Ceratophrys* (p. 20 )  
 8' No protuberance on upper eyelid ..... 9
9. Large parotid behind the eye; tympanum conspicuous; belly granules distinct and large .....  
 ..... genus *Bufo* (p. 62)  
 9' No conspicuous parotid; tympanum indistinct; ventral granules very fine ..... 10
10. Fingers and toes free or nearly so ..... genus *Physalemus* (p. 44 )  
 10' Fingers free or webbed; toes webbed ..... genus *Atelopos* (p. 48)
11. Pupil vertical ..... genus *Phyllomedusa* (p. 77)  
 11' Pupil not vertical ..... 12
12. A pair of upper dermic discs on dorsal surface of each finger disc ..... 13  
 12' No upper dermic discs on finger discs ..... 14
13. No maxillary teeth present ..... genus *Dendrobates* (p. 68)  
 13' Maxillary teeth present ..... genus *Colostethus* (p. 66)
14. Vomerine teeth absent ..... genus *Centrolenella* (p. 78)  
 14' Vomerine teeth present ..... 15
15. Vomerine teeth in two short series behind choanae; males with paired lateral vocal pouches  
 ..... genus *Phrynohyas* (p. 76)  
 15' Vomerine usually not in two short series; males without or with a single vocal pouch ..... 16
16. Toes completely webbed; vomerine teeth between choanae or slightly behind ..... genus *Hyla* (p. 70)  
 16' Toes not webbed or barely webbed; vomerine teeth well behind the choanae .....  
 ..... genus *Eleutherodactylus* (p. 21)

**B. Reptiles**  
**Key to the genera of snakes (suborder Serpentes)**

1. Body and head cylindrical; ventrals and dorsals of equal size, or ventrals less than two times larger than dorsals ..... 2  
 1' Body and head not cylindrical; ventrals two or more times larger than dorsals ..... 4
2. Body scale rows 14 ..... genus *Leptotyphlops* (p. 123)  
 2' More than 15 scale rows ..... genus *Liotyphlops* (p. 122)
3. Front fangs, either with a large pit between eye and nostril or loreal absent ..... 4  
 3' Without front fangs, nor pit and usually loreal present ..... 6
4. Banded red-black-white; no pit ..... genus *Micrurus* (p.163)  
 4' Not banded; with a pit between eye and nostril ..... 5
5. A caudal rattle present ..... genus *Crotalus* (p. 170)  
 5' No caudal rattle; tail pointed ..... genus *Bothrops* (p.167)
6. More than 40 rows of dorsals at midbody; many small scales on supracephalic region..... 7  
 6' Less than 35 rows of dorsals at midbody; supracephalic scales large ..... 9
7. Scales on snout and on head small, approximately the same size ..... genus *Boa* (p. 124)  
 7' On head at least a pair of enlarged internasals ..... 8
8. Large scales behind internasals; supralabials in contact with the eyes; one loreal .....  
 ..... genus *Epicrates* (p. 126)  
 8' Small scales behind internasals; supralabials separated from the eye ..... genus *Corallus* (p. 125)
9. Dorsals rows 12 or fewer ..... genus *Chironius* (p.130)  
 9' Dorsal rows 14 or more ..... 10
10. One internasal .....genus *Helicops* (p. 137)  
 10' Two internasals ..... 11
11. Anterior nasal fused with internasal..... genus *Stenorrhina* (p.158)  
 11' Nasal not fused with internasal ..... 12
12. Undivided subcaudals ..... genus *Pseudoboa* (p. 155)  
 12' Subcaudals divided ..... 13
13. Rostral tip turned up into a sharp ridge.....genus *Phimophis* (p. 154)  
 13' Rostral normal, not turned up ..... 14
14. Undivided anal ..... 15  
 14' Divided anal ..... 23
15. Snout pointed; head elongated, slender, loreal usually absent ..... genus *Oxybelis* (p. 151)  
 15' Snout rounded; head rounded, short; loreal present ..... 12
16. All or at least two dorsals keeled ..... 17  
 16' Smooth dorsals ..... 18
17. Preocular absent; 19 dorsal rows ..... genus *Ninia* (p. 150)  
 17' Preocular present; 16 or 18 dorsal rows ..... genus *Spilotes* (p. 158)
18. Vertebral row distinctly larger than paravertebral ..... genus *Sibon* (p. 157)  
 18' Vertebral row not distinctly larger than paravertebral..... 22
19. Preocular absent; 17-17 dorsal rows ..... genus *Atractus* (p. 127)  
 19' Preocular present ..... 23
20. 17 dorsal rows; sixth supralabial triangular .....genus *Drymarchon* (p. 132)  
 20' More than 17 dorsals; sixth supralabial normal ..... 24

21. Dorsal rows more than 21 ..... genus *Lampropeltis* (p. 138)  
 21' Less than 21 dorsal rows ..... 25
22. Dark and light crossbands ..... genus *Oxyrhopus* (p. 153)  
 22' Body uniformly colored ..... genus *Clelia* (p. 131)
23. One supraocular in contact with the eye .....genus *Masticophis* (p.147)  
 23' Two or more supralabials in contact with the eye ..... 24
24. Loreal absent ..... 25  
 24' Loreal present ..... 27
25. Dorsal rows 15-15, without reduction and smooth .....genus *Tantilla* (p. 159)  
 25' Dorsals with reduction, keeled ..... 26
26. Dorsal rows 15-13, snout rounded .....genus *Leptophis* (p. 141)  
 26' Dorsal rows 17-13, snout pointed .....genus *Oxybelis* (p. 151)
27. Dorsals keeled, with reduction ..... 28  
 27' Dorsals smooth, with or without reduction ..... 30
28. Dorsal rows 23 to 25 ..... genus *Pseustes* (p. 156)  
 28' Less than 21 dorsal rows ..... 29
29. Dorsal rows 19-15 ..... genus *Thamnodynastes* (p. 162)  
 29' Dorsal rows 17-15 ..... genus *Drymobius* (p. 133)
30. Dorsal rows without reduction ..... 31  
 30' Dorsal rows with reduction ..... 32
31. Dorsal rows 15-15 ..... genus *Erythrolamprus* (p. 135)  
 31' Dorsal rows 17-17 ..... genus *Imantodes* (p. 137)
32. Black longitudinal lines begin on snout ..... genus *Lygophis* (p. 146)  
 32' Spotted or blotched; when with longitudinal lines, they do not begin on snout.....33
33. Dorsals oblique; heavy body stout snakes .....genus *Xenodon* (p. 162)  
 33' Dorsals not oblique; slender body ..... 34
34. Usually 21 dorsal rows; dark roundish dorsal spots do not reach ventrals .....genus *Leptodeira* (p. 139)  
 34' Less than 21 dorsal rows; coloration not with roundish spots ..... 35
35. Two apical pits on dorsals; more than 165 ventrals .....genus *Mastigodryas* (p. 147)  
 35' One apical pit on dorsals; less than 160 ventrals .....genus *Liophis* (p. 143)

#### Key to the genera of lizards (suborder Sauria)

1. Lower eyelid absent; dorsal scales small, granular, of the same size as those on top of head ..... 2  
 1' Lower eyelid present; head with regular scales, larger than those on dorsum ..... 8
2. Toes with adhesive pads .....3  
 2' Toes without adhesive pads .....5
3. Toes completely expanded .....genus *Thecadactylus* (p. 91)  
 3' Toes not completely expanded ..... 4
4. Toes expanded in base ..... genus *Hemidactylus* (p. 85)  
 4' Toes expanded in apex ..... genus *Phyllodactylus* (p. 88)
5. Claws covered by scaly sheath ..... 6  
 5' Claws naked, without sheath ..... genus *Gonatodes* (p. 83)

6. Sheath asymmetrical; the inferolateral scale very large and adhesive .....genus *Spherodactylus* (p. 90)  
6' Sheath symmetrical ..... 7
7. Sheath consists of six scales, including a median superior scale ..... genus *Lepidoblepharis* (p. 86)  
7' Sheath consists of five scales; no median superior scale ..... genus *Pseudogonatodes* (p. 89)
8. Upper head with granular or irregular scales, the largest arranged in semicircles between the eyes; tongue fleshy, not extensible .....9  
8' Upper head with regular flat scales; tongue extensible, bifurcate ..... 14
9. Conspicuous dorsal crest present ..... 10  
9' No dorsal crest ..... 11
10. Large, flat, round scale below ear opening; head not strongly produced posteriorly ..... genus *Iguana* (p. 104)  
10' No round scale below ear opening; head strongly produced posteriorly..... genus *Basiliscus* (p. 103)
11. Digits flat, subdigital lamellae smooth; adult males with large gular fan..... genus *Anolis* (p. 92)  
11' Digits cylindrical or compressed; subdigital lamellae keeled or smooth; if smooth adult males lack gular fan ..... 12
12. Upper head scales conspicuously multicarinate; ear opening about twice as large as external nasal opening ..... genus *Anolis* (p. 92)  
12' Upper head scales not conspicuously multicarinate; ear opening more than two times larger than external nasal opening ..... 13
13. Anterior superciliaries elongate and diagonally overlapping, usually with elongate subocular scale.....genus *Ophryoessoides* (p. 106)  
13' Anterior superciliaries not conspicuous and overlapping; subocular subequal ..... genus *Polychrus* (p. 107)
14. Body scales semicircular, flat; no femoral pores.....genus *Mabuya* (p. 107)  
14' Body scales not semicircular nor flat ..... 15
15. Dorsal scales considerably shorter than ventrals, usually granular ..... 16  
15' Dorsals scales as long as ventrals ..... 18
16. Ventrals in about 30 transversal rows .....genus *Tupinambis* (p. 120)  
16' No more than 14 ventral transversal rows ..... 17
17. Tongue with posterior fold; glottal part undivided .....genus *Ameiva* (p. 108)  
17' Tongue without posterior fold; glottal part divided .....genus *Cnemidophorus* (p. 115)
18. Five toes, all with nails ..... 19  
18' Less than five toes; if five, the internal toe without nail ..... 20
19. Dorsal and ventral scales similar, somewhat quadrangular, arranged in transversal and longitudinal rows, not strongly keeled ..... genus *Anadia* (p. 111)  
19' Dorsal scales in oblique rows, strongly keeled ..... genus *Leposoma* (p. 118)
20. Ear opening present; less than 20 scale rows around the body ..... 21  
20' Ear opening absent; more than 20 scale rows around the body..... genus *Bachia* (p. 113)
21. Four toes ..... genus *Tretioscincus* (p. 119)  
21' Five toes ..... genus *Gymnophthalmus* (p. 117)

#### Key to the genera of turtles (order Testudines)

1. Carapace rounded and with 3 longitudinal ridges; feet wide and webbed .. genus *Kinosternon* (p.173)  
1' Carapace domeshaped, without longitudinal ridges; feetshort, stubby ..... genus *Geochelone* (p. 172)

**Key to the genera of crocodylians (order Crocodylia)**

1. Fourth tooth fits into a socket in the upper maxilla; 17 to 22 maxillary teeth; snout relatively short and wide ..... genus *Caiman* (p. 175)  
 1' Fourth tooth fits into an indentation in the upper maxilla; 14 to 15 maxillary teeth; snout long and narrow ..... genus *Crocodylus* (p. 175)

**1.3 Species Accounts**

**A. Caecilians**

**1. Family Caecilidae**

***Caecilia tentaculata* Linnaeus**

(Map No.3)

*Caecilia tentaculata* Linnaeus, 1758, Syst. Nat. X: 229. Medem, 1968, Rev. Acad. Colomb. Cienc. Fis. Nat. 13(50):158.

**Description:** Snout roundish and projects beyond mouth; nostrils visible from above; tentacle very close to mouth and not visible from above, but slightly before the nostrils, its distance from the eye greater than from nostril; eye in a socket, slightly raised, visible through the skin. Two nuchal collars beyond the head. Body cylindrical and uniformly thick from head to the terminal point; folds for the most part incomplete; scales present in grooves or folds throughout most of body; posteriorly each fold with a single row of overlapping scales; around 124 primary folds, incomplete dorsally except on the posterior part of the body and mostly incomplete ventrally. Around 34 secondaries, the first short and only laterally present but fusing dorsally, but before vent complete. A small unsegmented and flattened terminal area with a vent with 3 anterior and 4 posterior denticulations, and a small lateral pair. No anal glands. Teeth in 4 series, the premaxillary-maxillary teeth, 11-1-11 with group replacement through or nearly through the gums. Maxillary decrease posteriorly; 12-1-12 prevomers, larger than palatines; 11-10 dentary, anterior largest; 2-2 splenial teeth. Color above is grayish with the sides and outer part of ventral light brown; the median part of belly lighter gray than dorsum. The lateral grooves are grayish black. Total length about 566 mm.

**Distribution:** Somewhat incompletely known in detail from Panama, Colombia, Venezuela and the Guianas, also in Brazil, Ecuador and Perú. In Santa Marta it is found in the lowlands on the northwestern side.

**Ecology:** Marshy lowlands in the Magdalena valley around Santa Marta.

**Material:** Magdalena: Río Frío, 45 m. (MCZ 17376).

## **B. Salamanders**

### **1. Family Plethodontidae**

#### *Bolitoglossa savagei* Brame and Wake

(Map No.3)

*Oedipus adpersus*: Ruthven, 1922 (part) Misc. Publ. Mus. Zool. Univ. Mich., 8: 49.

Dunn, 1926 (In part), Northampton, Mass.: Smith College Fiftieth Annivers. Publ.: 393.

*Bolitoglossa savagei* Brame and Wake, 1963. Los Angeles County Mus., Contr. Sci., 69:31 fig 13. **Type locality:** Cerro San Lorenzo, 1400-2100 m., Sierra Nevada de Santa Marta, Depto de Magdalena.

**Description:** A member of the *adpersa* group. Snout subovoid and slightly truncate. Loreal region flat, canthus rostralis rounded. Small but conspicuous labial protuberances. Vomerine teeth 30-35; usually more than 70 maxillary teeth. Skin thickened, partially smooth dorsally and ventrally but sometimes under the microscope are distinguishable warty spicules especially in the head region and anterior part of the body. Hands and feet usually webbed; if incomplete, only the last two phalanges are free. Digital tips of hands and feet are round and project slightly beyond the web. Third finger and third toe are larger than the other digits. A transversal skin fold is present at the base of the neck. Skin of the dorsum smooth, On the flanks, from the axilla to the tip of the tail there is a series of many transversal furrows equally separated from each other.

**Color in life:** Variable, but usually the most common pattern is dorsum and top of the head light brown or light grey, flanks, limbs, tail and venter dark grey that somewhat outlines laterally the light dorsum, from posterior corner of the eyes to the tail. Other specimens are dark brown or grey above with the flanks, limbs and venter light grey or brownish. A few individuals are uniformly black or dark brown.

**Measurements:** Snout-vent length: males, 34-52.1 (43.6), females, 34.1-55.3 (49.4).

**Distribution:** Sierra Nevada de Santa Marta in the northern Colombia and possibly Merida, Venezuela. Probably, this species is restricted to Sierra Nevada de Santa Marta, since the only specimen reported from Merida seems to be a different species,

(See Wake's 1985 comment in *Amphibian Species of the World*). In Sierra Nevada de Santa Marta it has been reported from the northwestern sector from 780 to 2140 m.

**Ecology:** A species found in San Lorenzo, Alto de Mira and San Pedro de la Sierra. The species lives and breeds in bromeliads (Ruthven, 1922, Brame & Wake, 1963, Ruiz, pers. comm.), but it is also found active during the day in other types of vegetation such as ferns up to 3 m. above the ground. According to Brame & Wake (1963), some "specimens were occasionally found in decaying logs and stumps or undecaying leaves". Ruthven (1922) suggested that this species is viviparous, but this condition has not been proven (Brame & Wake, 1963).

**Material:** Sierra Nevada de Santa Marta. Magdalena: Alto de Mira, border of río Julepia, 780 m (ICN, Uncatalog specimens); Alto de Mira, Caño Negro, 910 m (ICN, Uncatalog specimens); Ciénaga, Corregimiento San Pedro de la Sierra, 1300 m. (ICN 3102, 3104, 3107, 3110, 3117-18, 3120, 3122-26, 3128, 3134, MCZ 88482, 88492-500); Hacienda Cincinati, San Lorenzo trail, 1830 m. (ANSP 19723-24 paratypes); La Cumbre, 2140 m. (UMMZ 63334 paratype); Minca-San Lorenzo, 1530-2100 m. (ICN 3798, 3801-06, 3808, 3810, 3812-3, 3815, 3818, 3822, 3829, 3836, 3861); Quebrada Viernes Santo, east slope of San Lorenzo, 1500-1800 m. (UMMZ 54592-93 paratypes); Río Frío, 1000 m. (FMNH 1815, USNM 36693-7000 paratypes); San Lorenzo, 1400-2100 m. (UMMZ 54595 holotype, 45615-20, 45622-26, 45628-30 paratypes, MCZ 3894-95 paratypes); San Lorenzo, La Popa, 1525 m (UMMZ 54592-93 paratypes); San Miguel, 1800-2100 m (UMMZ 48213, 48195 paratypes).

## C. Frogs

### 1. Family Leptodactylidae

#### *Ceratophrys calcarata* Boulenger

(Map No.4)

*Ceratophrys calcarata* Boulenger, 1890. Proc. Zool. Soc. London. 1890: 327. **Type locality:** "Colombia". Cochran and Goin, 1970. Bull. U.S. Natl. Mus., 288: 365.

*Ceratophrys calcaratus* : Ruthven, 1922. Misc. Publ. Mus., Zool. Univ. Michigan., 8:53.

**Description:** Head broader than long, snout blunt, broadly rounded when viewed from above; canthus rostralis indistinct with a thick ridge; loreal region usually flat, sometimes slightly concave; vomerine teeth absent; tongue condiform, free from behind;

tympanum large. Vocal sac is present in males. Fingers free with very narrow lateral fringes; First finger longer than second; two metacarpal tubercles outer larger than the inner; small and prominent subarticular tubercles. Toes short, the fourth longest, one third webbed, the free phalanges with lateral fringes; a horny spade-like inner metatarsal tubercle, the outer smaller or absent. Subarticular tubercles of the toes poorly developed and smaller than those on the fingers. Skin heavily granular, with many bony dorsal ridges, the most prominent of them are the sacral and supratympanic ridges, the latter extends to the angle of the mouth as a bony prominence. Below, the chin smooth and the belly granular. The granules around the anus larger than on the belly. The heel of the adspersed hindlimb reaches the tympanic region.

The color in preserved specimens is brownish above with large dark blackish brown dorsal and lateral patches irregularly distributed. The snout is somewhat lighter, with oblique dark brown stripes from the orbital region to the border of the upper lip. Ventral surfaces creamy light but the chin strongly spotted with brown. Limbs banded.

**Measurements:** Snout-vent length: males 65-72, females 67-75; head breadth: males 43-45, females 40-45; head length: 30-33, females 31-33; tibia length: males 22-24, females 21- 25, 45 femur length: males 23-25, females 21.5-25.7.

**Distribution:** Northwestern Colombia and Venezuela. In Sierra Nevada de Santa Marta, this species has been reported from the northwestern part.

**Ecology:** This nocturnal species is found in the xerophytic lowland scrub forest and in clearings. It is usually feared by natives as a poisonous frog. Ruthven (1922) observed, that when these frogs are disturbed "the enormous mouth is opened widely and the frog snaps viciously at the disturber. Individuals experimented upon would seize a finger and allow themselves to be carried about for several minutes". Because of the presence of this species in the arid zone of Santa Marta region, Rivero (1961) suggested that this species could occur in the llanos of Colombia and Venezuela.

**Material** Sierra Nevada de Santa Marta. Magdalena Curumaní, 100 m (USNM 118173); Fundación, 60 m (UMMZ 45529- 30, 45532, 45534-5, 45582).

#### Key to the species of *Eleutherodactylus*

(From Lynch and Ruiz-Carranza, 1985. Occ. Pap. Mus. Zool. Univ. Mich., 711:1-59).

1. Skin of venter smoot.....2  
 1' Skin of venter acrolate .....4

2. Tympanum recessed in cavity ..... *E. carmelitae*  
 2' Tympanum superficial ..... 3
3. Groin and concealed surfaces of thighs dark, with pale spots; no vocal slits on males; narrow pads on digits ..... *E. insignitus*  
 3' Groin and concealed surfaces of thighs cream, spotted with black; vocal slits on males; broader pads on digits ..... *E. w-nigrum*
4. Posterior surfaces of thighs bearing brown network ..... *E. megalops*  
 4' Posterior surfaces of thighs various but never finely reticulated with brown either uniformly colored or bearing pale spots or blotches ..... 5
5. Posterior surfaces of thighs uniform brown; no enlarged heel tubercles ..... 6  
 5' Posterior surfaces of thighs spotted or barred with brown; or bearing large pale spots; elongated tubercle on heel or not ..... 7
6. Digits bear large pads ..... *E. tayrona*  
 6' Digits bear narrow pads ..... *E. ruthveni*
7. Upper eyelids bearing conical tubercles; heel and outer edge of tarsus bearing pungent tubercles..... 8  
 7' Upper eyelids, heel, and outer edge of tarsus bearing only small non-conical tubercles; posterior surfaces of thighs bearing large pale (yellow or orange) spots; digital pads large ..... *E. sanctamartae*
8. White stripe on posterior throat and chest; underside of shank barred brown and cream; adult males at least 37.8 mm, adult females at least 58.2 mm SVL ..... *E. cristinae*  
 8' Throat and venter cream with brown spots (no chest stripe) underside of shank spotted cream, brown and black; adults less than 35 mm SVL .. ..... *E. delicatus*

*Eleutherodactylus carmelitae* Ruthven

(Map No. 4)

*Eleutherodactylus carmelitae* Ruthven, 1922. Misc. Publ. Mus. Zool. Univ. Michigan., 8:51. **Type locality:** Quebrada Viernes Santo, Cerro San Lorenzo, Dept. Magdalena, Colombia. 1524 m; Cochran and Goin, 1970. Bull. U.S. Natl. Mus., 288: 421. Lynch and Ruíz-Carranza, 1985. Occ. Pap. Mus. Zool. Univ. Mich., 711:8.

**Description:** Probably a member of the *fitzingeri* group. Snout short, but ovoidal dorsally and rounded on lateral profile; canthus rostralis rounded; loreal region concave; upper eyelid smooth, without tubercles. Cranial crests are not evident; postorbital and parietal regions with a shallow furrow; supratympanic fold extends from the eye to the shoulder; tympanum small and distinct, somewhat recessed in a tympanic cavity; below the tympanum are several larger tubercles; males without vocal sacs and slits; mature males with a thumb pad; vomerine teeth in two series separately medially by a small gap

of about 1/3 of the vomerine odontophore width. Skin of dorsum smooth, or finely granular under the microscope. Skin of the chin, throat, venter, and lower surfaces of limbs usually smooth, although it could be slightly aerolate on the groin region. Fingers long, slender and without lateral fringers, the first finger shorter than the second. Two distinct palmar tubercles, the outer larger than the inner. Subarticular tubercles small. Toes long free and the digital disks smaller than those of the fingers; two metatarsal tubercles, the inner larger and elongate, the outer small and somewhat conical. The heel of the adpressed hindlimb reaches the anterior corner of the eye or the tip of the snout.

**Color in preserved specimens:** Dorsum dark brown, sometimes with irregular blackish patches; the top of the head is also brown but there are some darker, wide bands from the orbit to the upper lip. Flanks yellowish, heavily reticulated with dark brown. Upper surfaces of the limbs banded with dark brown on a brownish yellow ground. Ventrally, light creamy yellow, sometimes immaculate or sometimes spotted with brown, especially on the chin, chest and lower surfaces of the limbs.

**Color in life:** Dorsum, greenish yellow with some irregular dark brown spots. Top of head and upper surfaces of limbs, are also yellowish sometimes with dark brown markings; . Ruíz-Carranza (1985) as follows: " In life *E. carmelitae* is green with dark brown to black markings, edged with pale green ( the limbs may be more yellowish green than dorsum) dorsally; throat dark gray with cream flecks; venter and undersides of legs pale dirty olive-cream; posterior surfaces of thighs brown; tops of digit tips bearing white spots; iris blood red.

**Measurements:** Snout-vent length: males 29.9-39.2 (35.5), females 36.5-48.9 (42.7); tibia length: males 18.2-23.2 (20.8), females 22.1-28.5 (24.6); femur length: males 17.1- 21.3 (19.4), females 21.1-24.3 (22.5); IOD: males 3.2-4.3 (3.8), females 3.2-4.5 (3.6).

**Distribution:** Restricted to Serranía San Lorenzo, 1524-2300 m.

**Ecology:** *E. carmelitae* is a nocturnal frog, found under rocks or in leaf litter, especially along streams. This species occurs in the cloud forest and in cleared areas of this forest from 1524 to 2200 m.

**Material:** Sierra Nevada de Santa Marta. Magdalena: Alto valley, Río Gaira, 1960 m (IND 222-23, 237, 239, 243-44, 304- 06, 318); Serranía San Lorenzo, (ICN 1654, LACM 114497), 1524 M (UMMZ 51110-11); 1800-2200 m (ICN 741-42, 1662);

1700- 2200 m (ICN 8236); San Lorenzo, cabañas road to Telecom, 2300 (ICN, 2804-2811); San Lorenzo, 6-7 Km, E. El Campano, 1720-1790 m (ICN 13005-07); 10 Km E. El Campano, 1850 m (KU 167969-70); 11 Km. E. El Campano, 2000 m (KU 167971); 12 Km. E. El Campano, 2150-2200 M. (ICN 13008); Finca La Granja, on road to San Lorenzo, 2300 m (USNM 150762-75, 150779, 150998, 151007); Quebrada Viernes Santo, 1524 m. (UMMZ 54527, paratype, 54528 holotype, 54530, 54532-34 paratypes).

*Eleutherodactylus cristinae* Lynch and Ruíz-Carranza

(Map No. 5)

*Eleutherodactylus cristinae* Lynch and Ruíz-Carranza, 1985. Occ. Pap. Mus. Zool. Univ. Mich., 711:10. **Type locality:** Cerro Kennedy, 10 Km. E. El Campano, 1850 m Departamento de Magdalena, Colombia.

**Description:** A member of the *unistrigatus* group. Snout long, subacuminate, canthus rostralis distinct, usually sharp; loreal region concave; prominent non-conical tubercle on upper eyelid; cranial crests absent in males, evident in females; supratympanic fold present; tympanum superficial. Long vocal slits in males, and internal vocal sac present. Skin of dorsum finely granular, the granules become more evident on the posterior part of the body, some skinfolds extend from the tympanic area to the groin region, limbs granular, sometimes warty; venter aerolate. Two palmar tubercles, the inner larger than the outer. Subarticular tubercles evident. Fingers long, slender with lateral fringes. Thumb pad present in adult males. Two large metatarsal tubercles. Small tubercles also present in palms and soles. Toes long, slender and free, with lateral fringes. The heel, knee and tarsus with scattered, but conspicuous tubercles. The heel of the adpressed hindlimb reaches the nostrils or the tip of the snout.

Color in preserved specimens: Dorsum brownish with some darker spots irregularly distributed, but usually present on the border of ridges. Lighter patches on the center of the dorsum. Flanks and limbs dark brown, somewhat banded with black. Concealed surfaces of limbs creamy spotted with brown. Top of head similar to the dorsum but with some blackish stripes on the supratympanic and supralabials. Ventrally, creamy irregularly spotted with brown especially the throat and chest.

Color in life: dorsum green brownish spotted with dark brown, sides of the body

darker than dorsum, limbs are banded with dark brown; venter greenish yellow reticulated with brown. There are gray patches on posterior surfaces of thighs.

**Measurements:** Snout-vent length: males 32.17-42.7 (38.27), females 58.2-62.7 (60.45); tibia length: males 19.8- 25.8 (22.63), females 35.25-37.9 (36.38); femur length: males: 19.2-24.1 (21.5), females 33.5-36.4 (34.7); IOD: males 4.4-4.3 (4.32), females 4.0-4.3 (4.2).

**Distribution:** Known from the Serrania San Lorenzo (1530-2600 m), the vicinity of Ciudad Perdida 2250 m, and above San Pedro de la Sierra, 2000 m in the northern and western part of Sierra Nevada de Santa Marta.

**Ecology:** Lynch and Ruíz-Carranza reported that some of the individuals were collected at night, on twigs and forest floor plants, near streams in cloud forest. Others were taken from recently cut area during a heavy rainstorm. They also observed that the frogs were 0.5 to 1.0 m above the ground.

**Material:** Sierra Nevada de Santa Marta. Magdalena Cienaga, Cuchilla Yerbabuena SE San Pedro de la Sierra, 2000 m (UMMZ 176885 paratype ); Cincinnati, 1530 m (ICN 3779); Ciudad Perdida, helipuerto, 2250 m (ICN 12828-29); Finca La Granja, on road to San Lorenzo, (USNM 150863, 150873-75, 150877, 151005, 151013, 151019); between Minca and Cerro San Lorenzo, 1530-2100 m (ICN 3950 paratype); San Lorenzo, (ICN 702, LACM 114499-500 paratypes) 1900 M (ICN 8237 paratype, 8238-9), 1960-2200 m (ICN 739 paratype), 2200-2600 m (ICN 2676); 6-7 Km. E. El Campano, 1720-1790 m (ICN 13009-13); 10 Km. E. El Campano, 1850 m U 168558 holotype); 11 Km. E. El Campano, 2000 m (KU 168561 paratype).

***Eleutherodactylus delicatus* Ruthven**

(Map No. 6)

*Eleutherodactylus delicatus* Ruthven, 1917c. Occas. Pap. Mus. Zool. Univ. Mich., 43:1.

**Type locality:** Santa Marta, Magdalena, San Lorenzo. Ruthven, 1922. Misc. Publ. Mus.

Zool. Univ. Mich., 8:53. Cochran and Groin, 1970 Bull. U.S. Natl. Mus., 288: 401.

Lynch and Ruíz-Carranza, 1985. Occ. Pap. Mus. Zool. Univ. Mich., 711:17

**Description:** A member of the *unistrigatus* group. Snout short, subovoid and rounded; canthus rostralis angular; one small conical tubercle on upper eyelid; cranial

crests absent in males; supratympanic fold extends from the eye to the posterior part of the tympanum; tympanum small and superficial; tympanic area slightly warty. Males with vocal sacs and slits; mature males with thumb pads; vomerine teeth in two series, triangular in shape and separated medially by a gap of about 1/3 of the vomerine odontophore width. Skin of dorsum finely granular under the microscope. Some specimens with a middorsal shallow furrow. A pair of occipital ridges, forming a )(-shaped figure; skinfolds from tympanic region to sacrum are evident. Skin of the chin, throat, venter, lower surfaces of limbs and to some extent the flanks are aerolated. Fingers long, slender and with very narrow lateral fringes; the first finger shorter than the second. Two distinct palmar tubercles, the outer smaller than the inner. Subarticular tubercles small. Toes long free and the digital disks smaller than those of the fingers; two metatarsal tubercles, the inner larger and elongate, the outer small and somewhat conical. Conical tubercles present on the heels. The heel of the adpressed hindlimb reaches the nostrils.

**Color in preserved specimens:** Dorsum and upper surfaces of limbs almost uniformly dark brown, or sometimes light brownish yellow. Top of the head of the same color as the body, but if light brownish yellow then the upper lip is spotted with dark brown. Flanks yellowish, spotted with dark brown. Venter and lower surfaces of limbs usually lighter than the flanks, light creamy yellow, heavily spotted with brown. Anal region sometimes darker than the venter, and reticulated with brown.

**Measurements:** Snout-vent length: male 21.0, females 27.5-31.0 (29.6) ; tibia length: male 14.3, females 17.6-18.2 (17.8); femur length: male: 13.2, females 16.5-17.6 (16.8); IOD: male: 2.5, females 3.2 (3.2).

**Distribution:** Restricted to Sierra Nevada de Santa Marta, in the Serranía San Lorenzo, 1524-2600 m, and San Pedro de la Sierra (2450-2500 m).

**Ecology:** Lynch and Ruíz-Carranza (1985) suggested that this species might occur at elevations higher than 2200 m. This species is restricted to the cloud forest.

**Material:** Sierra Nevada de Santa Marta. Magdalena: Cienaga, Cuchilla Yerbabuena, finca de Alfonso Vanegas 2500 m (UMMZ 176886); Serranía Cebolleta, 8 hrs by foot E. San Pedro de la Sierra, 2450 m (ICN 3026, 3029-30, 3037-38, 3048); Serranía San Lorenzo, 1524 m (UMMZ 50159 holotype, 50160 paratype, 54573-74); 2200-2600 m (ICN 2665-68, 2670, 8240).

*Eleutherodactylus insignitus* Ruthven

(Map No. 7)

*Eleutherodactylus insignitus* Ruthven, 1917a. Occas. Pap. Mus. Zool. Univ. Mich., 34:1.

**Type locality:** Sierra Nevada de Santa Marta, Heights of San Miguel, Departamento Guajira, Colombia, 1829-2134 m. Barbour and Loveridge, 1929, Bull. Mus. Comp. Zool., 69(10): 260. Cochran and Goin, 1970. Bull. U.S. Natl. Mus., 288: 424. Lynch and Ruíz-Carranza, 1985. Occ. Pap. Mus. Zool. Univ. Mich., 711:20.

**Description:** A member of the *fitzingeri* group. Snout very short, broadly rounded in dorsal view and subovoid in lateral profile; canthus rostralis angular; loreal region concave; no tubercles on the upper eyelid; cranial crests absent; supratympanic fold very conspicuous; tympanum distinct, small, and superficial; sometimes the tympanic region is granular; males without vocal sacs or slits; mature males without nuptial pads on thumb; vomerine odontophores separated medially by a gap equal to 1/3 of the odontophore width. Skin of dorsum smooth. A pair of occipital ridges, forming a ) ( shaped figure are present. Ventrally, the skin also smooth. Fingers long, slender and with conspicuous lateral fringes; the first finger longer than the second. One bifid, distinct palmar callus, subarticular tubercles small. Toes long, free, with lateral fringes and digital disks smaller than those of the fingers; two metatarsal tubercles, the inner larger and elongate, the outer small and somewhat conical. One small tubercle on heel; the heel of the adpressed hindlimb reaches the nostrils or the tip of the snout.

Color in preserved specimens: Dorsum is brownish with some darker spots irregularly distributed, but usually the borders of the ridges or skinfolds are outlined with black. Flanks and upper surfaces of limbs are brown, somewhat spotted with brown. The concealed surfaces of limbs are creamy, heavily reticulated with blackish brown. Top of head is similar to the dorsum but with some blackish stripes from the orbits to the upper lip. Venter, creamy irregularly spotted with brown, especially the throat and chest. The anal region is distinctly dark brown. According to Lynch and Ruiz-Carranza, (1985), the color in life is dorsum grey-brown with a bronze cast on the head; facial and limb markings black, outlined with white; groin and concealed surfaces of thighs white with black markings. Throat and undersides of forelimbs pale orange, venter off-white with black reticulations; tops of the tips of the digits white; iris reddish-brown with dark flecks.

**Measurements:** Snout-vent length: males 32.1-42.1 (37.1), females 47.6-48.0 (47.8); tibia length: males 24.3-28.7 (26.5), females 31.0-32.0 (31.5); femur length: males 21.1- 27.6 (24.35), females 29.9-30.1 (30.0); IOD: males 3.4-4.3 (3.85), females 5.5-6.0 (5.7).

**Distribution:** Known only from the northern and western flanks of the Sierra Nevada de Santa Marta, Colombia.

**Ecology:** This species is restricted to the cloud forest zone at altitudes between 1829 and 2134 m in the northern part of the Sierra Nevada, and between 1300 and 2000 m in the western part. According to Lynch and Ruiz (1985), this is a terrestrial frog that probably occurs along streams.

**Material:** Sierra Nevada de Santa Marta. **Guajira:** Riohacha, heights E. San Miguel, 1829-2134 m (UMMZ 48393 holotype, 48394, 48397-99, 48402-3, 48404(2), 48407). **Magdalena:** Ciénaga, Cuchilla Yerbabuena, 2000 m (ICN 13164- 66); Santa Marta, 6-7 Km. E. El Campano, 1720-1790 m (ICN 13014-17); between Minca and Estación San Lorenzo, 1530-2100 m (ICN 3949); Serranía San Lorenzo, 1700-2000 m (ICN 701, 8241-43).

*Eleutherodactylus megalops* Ruthven

(Map No. 8)

*Eleutherodactylus megalops* Ruthven, 1917b. Occas. Pap. Mus. Zool. Univ. Mich., 39:1.

**Type locality:** Santa Marta, San Lorenzo, 5000 ft. Dpto. Magdalena. Ruthven, 1922. Misc. Publ. Mus. Zool. Univ. Mich., 8:53. Cochran and Groin, 1970 Bull. U.S. Natl. Mus., 288: 435. Lynch and Ruíz-Carranza, 1985. Occ. Pap. Mus. Zool. Univ. Mich., 711:23.

**Description:** A member of the *unistrigatus* group. Snout short, subovoid dorsally and rounded in lateral view; canthus rostralis slightly angular; loreal region concave; no tubercles on the upper eyelid; no cranial crest; tympanum of moderate size and superficial. Long vocal slits and internal vocal sacs in males; vomerine teeth in two series, separated medially by a gap equal to the width of the odontophore.

Skin of the dorsum slightly granular, sometimes warty under the microscope; some skin folds begin from the tympanic area or the posterior corner of the eye and extend along the flanks to the groin; occasional specimens with a pair of x- shaped folds.

Tympanic area with a few warts. Chin, throat and lower surfaces of the limbs usually smooth; belly and the anal region usually aerolate.

Fingers long, slender with very narrow lateral fringes; first finger almost equal or slightly smaller than the second. Two metatarsal tubercles and a very small subarticular. Thumb pads in reproductive males. Almost inconspicuous tubercles on heel and tarsus. Toes long, with lateral fringes, and two metatarsal tubercles, the inner larger and elongate. The heel of the adpressed hindlimb reaches the anterior corner of the eye.

Color in preserved specimens: dorsum and top of the head usually uniformly brown or sometimes with black markings, irregularly distributed, but always outlining the dorsal folds and/or the tympanic ridge. In most specimens, the upper lip has a light stripe that extends from the snout to the posterior corner of the mouth, spotted with black. Hind limbs are banded above. Flanks are lighter than the dorsum, usually of the same color as the belly. Ventrally, belly and limbs are light creamy yellow, usually with small brown spots and dots, more concentrated on the chin and throat.

In life, dorsum is brown or reddish-brown, with darker markings. The venter is off-white with brown reticulation; groin and thighs yellowish salmon with a fine darker reticulation. This species is polychromatic, occasional individuals have dark green ground coloration. (Lynch and Ruiz, 1985).

**Measurements:** Snout-vent length: males 18.2-27.3 (23.2), females 27.6-34.4 (31.8); tibia length: males 12.0-15.2 (12.9), females 16.5-18.7 (17.6); femur length: males 12.0- 14.2 (12.8), females 16.5-17.6 (16.7); IOD: males 2.1-3.3 (3.0), females 3.2-3.4 (3.3).

**Distribution:** Northern and western part of the Sierra Nevada de Santa Marta.

**Ecology:** A very abundant terrestrial species, which is restricted to the leaf litter in cloud forest on the northern part of the massif from 1800 m up to about 2200 m and to the cloud forest of the northwestern slopes from 1500 m to 2500 m This species is sympatric with *A. sanctamartae*. Possibly, competition between the two species is prevented due to differences in temporal activity cycles between these two species, since *A. megalops* is more active during the day.

**Material:** Sierra Nevada de Santa Marta. Guajira: Heights of San Miguel, 1829-2134 m (UMMZ 48395, 48405(8), 48484(4), 48485(5), 48486(5), 48487(4), 50161, 54525). Magdalena: Cienaga, Cuchilla Yerbabuena, 2000 m (ICN 13167-77); 5.7 Km.

E. San Pedro de la Sierra, 2300 m (MCZ 88333-39); Serranía Cebolleta, 8 hrs. by foot E. San Pedro de la Sierra, 2450 m (MCZ 3006, 3013, 3019-20, 3032, 3036); 6-7 Km, E. El Campano, 1720-1790 m (ICN 13018-29); 8 Km. E. El Campano, 1850 m (KU 168384-90); 11 Km. E. El Campano, 2000 m (KU 168391-419, 170141-42 cleared and stained skeletons); 12 Km. E. El Campano, 2080 m (KU 168420-30); Cincinnati, 1530 m (ICN 3756, 3759-60, 3762, 3774-76, MCZ 4755-56, UMMZ 48444-48, 48450-51, 48453-55, 48457, 48459-65, 48469, 48471, 48474-76, 48479, 48481(2), 48482(7), 48483, 54526); heliport, W. Ciudad Perdida, 1300 m (ICN 12830); heliport SW. Ciudad Perdida, 2250 m (ICN 12831-47); alto valley Río Gaira, 1960 m (IND 215-21, 224-5, 228-29, 231, 234, 236, 238, 241-42, 284-85, 287-89, 293, 295-303, 306); Serranía San Lorenzo, 1524-2530 m (ICN 703-09, 711-13, 715, 717-18, 720-23, 725, 728, 731, 733-34, 738, 743-50, 752-56, 1649-53, 1656-57, 1659-61, 1663-81, 1683-86, 1688-1701, 2671-75, 2677-87, 2689-98, 3948, 4733, 2798, LACM 144501-06, 114509-15, MCZ 8981-82, UMMZ 48444 holotype, 48467-68, 48470, 48472-73, 48477-78, 54474-79, 54491-97, 54502, 54508-13, 54515, 54517-21, 54522(7), 54523(3)); Finca La Granja, on road to San Lorenzo, (USNM 150776-78, 150796-99, 150802-62, 150864-72, 150879, 150999-151000, 151003-04, 151006, 151008-12, 151014-18, 151020-23); Quebrada Viernes Santo, 1524 m (UMMZ 54480-88, 54498-501, 54505, 54524(2)); Tagua, near San Lorenzo, (UMMZ 54489-90).

*Eleutherodactylus ruthveni* Lynch and Ruíz-Carranza

(Map No. 9)

*Eleutherodactylus calcaratus*: Cochran and Goin, 1970 Bull. U.S. Natl. Mus., 288: 392.

*Eleutherodactylus vertebralis*: Cochran and Goin, 1970 Bull. U.S. Natl. Mus., 288: 432.

*Eleutherodactylus sanctamartae*: Lynch, 1978. Copeia, 1978: 21

*Eleutherodactylus ruthveni* Lynch and Ruíz-Carranza, 1985. Occ. Pap. Mus. Zool. Univ. Mich., 711:28 **Type locality**: Serranía Cebolleta, 8 hrs by foot E. San Pedro de la Sierra, Municipio Cienaga, Depto Magdalena, Colombia, 2450 m.

**Description**: A member of the *unistrigatus* group. Snout subacuminate dorsally and rounded in lateral view; canthus rostralis angular; loreal region concave; no tubercles on the upper eyelid; cranial crest evident in females; tympanum relatively large, and su-

perforated. Vocal slits and internal vocal sacs in males; vomerine teeth in two series, separated medially by a gap equal to the 1/3 width of the odontophore.

Skin of the dorsum smooth, but sometimes slightly granular on the posterior part of the body; some dorsolateral skin folds from tympanic area or the posterior corner of the eye to the groin. Skin of the lower border of the tympanum with a few warts. Chin, throat and lower surfaces of the limbs usually smooth; belly and the anal region usually aerolate.

Fingers long, slender with very narrow lateral fringes; first finger slightly smaller than the second, one semidivided or two metatarsal tubercles and a very small subarticular ones. Thumb pads absent in reproductive males. Almost inconspicuous tubercles on heel. Toes long, with lateral fringes, and two metatarsal tubercles, the inner larger and elongate. The heel of adpressed hind limb reaches the anterior corner of the eye of the nostrils.

Color in preserved specimens: dorsum and top of the head are usually brown with blackish reticulations or light brown with black longitudinal stripes; in a few specimens the black lines are restricted only to the borders of the dorsal ridges. Hind limbs above are brown with darker bands or reticulations. The flanks are usually lighter than the dorsum, strongly spotted with dark brown. Ventrally, belly and limbs are light creamy yellow, heavily spotted with brown. The spots are more concentrated on the chin and throat.

In life, dorsum pinkish-tan, or pale orange with darker markings. Ventrally, dirty white with grey spots; posterior surfaces of thighs grey with cream areas bordering thigh bands.

**Measurements:** Snout-vent length: males 24.2-32.4 (27.18), females 24.5-45.5 (36.27); tibia length: males 13.2- 19.8 (16.06), females 17.06-26.0 (21.12); femur length: males 13.2-17.6 (15.18), females 14.3-25.4 (19.52); IOD: males 2.1- 3.3 (2.76), females 3.2-4.3 (3.7).

**Distribution:** Restricted to Sierra Nevada de Santa Marta on the northwestern part from 1800-2600 m.

**Ecology:** Found in the cloud forest, of terrestrial habits, and sympatric with *E. carmelitae* and *E. megalops*.

**Material:** Sierra Nevada de Santa Marta. Magdalena Municipio Cienaga,

Cuchilla Yerbabuena, finca de Alfonso Vanegas, 2500 m (ICN 13178-79, UMMZ 176887-88 paratypes); 9.5 Km. E. San Pedro de la Sierra, 2600 m (MCZ 88352-53, 88355, 88555); Serrania Cebolleta, 8 hrs by foot E. San Pedro de la Sierra, 2450 m (ICN 3011 holotype, 3012, 3014-18, 3027-28, 3031, 3033-35, 3039 paratypes); 12 Km. E. El Campano, 2150- 2200 m (ICN 13072-76); Serranía San Lorenzo, 1800-2500 m (ICN 8254-72, 2803); San Lorenzo, cabañas road to Telecom, 2300 m (ICN uncataloged specimens); Finca La Granja, on road to San Lorenzo, (USNM 150780-95, 150876, 150883-85, 151024-25).

*Eleutherodactylus sanctamartae* Ruthven

(Map No. 10)

*Eleutherodactylus sanctamartae* Ruthven, 1917b. Occas. Pap. Mus. Zool. Univ. Mich., 39:1. **Type locality:** Santa Marta, San Lorenzo, Depto. Magdalena, Colombia, 5000 ft. [1524 m]. Ruthven, 1922. Misc. Publ. Mus. Zool. Univ. Michigan., 8:53. Cochran and Goin, 1970. Bull. U.S. Natl. Mus. 288: 411. Lynch and Ruíz-Carranza, 1985. Occ. Pap. Mus. Zool. Univ. Mich., 711:33.

**Description:** A member of the *unistrigatus* group. Snout short, subacuminate dorsally and rounded in lateral view; canthus rostralis angular; small tubercles on upper eyelid; cranial crests absent; tympanum large and superficial; tympanic area slightly warty; males with vocal sacs and slits; mature males without thumb pads; vomerine teeth in two series, triangular in shape and separated medially by a gap of 1/3 of the vomerine odontophore width. Skin of dorsum finely granular under the microscope; the granules become evident on the on the posterior part of the body and flanks. Most individuals have dorsolateral folds, and a very shallow middorsal fold on the posterior part of the dorsum present. Some individuals with occipital, and/or dorsal ridges. Usually skinfolds from tympanic region to sacrum are evident. Skin of the chin, throat, venter, lower surfaces of limbs and to some extent the flanks aerolate. Skin of limbs with very narrow ridges. Fingers long, slender and with lateral fringes; the first finger shorter than the second. Two distinct palmar tubercles, the inner elongate and larger than the outer. Small subarticular tubercles. Toes long free, with fringes; the digital disks smaller than those of the fingers; two metatarsal tubercles, the inner larger and elongate, the outer small and somewhat conical. Conical tubercles present on the heels, knee, and on the outer surface

of tarsus. Heel of the adpressed hindlimb reaches a point between the nostrils and the anterior corner of the eye.

**Color in preserved specimens:** This species is highly polymorphic. The most frequent patterns can be described as follows: Dorsum is uniformly dark brown, usually unicolor, but sometimes there are blackish reticulations. In some specimens the dorsal color is light brown with conspicuous dark brown longitudinal stripes or irregularly distributed dark brown spots of different sizes. Top of the head is of the same color as the dorsum, but if light brown then there are dark brown markings on upper lip, interorbital region or tip of the snout. An almost constant feature is the presence of a broad blackish brown stripe running from tip of the snout (if light brown color is dominant) or from the posterior corner of the eye (in darker individuals), which extends to the shoulder and ends laterally toward the belly. Upper surface of hind limbs has dark brown bars, somewhat outlined by light yellow; in the more melanistic individuals the hind limbs are uniformly brown or reticulate with black. The venter is light creamy, heavily spotted with brown. The anal region is always darkest.

**Color in life:** *E. sanctamartae* is brown, yellowish brown or reddish brown above with light brown and black markings; interorbital and occipital black marks that continue onto anterior flank, edged above with light brown; flanks brown with a few light spots; posterior surfaces of thighs yellowish brown to brown with yellow or orange spots; venter and throat variable, ranging from golden yellow with brown mottling or brown with heavy brown mottling on venter.

**Measurements:** Snout-vent length: males 24.9-39.7 (35.18), females: 38.3-45.5 (42.7); tibia length: males 19.8- 19.9 (19.06), females 17.0-22.2 (19.8); femur length: males 17.7-19.8 (18.18), females 16.8-21.5 (19.2).

**Distribution:** Restricted to the Sierra Nevada the Santa Marta on the northern and western part, between 1100-2450 m.

**Ecology:** This species occurs in the cloud forest, or sometimes in recently cleared areas; it is usually found among leaves of the forest floor, on fallen trees, or sometimes at 0.5 to 1.5 m above the ground, in the vegetation. (Ruthven, 1922; Lynch and Ruiz-Carranza, 1985).

**Material:** Sierra Nevada de Santa Marta. Guajira: Heights of San Miguel, 1829-2134 m (UMMZ 54544); vicinity Taquina, 2424-2727 m (UMMZ 50139-40, 54543(2)).

**Magdalena:** Municipio Cienaga, Cuchilla Yerbabuena, 2000 m (ICN 13180-81); Cuchilla Yerbabuena, Finca de Alfonso Vanegas, 2500 m (ICN 13182); Ciudad Perdida, 1100 m (ICN 12848-54); helipuerto, SW Ciudad Perdida 2250 m (ICN 12855-64); Quebrada Viernes Santo, 1524 m (UMMZ 54538); 5.7 Km. E. San Pedro de la Sierra, 2600 m (MCZ 88340-49); 9.5 Km. E. San Pedro de la Sierra, 2600 m (MCZ 88350-51, 88556); Serranía Cebolleta, 8 hrs by foot E. San Pedro de la Sierra, 2460 m (ICN 3010, 3025, 3051, 8273); 6-7 Km. E. El Campano, 1720-1790 m (ICN 13030-71); 8 Km. E. El Campano, 1850 m (KU 168557); 10 Km. E. El Campano, 1850 m (KU 168559-60); 11 Km. E. El Campano, 2000 m (KU 168562-64); Cincinnati, 1524 m (ICN 3780, UMMZ 48605 holotype, 54542); Serranía San Lorenzo, 1800-2500 m (ICN 710, 714, 716, 719, 724, 726-7, 729-30, 732, 735-37, 740, 751, 1655, 1687, 2669, 8244-53, 8274-75, LACM 114498, 114507-08, 114516-19, 114522-27, 114530, MCZ 8972-73, UMMZ 51130, 54537, 54539, 54541, 54545, 55667); San Lorenzo, cabañas road to Telecom, 2300 m (ICN uncataloged specimens); Finca La Granja, on road to San Lorenzo, 2300 m (USNM 150881-82).

*Eleutherodactylus tayrona* Lynch and Ruíz-Carranza

(Map No.11)

*Hylodes cruentus*: Ruthven, 1915a. Occ Pap. Mus. Zool. Univ. Mich., 1:1

*Eleutherodactylus cruentus*: Ruthven, 1922, Misc. Publ. Mus. Zool. Univ. Michigan., 8:51. Cochran and Goin, 1970. Bull. U.S. Natl. Mus., 288:415.

*Eleutherodactylus prolixodiscus*: Lynch, 1978. Copeia, 1978: 21. Duellman, 1979. Monogr. Nat. Hist. Mus. Univ. Kansas, 7:383.

*Eleutherodactylus tayrona* Lynch and Ruíz-Carranza, 1985. Occ. Pap. Mus. Zool. Univ. Mich., 711:28. Type locality: Serranía Cebolleta, 8 hrs. by foot E. San Pedro de la Sierra, Municipio Cienaga, Depto Magdalena, Colombia, 2450 m

**Description:** A member of the *lacrimosus* assembly. Snout short, subacuminate dorsally and rounded in lateral view; canthus rostralis slightly angular; loreal region flat, sometimes slightly concave; Sometimes small tubercles present on upper eyelid; cranial crests absent; tympanum superficial; males with vocal sacs and slits; mature males with thumb pads; vomerine teeth in two series, triangular in shape and separated medially by a gap

equal to 1/2 the width of the vomerine odontophore. Skin of dorsum, top of head and upper surfaces of limbs finely granular under the microscope; dorso-lateral folds from tympanic area to groin region. A supratympanic ridge from posterior corner of the eye to the shoulder. Skin of the chin, throat, venter, lower surfaces of limbs and to some extent the flanks aerolate. Fingers long, slender and with lateral fringes; the first finger shorter than the second. Two small palmar tubercles. Conical, distinct subarticular tubercles. A small tubercle on heel; toes long free, with fringes; the digital disks larger, or of the same size as those of the fingers; two metatarsal tubercles, the inner larger than the outer. Heel of the adpressed hindlimb reaches a point between the nostrils and the anterior corner of the eye.

**Color in preserved specimens:** Dorsum and upper surfaces of limbs are uniformly dark or light brown, usually unicolor, or sometimes irregularly spotted with darker brown spots of different sizes. The supratympanic ridge is outlined by dark brown. Top of the head is of the same color as the dorsum, but in some individuals there is a narrow black interorbital band. Flanks are as dark as the dorsum or sometimes the lower part is lighter, of the same color as the venter, which is usually uniformly light creamy yellow.

**Color in life:** top of the head is greenish brown, with an interorbital black band, followed by a pair of dark occipital spots. The dorsum is light brown or yellowish; sometimes with irregular longitudinal darker stripes, one on vertebral line and one lateral on each side. Upper surface of limbs are of the same color as dorsum, but spotted dark brown. Belly is light yellow or greyish yellow; sometimes spotted with brown.

**Measurements:** Snout-vent length: males 15.2-25.1 (22.2), females: 22.6-30.2 (26.9); tibia length: males 10.1-14.5 (12.6), females 12.6-15.1 (14.1); femur length: males 10.0- 11.8 (10.18), females 11.7-13.8 (12.9).

**Distribution:** Known from the northern and northwestern part of the Sierra Nevada de Santa Marta, between 1300-2700 m

**Ecology:** This species lives in bromelids growing on the ground, sometimes on steep inclines in the cloud forest. They are seemingly present in groups of individuals that call at night synchronously, followed by other group at a distance. They are very small in size; according to Lynch and Ruíz- Carranza (1985) the size varies geographically, but usually it is no more than 25.1 in males and 32.0 mm in females.

**Material:** Sierra Nevada de Santa Marta. Guajira: Heights E. San Miguel,

1829-2134 m (UMMZ 47015(2), 47016(4), 47019(3), 47021-25, 47028-36 [embryos]). **Magdalena:** Cincinati, 1530 m (ICN 3764); helipuerto, SW of Ciudad Perdida, 2250 m ((ICN 12890-96); ridge W. of Ciudad Perdida, 1300 m (ICN 12875-89); 6 Km E. El Campano, 1720 m (ICN 13077- 78); 12 Km El Campano, 2150-2200 (ICN 13079-80); Municipio Cienaga, Cuchilla Yerbabuena, 2000 m (ICN 13183-84(5)); Serranía Cebolleta, 2450 m (ICN 3007, 3009, 3021-24, 3041-43, 3045-46 paratypes, 3049 paratype, 3052-59 paratypes, 3060 holotype, 3061-81 paratypes, 3093-95 paratypes); Serranía San Lorenzo, La Cumbre, 2134 m (UMMZ 63777(24), USNM 118727-28); San Lorenzo, cabañas on road to Telecom, 2300 m (ICN uncataloged specimens); San Lorenzo, Finca La Granja, 2300- 2700 m (USNM 150878, 151026).

*Eleutherodactylus w-nigrum* (Boettger)

(Map No. 12)

*Hylodes w-nigrum* Boettger, 1892. Berichte Senckenberg. 71 Naturf. Gesell., 1892:28.

**Type locality:** Zurucuchu, approx. 15 km W. Cuenca Prov. Azuay, Ecuador, 3500 m.

*Eleutherodactylus insignitus* Ruthven (in part), 1917a. Occas. Pap. Mus. Zool. Univ. Mich., 34:1.

*Eleutherodactylus w-nigrum*: Cochran and Goin, 1970. Bull. U.S. Natl. Mus. 288:397. Lynch, 1978: Copeia 1978(1):21. Lynch, 1979a. Herpetologica, 35: 228- 229. Lynch and Ruíz-Carranza, 1985. Occ. Pap. Mus. Zool. Univ. Michigan, 711:43.

**Description:** A member of the *fitzingeri* group. Snout short, but ovoidal dorsally and rounded on lateral profile; canthus rostralis sharp; upper eyelid without tubercles. Cranial absent; males with vocal sacs and slits; mature males with a thumb pad; vomerine odontophore prominent. Skin of dorsum shagreened with granules and warts on upper flanks. Skin of the venter, smooth, without dorsolateral folds. Fingers with lateral fringes, first finger longer than the second. Two metatarsal tubercles, the inner elongate, and larger than the outer.

**Color in preserved specimens:** Dorsum is tan to brown, with interorbital bar. Flanks with dark brown spots. A canthal- supratympanic stripe and labial bands are prominent. Posterior surfaces of thighs are cream with dark brown spots. Ventrally, the coloration is light creamy yellow, spotted with grey brown.

**Measurements:** Snout-vent length: males 31.8-42.0, females 57.5-67.0.

**Distribution:** Western Andes of Ecuador, cordilleras Oriental, Central and Occi-

dental of Colombia. In Sierra Nevada de Santa Marta, it is found on the northern part, between 1800 and 2200 m.

**Ecology:** This species occurs in the cloud forest. Only two specimens have been reported from Sierra Nevada de Santa Marta.

**Material:** Sierra Nevada de Santa Marta. Guajira: Heights E. San Miguel, 1829-2134 m (MCZ 4070). Magdalena: San Lorenzo, 2200 m (ICN 8276).

**Remarks:** I did not examine any specimens of this species, so the description is based on Lynch and Ruiz, (1985).

*Geobatrachus walkeri* Ruthven

(Map No. 13)

*Geobatrachus walkeri* Ruthven, 1915d. Occas. Pap. Mus. Zool. Univ. Michigan., 20:1.

**Type locality:** "San Lorenzo, 8000 ft [= 2400 m.). Santa Marta Mountains, Colombia. Cochran and Goin, 1970. Bull. U.S. Natl. Mus., 288:493. Ardila-Robayo, 1979. Caldasia, 12(59): 383.

**Description:** Snout short, blunt, and rounded dorsally, wedged-shaped in profile. Vomerine teeth absent. Omosternum present. Canthus rostralis rounded, loreal region usually flat, sometimes slightly concave. Tympanum not indicated. Eye small, not prominent. Fingers long, and free without terminal disks. Two slightly distinct palmar tubercles. Subarticular tubercles absent. First finger larger than the second. No thumb pad in males. Only four toes, long, and free; one distinct inner metatarsal tubercle, and small subarticular tubercles. Skin of the upper surfaces, throat and chest smooth, on the belly and lower surfaces of the femur aerolate or finely granular. Skin of the top of head not co-ossified with the skull. Skin folds absent. Males without vocal sac. The heel of the adpressed hindlimb reaches the shoulder.

**Color in live specimens:** this species is highly polychromatic; however, the most frequent patterns can be described as follows: The dorsum is grayish brown, irregularly spotted with dark brown and usually with a broad middorsal dark brown stripe running from tip of the snout or from the interorbital region to the vent. Usually this broad stripe is interrupted medially by a tiny white line. Dorsum of the limbs is somewhat banded, and a narrow white or dark brown stripe is present on the posterior

surfaces of the thighs. The venter is uniformly light yellowish and slightly lighter than the dorsum, heavily spotted with dark brown. Other specimens have the dorsum uniformly brownish, with the tiny white middorsal line running from tip of the snout to the vent. The venter is unicolor. Occasionally there is a white line on the posterior surface of the thighs. Ruthven (1922) described the coloration as follows: "Most of the specimens are dark olive gray to olivaceous black above; the belly is gray in appearance due to the combination of blackish wash and minute white dots. Some specimens have russet dots on the dorsal surface, and few are brick red above, vinaceous rufus in the inguinal region, and Hay's russet on the belly. A narrow white or ochraceous tawny vertebral line may be present".

**Measurements:** Snout-vent length. Males 17.2-22.3 (19.8), females 19.9-23.2 (21.12); head breadth: males 5.2-6.3 (6.18), females 6.5-7.1 (6.8); tibia length: males 6.6-7.5 (7.12), females 7.2-8.8 (8.1), femur length: males 7.3-8.7 (8.22); females 8.5-9.2(8.95).

**Distribution:** Restricted to the regions of San Lorenzo, and San Pedro de la Sierra, in Sierra Nevada de Santa Marta, Colombia from 1750 m to 3000 m, and possibly higher altitudes.

**Ecology:** The species is found on the ground and under rocks in the cloud forest and in the Andean mountain forest, but it is also quite abundant in the clearings of these forests (Ruthven, 1922, Ardila, 1979), and on the side of the roads. The stomach contents reveal a diet composed of larvae, and adults of: Acari, Coleoptera (*Elateridae*, *Chrysomelidae*, *Curculionidae*), Diptera, Homoptera (*Cicadellidae*, *Fulgoridae*); Hymenoptera (*Formicidae*); Isoptera, Lepidoptera, Orthoptera (*Tettigoniidae*, *Gryllidae*). The species is territorial, and somewhat semifossorial. It lives in bromelids, as well as under rocks, logs and grasses; eggs are laid under rocks and the presence of the female nearby suggests some form of parental care. The eggs are spherical and of about 2,5 mm in size; each set has between 18 to 25 eggs that are wrapped in a translucent, jelly mass. There are no larval stages. (Ardila, 1979). The calls begin at about 6 PM and consist of short, spaced individual bips that can be heard till 9 PM. Another active calling period is in the morning, starting about 5 AM.

**Material:** Sierra Nevada de Santa Marta. NW páramo, (MCZ 16043-50). **Magdalena:** Finca Palestina, upper río Manso, 20 min. below mouth caño Tigre (MCZ

64898); 7 Km, E. San Pedro de la Sierra, 2600 m (MCZ 88551); 9.5 Km E. San Pedro de la Sierra, 2600 m (MCZ 88557); San Lorenzo, 1750-2750 m (ICN 3298, 3301, 3304, 3308, 3312-13, 3320, 3324, 3328-31, 3333, 3336-39, 3340, 3342-45, 3349, 3355-56, 3365-66, 3368-69, 3371-74, 3377-78, 3380, 3390, 3392); 2400 m (MCZ 3896, 10213, paratypes, UMMZ 47785 holotype, 47787-9, 48267, paratypes, 54609-12, 54614(2), 55676).

### Key to the species of *Leptodactylus*

1. Thighs with some stripes.....2  
 1' No thigh stripes..... *L. insularum*
2. A middorsal light stripe present..... *L. fragilis*  
 2' No middorsal stripe.....3
3. Lip stripes present..... *L. fuscus*  
 3' No light stripes..... *L. poecilochilus*

### *Leptodactylus fragilis* (Brocchi)

(Map No. 13)

*Cystignathus fragilis* Brocchi, 1877. Bull. Soc. Philomath. Paris, 1(7): 182. **Type locality:** Tehuantepec, Mexico. *Leptodactylus fragilis*: Heyer, 1978. Sci. Bull. Nat. Hist. Mus. Los Angeles. Co. 29:46.

**Description:** A member of the *fuscus* group. Snout rounded in dorsal view; canthus rostralis indistinct; loreal region concave; vomerine teeth in two series; tympanum large. Fingers long, free with lateral fringes. First finger much longer than second; one large metacarpal tubercle; small and prominent subarticular tubercles. Toes long, slightly webbed; two metatarsal tubercles, the inner larger than the outer. Subarticular tubercles of the toes well developed. Skin finely granular; the dorsal surface of the tibia with white tubercles. Below, the chin and the belly smooth, the skin of the femur granular. The heel of the adpressed hindlimb reaches a point between the eye and the nostril. The color in preserved specimens is brownish above spotted or blotched. Ventral surfaces are light. The posterior surface of the thigh has a light stripe; tibia banded; tubercles on the tibia, posterior surface of tarsus and those of the sole and foot are white.

**Measurements:** Snout-vent length: 40.8-43.7; tibia length: 22.2-23.0; femur length: 21.0-25.1.

**Distribution:** Southern Texas, Mexico. and Central America to northern Colombia and Venezuela. In Sierra Nevada de Santa Marta, it is found in the region around Fundación at 60 m.

**Ecology:** In Sierra Nevada de Santa Marta this species has been reported in the lowland xerophytic scrub forest, at sea level. Females lay the eggs in underground chambers constructed by the males (Dixon and Heyer, 1968; Heyer, 1978).

**Material.** Sierra Nevada de Santa Marta. Magdalena: Fundación, 60 m (UMMZ 48489-92, 48495-99, 48503-04, 48509, 48511, USNM 102409).

*Leptodactylus fuscus* (Schneider)

(Map No. 13)

*Rana fusca* Schneider, 1799. Hist. Amph., 1: 30. **Type locality:** Not stated, neotype from Surinam.

*Leptodactylus typhonius:* Ruthven, 1922. (In part) Misc. Publ. Mus. Zool. Univ. Michigan., 8:54.

*Leptodactylus sibilatrix:* Cochran and Goin, 1970. Bull. U.S. Natl. Mus., 288: 468.

*Leptodactylus fuscus:* Heyer, 1978. Sci. Bull. Nat. Hist. Mus. Los Angeles. Co., 29: 50.

**Description:** Snout triangular blunt and rounded dorsally, and rounded in profile. Canthus rostralis indistinct, loreal region flat. Tympanum large and round. Fingers long, slender and free. Two distinct palmar tubercles, the outer larger and rounded, the inner elongated and smaller. Subarticular tubercles conical, well developed. First finger longer than the second. Toes long, weakly webbed; third toe longer than the fifth. Only one outer, small, metatarsal tubercle is present. Three to four dorsolateral skinfolds. Skin of dorsum and upper surfaces of limbs smooth. Below, the skin smooth, but the anal region and the posterior surface of the thighs heavily aerolate. The heel of the adpressed hindlimb extends beyond the tip of the snout.

In preserved specimens the dorsum is blotched, with reddish brown on a somewhat lighter ground color. A middorsal white cream stripe extends from tip of the snout to the vent; sometimes narrower creamy white lines are present on each side of the broad middorsal stripe. The upper lip has a light creamy stripe. The venter and lower sur-

faces of limbs are white and immaculate. A narrow light stripe is present on posterior surface of thighs.

**Measurements:** Snout-vent length: 51.0.-60.0; tibia length: 25.2-30.1; femur length: 23.0-26.1.

**Distribution:** Panama throughout South America, east of the Andes, south to southern Brazil, Bolivia and Argentina. In Sierra Nevada it has been reported from the northwestern part, below 100 m.

**Ecology:** In Sierra Nevada de Santa Marta this species occurs in open marshes near Cienaga, but it is also present in the lowland xerophytic scrub forest at Fundacion. Ruthven (1922), observed that this species is found under logs and fallen leaves during the day, and it is active at night. As *L. fragilis*, individuals of *L. fuscus* are active above the ground, while fossorial activity is restricted to incubation of the eggs in incubating chambers constructed by the males (Heyer, 1978).

**Material:** Sierra Nevada de Santa Marta. Magdalena: Cienaga, Sea level (USNM 144159-60); Fundación, 60 m (MCZ 8968-69, UMMZ 48178-85, 48187-88, 48190-93, 48500).

### *Leptodactylus insularum* Barbour

(Map No. 14)

*Leptodactylus insularum* Barbour, 1906. Bull. Mus. Comp. Zool., 46:208. **Type locality:** San Miguel Island and Saboga Island, Bahia de Panama. Cochran and Goin, 1970. Bull. U.S. Natl. Mus. 288:457.

*Leptodactylus bolivianus*: Ruthven, 1922. (In part) Misc. Publ. Mus. Zool. Univ. Michigan., 8:54.

**Description:** Snout rounded in dorsal view; canthus rostralis rounded and not very distinct; loreal region slightly concave; vomerine teeth in two series behind the choanae; tympanum large. Fingers moderately long, with bulbous tips in males. First finger as long as the second; two large metacarpal tubercles; conical and prominent subarticular tubercles. Two horny black tipped thumb spines in mature males; toes long, free, with conspicuous lateral fringes; usually two small metatarsal tubercles. Subarticular tubercles of the toes weakly developed. Skin, dorsally smooth with many dorsolateral folds. Below, the chin and the belly smooth, the skin of the femur granular. The heel of

the adpressed hindlimb reaches a point between the eye and the nostril.

The color of live specimens is reddish above blotched with dark grey. Top of the head is of the same color as the dorsum; one or two black stripes run from the nostrils bordering the canthus rostralis, the upper eyelid and the supratympanic ridge. Also, a Y-shaped dark grey spot is present; the arms of the Y-shaped figure are on the interorbital region and the tail on the occipital region. Dorsally, the limbs are somewhat banded. Ventrally, the chin and limbs are yellowish, slightly spotted with grey; the border of the lower lip has small scattered white, conical granules; the venter, immaculate yellowish. Concealed surfaces of thighs are reticulated with dark greyish.

**Measurements:** Snout-vent length. Males 72-90 (85.6), females 67.8-75.9 (73.4); tibia length: males 40.1-44 (43.5) females 35-40 (36.7), femur length: males 35.2-40 (38.9), females 32-37.5 (35.7).

**Distribution:** Central America and northern South America to western Venezuela, also San Andres and Providencia islands and San Miguel Island and Saboga Island. In Sierra Nevada de Santa Marta it has been reported from sea level to about 700 m.

**Ecology:** This species has been reported from the xerophytic lowland scrub forest, where it occurs on the banks of streams and ditches. It is also found in grasslands or in clearings of the evergreen humid forest.

**Material:** Sierra Nevada de Santa Marta. Cesar: Valledupar, 206 m (UMMZ 54597-8). Guajira: Arroyo de Arenas, 150 m (UMMZ 54600-01). Magdalena: Bolívar, 45 m (UMMZ 54596); Ciénaga, 0 m (USNM 144157-58, 150926); Don Diego, 0 m (UMMZ 48118-19(3), 48488(10)); Finca de Francisco Paredes, río Guachaca, 680 m (ICN 2724); Fundación, 60 m (MCZ 8966-67, UMMZ 48106-08, 48110-11, 48112-17); Mamatoco, 20 m (UMMZ 48120 swallowed by a snake); Minca, río Manzanares, 625 m (USNM 150893-924); Rio Frio, 5 m (MCZ 16067-68).

*Leptodactylus poecilochilus* (Cope)

(Map No. 14)

*Cystignathus poecilochilus* Cope, 1862. Proc. Acad. Nat. Sci. Philadelphia, 14: 156.

**Type locality:** Turbo, Antioquia, Colombia.

*Leptodactylus bolivianus*: Ruthven, 1922. (In part), Misc. Publ. Mus. Zool. Univ. Michigan., 8:54.

*Leptodactylus poecilochilus diptychus*: Cochran and Goin, 1970. Bull. U.S. Natl. Mus., 288:464.

**Description:** A member of the *fuscus* group. Snout subacuminate, rounded dorsally, and rounded in profile. Canthus rostralis indistinct, loreal region slightly concave. Tympanum large and rounded. Vomerine teeth in two arch-shaped series. Fingers long, slender and with a very basal web. Two distinct palmar tubercles, the outer larger and rounded, the inner elongated and smaller. Subarticular tubercles conical, and prominent. First finger longer than the second. Toes long, weakly webbed; third toe longer than the fifth. Two weakly developed metatarsal tubercles. Distinct lateral ridge from tarsus to heel. Dorsolateral skinfold from eye to groin, and from axilla to groin. Supratympanic ridge around the tympanum and a shorter one runs from posterior corner of the mouth to the shoulder. Skin of dorsum and upper surfaces of limbs shagreened. Below, the chin chest and belly smooth, but the anal region and the posterior surface of the thighs heavily aerolate. The heel of the adpressed hindlimb extends to the eye.

In preserved specimens the dorsum is sepia brown spotted with darker brown. Below, sepia immaculate. Concealed surfaces of limbs heavily spotted with brown. A narrow light stripe on posterior surface of thighs.

**Measurements:** Snout-vent length: Males 36.1-42(40.6), females 45.2; tibia length: males 14-14.5 (14.3) females 14.5, femur length: males 13.8-14.0 (13.9), females 12.3.

**Distribution:** Southwestern Pacific coast of Costa Rica to northern Colombia and Venezuela. In Sierra Nevada de Santa Marta it has been reported from the lowlands on the northern, eastern and northwestern part.

**Ecology:** This species occurs in the lowland xerophytic scrub forest, from sea level to about 200 m.

**Material:** Sierra Nevada de Santa Marta. Cesar: Valencia, 100 m (UMMZ 54604-08). Guajira: Arroyo de Arenas, río Barbacoa, 150 m (UMMZ 54599, 54602-03). Magdalena: Fundación, 60 m(UMMZ 48505-06, 48508-09, 51106, USNM 102408, 102410); Río Frío, < 50 m (MCZ 16069).

*Physalemus pustulosus* (Cope)

(Map No. 15)

*Paludicola pustulosa* Cope, 1864. Proc. Acad. Nat. Sci. Philadelphia, 17: 180. **Type locality:** "New Granada in the river Truandó, Colombia".

*Eupemphix pustulosus*: Ruthven, 1922. Misc. Publ. Mus. Zool. Univ. Michigan., 8:54.

Cochran and Goin, 1970. Bull. U.S. Natl. Mus. 288:444.

*Eupemphix ruthveni* Netting, 1930. Ann. Carnegie Mus., 19(144): 167.

**Description:** Snout triangular blunt and rounded at the tip dorsally, rounded in profile. Canthus rostralis rounded, loreal region usually flat, sometimes slightly concave. tympanum barely indicated. Fingers long, slender and free. Two distinct palmar tubercles, the outer larger and somewhat elongate, the inner conical and smaller. Subarticular tubercles well developed. First finger equal or slightly larger than the second, sometimes of equal length. Thumb pad present in males. Toes long, 1/3 webbed; third toe a little longer than the fifth. Two small conical and prominent metatarsal tubercles of equal size, and smaller supernumerary tubercles. Skinfolds on knee and heel. Skin of the upper surfaces warty, sometimes arranged in longitudinal lines. Warts of larger size on the tympanic area of the males. Upper surfaces of limbs granular or warty. Skinfolds present on the flanks. Below, the skin smooth, but the anal region and the lower surfaces of the limbs granular or heavily aerolate. Males with a very large external vocal sac, with very prominent folds on the sides, near the angles of the mouth. In the females skinfolds also present on the chest but not as prominent as those of the males. The heel of the adpressed hindlimb reaches the tympanic area.

In preserved specimens the dorsum is sepia or brown, sometimes spotted irregularly with dark brown. The venter is unicolor, and slightly lighter than the dorsum.

**Measurements:** Snout-vent length. Males 13.2-31.1 (25.75), females 14.2-32.1 (25.7); tibia length: males 11.0- 18.2 (14.17), females 12.1-14.3 (13.5), femur length: males 9.8-12.1 (11.25), females 11.0-13.2 (12.1).

**Distribution:** Eastern and southern México throughout Central America to Colombia and Venezuela. In Sierra Nevada de Santa Marta this species occurs in the lowlands from sea level to 600 m.

**Ecology:** This species is found on the xerophytic lowland scrub forest around the massif as well as in the clearings of the cloud forest in San Lorenzo region. Ruthven (1922) observed that in the desert this species occurs near the ditches and marshes or in the forest pools and under logs on the low clearings, grasses and savannas.

**Material:** Sierra Nevada de Santa Marta. Cesar: Valencia, 100 m (UMMZ 54587-88). Magdalena. Bolívar, 45 m (UMMZ 54586); Bonda, Finca El Arandar, 45 m (USNM 152695-712); Ciénaga, Casa Blanca, 0 m (USNM 144155-56); Curumaní, 100 m (MCZ 21493); Don Diego, 0 m (UMMZ 48196); Fundación, 60 m (UMMZ 45565, 45582, holotype of *Eupemphix ruthveni*, 45580, 48201, 67627, USNM 118717 paratype of *E. ruthveni*); Mamatoco, 20 m (MCZ 15698 paratype of *E. ruthveni*, UMMZ 51132-3); between Mamatoco and La Tigrera 700 m (CM 5455 paratype of *E. ruthveni*, UMMZ 45583, CAS 54790); Minca, 600 m UMMZ 45487), 1530 m (ICN 3766-69, 3773); Parque Nacional Tayrona, sector "El Cedro", 360-400 m (ICN 11477-11482); Rio Frio, 50 m (MCZ 16057-58); Santa Marta, 0 m (UMMZ 45488 missing); Sevilla, 0 m (MCZ 16076).

*Pleurodema brachyops* (Cope)

(Map No. 15)

*Lystris brachyops* Cope, 1869 "1868". Proc. Acad. Nat. Sci. Philadelphia., 20:312. **Type locality:** Magdalena river, New Granada [=Colombia]".

*Pleurodema brachyops*: Ruthven, 1922. Misc. Publ. Mus. Zool. Univ. Michigan. 8:53. Cochran and Goin, 1970. Bull. U.S. Natl. Mus., 288:483.

**Description:** Snout blunt and rounded dorsally, rounded in profile. Canthus rostralis rounded, loreal region flat, sometimes slightly concave. Tympanum moderately large. Fingers long, slender and free, with lateral fringes. One large palmar tubercle. Subarticular tubercles well developed. First finger slightly larger than the second, thump pad present in males. Toes long, less than 1/3 webbed; free phalanges with lateral fringes. Two shovel-shaped and prominent metatarsal tubercles and smaller, conical and conspicuous subarticular tubercles. Skin folds on knee and heel. Skin of the upper surfaces smooth somewhat granular under the microscope, with a dorsolateral ridge from eye to groin and a second one encircling the tympanum. A large oval gland between the thigh and the groin. Below, the skin smooth, but the anal region and the lower surfaces of

the limbs granular or aerolate; skinfolds on the chest. Males with an external vocal sac. The heel of the adpressed hindlimb reaches the posterior corner of the eye.

In preserved specimens, the dorsum is light brown, sometimes irregularly spotted with dark brown. A dark spot is present under the eye; the inguinal glands are black. The venter and lower surfaces of the limbs are unicolor, white or sometimes the tibia and part of the inguinal region around the glands are spotted with pink.

**Measurements:** Snout-vent length: males 26.2.-31.2 (28.9), females 35.6-39.5 (37.6); tibia length: males 11.6- 12.5 (12.2) females 11.0-13.1 (12.2), femur length: males 12.0-12.5 (12.4), females 11.8-12.6 (12.69).

**Distribution:** Guyana and northern Brazil (Roraima) through Venezuela, northwestern Colombia and Panama. Also Margarita Island, Curacao, Aruba, and Bonaire. In Sierra Nevada de Santa Marta, this species has been reported from the northwestern corner of the massif.

**Ecology:** This species occurs in the xerophytic lowland scrub forest below 200 m. Ruthven, (1922) commented that the specimens were taken at night near irrigation ditches.

**Material:** Sierra Nevada de Santa Marta. Magdalena: Aracataca, 60 m (ANSP 19775); Bonda, Finca El Arandar, 45 m (USNM 152713-14); Cienaga, 0 m (USNM 144161-2); 12 K. E of Cienaga, 0 m (MCZ 80499); Curumani, (MCZ 21495-98); La Guaira, 5 Km W of Santa Marta, 0 m (AMNH 84374); Santa Marta, 0 m (MCZ 6074, UMMZ 45482[13]).

*Pseudopaludicola pusillus* (Ruthven)

(Map No. 16)

*Paludicola pusilla* Ruthven, 1916c. Occas. Pap. Mus. Zool. Univ. Michigan., 30:1. **Type locality:** Fundacion, Sierra Nevada de Santa Marta, Colombia.

*Pleurodema pusilla:* Ruthven, 1922. Misc. Publ. Mus. Zool. Univ. Michigan., 8:54.

*Pseudopaludicola pusillus:* Cochran and Goin, 1970. Bull. U.S. Natl. Mus., 288:489.

**Description:** Snout subelliptical dorsally, and subovoid in profile. Canthus rostralis rounded, loreal region concave. Tympanum hidden. Fingers long, slender and free, with swollen tips; first finger shorter than second. One large, round, palmar callus and

one small, lateral, inner tubercle. Distinct, basal, subarticular tubercles. One small but distinct conical tubercle on the forearm near the wrist. Toes long, and slender, with lateral fringes. Two small but prominent metatarsal tubercles and small, conical and conspicuous, basal, subarticular tubercles. One elevated, conspicuous and oblique tarsal ridge from the inner metatarsal tubercle that ends on the midway of heel. Skin folds on knee and heel. Skin of the upper surfaces smooth but shagreened under the microscope in females, and usually rugose and warty in males. A dorsolateral skinfold extends from posterior corner of the eye to the shoulder or sometimes to the groin and a shorter lateral skinfolds from axillae to groin. Below, the skin smooth, but the anal region heavily granular or aerolate. Males with two subgular vocal sacs weakly developed. The heel of the adpressed hindlimb reaches a point between the middle and the anterior corner of the eye.

In preserved specimens the dorsum is light brown, sometimes spotted with dark brown; in some specimens there is a middorsal white stripe that extends from tip of the snout to the vent. The venter and lower surfaces of the limbs are unicolor, yellowish cream.

**Measurements:** Snout-vent length: males 12.1-14.6, (13.2), females 15.8-17.1 (16.2); tibia length: males 5.8-7.5 (6.9), females 7.0-8.1 (7.6); femur length: males 5.6-7.2 (6.7), females 6.2-7.2 (6.8).

**Distribution:** Northeastern Colombia, to central and southern Venezuela, Guyana and Surinam. In Sierra Nevada de Santa Marta, it is found in the northern and northwestern part.

**Ecology:** This species is found in flood plains of the xerophytic lowland scrub forest, where it usually occurs near ponds and marshes as well as under rocks or near the shores of streams.

**Material:** Sierra Nevada de Santa Marta. Guajira: Arroyo de Arenas, río Barbacoas, 0 m (UMMZ 54589[16]), USNM 118182, 118721-22); Fonseca, 150 m (UMMZ exch. with J. Rouxcaught). Magdalena: Fundación, 60 m (UMMZ 48305 holotype, 48306-09 paratypes, 54591); Gaira, (AMNH 14353-54, MCZ 4757, UMMZ 48314-15 48317-18); Mamatoco, 20 m (UMMZ 51131).

## 2. Family Bufonidae

### Key to the species of *Atelopus*

1. Dorsum unicolor deep dark brown to black ..... 2
- 1'. Dorsum not colored as above or if unicolor no dark brown or blackish ..... 6
  
2. Venter light yellow or brownish, usually unicolor or sometimes with dark spots or patches .....3
- 2'. Venter of the same color as the dorsum. .... 4
  
3. Supraorbitals prominent, interorbital space concave,  
long and slender fingers, subarticular tubercles present ..... *Atelopus sp. B*
- 3'. Supraorbitals indistinct, short and flatten fingers; no subarticular or basal tubercles ..... *Atelopus sp. H*
  
4. Palms and soles as dark as the dorsum and venter ..... 5
- 4'. Palms and soles with lighter contrasting color;  
middorsal and dorsolateral ridges present; head flat and snout acuminate ..... *Atelopus sp. E*
  
5. Body stout, limbs muscular; toes flattened usually with conspicuous fringers,  
venter smoky gray ..... *Atelopus sp. A*
- 5'. Body slender, toes rounded with narrow fringers, venter dark blackish brown,  
never smoky gray ..... *A. carrikeri*
  
6. Body and venter dark grayish with some tan areas, body  
stout, limbs muscular, no dorsal or lateral ridges ..... *Atelopus sp. A*
- 6'. Body and color not as above ..... 7
  
7. Venter usually smooth, except for the anal area, rarely rugose; sides of the body  
dark brown outlined on its upper part by a very distinct darker brown line ..... *A. walkeri*
- 7'. Venter wrinkled, aerolate or rugose; no dark brown line along the darker color of the flanks ..... 8
  
8. Dorsum uniformly smooth never granular or warty, small *Atelopus*, (snout-vent  
length usually less than 41 mm)..... *Atelopus sp. B*
- 8'. Dorsum never smooth ..... 9
  
9. Body with many rounded granules or at least with heavily granular limbs. Dorsal  
granules larger than those of the venter ..... *Atelopus sp. F*
- 9'. Body with few granules; scarcely distributed ..... 10
  
10. Body light yellow, sprinkled with few minute brown dots; lateral ridges very  
conspicuous, outlined by large and squarish glands; snout strongly acuminate  
in males but subacuminate in females ..... *Atelopus sp. C*
- 10'. Dorsum either densely spotted with brown or with large dark spots in a creamy  
background, or unicolor light brown; ..... 11
  
11. Wide brownish black middorsal stripe, surrounded by  
dark yellow; belly lemonyellow with roundish black spots ..... *Atelopus sp. H*
- 11'. No wide middorsal stripe or, if present, it is a middorsal line ..... 12
  
12. The length of the foot is almost as long as the distance from anus to axilla;  
palms and soles dark ..... *Atelopus sp. G*
- 12'. The length of the foot is about half the length of the distance between anus and  
axilla, palms and soles light ..... *Atelopus sp. D*

*Atelopus carrikeri* Ruthven

(Map No. 16)

*Atelopus carrikeri* Ruthven, 1916b. Occas. Pap. Mus. Zool. Univ. Michigan, 28:1. **Type locality:** Páramo de Macostama, (8,000 to 15,000 ft), Santa Marta Mountains, Colombia, emended to "Department Guajira, Páramo de Macotama (E. Arahuaco, Indian village Macotama)" by Kluge, 1983.

*Atelopus carrikeri*: Ruthven, 1922. Misc. Publ. Mus. Zool. Univ. Michigan., 8:50.

*Atelopus carrikeri*: Cochran and Goin, 1970. Bull. U. S. Natl. Mus., 288: 139-140.

**Description:** Head slightly longer than broad. Snout roundish; upper jaw extending slightly beyond lower; Loreal region concave, canthus rostralis rounded, snout width smaller than eye-snout distance. Skin thickened, partially smooth dorsally and ventrally but sometimes under the microscope it presents distinguishable warty spicules, especially in the head region and anterior part of the body. Two fairly developed metatarsal tubercles; heel reaching to the axilla or between axilla and posterior border of the eye. Toes partially webbed, one to two phalanges free, usually with lateral fringers. First toe usually entirely webbed. Two palmar tubercles, outer larger than inner, subarticular tubercles at the base of each finger appear divided in two halves. The other subarticular tubercles only feebly developed. All fingers free except for a hardy distinguishable basal web which is more conspicuous between fingers one and two. Fingers with bulbous ends, and narrow lateral fringers. Oval thumb pad present only in mature males. Males with enlarged muscular arms joined to the forearm by the skin in the inner part of the elbow. The forelimbs in females slender and longer than in males. Skinfolds present in the wrist, elbow, knee, and heel. Many small warts behind eye extending to the shoulder, and laterally to the forearm. In some individuals minute warts are also present in the flanks and part of the hind limbs. Sexual dimorphism not very conspicuous. However, the females on the average are larger in size than the males.

Color in preserved specimens: Dorsally and ventrally uniformly black or dark brown.

**Measurements:** Snout-vent length: males 34.3-50 (42.15), females 42.1-54.3 (48.2); head length: males 12.1-17.2 (14.65), females 14.3-17.6 (15.95); head width: males 10.9- 13.4 (12.5), females 12.1-15.4 (13.75); snout width: males 4.3-5.0 (4.65), fe-

males 5.4-6.5 (5.95); tibia length: males 14.3-19.4 (16.85), females 14.4-19.8 (17.1); femur length: males 12.1-18.4 (15.2), females 15.4-19.8 (17.6); eye-snout distance: males 4.3-7.1 (5.7), females 5.5-7.6 (6.55); arm length: males 9.9-12 (10.95), females 11-13.2 (12.1); forearm length: males 10.0-12.3 (11.15), females 9.7-10.0 (9.85); foot length: males 15.0-20.0 (17.5), females 15.0-20.0 (17.5); hand length: males 7.0- 11.0 (9.0), females 10-15.0 (12.5).

**Distribution:** Páramo de Macotama, NE Sierra Nevada de Santa Marta, between 2400 and 4950 m.

**Ecology:** Ruthven (1922) observed that the specimens collected by M.A Carriker were found along small streams from melting snow.

**Material:** Colombia, Sierra Nevada de Santa Marta: **Guajira:** San Diego, Páramo de Macotama 2400 to 4950 m (UMMZ 48721 holotype, 48273-78 MCZ 4100 paratypes). **Cesar:** Rio Donachuí, Lake 4632 m (AMNH 92869).

*Atelopus walkeri* Rivero

(Map No. 16)

*Atelopus ignescens* Ruthven, (in part) 1922. Misc. Publ. Mus. Zool. Univ. Michigan., 8:50.

*Atelopus walkeri* Rivero, 1963c. Caribb. Journ. Sci., 3:117. **Type locality:** Don Diego, Santa Marta, Colombia.

*Atelopus walkeri:* Kluge, 1983. Misc. Publ. Mus. Zool. Univ. Michigan., 166:24.

**Description:** Head flat, longer than broad; snout acuminate, the upper jaw projecting beyond the lower. Eye- snout distance longer than eye diameter. The eye-snout distance larger in females than in males. Nostrils lateral, their distance from the tip of the snout shorter than their distance from eye. The edge of the upper eyelid with a heavy thick fold. Tympanum absent; tongue cylindrical elliptical, entire and free from behind. Canthus rostralis strongly angular; loreal region curved. Fingers free; one large and sometimes one small palmar tubercles; one small tubercle at the base of each finger; tip of fingers swollen. Toes about 3/4 webbed, except for the fourth which is only one half webbed. The web indented; lateral fringes around the second, third and fourth toes. Two metatarsal and small subarticular tubercles present. The heel of the adpressed hindlimb reaches the posterior corner of the eye. Skin above with some large conical warts, irregu-

larly distributed, visible with naked-eye, usually more numerous on the sides and on the posterior part of the body, and on the dorsum of the hind limbs. Skin of the parotid area and of the forelimbs with innumerable minute warts or granules, giving the skin a pustulous appearance. Some specimens with a row of large glands that extends from the parotid area to the hind limb. Ventrally, skin smooth, except for the area around the anus which is granular and presents several irregular wrinkles.

**Color in preserved specimens:** The dorsum is light brown, delimited on each side of the body by a dark brown lateral band outlined on its upper part by a darker line. The band on the side of the head and body runs from the tip of the snout to the groin or to the toes. In some specimens the brown band is pale. It is also present on the forelimbs and the dorsal portion of the hindlimbs. In most individuals, a middorsal ridge with a darker line is formed by many minute dark brown dots, that run from the tip of snout or from the interorbital region to anus. In some specimens an irregular X-shaped dark figure is present on the anterior dorsal part, starting from the supraorbital region and crossing on the vertebral region at the level of the forelimbs and spreading apart again toward the posterior part of the body.

The venter is olive with some dots or large brown irregular spots irregularly distributed, or the venter is almost immaculate. The lower surface of the hind limbs is always spotted with brown. A large dark brown postanal patch present in all the specimens. Sexual dimorphism is present. The males have shorter limbs and enlarged arms; they possess thumb pads and tend to be smaller than the females.

**Measurements:** Snout-vent length: males 33.2-39.8 (37.94), females 39.9-49.8 (43.75); head length: males 12.1- 13.2 (12.88), females 13.2-15.4 (14.01); head width: males: 10.0-11.0 (10.41), females 11.0-13.2 (11.56); snout width: males 3.2-3.3 (3.22), females 4.3-4.4 (4.31); tibia length: males 14.3-16.5 (15.87), females 16.5-20.9 (18.78); femur length: males: 14.3-16.5 (15.17), females 15.4-20.9 (17.96); eye-snout distance: males 4.3-5.5 (5.25), females 6.5-7.6 (6.86); arm length: males 11.0-12.6 (11.4), females 13.2-15.5 (13.96); forearm length: males 8.7-10.0 (9.68), females 10.9- 14.3 (11.52); foot length: males 12-16 (14.85), females 15-21 (17.3); hand length: males 8.0-10 (9.0), females 9.0-12 (10.33); eye diameter: males 3.2-4.3 (3.67), females 3.2-4.4 (3.6).

**Distribution:** Sierra Nevada de Santa Marta, Don Diego, E. Heights of San Miguel and Clurira, between 1500-2100 m.

**Ecology:** This species occurs on the northern part of the Sierra and is restricted to the cloud forest.

**Material:** Sierra Nevada de Santa Marta. Guajira: Don Diego, Clurira, 1500 m (UMMZ 48008-10 paratypes); Don Diego, E. Heights of San Miguel, 1800-2100 m (UMMZ: 48007 Holotype, 48001-6, 48011-14, paratypes).

*Atelopus* sp. A

(Map No. 16)

**Description:** Head flat, supraorbital region almost indistinct; snout subacuminate projecting beyond the lower jaw. Canthus rostralis roundish, little pronounced; loreal region concave. Nostrils approximately equidistant from the tip of the snout to the anterior corner of the eye. Upper eyelid with a thick edge. Fingers long, slender and free, except the first which is webbed and short. The tips of fingers and toes slightly swollen. One or two palmar calluses, one or two large subarticular tubercles at the base of each finger, and small subarticular tubercles in the phalanges. Toes are flattened, first two toes completely webbed, third and fifth are 1/2 webbed and the fifth is only 1/3 webbed. Conspicuous metatarsal tubercles are present. Thumb pad very well developed in males.

Forearms noticeably enlarged and muscular in the males, but not so in the females in which they are longer and slender. When the hind limb is adpressed, the heel reaches the tympanic area or the axilla. Skin above thick, studded, and smooth, with irregularly distributed pinhole dots, that in some specimens extend over the loreal region. In some specimens a shallow middorsal furrow extends from the snout to approximately the level of the axillar region. Many small warts behind eye extending ventrally toward the neck and dorsally to the shoulders and the forearms. The skin in the flanks from axilla to groin also warty or sometimes granular. If warty, the warts may extend dorsally on the sacral region. Ventrally, skin aerolate and rugose, slightly more aerolate and rugose around the anus. Sexual dimorphism is evident due to the enlarged arms and thumb pads in males.

Color in preserved specimens: Uniformly grayish brown dorsally or sometimes with some yellowish brown patches and spots; the dorsal part of the extremities are brownish

yellow with dark spots. Laterally and ventrally, the body is gray with brownish yellow spots. Soles, palms, heels and anal region uniformly smoky gray.

**Measurements:** Snout-vent length: males 45.2-52.0 (48.6), females 48.7-54.3 (52.1); head length: males 11.4- 17.6 (15.7), females 16.5-17.6 (16.87); head width: males 13.2-14.3 (14.08), females 15.4 (15.4); snout width: males 5.0-6.5 (5.7), females 6.5 (6.5); tibia length: males 17.2- 20.0 (18.3), females 18.8-20 (19.53); femur length: males 14.3-20.0 (17.2), females 20-22.1 (21.03); eye-snout distance: males 6.5-7.0 (6.62), females 7.6 (7.6); arm length: males 13.3-15.5 (14.58), females 15.4 (15.4); forearm length: males 12.1-14.4 (13.44), females 13.2-14.3 (13.93); foot length: males 18.7-23.0 (21.8), females 20-22 (21); hand length: males 12.0-13.2 (12.62), females 15 (15); eye diameter: males 4.3-4.4 (4.35), females 4.4 (4.4).

**Distribution:** East of Sierra Nevada de Santa Marta, Cuchilla Paramo de Cebolleta, between 3150-3900 m

**Ecology:** According to Pedro Ruíz's field notes the individuals were found in grasslands during the day. J. Plyler commented about the specimens collected on July 1975 " Air temperature 37 dg F, no wind, light rain, ice coating on terrain. The analysis of the stomach content showed the presence of some coleoptera, possibly Carabidae or Curculionidae. Some of the specimens were parasited by nematods found in the digestive track".

**Material:** Sierra Nevada de Santa Marta. Magdalena: Cienaga, Corregimiento de San Pedro de la Sierra, entre 3150- 3400 m Cuchilla Páramo de Cebolleta, (ICN: 2994, 2991-3, 2995-96, 3425-26); San Pedro de la Sierra 3900 m (USNM 198709-12; MCZ 88451-2).

*Atelopus* sp. *B*

(Map No. 17 )

**Description:** A small *Atelopus* with subacuminate snout, prominent supraorbitals and concave interorbital region. Canthus rostralis rounded. Fingers with basal web usually more conspicuous between fingers one and two. Two first toes entirely webbed others 1/2 to 2/3 webbed. When hind limb is adpressed, the heel reaches the shoulder or the tympanic area. Dorsally the skin of the body and limbs, except the forearm, smooth. Laterally, from the postorbital to inguinal region granular or warty. Ventrally, the skin of the throat usually smooth, or with small warts that extend over the anterior part of the

venter. The rest of the venter aerolate and the sides of the body wrinkled or granulated; postanal region with large glandular warts.

Color in preserved specimens: Above, uniformly black or dark brown. Below, the venter is uniformly yellow, sometimes either uniformly brownish or with dark brown patches on a yellow background; the lower part of the limbs is yellowish brown. In most specimens a brownish yellow inguinal spot is present. The concealed area of the femur is brownish yellow; the anal area is dark brown or grayish.

**Measurements:** Snout-vent length: males 28.7-41.0 (35.57), females 23.2-30.0 (25.96); head length: males 9.8- 13.3 (11.42), females 8.7-10.0 (9.43); head width: males 8.7- 12.1 (10.26), females 7.6-9.8 (8.77); snout width: males 3.2- 5.4 (4.32), females 3.2-3.3 (3.21); tibia length: males 11.0- 14.4 (13.25), females 9.8-12.1; femur length: males 10.0-15.5 (13.1), females 8.7-11.0 (10.02); eye-snout distance: males 4.3-6.5 (4.85), females 3.2-5.4 (3.8); arm length: males 8.7- 13.2 (11.27), females 6.5-10.0; forearm length: males 7.6- 11.0, females 6.5-7.7 (7.2); foot length: males 11.0-16.0 (14.0), females 8.0-12.0 (6.75); hand length: males 8.0-11.0 (9.12).

**Distribution:** Sierra Nevada de Santa Marta, Mamacanaca valley 3270 m; and Pico Simonds 4500 m

**Ecology:** The specimens from Pico Simonds, as noted by the collector John Plyler, "were found in small stream on SE slope near camp 12." Water and air temperature, 8 degrees Celsius. The specimens from Pico Simonds (USNM 211445-50) are smaller on average, darker dorsally and ventrally, and lack the inguinal light area, present in most of the specimens from Mamacanaca. Moreover, they have more warts and granules laterally as well as ventrally. For this ecologically different population inhabiting a higher altitude, darker coloration probably facilitates better heat absorption while the granular or warty skin prevents loss of the heat that at the altitude of 4500 m is a limiting ecological factor.

**Material:** Sierra Nevada de Santa Marta: Magdalena: Mamacanaca valley 3270 m (UMMZ 85600, 28 specimens, AMNH 50965-67); Pico Simonds, 4500 m (USNM 211445-50).

*Atelopus sp. C*

(Map No.17)

**Description:** A small *Atelopus* with flat head, snout sharply acuminate, projecting well beyond the lower jaw in males, and subacuminate and moderately projecting beyond the mouth in females. Canthus rostralis roundish or slightly angular. The dorsum, on each side of the body, with a row of large, slightly squarish glands forming a very thick dorsolateral edge that runs from the posterior corner of the eye to the anus. Sometimes roundish glands also behind the corners of the mouth. Fingers long, slender and free, except for an almost inconspicuous basal web between fingers one and two. One large palmar callus and smaller subarticular tubercles on the base of each finger. Feet webbed, the web indented and covers only 1/2 or 1/3 of the four toe; the free phalanges with narrow fringers. The heel of the adpressed hindlimb reaches between the tympanic region and the posterior corner of the eye. Heels touch when tibiofibulae are parallel to femora and the digit tips reach posterior margin of thigh when the forelimbs are adpressed along the body. Skin of the head smooth but the dorsum, flanks and the upper surfaces of the limbs with irregularly distributed conical warts. Ventrally, the skin aerolate and wrinkled. Several thick skin folds present across the throat behind the angle of the mouth. Color in preserved specimens: Dorsum and venter are light yellow, sprinkled with dark brown dots or spots; sides of the body and limbs are sepia brown. The concealed surfaces of the limbs are dark brown, spotted with yellow.

**Measurements:** Snout-vent length: male 34.3 female 47.7; head length: male 14.3, female 16.5; head width: male 11.0, female 13.2; snout width: male 3.3, female 5.4; tibia length 15.4 female 19.8; femur length: male 16.5, female 19.8; eye- snout distance: male 6.5, female 7.6; arm length: male 11.0, female 16.5; forearm length: male 10.9, female 13.2; foot length: male 15.0, female 19.0; hand length: male 69.0, female 11.0 eye diameter: male 4.3, female 4.4.

**Distribution:** Northwestern part of the Sierra Nevada de Santa Marta; the altitudinal distribution for this species is unknown.

**Ecology:** The only two known specimens have been reported from the paramo region of Río Frío on the northwestern part of the Sierra. I assume that this species occurs below 3000 m. Possibly, this species is sympatric with *Atelopus sp. G*.

**Material:** Sierra Nevada de Santa Marta. Magdalena: Páramo near Río Frío (UMMZ 148808-9).

*Atelopus sp. D*

(Map No. 17)

*Atelopus ignescens* Ruthven, (In part ) 1922. Misc. Publ.Mus. Zool. Univ. Michigan., 8:50.

*Atelopus carrikeri* Rivero, (In part) 1963c. Caribb. Jour.Sci., 3:117.

**Description:** A large *Atelopus* with flat head, longer than broad; acuminate or subacuminate snout, projecting beyond the mouth and with somewhat swollen tip of the snout and lips. Lower jaw extends slightly beyond the nostrils. Interorbital space flat, sometimes slightly concave; nostrils closer to the tip of the snout than to the eye. Eye-snout distance much more larger than eye diameter. Canthus angular; loreal region slightly concave and vertical. Forelimbs long and slender in females, shorter and enlarged in males. The palmar tubercle always very large, and only one small subarticular tubercle at the base of each finger. All fingers and toes with bulbous tips; fingers slender, long and free, usually with a rudimentary basal web between them. In some specimens, the interdigital distance between fingers two and three larger than the distances between fingers one-two or three-four. Thumb pads strongly developed in males. Toes entirely webbed except for the last two phalanges of the fourth toe free and with lateral fringes. Soles with some metatarsal tubercles. When the hind limb is adpressed, the heel reaches the area between shoulder, and axilla. Skin of the dorsum smooth, sometimes with a few large conical warts, usually more conspicuous in the posterior region. Some specimens with a middorsal (vertebral) ridge. In the flanks between the axilla and the groin the skin is rugose or granular or both. Thick dorsolateral edge from snout to groin. At the level of the upper eyelid a thick skinfold. Some individuals present large glandular granules along the lateral edges that extend from the postocular region to the groin. Tympanic region with large warts; middorsal ridge well developed. The skin around the anal region strongly wrinkled and granular. The upper surfaces of limbs usually very granular.

**Color in preserved specimens:** Dorsum is densely spotted with brown on a creamy background color, although some of the individuals, usually adult females, are unicolor light brown. The dark spots when present concentrate on the anterior part of the dorsum to form an X-shaped figure with the upper extension beginning in the supraorbital region. Laterally, a very wide black or dark brown stripe runs from snout to feet. Anal area, forelimbs and hind limbs are dark brown. The latter are usually spotted with cream yellow at least on the lower surfaces. Palms of hands and soles of feet are light cream or light brown. Venter is creamy with large dark, brown spots on throat and belly, sometimes belly is yellowish creamy sprinkled with small dark brown spots.

**Measurements:** Snout-vent length: males 36.5-41.0 (38.9), females 45.4-56.6 (50.82); head length: males 13.2-14.3 (13.48), females 15.4-18.7 (16.5); head width: males 10.9- 11.0 (10.96), females 12.1-14.8 (13.27); snout width: males 3.2-4.3 (3.61), females 4.3-5.4 (4.47); tibia length: males 14.4-18.8 (15.85), females 18.3-21.0 (19.8); femur length: males: 12.2-16.5 (14.88), females 16.5-20.9 (19.18); eye- snout distance: males 5.4-6.6 (6.0), females 6.5-9.7 (7.9); arm length: males 10.9-13.2 (11.83), females 14.3-18.7 (16.81); forearm length: males 9.7-11.0 (10.32), females 11.0-14.3 (12.65); foot length: males 13-16 (15.12), females 20-23 (21.28); hand length: males 8.0-11 (9.37), females 12- 13 (12.28); eye diameter: males 3.2-4.3 (4.02), females 4.3 (4.3).

**Distribution:** Sierra Nevada de Santa Marta. Region of San Lorenzo, Quebrada Viernes Santo from 1500 to 2250 m

**Ecology:** This species occurs on the northwestern part of the Sierra within the cloud forest.

**Material:** Sierra Nevada de Santa Marta. **Magdalena:** San Lorenzo, 1500 m (UMMZ 54575, 2 specimens, 54576); 1900 m (ICN 433, 421, 423-4, 435-6, 438, 446, 2896); Quebrada Viernes Santo, 1524 m (UMMZ 54579-0 paratypes of *A. walkeri*); La Cumbre, 2250 m (UMMZ 63778).

*Atelopus* sp. *E*

(Map No. 18 )

**Description:** Head, flat much longer than broad, snout acuminate, with a swollen tip, and a ridge running from the tip of snout to the upper lip. Canthus rostralis angular; loreal region slightly concave, border of eyelid thick that continues as a thick

dorsolateral edge along the body, and outlined from the tympanic area by large glandular granules. Two palmar tubercles, the outer larger and more conspicuous than the inner. Small subarticular tubercles, the basals larger than the others. Fingers long, free with narrow lateral fringes and bulbous tips. Forelimbs long and slender. Heel of the adpressed hindlimb reaches the shoulder; Toes entirely webbed, except the fourth that is only one third; the free phalanges with lateral fringes; end of the toes with swollen tips. Metacarpal tubercles small. A middorsal ridge well developed. Skin fairly smooth but pustular under the microscope. Many warts present from posterior border of eye to the shoulder; hind limbs and forelimbs very warty. Anal region with granular appearance and many transversal wrinkles.

**Color in preserved specimen:** Entirely black, except for the white tips of the fingers and toes and the white tubercles of the palms and soles.

**Measurements:** Snout-vent length: 51.0; head length: 16.5; head width: 12.2; snout width 4.3; tibia length 20.9; femur length 20.9; eye-snout distance 7.6; arm length 17.6; forearm length 13.2; foot length 19; hand length: 11; eye diameter: 4.3.

**Distribution:** Known only from the northern part of the Sierra Nevada de Santa Marta, Colombia between 1700-2300 m.

**Ecology:** The only known specimen was taken from a zone of cloud forest.

**Material:** Sierra Nevada de Santa Marta. Magdalena: Buritaca, transect, 1700-2300 m, Cuchilla entre el Buritaca y el Guachaca, (ICN: 3430).

*Atelopus* sp. *F*

(Map No. 18)

**Description:** Snout subacuminate and somewhat flat. Canthus rostralis distinct, loreal region concave. One large outer palmar callus and a smaller inner one; small and irregular secondary palmar tubercles between outer callus and the basal tubercles. Palms granular and with some skinfolds; fingers long, slender with a small basal web and very narrow lateral fringes. First and second toes completely webbed, third, fourth and fifth only 1/3 webbed, the free phalanges with lateral fringes; heel of the adpressed hind limb reaches the shoulder or the tympanic area. Anterior dorsocephalic region smooth, with small furrow running from tip of snout to the center of the interorbital region. Most of the individuals with two divergent middorsal ridges on the suprascapular region. Dor-

sum, upper surfaces of limbs and anal region with numerous and large tubercles or warts that sometimes give the specimens a very granular appearance. Ventrally, the chin and the lower surfaces of the limbs smooth. Ventrally the skin covered with small granules. The sides of the body the granules intermediate in size as compared to those on the dorsum and those on the venter.

Color of the preserved specimens: Grayish or grayish yellow above, with blackish or brownish black markings. An oblique interorbital crossband and diverging blackish dorsolateral stripes represent the most common color pattern of this species. Laterally, the body is uniformly grayish, black or brownish black and ventrally sepia yellow or orange yellow, with few to many irregular dark spots. The postanal region is uniformly or almost uniformly dark brown. Extremities above have dark transversal bands of irregular size ; ventrally they can be almost yellow or yellowish sepia with dark lateral spots. Palms and soles are almost always light.

**Measurements:** Snout-vent length: males 41.0 (41.0), females 46.5-60.0 (51.94); head length: males 14.3 (14.3), females 15.4-18.7 (17.15); head width: males 12.1 (12.1), females 9.4-17.6 (14.7); snout width males 4.3 (4.3), females 4.3-6.5 (5.3); tibia length: males 17.7-18.7 (18.2), females 18.7-22.1 (20.55); femur length: males 15.4-15.5 (15.45), females 19.9-22.1 (20.85); eye-snout distance: males 6.5 (6.5), females 6.5-8.7 (8.07); arm length: males 13.2 (13.2), females 15.4-19.8 (17.3); forearm length: males 11.0-12.2 (11.6), females 13.2-16.5 (17.28); foot length: males 18.0 (18.0), females 21-26 (23.3); hand length: males 11.0 (11.0), females 13-18 (15.3); eye diameter: males 4.3 (4.3), females 4.3-5.4 (4.7).

**Distribution:** Known only from Serrania de San Lorenzo, on the northwestern part of the Sierra, between 2250-2600 m.

**Ecology:** Possibly this species occurs along the cloud forest between San Pedro de la Sierra and Serrania de San Lorenzo. This species is sympatric with *Atelopus sp. D* in La Cumbre, Serrania of San Lorenzo.

**Material:** Sierra Nevada de Santa Marta. Magdalena: 5.7 Km E San Pedro de la Sierra. 2300 m (MCZ 88458, UMMZ 63778); 9.5 Km E. San Pedro de la Sierra. 2600 m (MCZ 88453, 88455); La Cumbre 2250 m (MCZ 88456-7, 88459-65).

*Atelopus* sp. *G*

(Map No. 18)

**Description:** Head concave, with the supraorbital region almost indistinct; snout subovoid, somewhat projecting beyond the jaw. The tip of the lower jaw swollen and with a slight protuberance that fits into a notch on the upper jaw. Canthus rostralis roundish and the loreal region concave. Tongue half free, and somewhat pyriform with the posterior part wider than the anterior. Palate smooth, nostrils closer to the tip of the snout than to the anterior corner of the eye. Pupil horizontally elliptical; upper eyelid with a thick edge; the postorbital region slightly swollen and also above the tympanus. Fingers flattened with lateral fringes. First finger distinct. Tips of fingers and toes slightly swollen; two palmar tubercles, the outer larger than the inner, the latter almost indistinct. Small tubercles at the base of each finger; only one subarticular tubercle on the fourth finger. Foot very large; its length to the fourth finger longer than femora. Toes flattened, completely webbed except the fourth; the web indented and on the fourth toe continues as lateral fringe along the last two phalanges. Two metatarsal tubercles, the inner larger than the outer; small but distinct subarticular tubercles. Heel of the addressed hind limb reaches the tympanic area; finger tips of the extended forelimb reach posterior margin of the thigh. Dorsum of head between the eyes with roundish gland-like granules that on the dorsum appear as rounded depressions, like small round craters. Where no craters present, dark color outlines the cell-like crater areas which continue to the protruding ischium area; a small dark central dot present in many of the depressions. A paravertebral ridge on each side of the body begins just behind the interorbital area that diverge posteriorly sloping downwards (as ilia) and converge again forming a protuberance (ischium) well above the cloaca. Cloaca half distance between the ischial protuberance and the posteroventral region. A slightly depressed middorsal line from the snout to the end of the interorbital glandular area continues as a somewhat irregular middorsal line as a ridge or as a depression to the protruding ischial end point near the cloaca.

Laterally warty, many warts with pointed spicules, from the postorbital area to the hind limb and wrinkled between the axilla and hind limb. Warts extend also on the forelimbs. Legs smooth. Venter heavily aerolate and wrinkled; lower jaw with a few crater-like depressions, similar to those on the posterior part of dorsum; a few small warts on the region behind the mouth. Anal region below smooth but with gland-like

granules of different size on the concealed surfaces of limbs; three larger but irregular glands on both sides of cloaca.

**Color in preservative:** Dorsum and upper part of the limbs are brownish sepia, irregularly spotted with darker brown spots or dots. Interorbital region has dark brown arrow-shaped figure pointing backwards that continues as an irregular narrow dark brown vertebral line. Laterally, the head is yellowish white, spotted with light brown; gular area is mottled with yellow and brown and the tympanic area is dark brown. Lateral and ventral parts of the body are dark grayish brown with the glands and warts light grayish brown with light yellowish tubercles. The cloacal opening is white and a few large glands on both sides of the cloaca are yellowish.

**Measurements:** Snout-vent length: 57.6; head length: 19.8; head width: 16.5; snout width: 6.5; tibia length: 21.0; femur length: 23.2; eye-snout distance: 9.7; arm length: 15.4; forearm length: 14.3; foot length: 27.6; hand length: 17.6; eye diameter: 4.3.

**Distribution:** Known from the northwestern part of the Sierra Nevada de Santa Marta, around 3500 m.

**Ecology:** This species has been reported from the paramo region of Rio Frio on the northwestern part of the Sierra. I assume that this species occurs around 3500 m. Possibly this species is sympatric with *Atelopus sp. C*.

**Material:** Sierra Nevada de Santa Marta. **Magdalena:** Pa'ramo near Río Frío, approx. 3500 m (UMMZ 148807).

*Atelopus* sp. **H**

(Map No. 18)

**Description:** Head flat, longer than broad, snout subacuminate, with swollen tip. Eye diameter less than snout width. Tongue narrow 3/4 free from behind in form of an obtuse eight; canthus rostralis rounded; loreal region concave, border of eyelid with somewhat thick edge. Tympanum absent; two small subarticular tubercles on the base of each finger. Two palmar tubercles, the outer larger than the inner. Fingers free, long, and somewhat flatten, with bulbous tips. First finger with a small oval pad; forearm enlarged and flatten; the heel of the adpressed hindlimb reaches the shoulder; toes entirely

webbed, except the fourth that is almost half free, the free phalanges with lateral fringes. The web is indented; the toes with swollen tips. Metacarpal tubercles absent, but with minute subarticular tubercles. Dorsum from the tip of snout to the anal region, flanks, arms and entire hind limbs smooth. Tympanic area conspicuously warty; small warts extend ventrally to the neck and to the dorsal region of the forearm. Gular and ventral part of the body with shallow wrinkles and the ventral part of the anal region wrinkled and slightly aerolate.

**Color in preservative:** There is a significant variation in the color pattern. Dorsum may be uniformly brownish black above including the upper surfaces of limbs. Venter creamy yellowish and immaculate, including the lower surfaces of the limbs, but in some specimens the venter is yellowish with large and irregular dark gray midventral area that begins from the left lower lip and continues to the buttocks. The latter also uniformly dark gray. One specimen is dark sepia above with an irregularly dark brown midvertebral area and with large cross bars on the dorsal and ventral part of the limbs. The venter is lemon yellowish with large roundish black spots and the postanal region is black. Palms are uniformly yellow; and the feet are yellow with a large irregular blackish spot. Tips of fingers and toes are irregularly blackish.

**Measurements:** (Only males are known). Snout-vent length: 37.6-43.2 (39.7), head length: 13.2-14.3 (13.48); head width: 11.0 (11.0); snout width: 3.2-5.4 (4.7); tibia length: 14.3-16.1 (15.3); femur length: 14.3-16.1 (15.6); eye-snout distance: 4.3-5.4 (4.8); arm length: 11.0-13.3 (12.50); forearm length: 10.9-11.0 (11.0); foot length: 14-18 (15.7); hand length: 10-11 (10.3) eye diameter: 4.3.

**Distribution:** This species has been reported from San Sebastián de Rábago on the eastern part of the Sierra.

**Ecology:** This is the only species of *Atelopus* known from the eastern part of the Sierra, and occurs in the cloud forest, around San Sebastián at 2000 m.

**Material:** Sierra Nevada de Santa Marta. **Magdalena:** San Sebastián de Rábago, 3 km, W near pantano 2000 m (CM 91234-6).

### Key to the species of *Bufo*

1. Parotid gland small and triangular ..... 2  
 1' Very well developed parotid gland... ..... *B. marinus*

2. Tubercles on the top of the head flatter and smaller than those on the body .....  
 .....*B. granulosus humboldti*  
 2' Tubercles on the top of the head larger than those on the body ..... *B. granulosus beebei*

*Bufo granulosus beebei* Gallardo

(Map No. 19)

*Bufo granulosus* Ruthven, 1922. (In part) Misc. Publ. Mus. Zool. Univ. Michigan., 8:55.

*Bufo granulosus beebei* Gallardo, 1965. Bull. Mus. Comp. Zool. 134: 114. **Type locality:** Churchill-Roosevelt hwy., Trinidad. Cochran and Goin, 1970. Bull. U.S. Natl. Mus., 288: 97.

**Description:** Body stout; head elongated somewhat depressed. Snout rounded; canthus rostralis concave, loreal region concave. Tympanum large and distinct. Cephalic crests with smooth borders, extend from tip of the snout, along the canthus rostralis, around the eye and the tympanum. Another canthal crest present on the parietal region. Fingers free, slightly long with narrow lateral fringes. Thumb pad present. One large palmar callus, metacarpal tubercles distinct. Toes relatively short 1/4 webbed, two metatarsal tubercles, the outer smaller. Well developed skinfold on heels and knees. Adpressed heel of the hindlimb reaches the axilla; when limbs laid along the sides of the body knee and elbow are very well separated. Skin above, granular or tubercular, the tubercles on the top of the head and along the dorsolateral region larger than those on the body; parotid gland small and triangular in shape. Venter finely granular with transversal wrinkles on the posterior part of the belly; the parotid region slightly warty. External vocal sac in males.

In preserved conditions the dorsum is brown with two dark brown spots on the shoulders, and dark patches on the sacrum. Limbs with dark spots; venter light immaculate.

**Measurements:** (only one mature male is known). Snout-vent length: 44.

**Distribution:** Venezuela, Colombia and Trinidad. The only known specimen from Sierra Nevada de Santa Marta, was reported from Gaira, at sea level.

**Ecology:** In Sierra Nevada de Santa Marta this species occurs in the xerophytic lowland scrub forest at 0 m.

**Material:** Sierra Nevada de Santa Marta. Magdalena. Gaira, 0 m (UMMZ 45527).

*Bufo granulosus humboldti* Gallardo

(Map No. 19)

*Bufo granulosus* (Not of Spix): Cope, 1899. Scient. Bull. Mus. Phila. 1:1.

*Bufo granulosus*: Ruthven, 1922. (In part) Misc. Publ. Mus. Zool. Univ. Michigan., 8: 55.

*Bufo granulosus humboldti* Gallardo, 1965. Bull. Mus. Comp. Zool., 134: 117. **Type locality:** Gualanday, W. of Girardot, Tolima, Colombia. Cochran and Goin, 1970. Bull. U.S. Natl. Mus., 288:98.

**Description:** Body stout; snout short, rounded, the upper jaw extending beyond the lower; canthus rostralis curved; loreal region concave. Eyes large and prominent. Tympanum distinct. Cephalic crests well marked. Fingers somewhat long with lateral fringes, slightly webbed at the base. One large palmar callus, and metacarpal tubercles present. Toes moderately long 1/2 webbed; two metatarsal tubercles, the outer smaller. Well developed skinfold on heels and knees; soles granular. Adpressed heel of the hindlimb reaches the axilla; if limbs laid along the sides of the body knee and elbow are slightly separated. Skin above, granular or tubercular, but the tubercles on the top of the head flatter and smaller than those on the body; parotid gland, small and triangular in shape. Venter with very small granules and somewhat transversal folds on the belly; a short glandular ridge from the posterior corner of the eye to the parotid region. On the top of the head, on each side a narrow crest extends from the nostrils to the anterior part of the eye and around the supraorbital area and extends to the occipital region. In some specimens a second ridge extends from the tip of the snout, outlining the upper labials, to the anterior corner of the eye.

In preserved conditions the dorsum is brown, irregularly spotted with dark brown. Sometimes there is a transversal dark brown band on the interorbital region; the limbs have transverse dark bands; the venter is light brown, sometimes immaculate or spotted with dark brown.

**Measurements:** Snout-vent length: males 36.6-59 (55.5), females 53.6-64.5 (57.7).

**Distribution:** Panama, Colombia and Venezuela. In Sierra Nevada de Santa Marta this species is found in the northern, northwestern and southeastern part, from sea level to 250 m.

**Ecology:** The distribution of *B. g. humboldti* in Sierra Nevada de Santa Marta is associated with the hydrographical network in the lowland around the massif. This observation partly confirms Gallardo's conclusion that the occurrence of each subspecies is correlated with the basins of the main rivers within the total range of distribution of the whole group.

**Material:** Sierra Nevada de Santa Marta. Cesar: Valencia, 100 m (UMMZ 54637); Valledupar, 206 m (UMMZ 54635-6). Magdalena: Aracataca, 60 m (ANSP 19731); Bonda, Finca El Arananar, 45 m (USNM 152735-49); Curumaní 100 m (MCZ 21499); Fundación, 60 m (MCZ 8978, paratype, UMMZ 45523, 48202-7, 48209); Lower Rio Manzanares between Santa Marta and Mamatoco, 30-60 m (USNM 150892); Mamatoco, 30-60 m (UMMZ 45524, 45526, 48208); Río Frío, < 50 m (MCZ 16052, 16054, 21499); Santa Marta, 4 m (MCZ 8977).

*Bufo marinus* (Linnaeus)

(Map No. 19)

*Rana marina* Linnaeus, 1758. Syst. Nat. Ed. 10., 1: 211. **Type locality:** America.

*Bufo marinus:* Ruthven, 1922. Misc. Publ. Mus. Zool. Univ. Michigan. 8: 54. Cochran and Goin, 1970. Bull. U.S. Natl. Mus., 288:105.

**Description:** Body stout, snout rounded; canthus rostralis angular, loreal region concave. Tympanum large and distinct. Top of head with very distinct ridges. Fingers free, long with lateral fringes. Thumb pad present. One large palmar callus, metacarpal tubercles well developed. Toes long, 1/3 webbed, two metatarsal tubercles, the inner smaller. Well developed skinfold on heels and knees. The adpressed heel of the hindlimb reaches the shoulder; when limbs are laid along the sides of the body knee and elbow are separated. Skin above, granular or warty. Top of the head with very few granules. Parotid gland, large and triangular in shape. Venter finely granular with transversal wrinkles on the throat, and lower part of the belly; parotid region with large granules.

Males have smaller but more numerous dorsal granules than females. External vocal sac present in males.

In preserved specimens and in life, the dorsum is sepia brown with darker spots around some of the tubercles or granules. Top of the head and dorsum of the same color with some dark brown patches at least in the interorbital region; dark brown spots outline the cephalic ridges. Limbs with dark spots; venter lighter, somewhat reticulated with brown.

**Distribution:** From southern Texas, through tropical Mexico, Central America and northern South America. In Sierra Nevada de Santa Marta it has been found in the northwestern part from sea level to 1530 m.

**Ecology:** A very common and widely distributed species that has become adapted to many different environments. It occurs in the xerophytic lowland scrub forest, in the humid evergreen seasonal forest, as well as in the cloud forest. Usually, the eggs are deposited in unconstrained bodies of water where tadpoles develop to the adult stage; clutches are large.

**Material:** Sierra Nevada de Santa Marta. Magdalena: Alto de Mira, 1080 m (Observed); between Aguadulce and La Victoria (UMMZ 45400); between Aguadulce and Minca, (UMMZ 45500, 45503, 45510, 45513-17); Bonda, 45 m (CM 2633); Fundación, 60 m (UMMZ 45491, 45501-02, 45505-06, 45522); between La Tigrera and Minca, 180-600 m (UMMZ 45508-09, 45511); La Victoria, 900 m (UMMZ 45493); between Mamatoco and La Tigrera, 700 m (UMMZ 45507); Minca, 625 m (ANSP 19702-3, UMMZ 45512, 45518); San Lorenzo, 1350 m (UMMZ 454989-90, 45494-98, 45504, 45519-21).

### 3. Family Dendrobatidae

#### *Colostethus* sp A

(Map No. 20)

*Phyllobates subpunctatus*: Ruthven, 1922. Misc. Publ. Mus. Comp. Zool. Univ. Michigan, 8:49.

**Description:** Snout subovoid dorsally, short and truncate in profile; head as broad as the body; canthus rostralis rounded; loreal region flat, nostrils lateral, closer to

the tip of the snout than to the eye. Vomerine teeth absent. Tympanum large, slightly distinct; eye large, and prominent, its diameter larger than its distance from tip of snout. Fingers long, slender and free, phalanges with narrow lateral fringes; first finger of equal length as the second. Fingers with bilobed bulbous tips. Two metacarpal tubercles, the outer rounded and larger than the inner which is elongate. Subarticular tubercles, conical, and distinct. Toes free; one weakly developed metatarsal tubercle, subarticular tubercles weakly developed or absent. One slightly elevated oblique tarsal ridge from thumb to the middle of the tarsus. Third toe longer than fifth. The heel of the adpressed hindlimb reaches a point between the tympanic region to the middle of the eye.

Skin of the dorsum smooth, slightly pustular under the microscope. Ventrally, smooth except the anal region which is granular.

In preservative the dorsum is light brownish, yellowish or rarely black brown. All specimens have two dorsolateral darker stripes from tip of snout to the groin. In some individuals the upper border of these stripes are outlined by a white line from shoulders to groin. Flanks and dorsum of limbs slightly reticulated with dark brown. Venter and lower surfaces of limbs uniformly sepia.

Live specimens have the dorsum green yellowish or brown yellowish with two dorsolateral black stripes that run from tip of the snout to the sacral region. Each of these bands is outlined by golden lines. Flanks are slightly lighter than the dorsum.

**Measurements:** Snout-vent length: males 18.2-20.5 (19.5), females 19.3-23.4 (20.75); tibia length: males 9.0-10.6 (9.6), females 9.2-10.6 (9.6), femur length: males 8.8-9.7 (9.3); females 9.3-10.2 (9.5).

**Distribution:** Species restricted to the Sierra Nevada de Santa Marta, where it has been reported from the northern and northwestern part.

**Ecology:** This species occurs in the cloud forest of San Lorenzo, between 600-1650 m. It is abundant near water and in the clearings of the forest. The eggs are deposited on land and the tadpoles are carried by the males.

**Material:** Sierra Nevada de Santa Marta. Magdalena: Don Diego, (UMMZ 48270); Minca, 600 m (UMMZ 45477); between Minca and Aguadulce, 900 m (UMMZ 45476); San Lorenzo, 1350 m (UMMZ 45470(3)-72(2), 45473 exch with CAS, 45474-75, 45478 (1 male and 15 tadpoles, 45479 1 male and 11 tadpoles, 45480 1 male and 3 tadpoles, 45481 1 male, 4 tadpoles, 54615-16); San Lorenzo, hacienda Cincinnati, 1524-

1530 m (UMMZ 46792-94, 48194); San Miguel, 1650 m (UMMZ 48269(3)) San Lorenzo, 1630 m (ANSP 19766); San Lorenzo, Quebrada Viernes Santo, 1524 m (UMMZ 54617-18); La Tagua, 1700 m (ICN uncataloged specimens).

*Dendrobates truncatus* (Cope)

(Map No. 20)

*Phyllobates truncatus* Cope, 1869 "1868". Proc. Acad. Nat.Sci. Philadelphia, 20:312.

**Type locality:** Magdalena river, New Granada [=Colombia].

*Phyllobates lugubris*: Cochran and Goin, 1970. Bull. U. S. Natl. Mus. 288:19.

*Dendrobates truncatus*: Silverstone, 1975. Sci. Bull. Natl. Hist. Mus. Los Angeles. Co. 21:49.

**Description:** A member of the *tinctorius* group. Snout blunt and rounded at the tip dorsally, rounded in profile. Upper jaw extending beyond the lower. Canthus rostralis rounded, loreal region usually flat, sometimes slightly concave. Tympanum rounded and small. Fingers long, slender and free with large disks. First finger slightly shorter than the second. One rounded, distinct, palmar tubercle. Subarticular tubercles well developed. Toes long, free; third toe longer than the fifth. Two small conical and prominent metatarsal tubercles, outer elongate and larger than the inner; small subarticular tubercles. Skin of the upper surfaces slightly granular under the microscope. Skinfolds present on the flanks. Below, the skin smooth but the anal region and the thighs heavily aerolate. The heel of the adpressed hindlimb reaches the posterior corner of the eye.

In preservative the dorsum is black, with light dorsolateral stripes. The venter is black, reticulated with light bluish.

**Measurements:** Snout-vent length: 23.5-31.1 (26.8); tibia length: 9.8-12.1 (10.9); femur length: 10.1-13.2 (11.3).

**Distribution:** Río Magdalena drainage and the Caribbean coast of Colombia; lowlands around the central and western Andes, west to the Golfo de Uraba, Colombia. In Sierra Nevada it has been reported from the northwestern part from sea level to 300 m.

**Ecology:** This is a diurnal species that inhabits the humid evergreen seasonal forest. Probably, this species occurs near streams around Rio Frio, which is a highly xero-

phytic region. It is known that small, still bodies of water in bromelids, or tree holes, are used as tadpole release sites. (Silverstone, 1975).

**Material:** Sierra Nevada de Santa Marta. **Magdalena:** Parque Nacional Tayrona, 230-290 m (AMNH 88578-79), Río Frío, < 50 m (MCZ 16059-64).

#### 4. Family Hylidae

##### *Cryptobatrachus boulenger* Ruthven

(Map No. 21)

*Cryptobatrachus boulenger* Ruthven, 1916e. Occas. Pap. Mus. Zool. Univ. Michigan, 33:2. **Type locality:** San Lorenzo, Department of Magdalena, Colombia. Barbour and Loveridge, 1929. Bull. Mus. Comp. Zool., 69(10):245. Dunn, 1944c. Caldasia, 517. Peters, 1952. Occ. Pap. Mus. Zool. Univ. Michigan, 539:12. Goin, 1961. Ann. Carnegie Mus., 36(2):8. Cochran and Goin, 1970. Bull. U.S. Natl. Mus., 288:161. Rivero, 1966. Carib. J. Sci., 6(3-4): 137.

*Hyloscirtus boulengeri*: Noble, 1917. Bull. Amer. Mus. Nat. Hist. 37(30):805.

*Cryptobatrachus fuhrmanni*: Ruthven, 1922. Misc. Publ. Mus. Zool. Univ. Michigan, 8:55.

**Description:** A member of the *fuhrmanni* group. Snout subovoid, triangular in dorsal view, rounded in profile. Canthus rostralis distinct, loreal region concave; vomerine teeth transverse and straight between the choanae in two series separated by a gap less than 1/3 the width of the odontophore. Tympanum large and round. Fingers free, slender, with very large terminal disks. Fourth finger considerably longer than the second. Toes 1/2 webbed. Two distinct metatarsal tubercles, the outer larger than the inner. Skin of dorsum and top of head smooth in small specimens but strongly warty in larger specimens. Supratympanic fold well developed; tympanic area warty; the warts sometimes extend from posterior corner of the eye to the shoulder. Ventrally, the skin of chin and throat smooth, and the belly granular or aerolate. The heel of the adpressed hindlimb reaches beyond the tip of the snout.

The color in life is dark green, yellowish or brownish above with dark brown patches irregularly distributed. Usually there is a dark brown interorbital band. The

supratympanic fold is black. Ventral surfaces are creamy light, and the limbs are banded with brown.

**Measurements:** Snout-vent length: 30-40.1 (34.5); tibia length: 17.3-24.2 (19.8); femur length: 19.5-26.3 (25.7).

**Distribution:** Restricted to Cerro San Lorenzo on the northwestern part of Sierra Nevada de Santa Marta.

**Ecology:** This species occurs in the cloud forest of San Lorenzo, along the streams between 680 to 1550 m. The adults are usually found under leaves and among rocks. The females of this genus carry 20-33 eggs in small depressions on their backs; the larvae present bell-shaped gills, short filamentous tails, and complete their development inside the egg. The young frogs at the time of hatching are tailless and about 10 mm long.

**Material:** Sierra Nevada de Santa Marta. Without additional data (UMMZ 47407, 47408(30)-09); **Magdalena:** Alto de Mira, Caño Rio Julepia, 780 m (ICN Uncataloged specimens); Cincinnati, 1524-1530 m (UMMZ 48300, 48530, holotype, 48531-35, 48537-38, paratypes, 54622, 54631-33, 54638); Finca de Francisco Paredes, border of Río Guachaca, 680 m (ICN Uncataloged specimens); Macho solo, caño La Danta, 800 m (ICN Uncataloged specimens); Quebrada Viernes Santo, 1524 m (UMMZ 54627-28); Quebrada Hueva Santa { Quebrada Viernes Santo ?}, (UMMZ 54629); San Lorenzo, 1250 m (UMMZ 48614-15, 48617, 54620-21, 54623-25).

### Key to the species of *Hyla*

1. Small frogs, less than 3 cm long, dorsum sepia brown with dark brown longitudinal or oblique stripes or with dark brown reticulation ..... *H. microcephala microcephala*
- 1' Large frogs, more than 3.5 cm long; color pattern not as above ..... 2
2. First finger with a large basal membrane; entire venter heavily granular ..... *H. pugnax*
- 2' First finger free, without basal membrane; venter only partially granular, mostly on the posterior part of the body ..... 3
3. Dorsum with dark brown diffuse patches and usually an irregular dark grayish brown middorsal patch ..... *Hyla crepitans*
- 3' Dorsum sepia brown with minute or small dark brown dots; no middorsal dark patch .....4
4. Canthus rostralis well distinct; fingers only with a trace of web ..... *Hyla cf. punctata*
- 4' Canthus rostralis almost indistinct; several fingers completely webbed ..... *Hyla sp. A*

*Hyla crepitans* Wied-Neuwied

(Map No. 21)

*Hyla crepitans* Wied-Neuwied, 1824. Abbild. Naturgesch.rasil. 47. **Type locality:** Tam-  
buril, Jiboya and areal daConquista, Bahia Brasil. Ruthven, 1922 (in part). Misc.Publ.  
Mus. Zool. Univ. Mich., 8: 55. Cochran and Goin, 1970 (in part). Bull. U.S. Natl. Mus.  
288: 192. Kluge, 1979. Occas. Pap. Mus. Zool. Univ. Michigan., 688: 7.

**Description:** A member of the *boans* group. Snout subovoid, in dorsal view,  
rounded in profile. Canthus rostralis rounded, loreal region flat; vomerine teeth in two  
arched series between the choanae. Tympanum large and round; supratympanic fold dis-  
tinct. First finger free, the other three 1/3 webbed, all with very large terminal disks.  
First finger shorter than second; external rudiment of plex. A slightly developed fold  
from elbow to wrist. Subarticular tubercles well developed. Toes completely webbed.  
Inner distinct metatarsal tubercle, the outer absent. A tarsal fold present. Skin of dorsum  
and top of head smooth. Tympanic area slightly aerolate. Ventrally, the skin of chin and  
throat smooth, and the belly, under surfaces of thighs and anal region granular. The heel  
of the adpressed hindlimb reaches slightly beyond tip of the snout.

The color in life is light brown above, heavily spotted with minute dots, and with  
dark brown diffuse patches. Usually there is a grayish brown middorsal patch, irregular  
in size and shape. Flanks are lighter with many dark brown transversal lines. Ventral sur-  
faces are creamy light. Concealed surfaces of limbs are striped with brown.

**Measurements:** Snout-vent length: males 45.0-52.2 (50.15), females 51.6-58.4  
(55.6); tibia length: males 27.1- 31.7 (30.0), females 31.0-33.4 (32.3); femur length:  
males 26.6-31.3 (28.6), females 31.0-32.0 (31.3).

**Distribution:** Central and northeastern Brazil, Guianas, northern Colombia and  
Venezuela, eastern Panama, northern Honduras. In Sierra Nevada de Santa Marta, it is  
found in the northwestern part below 300 m.

**Ecology** They are characterized by an extremely pugnacious behavior and well  
developed spines for fighting; Breder (1946) and Lutz (1960), studied the aggressive be-  
havior exhibited by the males in defense of their mud nests. The species is usually found  
in the xerophytic scrub forest and in disturbed areas; it breeds in shallow temporal ponds

at the margins of the forest. In Bonda and Fundacion the species is sympatric with *H. pugnax*.

**Material:** Sierra Nevada de Santa Marta. **Magdalena:** Ariguani, near Guatipurí river, (UMMZ 85599); Bonda, Finca El Aranan, 45 m (USNM 152713, 152717-33); Finca de Francisco Paredes, rio Guachaca, 680 m (ICN Uncataloged specimens); Fundación, 60 m (UMMZ 46913); Konkusgena, 2000 m (ICN Uncataloged specimens); La Concepcion, 1000 m (MCZ 2324-25); Minca-Cincinnati, 1530 m (ICN 3777-8); Minca, San Lorenzo 1600 m (ICN 3863); Palomina, 1500 m (MCZ 2326-31, UMMZ 48302); Parque Nacional Tayrona, trail between Cañaverál & El Pueblito, 230-290 m (NS 80); Parque Nacional Tayrona, within 2 km. El Cedro station, (NS 197-87); Pueblo Bello (CAS 116214-20); Rio Frio, < 50 m (MCZ 16051); Santa Marta, 0 m (MCZ 2326-8, 2330).

*Hyla microcephala microcephala* Cope

(Map No. 21)

*Hyla microcephala* Cope, 1886. Proc. Am. Philos. Soc., 23:281. **Type locality:** "Chiriqui" Panama. Cochran and Goin, 1970. Bull. U. S. Natl. Mus., 288: 280.

*Hyla underwoodi*: Ruthven, 1922. Misc. Publ. Mus. Zool. Univ. Michigan., 8:55.

**Description:** A member of the *Hyla microcephala* group. Snout subovoid, slightly truncate in dorsal view, round and truncate in profile; vomerine teeth in two series lying close to each other between the small choanae. Nostrils lateral, close to tip of the snout; canthus rostralis indistinct; loreal region slightly concave. Tympanum small but distinct; eye large and prominent. First finger free, the others with a basal web. The free phalanges with narrow lateral fringes. Subarticular tubercles small, conical and conspicuous. One large inner palmar tubercle, the outer absent. Fingers and toes with large terminal disks. Toes 2/3 to fully webbed; the web indented. One inner, slightly distinct, metatarsal tubercle. A lateral ridge on the inner side of the tarsus. The heel of the adpressed hindlimb reaches a point between the eyes and the nostrils. Males with external vocal sac. Skin of dorsum and flanks somewhat aerolate; ventrally, the chin smooth and the venter heavily granular. Lateral skinfolds present.

The color in preservative is sepia above, finely spotted with dark brown dots. In some specimens there are two or more longitudinal dark brown stripes that extend from

the interorbital region to the sacrum; or sometimes, the dorsum is light sepia, irregularly reticulated with darkish brown. Venter and lower surfaces of limbs are usually light yellowish or creamy white.

**Measurements:** Snout-vent length: males 22.4-26.3 (25,3), females 23,1-27,0 (25.6); tibia length: males 10.4-14.0 (12.8), females 11.6-14.2 (13.3); femur length: males 10.4- 13.0 (12.6), females 11.6-12.6 (12.2).

**Distribution:** Southeastern Mexico, Central America, northern and eastern South America, to southeastern Brazil. In Sierra Nevada de Santa Marta, it is found in the lowlands around the massif in the eastern and northwestern part.

**Ecology:** This species occurs in the region of the lowland xerophytic, scrub forest, below 100 m.

**Material:** Sierra Nevada de Santa Marta. Magdalena: Aracataca, 60 m (ASNP 19755-57); Curumaní, 100 m (USNM 118247-48); Fundación, 60 m (UMMZ 48281-82).

*Hyla pugnax* O. Schmidt

(Map No. 22)

*Hyla pugnax* O. Schmidt, 1857. Sitzungsber. Akad. Wiss. Wien. Math. Naturwiss. Kl., 24:11. **Type locality:** "Along the Chiriquí river not far from Bocas del Toro, Panama".

Kluge, 1979. Occas. Pap. Mus. Zool. Univ. Michigan., 688: 11.

*Hyla crepitans:* Ruthven 1922 (In part). Misc. Publ. Mus. Zool. Univ. Michigan. No 8: 55. Cochran and Goin, 1970 (In part). Bull. U.S. Nat. Mus., 288:192.

**Description:** A member of the *boans* group. Snout subovoid, in dorsal view, rounded in profile. Canthus rostralis rounded, loreal region slightly concave; vomerine teeth in two series between the choanae. Tympanum large and round; supratympanic fold distinct. First finger with a large basal membrane, the other three 1/3 webbed; free phalanges with lateral fringes; all fingers with very large terminal disks. First finger shorter than second; a moderately projecting rudiment of a plex. A slightly developed fold from elbow to wrist. Subarticular tubercles conical and well developed. Toes completely webbed. One inner distinct metatarsal tubercle, the outer absent. A tarsal fold weakly developed; subarticular tubercles conical and prominent. Skin of dorsum and top of head

smooth, shagreened under the microscope. Flanks with many skinfolds. Ventrally, the skin heavily granular, larger granules around the anus. The heel of the adpressed hindlimb reaches the tip of the snout.

The color in preservative is light brownish above with some scarcely distributed dark brown spots, and with grey brownish diffuse patches that form a dorsal reticulation. Flanks lighter than dorsum with several dark brown transversal lines. Ventral surfaces are yellowish, and the concealed surfaces of hindlimbs are striped with brown.

**Measurements:** Snout-vent length: males 65.9-73.3 (72.3), females 64.8-72.4 (71.6); tibia length: males 37.1-40.7 (39.2), females 35.0-40.4 (39.3); femur length: males 36.6- 40.3 (38.6), females 36.3-41.1 (38.5).

**Distribution:** Central Panama, Caribbean lowlands and valleys of the Rio Cauca and Río Magdalena in Colombia. In Sierra Nevada de Santa Marta it is found in the northern, and northwestern part, below 200 m.

**Ecology:** This is a lowland species that in Sierra Nevada de Santa Marta occurs in the flood plains in the xerophytic scrub forest. In the northwestern part of the massif it is sympatric with *H. crepitans*.

**Material:** Sierra Nevada de Santa Marta. Guajira: Arroyo de Arenas, rio Barba-coa, 0 m (UMMZ 54619). Magdalena: Aracataca, 60 m (ANSP 19779); Bonda, Finca El Arandar, 45 m (USNM 152715-6); Curumaní, 100 (MCZ 21475-79, 21483); Fundación, 62 m (UMMZ 46908-12, 469014-21); Río Frío, < 50 m (MCZ 16051).

*Hyla cf. punctata*

(Map No. 23)

*Calamita punctata* Schneider, 1799. Hist. Amph., 1:170. **Type locality:** "Surinam".

*Hyllela pearsei* Ruthven, 1922. Misc. Publ. Mus. Zool. Univ. Mich., 8:57. **Type locality:** Colombia, Magdalena, Santa Marta Mts., Fundación. Cochran and Goin, 1970. Bull. U.S. Natl. Mus., 288:222.

**Description:** Snout subovoid, slightly truncate in profile; Nostrils lateral, close to tip of the snout; canthus rostralis distinct; loreal region concave. Tympanum inconspicuous; eyes prominent. Fingers with basal web. The first shorter than second. Fingers and toes with large terminal disks. The heel of the adpressed hindlimb reaches a point be-

tween the eyes and the nostrils. Skin of dorsum and flanks smooth; the venter heavily granular. Lateral skinfolds present. The color in preservative is light brown, finely spotted with dark brown dots.

**Measurements:** Snout-vent length: 14 mm; head length: 4.9 mm; femur length 7.3

**Remarks:** Cochran and Goin, (1970) synonymized *Hyla pearsei* and *Hyla punctata* based on the examination of the type specimen (UMMZ 54369) indicating that this is an immature specimen. Duellman, (1974) agreed that this is a juvenile specimen, but he was not convinced that it represents *H. punctata*. His argument was based on zoogeographic grounds, because Santa Marta is far away from the known distribution of *Hyla punctata*. As the type specimen agrees with *Hyla punctata*, I provisionally included *H. pearsei* in its synonymy.

**Distribution:** Amazon and Orinoco basins; Brazil; Chaco of Paraguay and Argentina; Guianas, northern Colombia and Trinidad. In Sierra Nevada de Santa Marta, the species occurs in the lowlands of the northwestern part below 100 m.

**Ecology:** The only known specimen was collected "in tall grass in an open marsh" Ruthven, 1922.

**Material:** Sierra Nevada de Santa Marta. **Magdalena:** Fundación, 60 m (UMMZ 54639, type of *Hylella pearsei*).

*Hyla sp A*

(Map No. 22)

**Description:** Snout subovoid, in dorsal view, rounded in profile. Canthus rostralis indistinct, loreal region flat; vomerine teeth in two series between the choanae, separated by a gap equal to the width of the odontophore. Tympanum large and round; supratympanic fold distinct. First finger free, the other three 1/3 webbed, free phalanges with a narrow fringe; all fingers with very large terminal disks. First finger shorter than second and second and fifth of equal size; external rudiment of plex. A slightly developed fold from elbow to wrist. Small supernumerary palmar tubercles; subarticular tubercles conical and well developed. First and fifth toes 1/3 webbed, second, third and fifth toes completely webbed; free phalanges with lateral fringes. Inner distinct

metatarsal tubercle, the outer absent. A tarsal fold present. Skin of dorsum and top of head smooth. Tympanic area slightly aerolate. Ventrally, the skin of chin and throat with very fine granules; the belly, under surfaces of thighs and anal region with larger granules. The heel of the adpressed hindlimb reaches slightly beyond the tip of the snout.

The color in preservative is light sepia brown above, heavily spotted with minute dark brown dots. Flanks lighter than dorsum with irregular, oblique brownish black lines. Ventral surfaces creamy light. Posterior surfaces of thighs with poorly defined brown stripes. A supraanal white border.

**Measurements:** Snout-vent length: 43.3; tibia length: 25.4; femur length: 25.4.

**Distribution:** Restricted to the northwestern part of the Sierra Nevada de Santa Marta.

**Ecology:** The only known specimen was collected in the cloud forest of San Lorenzo, Cincinatti, at 1530 m.

**Material:** Sierra Nevada de Santa Marta. Magdalena: Minca-Cincinatti, 1530 m (ICN 3960).

*Phrynohyas venulosa* (Laurenti)

(Map No. 22)

*Rana venulosa* Laurenti, 1768. Synops. Rept., 31. **Type locality:** Restricted by Duellman, 1956. to Lago Tefte, at the mouth of rio Tefte, where it empties into the Rio Solimoes, Amazonas, Brazil.

*Hyla venulosa:* Ruthven, 1922. Misc. Publ. Mus. Zool. Univ. Michigan., 8: 55.

**Description:** Snout short and rounded. Canthus rostralis slightly defined and loreal region concave; tympanum very distinct about 3/4 the eye diameter, and encircled by a supratympanic fold. Fingers short and robust, about 1/2 webbed and with large discs. The diameter of the disc of third finger larger than the diameter of the tympanum. First finger shorter than second. Subarticular tubercles small but prominent; palmar tubercles absent. Toes three fourths webbed, the web of the fourth toe reaching the penultimate phalanx. A elongate distinct, inner and a small rounded, outer metatarsal tubercles. Skin of the dorsum with scattered glandular granules, more evident on the

posterior part of the dorsum; flanks and tympanic region glandular. ventrally, the skin of the throat, chest and belly, and lower surfaces of limbs strongly granular. Heel of the adpressed hindlimb reaches the eye.

Color in preservative is dorsum light brown with a dark brown stripe from the interorbital area to the sacrum. Limbs with two dark brown transversal bands; ventral surfaces are light brown as the dorsum.

**Measurements:** Snout-vent length: 76.5; head length: 25.2; head width: 23.5; tibia length: 34.0; femur length: 35.3.

**Distribution:** Lowlands of Mexico, Central America, to Colombia, Venezuela and Amazon basin in Brazil, Guianas, and Paraguay. In Sierra Nevada de Santa Marta, it occurs in the lowlands of the northwestern part, at 60 m

**Ecology:** The only known specimen was collected from the xerophytic scrub forest of Fundacion. Breeding takes place in shallow and temporary ponds. Some social organization has been reported by Duellman (1970) for some populations in Costa Rica. Due to whitish and venomous secretions of the skin, it is known in some parts of South America as "rana lechera".

**Material:** Sierra Nevada de Santa Marta. Magdalena: Fundación, 60 m (UMMZ 48263).

### *Phyllomedusa sp. A*

(Map No. 24)

*Phyllomedusa tarsius:* Ruthven, 1922. Misc. Publ. Mus. Zool. Univ. Michigan., 8:57.  
Cochran and Goin, 1970. Bull. U.S. Natl. Mus. 288: 340.

**Description:** Head much broader than long; snout rounded in dorsal view, short, roundish and truncate in profile. Tongue entire, elongate, slightly notched posteriorly and free from behind; vomerine teeth in two oblique rows between the large choanae. Eye diameter greater than the distance between the eye and nostril; interorbital region distinctly concave, eyes not particularly prominent; canthus rostralis angular and slightly elevated, loreal region concave; tympanum prominent about one half of the eye diameter. Parotid glands indistinct. One large elongate inner metacarpal tubercle and numerous small but prominent palmar tubercles; subarticular tubercles conical, distinct; fingers long and free. First finger shorter than and opposable to the second, the latter about one

third shorter than the third. Fourth finger slightly shorter than the third, but longer than the second; disks moderate, the largest disc slightly less than half the size of the tympanum. A small, almost indistinct inner metatarsal tubercle, no outer metatarsal tubercle. Toes free and long with a very narrow lateral fringe; first and third toes longer than the second. Subarticular tubercles conical, small but well developed; heel of adpressed hindlimb reaches the anterior corner of the eye. Skin of the dorsum chagrin, with many pinholes on upper eyelids, tympanic area and anterodorsal region. Transversal gular skin folds. Ventrally strongly granular, especially the lower part of the flanks, belly and anal region. In the latter, the granules large and glandular, forming a superior border of the anus; anus terminal. Below, ulna and tarsus warty; a well defined ulnar ridge from the elbow to the wrist that continues as the outer fringe of the fourth finger; a series of tubercles run parallel to the ridge from elbow to the wrist; a series of tarsal warts and tubercles form an irregular inner ridge.

Color in preservative: Dorsum is purplish blue above with irregular grayish blue and dark yellowish areas. The flanks grayish with roundish creamy white patches. Limbs grayish blue above and brownish yellow below. Concealed surfaces of hind limbs are irregularly reticulated, dark purplish on a yellowish creamy ground color.

**Measurements:** Snout-vent length: 78.7; head length: 23.2; head width: 26.5; tibia length: 35.4; femur length: 34.3.

**Distribution:** Known only from the lowlands of the northwestern part of the Sierra Nevada de Santa Marta.

**Ecology:** Ruthven (1922), noted that the only known specimen was collected in Aracataca, in dense wood flood-rain forest. He also reported a specimen observed in Fundacion.

**Material:** Sierra Nevada de Santa Marta. Magdalena: Aracataca, 60 m (UMMZ 54634); Fundación, 60 m (Ruthven, 1922).

## 5. Family Centrolenidae

### Key to the species of *Centrolenella*

1. Dorsum green or light with minute dark brown spots; in life heart not visible through skin ..... *Centrolenella* sp A  
 1' Dorsum green or light without dark spots; in life, heart visible through skin ..... *Centrolenella* sp B

*Centrolenella sp.* A McDiarmid and Savage.

(Map No. 23)

*Hylopsis platycephala*: Lynch, 1981. J. Herpetol., 15(3): 283.

*Centrolenella sp.* McDiarmid, R., and J. Savage, 1984. J. Herpetol., 18(2): 213.

**Description:** Head flat; snout round dorsally and round and short in profile. Vomerine teeth absent. Canthus rostralis roundish, barely distinct; loreal region slightly concave. Eyes rather prominent. Tympanum concealed; skinfold present in the tympanic area. Males with external median vocal sac. Fingers long, slender and free, except for a basal web between third and fourth fingers. Prominent humeral spines, in males, weakly developed in females. The tips of fingers and toes with terminal disks of similar size. Small subarticular tubercles. One oval palmar tubercle. Toes webbed first two toes completely webbed, third and fifth are 1/3 webbed and the fourth is only 1/3. The web is indented, free, phalanges with a very narrow fringes. Inner oval metatarsal tubercle, the outer is absent. Arms with a prominent humeral ridge. When the hind limb is adpressed, the heel reaches a point between the anterior corner to the eye and the nostrils. Skin smooth, with pinhole dots irregularly distributed, that in some specimens extend over the tympanic region.

Ventrally, the chin and chest smooth, the venter heavily aerolate.

Color in preserved specimens: Dorsum is light creamy, and finely spotted with minute dark brown dots. Venter is immaculate light yellow. In life the specimens are green dorsally, spotted with minute creamy dots; flanks and digits are yellow with white tarsal and labial stripes (Lynch, 1981).

**Measurements:** Snout-vent length: males 29.5-31.3 (30.0), females 29.5-31.2 (30.3); tibia length: males 15.2-16.7 (15.5), females 12.9 (juvenile); femur length: males: 15.2- 17.1(16.6), females 12.9 (juvenile).

**Distribution:** Restricted to the northwestern part of the Sierra Nevada de Santa Marta.

**Ecology:** This species occurs in the cloud forest of the Serrania de San Lorenzo, between 1200 to 2000 m.

**Remarks:** This species was interpreted by Lynch (1981) as *Hyloopsis platycephalus*, described by Werner in 1894. Werner's description was based on a specimen (now lost) from "Sud America", but as suggested by McDiarmid and Savage (1984), it is highly improbable that the specimen could have been collected in Sierra Nevada de Santa Marta. They also demonstrated that the Santa Marta specimens do not fit Werner's description.

**Material:** Sierra Nevada de Santa Marta. Magdalena: Cienaga, San Pedro de la Sierra, hacienda "Tierra Grata", 1300 m (ICN 2903, 2918); Serranía San Lorenzo, near Inderena station, 2000 m. (ICN 3541); 10 Km E El Campano, W slope Cerro Kennedy, 1850 m (KU 169750-52); 4 Km E. El Campano, 1420 m (KU 169753 neotype for *Hyloopsis platycephala*, 169754, 169753-54, 170224[eggs]); 1 Km E. El Campano, 1220 m (KU 169755).

***Centrolenella* sp. B**

(Map No. 23)

**Description:** Head flat; snout round dorsally, and round and short in profile. Canthus rostralis barely distinct; loreal region slightly concave. Eyes prominent. Tympanum concealed; Fingers long, slender and free, except for a basal web between third and fourth fingers. Tips of fingers and toes with terminal disks of moderate size. Toes webbed; first two toes completely webbed, third and fifth are 1/3 webbed. The web is indented, free; phalanges with very narrow fringes. When the hind limb is adpressed, the heel reaches a point between the eye and the nostrils. Males with distinct spines.

Skin smooth. Ventrally, the chin and chest smooth, the venter slightly aerolate. Color in live specimens: Dorsum is light green; eyes golden with a horizontal pupil. Venter is immaculate greenish white. The peritonium covering half of the body.

**Measurements:** Snout-vent length: males 28.5-30.3 (29.0), females 28.5-31.0 (30.5); tibia length: males 15.3-15.7 (15.4), females 12.9-14.0; femur length: males 17.2- 17.6 (17.3), females 16.8-17.0.

**Distribution:** Restricted to the northwestern part of the Sierra Nevada de Santa Marta.

**Ecology:** This species was found in the cloud forest of Cano Negro, Alto de Mira at an altitude of 960 m. Two females were found with an egg mass. Three eggs are laid on the lower surface of Cyclantaceae leaves. Parental care is suggested by the fact that the female puts her belly in a central hole of the egg mass. Number of eggs in a clutch varies from 65 to 79.

**Material:** Sierra Nevada de Santa Marta. Magdalena: Alto de Mira, Caño Negro, 910 m (IND 5 uncataloged specimens).

## 6. Family Microhylidae

### *Chiasmocleis panamensis* Dunn, Trapido and Evans

(Map No. 24)

*Chiasmocleis panamensis* Dunn, Trapido and Evans, 1948. Amer. Mus. Novit., 1376: 1.

**Type locality:** "Old Panama, Republic of Panama". Nelson, 1972. Copeia, 1972: 895.

*Gastrophryne ovalis*: Ruthven, 1922. Misc. Publ. Mus Zool. Univ. Michigan, 18: 51

*Elachistocleis ovalis*: Cochran and Groin, 1970. Bull. U.S Natl. Mus., 288: 77.

**Description:** Snout triangular in dorsal view, pointed in profile; palatine bone and vomerine teeth absent; nostrils lateral, very close to the tip of the snout; canthus rostralis indistinct, loreal region flat; eye diameter equal to its distance from the tip of the snout. Tympanum concealed. Fingers moderately long, free, with terminal disks; first finger, the shortest; second of equal length to the fourth. Two sometimes three conspicuous, round palmar tubercles. Small, but conspicuous conical, subarticular tubercles; ulnar ridge present; dorsolateral skinfolds extend from shoulder to groin. Toes unwebbed; two weakly developed tarsal tubercles and small but conspicuous, conical subarticular tubercles. Second toe larger than the third and third larger than the fifth. The heel of the adpressed hindlimb reaches between the tympanic region and the shoulder. Skin above and below smooth, except the anal region which is slightly aerolate.

The color in preservative is uniformly light beige.

**Measurements:** Snout-vent length: 19.2-19.8 (19.4); tibia length: 7.3-8.3 (7.8); femur length: 7.5-8.5 (8.0).

**Distribution:** Central Panama, northern, central and western Colombia. In Santa Marta it has been reported from the northwestern part, at above 60 m.

**Ecology:** Ruthven (1922) reported that the specimens were found under logs and low woods. Nelson (1972) observed that the most common habitat of this species is the altered areas in the lowland forests.

**Material:** Sierra Nevada de Santa Marta. Magdalena: Fundación, 60 m (UMMZ 45576, 48266).

*Relictivomer pearsei* (Ruthven, 1914)

(Map No. 24)

*Hypopachus pearsei* Ruthven, 1914b. Proc. Biol. Soc. Washington, 27:77. **Type locality:** Fundacion, Sierra Santa Marta, Colombia. Ruthven, 1922. Misc. Publ. Mus. Zool. Univ. Michigan, 18: 50. Barbour and Loveridge, 1946. Bull. Mus. Comp. Zool. 96(2):132. *Elachistochleis ovalis* (not of Schneider): Parker, 1934. Brit. Mus., 8: 121. Dunn, 1944c. Caldasia, 2: 524. Dunn, 1949. Amer. Mus. Novit., 1419: 1. *Relictivomer pearsei*: Carvalho, 1954. Occ. Pap. Mus. Zool. Univ. Michigan, 555:13. Cochran and Goin, 1970. Bull. U.S Natl. Mus. 288: 74.

**Description:** Snout pointed in dorsal view, short and pointed in profile; upper jaw extending well beyond the lower; palatine bone and vomerine teeth absent; nostrils lateral, canthus rostralis weakly defined, loreal region rounded; eyes small, almost inconspicuous. Tympanum concealed. Fingers moderately long, free, without terminal disks; second finger of equal length to the fourth. One round inner palmar tubercle. Toes free; one weakly developed tarsal tubercle and small but conspicuous, conical subarticular tubercles. Third toe larger than the fifth. The heel of the adpressed hindlimb reaches between the axilla and the shoulder. Skin above and below smooth.

The color in preservative is light brown above; below, irregularly patched with yellowish and brown.

**Measurements:** Snout-vent length: 33.4; tibia length: 12.8; femur length: 12.7.

**Distribution:** Colombia and Panama. In Sierra Nevada it has been reported from the lowlands of the northwestern part.

**Ecology:** This species occurs in the lowland xerophytic scrub forest at Fundacion and Rio Frio. The specimens have been collected under logs near open marshes (Ruthven, 1922), or near stagnant waters.

**Material:** Sierra Nevada de Santa Marta. **Magdalena:** Fundación, 60 m (UMMZ 45567-69 paratypes of *H. pearsei*, 45571 holotype of *H. pearsei*, 45573, 45608, MCZ 3727, 6075, USNM 51215); Rio Frio, 0 m (MCZ 16066).

## D. Lizards

### 1. Family Gekkonidae

#### Key to the species of *Gonatodes*

1. White or light vertebral stripe present, diffuse in females; head dark spotted above ..... *G. vittatus vittatus*  
 1' No light vertebral stripe; head lighter than body, giving a hooded appearance ..... *G. albogularis fuscus*

#### *Gonatodes albogularis fuscus* (Hallowell)

(Map No. 25)

*Stenodactylus fuscus* Hallowell, 1855., Jour. Acad. Nat. Sci. Phila., (2)3:33. **Type locality:** Nicaragua; restricted by Smith and Taylor (1950) to Rama, Nicaragua.

*Gonatodes fuscus*: Ruthven 1922., Misc. Publ. Mus. Zool. Univ. Mich., 8: 57.

*Gonatodes albogularis fuscus*: Vanzolini and Williams, 1962. Bull. Mus. Comp. Zool., 127(10): 493. Mechler, 1968. Rev. Suiss. Zool., 75 (2): 305.

**Description:** Rostral with a median sulcus, slightly notched above; snout granules decreasing posteriorly and the nostril surrounded by one infranasal, two postnasals and a small supranasal as well as the rostral. The superciliary granules slightly prominent. Six supralabials, the anterior largest reaching up to the middle of the orbit; five infralabials extending as far as supralabials, the anterior very large. Parietal and temporal granules of equal size. The large symphysial followed by a transversal row of usually 6 enlarged gulars, followed by small gulars, smooth, juxtaposed and graded posteriorly into granules until grading into ventrals. Dorsal granules smooth, smaller than those on

the snout; ventrals smooth, oval and imbricate. Smooth scales on the dorsal part of the forelimbs and the ventral part of the hindlimbs, the rest of the body granular. Toes from the largest to smallest, 4, 3, 2, 5, 1. Third finger with 14-20 ventral lamellae, and fourth toe, 18-22. Claws uncovered.

Males have a light, pinkish head and the dorsum and flanks are dark grey or brownish gray; the venter is tan or dark brown or gray. The whole head is lighter, giving it a hooded appearance. Females and juveniles have a gray ground coloration with marblings from the nape on that continue as pairs of spots on the dorsum. The vertebral region is lighter and the ventral sides are whitish or yellowish with small dark dots. In life, the specimens have an orange throat with yellow lines. The light hood is copper colored.

The length of the head and body ranges in adults from 31 to 37 mm.

**Distribution:** Cuba, El Salvador, to western Colombia, and southern United State (introduced).

In Sierra Nevada de Santa Marta, it is found in the lowlands below 300 m, occasionally up to 600 m.

**Ecology:** This is a very common lizard in the xerophytic scrub forest. According to Ruthven (1922), this lizard is "often found in logs, trees, particularly those which are partly decayed."

**Material:** Sierra Nevada de Santa Marta. Without additional data, (UMMZ 45455, 48251-60). **Cesar:** Las Pavas, <500 m. (UMMZ 54514-5, UMMZ 54659-61); Rio Cesar, (USNM 117481-96); Valledupar, 206 m (UMMZ 54655-8, 54678-82); **Gua-jira:** Fonseca, Río Ranchería, 150 m (UMMZ 54654, 54674- 7); Riohacha, 5 m (UMMZ 54640-53, 54662-73). **Magdalena:** Bonda, 45 m (MNHG 1067.53-57, 1067.89-91); Don Diego (UMMZ 48262); Fundación, 60 m (UMMZ 45446-7, 45, 48248-50); Mamatoco, 600 m (UMMZ 45452); between Mamatoco and La Tigra, 600 to 1200 m (UMMZ 45448-50, 45554); Río Frío, < 50 m (MCZ 25986-7); Santa Marta, 0 m (AMNH 38981).

*Gonatodes vittatus vittatus* (Lichtenstein)

(Map No. 25)

*Gymnodactylus vittatus* Lichtenstein, 1856, Nomencl. Mus. Zool. Ber.: 6. **Type locality:** La Guayra, Puerto Cabello and Caracas, Venezuela. Medem, 1968, Rev. Acad. Colomb.

Cienc. Exac. Fis. Nat. 13(50):166.

**Description:** A large rostral, usually larger than the first supralabial, 3 to 4 supralabials and 4 to 5 infralabials. The body and head covered by small granules. The venter covered by larger scales. The fourth toe with 15 to 18 lamellae in males and 17 to 21 in females.

Dorsum in males is brown or blackish, with a median light stripe. There is a narrow, longitudinal, dark band on each side of the middorsal streak. In females, the ground color of the dorsum is much lighter, usually grayish, and the median light stripe is often very indistinct or sometimes absent. The middorsal longitudinal band is replaced in the females by two rows of dark spots.

The length of the head and body in adults ranges from 28 to 35 mm.

**Distribution:** Colombia, Venezuela, and offshore islands.

In Sierra Nevada de Santa Marta, it is found around the massif below 600 m. One report from Palomina 1500 m is probably in error.

**Ecology:** This species inhabits arid and semiarid zones. The females usually lay eggs under the debris of coconut fruits and on the roofs of the houses, as they are made of palm leaves.

**Material:** Sierra Nevada de Santa Marta. Without additional data, (MCZ 38781).

**Guajira:** Arroyo de Arenas, Río Barbacoa, 150 m, (UMMZ 54687-703, 54742); Fonseca, Rio Rancheria, 60 m (UMMZ 54683-6). **Magdalena:** Aracataca, 60 m (ANSP 19750); Don Diego, (UMMZ 48261-2); Hacienda "Don Diego", río Don Diego, E of Santa Marta, sea level, (MCZ 78435); Palomina, 1500 m [probably in error] (MCZ 6567).

*Hemidactylus brookii leightoni* Boulenger

(Map No. 26)

*Hemidactylus leightoni* Boulenger, 1911. Ann. Mag. Nat. Hist. (8)7: 19. **Type locality:** Honda, Rio Magdalena, Colombia, 300-400 ft.

*Hemidactylus brookii leightoni*: Kluge, 1969. Misc. Publ. Mus. Zool. Univ. Mich. 138: 1-78

**Description:** Moderately sized lizard; 12 to 17 supralabials and 7 to 9 infralabials. Dorsal surfaces of the body covered by small scales and large conical granules. The venter covered by flat scales. Fourth toe, with 11 to 13 enlarged lamellae. Dorsum brown. The tips of the elevated scales are darker. Head of the same color as the dorsum. The venter and ventral surfaces of the limbs light creamy. 25 preanal pores. Length of head and body of the measured specimen is 45 mm.

**Distribution:** Northwestern coast to central highlands of Colombia. In Sierra Nevada de Santa Marta, it has been reported from Rio Frio, on the northwestern.

**Ecology:** The two specimens reported from Sierra Nevada de Santa Marta were taken at Rio Frio, a small town on the western part surrounded by xerophytic scrub forest. Mechler (1968) suggested that this species could have been introduced into the New World from Africa during the slave trade, an idea rejected by Kluge, 1969.

**Material:** Sierra Nevada de Santa Marta. Magdalena: Río Frío, < 50-m (MCZ 29692-3).

### Key to the species of *Lepidoblepharis*

1. Tip of tail light; ventrals in 18-20 diagonal rows at midbody ..... *L. miyatai*  
 1' No light tail tip; 12-15 diagonal rows of ventrals ..... *L. sanctaemartae sanctaemartae*

#### *Lepidoblepharis miyatai* Lamar

(Map No.26)

*Lepidoblepharis miyatai* Lamar, 1985. Herpetol., 41(2):128. **Type locality:** Ancón Gairaca, (=Ensenada de Gayraca), Departamento de Magdalena, Colombia (11 20'N, 74 07' W), at sea level.

**Description:** Rostral large, with a median cleft; mental also large, with a nearly straight posterior border and without a cleft; the lateral edges almost parallel; from second postmental row the gulars small and granular. One postnasal; four supralabials, decreasing in size posteriorly; three infralabials decreasing in size posteriorly. Polygonal granules covering the snout, increasing in size toward the vertex. Dorsals larger than

those on head and neck, smooth and slightly flat; ventrals flat, smooth and imbricate, arranged in 18 to 20 diagonal rows.

Infradigital lamellae under the fourth toe, usually 9, sometimes 8-10; digits short.

Dorsum is reddish brown, with a few brown markings middorsally that intensify toward the tail forming a distinct dark brown blotch. Sides of neck and trunk are darker than the dorsal color. Legs are brownish, slightly spotted. Head has a cream semicircular band running from the snout to the eyes and the temporal and occipital region. Venter is white, inconspicuously dotted with brown. Palms and soles are brown and the anus is bordered by brown preanal granules.

**Distribution:** Known only from Parque National Tayrona, 15 Km NE. of Santa Marta, at sea level.

**Ecology:** It is found in the xerophytic scrub forest bordering the northern part of the Sierra. "All the specimens were collected during the day near sea level in leaf litter on the forest floor." Medem, cited by Lamar (1985). This species is distributed near the ecological boundary of *L. sanctamartae*, but the latter seems to have a wider distribution.

**Material:** Sierra Nevada de Santa Marta. Without additional data, (ICN 3124).

**Magdalena:** Bahia Gairaca, Ensenada de Gayraca, sea level (UTA 11004 Holotype, 11005, paratype); (MCZ 154447-9, 156973- 4 paratypes).

*Lepidoblepharis sanctamartae sanctamartae* (Ruthven)

(Map No. 26)

*Lathrogecko sanctamartae* Ruthven, 1916. Occ. Pap. Mus. Zool. Univ. Mich., 21:2.

Ruthven, 1922. Misc. Publ. Mus. Zool. Univ. Mich., 8:58.

*Lepidoblepharis sanctamartae sanctamartae*: Barbour and Loveridge, 1946. Bull. Mus.

Comp. Zool., 59 (2):136. Mechler, 1968. Rev. Suiss. Zool., 75(2): 348. Medem, 1968,

Rev. Acad. Colomb. Cienc. Exac. Fis. Nat. 13(50):167. Lugo, 1981. Bol. Dept. Biol.

Univ. Nac. Colombia, 3:19.

**Description:** Rostral large with median cleft. Mental large with somewhat concave posterior margin, and with cleft, followed by several large postmentals. Two postnasals, and 3 to 4 upper labials, the first larger; 3 infralabials, the first the largest. The

snout covered with several large scales; top of the head and neck covered with granular scales. Dorsal scales flattened and fully imbricate, smaller than the ventrals. The ventral in 12 to 15 diagonal rows. Infradigital lamellae under the fourth toe usually 8, sometimes 7 to 9. Digits short. The tail tapers off to a sharp point.

Dorsum and top of the head of males are light brown with a yellowish white semicircular band that runs from the snout to the orbit and across the temporal and the occipital regions. Chin and belly are pale yellow bordered by brown spots. Some larger spots present over the axillary and pelvic regions. Large white spots present on the thighs. The head of the females is pale brown with an almost indistinct semicircular band.

The snout-vent (s-v) length ranges from 18.2 to 21.5 mm.

**Distribution:** Sierra Nevada de Santa Marta. This species extends around the massif from sea level to about 2200 m.

**Ecology:** This species has a wider and higher distribution than *L. miyatai*; it extends from the xerophytic lowland scrub forest in the northern, northeastern southern part to the cloud forest, 2200 m on the northwestern slopes. There is a pronounced sexual dimorphism in color and in body size. This is an easy species to maintain and reproduce in captivity. Usually only one egg is laid by the female under the debris of coconut fruits; possibly this is a cannibalistic species (Medem, 1968).

**Material:** Sierra Nevada de Santa Marta. Cesar: Las Pavas, <500 m (UMMZ 54734, exch. with British Mus.); Valencia, 100 m (UMMZ 54732). Guajira: Fonseca, Río Barbacoa, 150 m (UMMZ 54730-1); Fonseca, Río Ranchería, 150 m (UMMZ 54733); Magdalena: Bonda, 45 m (MNHG 1073.67-70); Bonda, Finca El Arandar, (MCZ 81560-5); Fundación, 60 m (UMMZ 47790, holotype, 47791-2 paratypes, 47793, exch. with MCZ, paratype = MCZ 11304); San Lorenzo, 2200 m (ICN 5744); between La Tigra and Bolívar, Tamocal river, no altitudinal data (UMMZ 54727-9).

*Phyllodactylus ventralis* O'Shaughnessy

(Map No. 27)

*Phyllodactylus ventralis* O'Shaughnessy, 1875. Ann. Mag. Nat. Hist., (4)16: 263. **Type locality:** "Jamaica". Dixon 1962 Southwestern Nat. 7: 222. suggested that it may be

Colombia or Venezuela. Ruthven, 1922. Misc. Publ. Mus. Zool. Univ. Mich., 8:58.  
 Mechler, 1968. Rev. Suiss. Zool., 75(2): 363. Medem, 1968, Rev. Acad. Colomb. Cienc.  
 Exac. Fis. Nat. 13(50):167.

**Description:** Rostral large, with a vertical groove; 2 postmentals in contact with the first infralabial and 2 internasals bordered posteriorly by 4 to 6 smaller scales; 12 to 18 interorbital scales. The head covered by small scales except those on the loreal region and on the parietal region which are larger, and prominent. On the dorsum two longitudinal rows of enlarged elevated scales, each row with 33 to 49 scales from head to base of the tail. The venter with flat scales in 21 to 25 transversal rows. Fourth toe with 11-15 lamellae. Dorsum is brown or grayish brown with lighter bands intermixed with darker bands. The tips of the elevated scales are lighter. Head is of the same color as the dorsum with a brownish stripe running from nasals to the base of the parietal region. The supralabials are whitish with dark brown marks. The S-V length ranges from 50.0 to 63.0 mm.

**Distribution:** Northern Colombia and Venezuela, and Margarita Island. In Sierra Nevada de Santa Marta it has been reported from the northwestern part from sea level to about 1000m.

**Ecology:** This species occurs on the arid and semiarid zones of the Caribbean coast. In Sierra Nevada de Santa Marta, it is found in the xerophytic lowland scrub forest. Ruthven, (1922) reported that this species lives in abandoned buildings, or under stones and barks.

**Material:** Sierra Nevada de Santa Marta. Without additional data (UMMZ 45463, 48177). **Magdalena:** Bonda, 45 m (MHNG 1067.72-74, 28 VII. 1964) Bolivar, 65 m (UMMZ 54737); between Mamatoco and La Tigrera, (UMMZ 45461-2).

*Pseudogonatodes furvus* Ruthven

(Map No. 27)

*Pseudogonatodes furvus* Ruthven, 1915c. Occ. Pap. Mus. Zool. Univ. Mich., 19:2. **Type locality:** San Lorenzo, Santa Marta Mountains, Colombia, 1500 m Vanzolini, 1967. Pap. Avul. Zool., 21(1):1. *Lepidoblepharis intermedius*: Ruthven, 1922. Misc. Publ. Mus. Zool. Univ. Mich., 8: 58.

**Description:** Snout pointed, with granules decreasing posteriorly, rostral large, and notched above; five supralabials, the first largest and reaching the anterior margin of the orbit; four to five infralabials. small, slightly tubercular gular scales. Dorsal scales granular and prominent smaller than those on the venter. Ventral scales flat smooth and imbricate. Anterior limbs with scales, the posterior granular. Digits with retractile claws and with lamellae. Tail cylindrical, covered with imbricate scales, larger below. Males without femoral pores.

Dorsum is dark brownish with some light spots that continue on the tail as slightly visible stripes. The top of the head is as the dorsum, with a light patch that runs from the eye to the occipital region and a second one on the nape. The labials are whitish with dark centers. Laterally, a series of light spots form two rows from head to groin. The venter is light, irregularly spotted by black. The tail below is black with light patches of irregular size.

The S-V length in adults ranges from 42 to 45 mm.

**Distribution:** Northwestern part of Sierra Nevada de Santa Marta, Colombia.

**Ecology:** According to Ruthven (1922), the type specimen was found "in a wet and very much decayed log in the forest." It is found from the xerophytic lowland forest at sea level up to the cloud forest at 1500 m.

**Material:** Sierra Nevada de Santa Marta. Magdalena: San Lorenzo, 1500 m (UMMZ 47782 Holotype, 47783 a specimen found on the stomach of *Drymobius = Mastigodryas boddaerti ruthveni*); Rio Frio < 50 m (MCZ 29700).

*Sphaerodactylus heliconiae* Harris

(Map No. 27)

*Sphaerodactylus heliconiae* Harris, 1982. Occ. Pap. Mus. Zool Univ. Mich., 704:3. **Type locality:** Colombia, Magdalena, 3 Km E. Candelaria. Harris and Kluge. 1984, Occ. Pap. Mus. Zool. Univ. Mich., 706: 1.

**Description:** Rostral notched and with a median cleft; 2 supranasals and 1 to 2 postnasals. The snout scales keeled and flatten. Small granules on top of the head. Four large supralabials, the anterior the largest; four large and 3 to 4 smaller infralabials. Parietal and temporal with smooth granules of equal size; gulars, smooth. Dorsal granules

keeled and juxtaposed. Males with large abdominal eschuteon. Digits with small scales and the fourth toe with 10-13 lamellae.

Males have brown dorsum somewhat reticulated with dark brown, and belly is pale brown. The top of the head is reddish brown, orange in life (Harris, 1982) with a dark brown stripe between the snout and the anterior corner of the eye. There are two stripes from postorbit to the temporal region.

Females have brown dorsum with dark, somewhat parallel stripes on the head and dorsum. Top of the head is similar to the ground color of the dorsum but there is a continuous stripe running from the loreal region to the temporal. The other stripes on the posterior part of the head are replaced by rows of spots. The venter is lighter than the dorsum. Tail with light bands.

The S-V length ranges in adults from 28 to 32 mm.

**Distribution:** Lowlands, west of Santa Marta mountains, Colombia.

**Ecology:** This species is found in the xerophytic scrub forest in the northwestern part of the Sierra. According to Harris (1982), the specimens seem to be highly associated with heliconias; some were found on the leaves of this plant floating in water, while others were collected from cut plants. The females lay only one egg at a time.

**Material:** Sierra Nevada de Santa Marta. Magdalena: Candelaria, beside a canal connecting Río Frío and Río Sevilla 50 m (ICN 3225 Holotype, 3223-4, 3226, UMMZ 171649- 52, paratypes); 17 Km E Sevilla, 50 m (MCZ 29699 paratype).

*Thecadactylus rapicaudus* (Houttuyn)

(Map No. 27)

*Gekko rapicauda* Houttuyn, 1782. Verh. Zeeuw.Genootsch. Wet. Vlissingen, 9: 323.

**Type locality:** West Indies; Restricted to Chichen Itza, Yucatan, Mexico by Smith and Taylor, 1950. Bull. U.S. Natl. Mus., 199: 49.

*Thecadactylus rapicaudus:* Ruthven, 1922. Misc. Publ. Mus. Zool. Univ. Mich., 8: 58.  
Mechler, 1968. Rev. Suiss. Zool., 75(2): 365.

**Description:** Head and dorsum with minute granular scales interspaced with larger tubercles. Under each toe two rows of considerably expanded adhesive pads.

Claws in contact with the adhesive pads of the basal phalanx.

Dorsum is brownish or grayish with irregular blackish and lighter markings of different shapes and sizes. Head and neck are of the same color as the dorsum, with irregular black or dark brown stripes. On the tail, several irregular somewhat quadrangular dark crossbands, separated by lighter, variably mottled bands. The venter is whitish or yellowish light brown.

The S-V length in adults varies between 70 to 100 mm.

**Distribution:** Lesser Antilles, Mexico, Central America, northwestern South America, to Guianas and Trinidad. Also both sides of the Ecuadorian Andes. In Sierra Nevada de Santa Marta this species is found on the eastern, northern, northeastern and southeastern part.

**Ecology:** The species is found in the xerophytic lowland scrub forest. Ruthven (1922) reported that this species is active at night, running on the tree trunks. At day they are found under the barks. This species feeds on small animals such as insects, molluscs and other smaller gekkos. Roze (1964) observed that this is a strongly competitive species that has invaded Venezuela and Brazil and is responsible for the displacement of other native species.

**Material:** Sierra Nevada de Santa Marta. Cesar: Caracolcito, < 500 m (USNM 117463-5); Las Pavas, (UMMZ 54792); Valencia, 100 m (UMMZ 54790-1). Guajira: Rio Barbacoa, (Possibly Arroyo de Arenas, 150 m) (UMMZ 54786-8); Fonseca, Río Ranchería, 150 m (UMMZ 54789). Magdalena: Mamatoco, 600 m (UMMZ 44456); between Mamatoco and La Tigrera, 700 m (UMMZ 45457).

## 2. Family Iguanidae

### Key to the species of *Anolis*

1. Most of head scales strongly multicarinated; no adhesive subdigital pad  
under phalanges three or four ..... *A. onca*
- 1' Head scales single keeled or smooth ..... 2
2. More than six rows of large, keeled and rhomboid, dorsals, distinct from lateral granules; large  
and keeled ventrals similar to dorsals; black dewlap in both sexes ..... *A. auratus*
- 2' Dorsals not rhomboid but granular, larger or not than laterals. Dewlap not black or with black  
spots ..... 3
3. At least some supracephalic scales keeled ..... 4
- 3' All supracephalic scales smooth ..... 6

4. Supraorbital semicircles of large scales, in contact, white line from subocular region to beyond ear ..... *A. sanctamartae*  
 4' Supraorbital semicircles of small scales not in contact, separated by one or more scales ..... 5
- 5 Dorsal scales small and keeled. but larger than the laterals which are granular and smaller than ventrals, small anoles ..... *A. tropidogaster*  
 5' Dorsal granules slightly keeled and as big as the laterals. Ventrals larger, rounded and keeled. Medium size anoles ..... *A. biporcatus*.
6. Several rows of paravertebral larger than the lateral granules and keeled ..... *A. sp. B*  
 6' Dorsal granules approximately of equal size as lateral, smooth ..... 7  
 7. Black dorsal cross bands clearly distinct, extending laterally ..... 8  
 7' Not or poorly developed dark dorsal spots or light longitudinal dorsal stripe ..... *A. solitarius*
- 8 Males with conspicuous postparietal protuberance and black line from eye to shoulder; females with black spotted dewlap ..... *A. menta*  
 8' No postparietal protuberance in males; no dewlap in females ..... *A. sp. A*

### *Anolis auratus* Daudin

(Map No. 28 )

*Anolis auratus* Daudin 1802. Hist. Nat. Rept., 4:89. **Type locality:** unknown.

*Norops auratus:* Ruthven 1922., Misc. Publ. Mus. Zool. Univ. Mich., 8:59.

**Description:** This is a beta Anolis, member of the *auratus* group. Head nearly twice as long as broad; upper head scales small and tricarinate. Occipital slightly enlarged; 3 to 4 internasals; 2 to 5 loreal rows, and 2 to 4 canthals. Usually five, sometimes 6, keeled supralabials to center of eye and 5 keeled infralabials; 3 to 4 supraorbitals. Dewlap moderately enlarged in males, slightly indicate in females. Gular scales keeled. Dorsal scales strongly keeled, in 10 to 13 longitudinal rows. The lateral scales minute and keeled. The ventral scales rhomboidal, imbricate and keeled. Tail covered with sharply keeled scales. 24-33 lamellae on the fourth toe.

Dorsum is grayish brown, with a paravertebral white stripe running from the anterior corner of the eye, bordering it along the lower eyelid and extending to the mid-body. Infralabials and venter are immaculate. The naked skin of the dewlap in males is dark blue; the same color is slightly visible in females.

The S-V length in adults ranges from 38 to 56 in both sexes.

**Distribution:** Panama, Colombia, Ecuador, Venezuela to French Guiana. In Sierra Nevada de Santa Marta it is found in the northern, northwestern and southeastern part, from sea level to about 2400 m.

**Ecology:** This is a very abundant form in Colombia, and in the Sierra Nevada it occurs from xerophytic lowland forest, to humid evergreen seasonal forest, in open woods and in clearings; usually found in grass, low bushes, and around open marshes, Ruthven (1922) observed that this species was abundant at Bolivar and Fundacion. Possibly, the females lay only one egg at a time; I found one egg 11 mm X 6 mm in a female from Pozos Colorados.

**Material:** Sierra Nevada de Santa Marta. Cesar: Las Pavas, <500 m (UMMZ 54763-5); Pueblo Viejo, 2400 m (UMMZ 55683); Valledupar, 206 m (UMMZ 54751-2); Valencia, 100 m (UMMZ 54754-5, 54757-8, 54760-2, 54766). Guajira: Arroyo de Arenas, río Barbacoa, 150 m (UMMZ 54746-50). Magdalena: Bolívar, 45 m (UMMZ 54743(2)-45); Fundación, 60 m (UMMZ 48221-7, 48230, 48232-3); Mamatoco, <20 m (UMMZ 48228, 48231, 48236, 48238); Minca, 625 m (UMMZ 48217-20, 48229, 48234-5, 48239-42); Palomina, 1000 m (UMMZ 55684); Pozos Colorados, ca, 11 Km S. of Santa Marta, < 50 m (AMNH 105896-106007); Santa Marta, 0 m (UMMZ 48237).

*Anolis biporcatus biporcatus* (Wiegmann)

(Map No. 28)

*Anolis biporcatus* Wiegmann, 1834. Herpetologia Mexicana: 47. **Type locality:** Mexico. Medem, 1968, Rev. Acad. Colomb. Cienc. Exac. Fis. Nat. 13(50):168.

*Anolis solifer* Ruthven, 1916d. Occ. Pap. Mus. Zool. Univ. Michigan, 32:4. **Type locality:** La Concepcion, Santa Marta Mountains, Colombia. Ruthven 1922., Misc. Publ. Mus. Zool. Univ. Michigan, 8: 58. *Anolis biporcatus biporcatus* Williams, 1966. Breviora, 239:9.

**Description:** This is a beta *Anolis*, member of the *petersi* group. Upper head scales small including the interparietal. Occipital very small and smaller than the ear. Three internasals, and 5 canthals; 1 to 5 loreal rows; 8 supralabials to the center of the eye and 10 infralabials. Eight keeled supraorbital scales. Two scale rows between supraorbital semicircles. Dewlap moderately enlarged, covered by strongly keeled scales, almost as large as the ventrals.

Dorsal scales smooth, those at the middorsal line, a little larger than those of the flanks. Ventrals slightly larger than dorsals and all keeled. Tail compressed. Twenty lamellae on the fourth toe.

Dorsum is unicolor, brown-reddish, and the venter is grayish or bluish. The naked skin of the dewlap is dark purple.

The (S-V) of the only known specimen from Sierra Nevada de Santa is 65 mm.

**Remarks:** Williams (1966), considered *A. solifer* as a synonym of *A. biporcatus*, because the type specimen does not differ from the Panamanian form of *A. biporcatus* ("except for the exceptionally short hind limbs", a character that is also present in some Venezuelan specimens)

**Distribution:** Mexico to northern Colombia. In Sierra Nevada de Santa Marta, it has been reported from the northwestern part at 1000 m.

**Ecology:** According to Williams (1966) this is a strongly arboreal species. In Sierra Nevada de Santa Marta, it was collected in the cloud forest.

**Material:** Sierra Nevada de Santa Marta. Magdalena: La Concepción, 1000 m (MCZ 6549 type of *Anolis solifer* Ruthven).

*Anolis menta* Ayala, Harris & Williams

(Map No. 28)

*Anolis menta* Ayala, Harris & Williams, 1984. Pap. Avul. Zool. S. Paulo, 35(12):135.

**Type locality:** Cuchilla Hierbabuena, 4 Km southeast of San Pedro de la Sierra in the Sierra Nevada de Santa Marta Mountains, Magdalena Department, Colombia (10 53'N; 74 1'W).

**Description:** This is an alpha Anolis, member of the *tigrinus* group. Upper head scales enlarged and smooth. The interparietal greatly enlarged; 3 to 5 internasals; 3 to 5 loreal rows, and 4 to 6 canthals. Six to 8 slightly keeled supralabials to center of the eye and 5 to 7 keeled infralabials. The supraorbital semicircles in contact with 6 to 7 large supraorbital scales; mental semidivided. Dewlap present in both sexes, larger in males, with scales larger than those of the abdomen and smooth; gular scales granular small, and smooth. Dorsal scales granular except for those on the vertebral region which are

slightly larger, flat and somewhat keeled. The ventral scales are much larger than dorsals, rhomboidal, smooth, and subimbricate. Tail scales, smooth. Large postanal scales in males, absent in females. Fourth toe with 17-18 lamellae .

According to Harris et al., (1984), in life the dorsum of males is "pale yellowish green with broad dark sienna-brown bands... Dewlap bicolored, white with a wide lemon-yellow band along the ventral and posterior edge, scales pure white". In preservative the dorsum is yellowish brown with 4 to 5 transversal dark brown bands along the body, and 3 or 7 on the tail. In some males the last portion of the tail (more than 1/2) is dark brown. In the paratype male there is a very well defined black line running from anterior part of the snout to the shoulder. Dewlap is white, the naked skin slightly yellow. Harris (1984) described the color in life of the females as follows: "one female was light green and the other grayish with a series of saddle-shaped sienna brown spots along the vertebral region and a diagonal of small round brown spots on the sides. The belly of the green specimen was nearly white, the other had a speckling of tiny dark spots encroaching from the sides. The dewlaps were pinkish (salmon in the green specimen)..." In preservative, the dorsum in females is light grayish and the transversal bands observed in the males are replaced in the females by vertebral patches and a series of dark brown spots from the vertebral region toward the sides. The tail lacks transversal bands. Dewlap is white with conspicuous black rounded spots.

In both sexes, top of the head is brown, with an interorbital dark brown transversal band; the upper labials, infralabials, chin, throat and venter are white or yellowish. The S-V length in adults ranges from 45 to 56 mm.

**Distribution:** Sierra Nevada de Santa Marta, known only from the northern side.

**Ecology:** Ayala, et. al. (1984) reported that the specimens from Cuchilla Hierbabuena, "were found sleeping at night on exposed sites along the edges of a cool cloud forest premontane/ lower montane wet forest).... Two clung on the edges of leaves 1-3 m. high. The type and one of the females were within one half meter of each other on grass blades about 70 cm. about the ground."

**Material:** Sierra Nevada de Santa Marta. Magdalena: "West side of the Sierra Nevada de Santa Marta", no additional data (MCZ 29685). Cuchilla Yierbabuena, 4 Km southeast of San Pedro de la Sierra (10 53'N; 74 1'W), 2000 m (MCZ 159013 Holotype, 159014, ICN 3682 paratypes).

*Anolis onca* (O'Shaughnessy)

(Map No. 28)

*Norops onca* O'Shaughnessy, 1875. Ann. Mag. Nat. Hist., (4) 15: 280. **Type locality:** Venezuela and the Island of Dominica.

*Tropidodactylus onca*: Ruthven, 1922. Misc. Publ. Mus. Zool. Univ. Mich., 8:59.

*Anolis onca*: Williams, 1974a. Breviora, 421: 1-21.

**Description:** A beta anolis of the *onca* group. Upper head scales subequal and pluricarinate. Occipital slightly enlarged, but not larger than the ear; 3 to 5 internasals; 2 to 5 loreal rows, and 3 to 4 canthals. Usually 10, sometimes 9 keeled supralabials to center of eye and separated from the subocular by more many small scales; 11 to 13 keeled infralabials. 11 to 13 supraorbitals, the supraorbital semicircles usually separated by more than one scale row, and comprised of 7 to 8 large scales. Dewlap enlarged in males, slightly indicated in females. Gular scales keeled. Dorsal scales strongly keeled, smaller than the ventrals. The lateral scales smaller than vertebrals and keeled. The ventral scales rhomboidal, imbricate and keeled. Tail covered with sharply keeled scales; 20-23 lamellae on the fourth toe.

Dorsum is yellowish brown, or grayish white spotted with brown. Top of the head as the dorsum with an interorbital dark brown band. Venter slightly lighter than dorsum. The naked skin of the dewlap in males is blackish.

The S-V length in adults ranges from 50 to 72.

**Distribution:** Northern Colombia; northeastern and northern Venezuela, and Margarita Island.

**Ecology:** In Sierra Nevada de Santa Marta this species is abundant in xerophytic lowland scrub forest. It is terrestrial, active during the day - morning and afternoon, avoiding the intense noon heat - in the sandy, stony terrain. The species is not arboreal but is occasionally found on the roots projecting above the ground of the scrubs and other xerophytic vegetation. During the night and around high noon it hides beneath stones and dry trunks as well as uses burrows made by other animals, including whiptail lizards (*Cnemidophorus lemniscatus*), and crustaceans.

**Material:** Sierra Nevada de Santa Marta. Guajira: Riohacha, 0 m (UMMZ 54799, 54801-7, 54810-13).

*Anolis sanctamartae* Williams

(Map No. 29)

*Anolis sanctamartae* Williams, 1982. Breviora, 467: 16. **Type locality:** Colombia, Cesar, San Sebastián de Rábago. Sierra Nevada de Santa Marta.

**Description:** This is a beta *Anolis*, member of the *punctatus* group. Upper head scales large, flat, and smooth. Smaller and slightly keeled on the tip of the snout. The rostral higher on the tip of the snout than on the sides, and extends well toward the lateral part of the snout. The rostral in contact with the anterior and posterior nasals, visible from above and from a lateral view. The interparietal, and parietals greatly enlarged; the interparietal the largest, larger than the ear, and broadly in contact with the supraorbital semicircles. Four to 6 internasals; 4 to 5 loreal rows, and 4 to 5 canthals; 7 supralabials to the center of the eye, and 7 infralabials. The supraorbital semicircles in contact, comprised of 8 to 10 large scales. Mental semidivided. Dewlap large in males, extending from the posterior part of the head up to 2/3 of the anterior part of body; slightly indicated in females. Gular scales fairly large. Dorsal scales from occipital region to the first six vertebral rows large, flat, subimbricate and slightly keeled, granular posteriorly and laterally. The chest scales keeled; the ventral scales much larger than dorsals, smooth, and subimbricate. Tail scales keeled. Large postanal scales in males, absent in females. 18-19 lamellae on the fourth toe.

Dorsum and top of the head is grayish brown, with a series of paravertebral dark brown ovoid patches in females and only traces of these blotches on the posterior part of the dorsum in males. Irregular oblique dark brown streaks on flanks. Both sexes have an interorbital dark brown transversal band, and a light stripe from subocular to above the ear. The throat and the venter smudged with dark brown. Limbs and tail are weakly banded. Dewlap skin in males is white. The S-V length in adults ranges from 50 to 55 mm.

**Distribution:** Known only from the southeastern part of the Sierra Nevada de Santa Marta, Colombia.

**Ecology:** This species has been taken in a savanna region at 2000 m.

**Material:** Sierra Nevada de Santa Marta. Cesar: San Sebastián de Rábago, 2000 m (CAS 113922 holotype, 113924, MCZ 113923 paratypes).

*Anolis solitarius* Ruthven

(Map No. 29)

*Anolis solitarius*. Ruthven, 1916d. Occ. Pap. Mus. Zool. Univ. Mich., 32:2. **Type locality:** San Lorenzo, Santa Marta mountains, Colombia, 1500 m. Ruthven, 1922.(in part), Misc. Publ. Mus. Zool. Univ. Mich., 8: 58. Medem, 1968. Rev. Acad. Colomb. Cienc. Exac. Fis. Nat. 13(50): 169.

**Description:** An alpha Anolis, member of the *tigrinus* group. Upper head scales large, flat, and smooth, smaller on the tip of the snout. The rostral in contact with the anterior nasal. The interparietal greatly enlarged, larger than the ear, and in contact with the supraorbital semicircles. Four to 6 internasals; 3 to 5 loreal rows, and 3 to 5 canthals. Usually 7, sometimes 6, supralabials to center of eye; 6 to 7 infralabials. The supraorbital semicircles usually in contact, sometimes separated, at least anteriorly, by one or 2 scales. The supraorbital semicircles comprised of 7 to 9 large scales. Mental semidivided. Dewlap moderately large in males, slightly indicated in females; dewlap's scales elongate, narrow and smooth. Dorsal scales granular except for those of the vertebral region, slightly larger than those on the flanks. Ventral scales much larger than dorsals, rounded, smooth, and subimbricate. Tail scales keeled. Large postanal scales in males, absent in females. 16-18 lamellae on the fourth toe. Dorsum is uniformly brownish or grayish brown with 4 to 6 vertebral dark brown ovoid patches barely distinguishable in some specimens. In a few specimens the vertebral region is covered by a light brown stripe that may be interrupted or not by the brown patches. The top of the head is slightly darker than the dorsum. Dewlap scales are reddish orange spotted with white, and the naked skin is dark brown or blackish; the same color is barely perceptible in females. The supralabials, the lower part of the head and the venter is light grey, sometimes spot-

ted with dark. Tail and limbs are usually unicolor yellowish, rarely banded. The S-V length in adults ranges from 38 to 52 mm. in both sexes.

**Distribution:** Endemic to Sierra Nevada de Santa Marta. It has been found on the northern and northwestern part, above 780 m.

**Ecology:** This species is restricted to heavily forested areas, and is frequently present in cloud forest. Ruthven (1922) noticed that individuals of this species are found on the ground or on trees as well as associated with shrubs and vines.

**Material:** Sierra Nevada de Santa Marta. Magdalena: Alto de Mira, border of rio Julepia, 780 m (ICN, Uncatalog specimens); Ciudad Perdida, 1100 m (ICN 5797-5800, 6180- 6186); La Frontera, Río Buritaca, (IND 2286-2288); Palomina, 1500 m (MCZ 12053 Paratype); San Lorenzo, 1500 m (UMMZ 48303 holotype, 48319-20, paratypes).

*Anolis tropidogaster* Hallowell

(Map No.29)

*Anolis (Draconura) tropidogaster* Hallowell, 1857. Proc. Acad. Nat. Sci. Phila., 1857: 224. **Type locality:** Colombia.

*Anolis gaigei* Ruthven, 1916d. Occas. Pap. Mus. Zool. Univ. Mich., 32:6. **Type locality:** San Lorenzo, Santa Marta mountains, Colombia.

**Description:** This is a beta *Anolis*, member of the *auratus* group. Upper head scales keeled. Occipital enlarged; 4 to 6 internasals; 1 to 6 loreal rows, and 2 to 4 canthals. Usually 8, sometimes 7 or 9, keeled supralabials to center of eye and 8 to 9 keeled infralabials. Seven to 10 supraorbitals. Dewlap moderately enlarged in males, absent in females.

Dorsal scales small and keeled. The lateral scales very small and keeled. The ventral scales rounded, imbricate and keeled. Fourth toe with 15-17 lamellae. Dorsum is brownish, sometimes with a vertebral light brown stripe. Laterally pale brown. Venter is immaculate, extending onto the sides of the body. The naked skin of the dewlap in males is reddish.

The (S-V) length in adults ranges from 41 to 45 mm in both sexes.

**Distribution:** Mexico to northern Colombia. In Sierra Nevada de Santa Marta it is found in the northern, northwestern, eastern and southeastern part, from about 100 to 2500 m.

**Ecology:** According to Ruthven (1922), this species is more frequently found in dry as well as wet forest between 180 m and 810 m. When found above 800 m, it is restricted to clearings in the cloud forest.

**Material:** Sierra Nevada de Santa Marta. Cesar: Las Pavas, < 500 m (UMMZ 54826-30, 56513); Pueblo Viejo, 2400 m (MCZ 6562 paratype of *Anolis gaigei*, 171282-86, UMMZ 48322- 3); Valencia, 100 m (UMMZ 54822-5). Guajira: Arroyo de Arenas, 150 m (UMMZ 54818-20). Loma Larga, 750-900 m (UMMZ 54821); Magdalena: Aguadulce, 900 m (UMMZ 48329-4, paratypes of *Anolis gaigei*) Fundación, 60 m (UMMZ 48327-8 paratypes of *Anolis gaigei*); La Tigra, 180-1200 m (UMMZ 48324 paratype of *Anolis gaigei*); Minca, 625 m (UMMZ 48325-6, paratypes of *Anolis gaigei*); Palomina, 1500 m (UMMZ 48321, 55685(4), 56014); Quebrada (this locality probably refers to Quebrada Viernes Santo in San Lorenzo) (UMMZ 54816); San Lorenzo, 810 m (UMMZ 48304 holotype of *Anolis gaigei*, MCZ 1712090-92, 171294-95); San Lorenzo, Hacienda Cincinnati, 1500 m (ANSP 19714-15, UMMZ 54814-5); Tamocol (UMMZ 54817).

*Anolis* sp. A

(Map No.30 )

*Anolis solitarius* Ruthven 1922. (in part), Misc. Publ. Mus. Zool. Univ. Mich., 8: 58.

**Type locality:** Sierra Nevada de Santa Marta, Magdalena, Santa Marta, carretera hacia Estación Experimental San Lorenzo, 1720-1790 m

**Description:** An alpha *Anolis*, member of the *tigrinus* group. Frontal depression distinct with pronounced edges along the supraorbital semicircles and the parietal depression. Head elongated; upper head scales smooth, enlarged, smaller anteriorly. Interparietal large; 3 to 4 internasals; 4 to 5 loreal rows, and 5 to 7 canthals. Seven to 8 supralabials to center of eye and 6 to 8 infralabials. Seven to 10 supraorbitals. Dewlap enlarged in males, slightly indicated in females. Gular scales granular and smooth. Dor-

sal scales granular. The lateral scales smaller and swollen. The ventral scales larger than dorsals, rounded, smooth and juxtaposed. Tail covered with keeled scales posteriorly, those near the base smooth. Fourth toe with 18 to 20 lamellae.

Dorsum is bluish grey or light grayish brown with 5 to 6 broad transversal dark brown bands, which are usually outlined by darker brown spots in males and vertebral brown spots in females. The males have a large rounded blackish brown spot just behind the ear; dewlap is white. The (S-V) length in adults ranges from 43 to 51 mm.

**Distribution:** Restricted to Sierra Nevada de Santa Marta where it is found on the northwestern side, between 1700 to 2000 m.

**Ecology:** San Lorenzo is one of the largest ridges of the Sierra Nevada, located on the northwestern face. This species is found in the cloud forest of this massif between 1500 to 2000 m.

**Material:** Sierra Nevada de Santa Marta. Magdalena: without additional data (ICN 6165-6172); Quebrada Viernes Santo, 1524 m (54777-85); San Lorenzo, camino Dos Quebradas, 2000 m (ICN 2542); San Lorenzo, carretera hacia Estación Experimental San Lorenzo, 1720-1790 m (ICN 6144 holotype, 6172; INC 6143, 6145 -6150, 6152, 6154-6162, 6164); San Lorenzo, Hacienda Cincinnati, 1530 m (ANSP 19716).

*Anolis sp. B*

(Map No.30 )

**Description:** This is an alpha Anolis, member of the *tigrinus* group. Upper head scales moderately large and smooth. The interparietal is enlarged; 3 internasals; 2 to 5 loreal rows, and 5 canthals. Eight supralabials to center of the eye and 5 to 8 infralabials. The supraorbital semicircles widely in contact, comprised of 7 scales. The supraorbital semicircles in contact with the supraorbital disks. The latter with 4 large scales, the remainder of the supraorbital area covered by small granular scales. Mental semidivided. Dewlap moderately large in males, unknown in females; dewlap scales elongated and smooth; gular scales granular small, and smooth. Middorsal scales enlarged, flat and smooth; those on the flanks granular. The ventral scales slightly larger than middorsals, rounded, smooth, and subimbricate. Tail scales uncarinated, keeled and imbricate. Large postanal scales in males; 18 lamellae on the fourth toe.

Dorsum is light grey with somewhat blurred vertebral spots. A series of black

spots form a longitudinal stripe from the ear opening to the middle part of the flanks. Top of the head is grayish, irregularly spotted with light brown. Supralabials are whitish, spotted with brown. Head below, whitish yellow, spotted with dark. Venter is light blue. Limbs and tail are irregularly banded with brown. Dewlap white.

The only known specimen is an adult male which has the SV length of 50 mm.

**Distribution.** Only known from Sierra Nevada de Santa Marta from 900 to 1650 m.

**Ecology:** The only specimen was found in the Hacienda Cincinnati which is a coffee plantation located on the western slopes of San Lorenzo, between 900 to 1650 m.

**Material:** Sierra Nevada de Santa Marta. Magdalena: San Lorenzo, Hacienda Cincinnati, 1530 m, (ANSP 19713).

*Basiliscus basiliscus barbouri* Ruthven

(Map No.30 )

*Basiliscus barbouri* Ruthven, 1914a. Proc. Biol. Soc. Washington, 27:9. **Type locality:** Gaira river at Minca, San Lorenzo, Santa Marta Mountains, Colombia, 660 m Ruthven, 1922. Misc. Publ. Mus. Zool. Univ. Michigan, 8: 59. Barbour and Loveridge, 1946. Bull. Mus. Comp. Zool., 96(2):78.

*Basiliscus basiliscus barbouri:* Maturana, 1962. Bull. Mus. Comp. Zool., 128:26. Peters and Donoso Barros, 1970 U.S. Bull. Natl. Mus., 297:84. Medem, 1968. Rev. Acad. Colomb. Cienc. Exac. Fis. Nat., 13(50):169.

**Description:** The head crest present only in males, slightly conspicuous in females; head scales small. Interparietal usually in contact with the supraorbital semicircles or sometimes separate from them by 1 to 2 scales. One or 2 scales between the supraorbital semicircles; 2 to 4 chin shields in contact with the infralabials. Dorsal crest with serrate border, large and conspicuous. Caudal crest lower than the dorsal crest but similar in appearance. Dorsal scales irregularly enlarged. Ventral scales smooth. Toes of hind limbs with a fringe of flat scales ranging from 35 to 42 and forming serrate margins.

Dorsum is brownish olive, or greenish brown, with dark brown or black transver-

sal bars. The dorsal crest lighter with some black spots at the base. A well defined yellow stripe runs from the upper part of the ear to the anal region and a light creamy line runs from maxillary protuberances to the shoulder. Top of the head is brown with a lighter supraciliary band. The lower surface of the body whitish, spotted with grey. The chin, throat and chest are white with black bands.

The S-V length in adults ranges from 72 to 180 mm.

**Distribution:** Western Venezuela and Santa Marta, Colombia. In Santa Marta it is found in the northwestern and southeastern part from sea level to 1000 m.

**Ecology:** This is a very common lizard that occurs in the xerophytic scrub forest, the humid seasonal forest and in the lower range of the cloud forest. Ruthven (1922) observed that this species is always found near streams.

**Material:** Sierra Nevada de Santa Marta. No additional data, (UMMZ 45444 paratype of *Basiliscus barboursi*). **Cesar:** Valledupar, 206 m (UMMZ 54925); Valencia, 100 m (UMMZ 54926); **Guajira:** Loma Larga, 750-900 m (UMMZ 54923-4). **Magdalena:** Bolivar, 45 m (UMMZ 54922); Bonda, 45 m (CM 937- 8); La Concepción, 1000 m (MCZ 6550(2), 116471-2); Fundación, 60 m MCZ 11307, paratype exch UMMZ, UMMZ 45416, 45423, 45427-8, 45430, 45445); paratypes of *Basiliscus barboursi*); Macho Solo, Caño La Danta, 800 m (ICN, Uncatalog specimens); Palomina, 1500 m (MCZ 6560-65, 6572, 11307 paratypes of *Basiliscus barboursi*); between Mamatoco and La Tigrera, (UMMZ 45413, 45415, 45417-9, 45421 Exch with FMNH, 45422, 45424-6, 45431-5, 45440, 45442 paratypes of *Basiliscus barboursi*); Minca, 625 m (UMMZ 45429, 45436-9, 45443, paratypes of *Basiliscus barboursi*); Minca, Gaira river, 660 m (UMMZ 45411 Holotype of *Basiliscus barboursi*, 45420 paratype of *Basiliscus barboursi*); ); Río Frío, < 50 m MCZ 29706, 32767-9, 53256); Santa Marta, near Río Manzanares, (UMMZ 45464 paratype of *Basiliscus barboursi*); Santa Marta, 39 Km to Riohacha road, 0 m (MCZ 139864).

*Iguana iguana iguana* (Linnaeus)

(Map No.31)

*Iguana iguana* Linnaeus, 1758. Systema Naturae, Ed. 10:206. Type locality "in Indiis".

*Iguana iguana*: Ruthven 1922., Misc. Publ. Mus. Zool. Univ. Michigan, 8:59.

**Description:** Head moderately large with obtuse canthus rostralis; tympanum large and oval. Head scales smooth, variable in size, larger on the forehead and in the interorbital region. Interparietal large, supraorbital scales small; 10 to 12 supralabials. Dorsonuchal crest larger in males than in females. Large, triangular scales on the crest of the anterior border of the gular appendage. Small scales on the gular appendage that increase in size toward the sides. Dorsal scales very small and keeled; large conical and keeled scales on the neck. Ventral scales larger than dorsals sometimes keeled. On each side 12 to 19 femoral pores. Tail compressed, crested dorsally; tail scales keeled.

Dorsum is green, sometimes spotted with darker and lighter green. The flanks are green with a series of vertical dark bands, outlined by white. Tail base with darkish brown. The S-V length in adults ranges from 300 to 326 mm.

**Distribution:** From southern Costa Rica and Caribbean islands to tropical South America.

**Ecology:** This arboreal and strictly vegetarian species is found in mostly dry to humid tropical lowlands and low montane vegetation, and in humid riparian formation. Ruthven, 1922 observed: " ..this lizard is generally abundant on the shores, frequenting the branches overhanging the water, from which they throw themselves when alarmed. In the regions where the streams are shallow the species is apparently less abundant, does not have this habit, and, while occurring along the streams, seems to be more generally distributed. At Riohacha old and young individuals were found in the desert scrub at a distance of a mile from water, in this habitat running about on the ground like the large Ameivas." It has been declared an endangered species; inhabitants of the region eat the meat and the eggs of this species.

**Material:** Sierra Nevada de Santa Marta. Without additional data, (USNM 50671). **Cesar:** Valledupar, 206 m (UMMZ 54935-6); Valencia, 100 m (UMMZ); **Guajira:** Riohacha, 0 m (UMMZ 54928-3); San Juan del Cesar, (UMMZ 54934); **Magdalena:** Bolívar, 45 m (UMMZ 54927); Fundación, 60 m UMMZ, 45398-400, 45404, all missing, 45401, 45406-8 skulls, 45409 skeleton,); Mamatoco, 20 m (UMMZ 45403); between Mamatoco and La Tigrera, (UMMZ 45402).

*Ophryoesssoides erythrogaster* Hallowell

(Map No.32 )

*Brachysaurus erythrogaster* Hallowell, 1857 ["1856"] Proc. Acad. Nat. Sci. Phila., 1856:

232. **Type locality:** New Grenada.

[*Ophryoesssoides*] *erythrogaster*: Etheridge, 1966. Copeia, 1966: 88. Peters and Donoso Barros, 1970 U.S. Nat. Mus. Bull. 297: 213. Medem, 1968. Rev. Acad. Colomb. Cienc. Exac. Fis. Nat. 13(50): 170.

**Description:** Upper head scales large, keeled; tympanum large and oval; parietal and interparietals of equal size, 4 internasals; 1 to 2 loreal rows, and 3 sharply angular canthals. 4 supralabials and 5. The supraorbital semicircles widely in contact comprised of 6 to 7 large, keeled scales. The supraorbital semicircles separate from the supraorbital disks by one row of small scales. The latter with 5 large scales, the remainder supraorbital area covered by small scales. Mental single. Dorsal, gular and ventral scales are large and keeled. Middorsal scales enlarged, raised, forming a low dorsal crest. Males lack extensive gular fan. Tail scales uncarinated, and keeled. Digits compressed; 17 to 18 lamellae on the fourth toe.

Dorsum, head and limbs brownish. A white line covering all the supralabials, loreals and suboculars, runs to the tympanic area or sometimes extends beyond as a narrower line to the shoulder. Ventrally, brownish, but the chin, throat and sides of the abdomen are reddish. The S-V length in adults ranges from 60 to 76 mm.

**Distribution:** Sierra Nevada de Santa Marta and northern Andean highlands of Colombia.

**Ecology:** This species occurs on the ground of the xerophytic scrub forest and the humid evergreen seasonal forest, below 600 m. Medem (1968) observed that the brown color of the body helps the animal to get very well camouflaged with the ground vegetation.

**Material:** Sierra Nevada de Santa Marta. Cesar: Valencia, 100 m. (UMMZ 54740). Magdalena: Bolívar, 45 m. (UMMZ 54739); between Mamatoco and La Tigra, (UMMZ 45465); between Minca and La Tigra, (UMMZ 45467); Tamocal river, (UMMZ 45466, 45469, exch with MZC).

*Polychrus gutturosus* Berthold

(Map No.31)

*Polychrus gutturosus* Berthold, 1846b, Nachr. Univ. konigl. Ges. Wiss. Gottingen, 8-10: 11.

**Description:** Snout pointed; nostril equidistant between orbit and tip of snout; orbit a little larger than tympanum. Supracephalic scales smooth or feebly granulated, large on the snout. Supraorbital semicircles of regular large scales, separated by one row of small scales; supraoculars small; labials large and mental with a posterior median cleft. Gulars oval and striated, larger than ventrals. Scales on gular pouch separated by granules. Body scales of nearly equal size; dorsals and laterals unicarinate, but ventrals tricarinate or quecarinate. Limbs moderate with quincarinate scales; 6-8 femoral pores on each leg; tail with unicarinate scales.

Olive brown above, greenish yellow below. The backs of the thighs have an irregular yellow band. The tail has indistinct dark crossbands.

One specimen measures 153 mm body length and 338 mm of tail length.

**Distribution:** From Nicaragua to western Colombia and Ecuador.

**Ecology:** This well camouflaged species is found on tree trunks in lowland forests.

**Material:** Sierra Nevada de Santa Marta. Magdalena: Aracataca, (ANSP 19783).

### 3. Family Scindidae

*Mabuya mabouya mabouya* (Lacepede)

(Map No. 31)

*Lacertus mabouya* Lacepede, 1788. Hist. Nat. Quadrup. Ovipares 1:376. **Type locality:** America and the Antilles; restricted to the Lesser Antilles by Dunn, 1936; further restricted to St. Vincent Island by Smith and Taylor, 1950.

*Mabuya agilis:* Ruthven 1922., Misc. Publ. Mus. Zool. Univ. Mich. No. 8: 64.

**Description:** Upper head scales large and smooth; 1 pair of supranasals in contact behind the rostral; 1 large frontonasal in contact with the loreals. 1 large frontal in contact with the 2 frontoparietals; 4 supraoculars, the most anterior smaller than the others; interparietal slightly smaller than the parietals. 7 supralabials and 5 infralabials. Dorsal scales smooth. Subdigital lamellae smooth.

Dorsum olive brownish above with a few small dark brown spots; a well defined dark brown lateral band runs from anterior part of the head to the base of the tail, bordered by a light streak; lower surfaces yellowish white or grayish. The body length (S-V) in adults ranges from 60 to 73 mm.

**Distribution:** Panama, Colombia, Ecuador, Amazon region and Caribbean islands including Pato, Trinidad, Tobago, Barbados and Lesser Antilles. In Sierra Nevada de Santa Marta it is found on the southeastern part below 500 m.

**Ecology:** This skunk is viviparous; usually the female gives birth to 4 to 6 young each time. This species feeds mostly on arthropods.

**Material:** Sierra Nevada de Santa Marta. Guajira: Arroyo de Arenas, Rio Barba-coa, (UMMZ 54793-4); Las Pavas 500 m (UMMZ 54798); Valencia, 100 m. (UMMZ 54795-7). Magdalena: Rio Frio, < 50 m. (MCZ 29726).

#### 4. Family Teiidae

##### Key to the species of *Ameiva*

1. Frontal divided transversally; 10 rows of ventrals ..... *A. bifrontata* ssp.  
1' Frontal undivided; 12 ventral rows ..... *A. ameiva fischeri*

##### *Ameiva ameiva fischeri* Peters and Donoso

(Map No. 33)

*Ameiva ameiva fischeri* Peters and Donoso-Barrios, 1970. Bull. U. S. Natl. Mus. 297: 19. (nomen novum for *A. a. maculata* Fischer, 1879).

*Cnemidophorus maculatus* Fischer, 1879 Verh. Naturwiss. Ver. Hamburg, 67: 95. **Type locality:** Sabana Larga, Colombia.

*Ameiva ameiva maculata:* Barbour and Noble, 1915. Bull. Mus. Comp. Zool., 59:467.

**Description:** A single pair of frontoparietals broadly in contact; 2 nasals, one loreal and 5 occipitals; 6-7 supraoculars; 7-8 large supralabials, and 5 large infralabials, separated from the chin shields by granular scales. Chin and throat with small granules, but with a poorly defined band of larger granules extending across the throat. Ventrals in 12 or less rows and the dorsum with small granular scales. The preanal scale very small and undifferentiated.

Dorsum is olive grey or grayish blue, outlined by a lighter bluish dorsolateral line, surrounded dorsally by a wavy irregular string of black spots that can form a black line. A lateral light blue line forms the lower border of the dorsolateral black line. The sides are bluish black, with transversal rows of light spots, coloration that also cover the outer ventrals. A series of regular white spots, arranged in transversal rows are present on each side of the body. The white spots are surrounded by black, which occasionally forms vertical bars. Venter whitish; the chin white, usually spotted with blue grey. The S-V adult length ranges from 80 to 200 mm.

**Distribution:** Sierra Nevada de Santa Marta and Sabana Larga, Colombia.

**Remarks:** A specimen (AMNH 97384) from "Magdalena, Santa Marta, east hills, site 24", collected by Hutchinson represents the subspecies *Ameiva ameiva praesignis* which is not known in the area of study.

**Ecology:** This species occurs in xerophytic environments, clearings and secondary forests; individuals are quite active on warm, sunny days.

**Material:** Sierra Nevada de Santa Marta. **Cesar:** Valledupar, 206 m (UMMZ 54915-6, 54935-6); Valencia, 100 m (UMMZ 54917-21). **Guajira:** Fonseca, Río Ranchería, 150 m (UMMZ 54911-4) Loma Larga, 750-900 m (UMMZ 54910); Riohacha, 0 m (UMMZ 54900-4); Río Barbacoa (UMMZ 64908-9). **Magdalena:** no additional data (UMMZ 45300, 45306); Aguadulce, 900 m (UMMZ 45302-3, 45308-9); between Aguadulce and Minca, 625-900 m (UMMZ 45301); Aracataca, 60 m (ANSP 19751); La Tigrera, 180 m (UMMZ 45299); Mamatoco, < 20 m (UMMZ 45297-8, 45307); Minca, 625 m (UMMZ 45304-5).

*Ameiva bifrontata* ssp.

(Map No. 33)

*Cnemidophorus divisus* Fischer, 1879., Verh. Naturwiss. Ver. Hamburg, 67:99. **Type locality:** Barranquilla, Colombia

*Ameiva bifrontata divisus*: Barbour and Noble, 1915. Bull. Mus. Comp. Zool., 59:467. Ruthven, 1913. Misc. Publ. Mus. Zool. Univ. Mich., 2:1. Ruthven, 1922. Misc. Publ. Mus. Zool. Univ. Mich., 8: 60. Ruthven, 1924. Misc. Publ. Mus. Zool. Univ. Mich., 155:1.

*Ameiva bifrontata bifrontata*: Medem, 1968. Rev. Acad. Col. Cienc. Exac. Fis. Nat. 13(50): 172.

**Description:** Nostril between two nasals, the anterior part in contact behind the rostral; frontonasal in contact with the loreal. Prefrontals in contact; frontal divided transversally and separated or not from the supraoculars; 5 occipitals; six superciliaries; 4 supraoculars; 5 or 6 infralabials. Chin and throat covered by small scales; between two throat folds 4 or 5 irregular rows of scales; 3 enlarged preanals; 13 to 18 femoral pores. About 10 longitudinal ventral rows of rectangular scales in about 32 to 35 transversal rows; the two outer rows consist of more roundish scales. Dorsum with small, smooth granules. The caudal scales in transversal rows and strongly keeled.

Dorsum is dark grayish brown or olive brown, but from the nape to tail there are two parallel light blue streaks on each side of the body. They continue as series of light dots on the tail. The dorsum is mottled with black. The top of the head is olive; occasionally, the tip of the snout is white. The supralabials are light, sometimes spotted with olive brown. The upper surfaces of the limbs are strongly spotted with whitish blue. The chin, the venter and the lower surfaces of the limbs are light yellowish or creamy. Usually, the dorsal color extends onto the outer ventrals.

**Distribution:** Northwestern Colombia, and probably Venezuela.

In Sierra Nevada de Santa Marta, it is found on the northern and northwestern part, from sea level to 650 m

**Remarks:** In the northern and northeastern part of the Sierra from Don Diego, Magdalena to Guajira region occur intergrades between *A. b. bifrontata* x *divisa* because of the condition of supraocular granules. The rest of the specimens have been assigned

either to *A. b. divisa* or to intergrades. As many specimens are difficult to assign to a subspecies, I use the specific name, until further studies have been done on the Santa Marta population.

**Ecology:** In Sierra Nevada de Santa Marta it is found in lowland xerophytic scrub forest and low altitude dry forest.

**Material:** Sierra Nevada de Santa Marta. No additional data, (UMMZ 45374).

**Cesar:** Badillo, <200 m (UMMZ 54996-7); Valledupar, 206 m (UMMZ 55024-8,

54030); **Guajira:** Fonseca, 150 m (MCZ 163154); Fonseca, Río Ranchería, 150 m

(UMMZ 54993-5, 55032); Riohacha, 0 m (UMMZ 54969, 54971-92, 54998- 55017).

**Magdalena:** Aracataca, 60 m (ANSP 19717); Don Diego, 0 m (48094-5); Fundación, 60

m (MCZ 10573-4, UMMZ 45390-1, 45393-6); Minca, 625 m (UMMZ 45371, 45375,

45377, 45379, 45387); La Tigrera, 180 m (MCZ 10572, UMMZ 45378, 45385, 45392);

Mamatoco, 20 m (UMMZ 45380-1); between Mamatoco and La Tigrera (UMMZ 45372,

45382-3); Pozos Colorados, ca. 11 km south of Santa Marta <50 m (AMNH 97385-7,

106210-3, 106187- 213, 109834-8); Río Frío, 50 m (MCZ 29714); Santa Marta, 4 Km N of the airport (MCZ 160194); Tucurinca, 50 m (ANSP 19780).

### Key to the species of *Anadia*

1. Ventrals with large dark spot; no prefrontalscales ..... *A. altaserrania*  
 1' No large dark spots on ventrals; prefrontals present ..... *A. pulchella*

### *Anadia altaserrania* Harris & Ayala

(Map No.32)

*Anadia altaserrania* Harris and Ayala, 1987. *Herpetologica*, 43(2):186. **Type locality:** Between Duriameina (10 39' N, 73 39' W) and Mamacanaca (10 43'N, 73 39 W) Sierra Nevada de Santa Marta, Dept. Magdalena, Colombia, 3383-3452 m.

**Description:** Nasal undivided, loreal present, and no prefrontals. One parietal between two interparietals, two pairs of small occipitals; 3 supraoculars. Enlarged scales on the temporal region; a single anterior chin shield, followed by three pairs of scales, the

first two larger and in contact; gular region with a conspicuous collar fold. Dorsal scales in 45 to 47 rows in the middle of the body, squared, slightly keeled, somewhat decreasing in size towards the sides. Ventrals wider than dorsals, squarish and strongly imbricate, in 32 to 33 transverse rows, and in 12 longitudinal rows; 3 to 4 femoral pores.

Dorsum is brownish, striped with brown, tan and grayish longitudinal lines. Top of the head is dark brown with irregular tan spots; chin tan, with many brown spots. The venter is yellowish tan, with rounded dark brown spots on the anterior portion of each scale.

The snout-vent length of the only known specimen is 76 mm.

**Distribution:** Known from Sierra Nevada de Santa Marta, at 3452 m.

**Ecology:** This species has probably the highest altitudinal distribution of all the lizards in Sierra Nevada de Santa Marta. It has been found at elevations around 3452 m, in the paramo formation.

**Material:** Sierra Nevada de Santa Marta. Magdalena: between Duriameina (10 39' N, 73 39' W) and Mamancanaca (10 43'N, 73 39' W), 3383-3452 m (UMMZ 85597).

*Anadia pulchella* Ruthven

(Map No. 32)

*Anadia pulchella* Ruthven, 1926, Occ. Pap. Mus. Zool. Univ. Michigan, 177:1. **Type locality:** La Cumbre, Hacienda Vista Nieve, Santa Marta Mountains, Colombia, 2100 m. Dunn, 1937b. Proc. Biol. Soc. Washington, 50:11. Dunn, 1944e. Caldasia 3:64. Medem, 1968. Rev. Acad. Col. Cienc. Exac. Fis. Nat. 13(50): 172. Oftedal, 1974. Arq. Zool., 25 (4):235. Harris and Ayala, 1987. Herpetologica, 43(2):185.

**Description:** Nasal undivided, loreal present, one large frontonasal and two prefrontals. Five parietals, several small occipitals; 3 supraoculars. The temporal region with enlarged scales; the mental followed by a single chin shield and four pairs of large scales, the first two in contact; gular scales quadrate, irregular in size. Dorsal scales in 37-45 rows in the middle of the body, square, smooth and juxtaposed, slightly increasing in size towards the sides; 40 to 43 row scales between the occipital and the base of the tail; ventrals imbricate, in 29 to 35 rows; 6 to 9 femoral pores.

Dorsum is olive or light brown, irregularly spotted with dark brown that posteriorly forms transversal bands, interrupted on the vertebral region. The top of the head is of the same color as the dorsum; a brown band on each side runs from the tip of the snout to the shoulder. The tail is of the same color as the dorsum with two rows of darker spots. Laterally, there are irregularly defined light spots. The labials and the chin are yellow that extends toward the throat as a single stripe outlined by dark. The venter is light greenish yellow, spotted with dark. The body length of the adults is around 50 mm.

**Distribution:** Known from the northwestern and eastern part of the Sierra Nevada de Santa Marta.

**Ecology:** It is restricted to the cloud forest from 2000 to 2700 m. Ruthven (1926) reported that the holotype was found in a bromeliad plant.

**Material:** Sierra Nevada de Santa Marta. Cesar: Near San Sebastián, Mt Figueroa, 2700 m (UMMZ 85598) Magdalena La Cumbre, 2250 m (MCZ 22409, UMMZ 143402), La Cumbre, Hacienda Vista Nieve, 2700 m (UMMZ 63333 holotype).

### Key for the species of *Bachia*

1. Three toes on the forelimb; Preanal pores absent ..... *Bachia talpa*  
 1'. Forelimb with 4 toes. One preanal pore present only ..... *Bachia bicolor*

### *Bachia bicolor* (Cope)

(Map No. 35)

*Heteroclonium bicolor* Cope, 1896, Proc. Acad. Nat. Sci. Phila., 1896:466. **Type locality:** Bogota, Colombia.

*Bachia bicolor* Ruthven, 1922. Misc. Publ. Mus. Zool. Univ. Mich., 8:63. Medem, 1968. Rev. Acad. Col. Cienc. Exac. Fis. Nat. 13(50): 173. Dixon, 1973, Misc. Publ. Mus. Nat. Hist. Univ. Kansas, 57:23.

**Description:** Frontonasal scale and 2 parietals present, but the prefrontal, interparietals and supraoculars absent. Five supralabials and 5 infralabials. Second pair of the chin shields not in contact medially; 7 to 9 gular scales. The dorsal scales smooth and

hexagonal in shape. The venter covered by squarish scales, in 32 to 39 rows from pectoral shield to preanal plate. Forelimb with 4 toes and the hindlimbs with 1 to 3 apical scales. One preanal pore present in males only.

The dorsum and venter are brownish, somewhat mottled with black. The top of the head is also dark brown but lighter below. The S-V length in adults ranges from 104 to 107 mm.

**Distribution:** Sierra de Perija, western Venezuela; northern and central Colombia. In Sierra Nevada de Santa Marta it is found in the northern and northwestern part, from sea level up to 1500 m.

**Ecology:** This is a small lizard usually found beneath rocks, and logs in xerophytic lowland scrub forest (Ruthven, 1922).

**Material:** Sierra Nevada de Santa Marta, Guajira: Loma Larga, 750-900 m (UMMZ 54776, 3 specimens). Magdalena: Bolívar, 45 m (UMMZ 54767); Mamatoco, 20 m (UMMZ 45296); Parque Nacional La Frontera-río Buritaca (IND 2285); Palomina, 1500 m (MCZ 6557, 6559); Río Frío, banana belt, < 50 m (MCZ 25053, 29325, 29715); Tucurínca (ANSP 19772).

*Bachia talpa* Ruthven

(Map No. 34)

*Bachia talpa* Ruthven, 1925. Proc. Boston Soc. Nat. Hist., 38: 101. **Type locality:** Valle Dupar (it should be Valledupar), Sierra Nevada de Santa Marta, Colombia. Barbour and Loveridge, 1946. Bull. Mus. Comp. Zool., 96(2): 78. Medem, 1968. Rev. Acad. Col. Cienc. Exac. Fis. Nat. 13(50): 173. Dixon, 1973. Misc. Publ. Mus. Nat. Hist. Univ. Kansas, 57:24.

*Bachia dorbignyi*: Ruthven, 1922. Misc. Publ. Mus. Zool. Univ. Mich., 8:63.

**Description:** Nasal, frontonasal and parietals present, but the prefrontal, interparietals and supraoculars absent; 5 supralabials and 5 infralabials. Second pair of the chin shields separated medially. The dorsal scales smooth and hexagonal in shape. The venter covered by squarish scales, 36 to 38 from pectoral shield to preanal plate. Three toes on the forelimb and the hindlimbs with 1 to 3 apical scales. Preanal pores absent in

both sexes.

The dorsum and top of the head are brownish with one vertebral and 2 paravertebral black stripes running from the top of the head to tip of the tail. The top of the head is also dark brown but lighter below. The venter is darker than the dorsum. The S-V length in adults ranges from 62 to 63 mm.

**Distribution:** Sierra Nevada de Santa Marta in the eastern and southeastern part, below 500 m.

**Ecology:** This microteiid lives also in the dry forest and it is usually found under rocks, fallen trees and logs.

**Material:** Sierra Nevada de Santa Marta. No additional data, (MCZ 14636, lost).

**Cesar:** Valledupar, 206 m (UMMZ 54769-71) Valencia, 100 m (UMMZ 54772-3). **Gujira:** Fonseca, 150 m

*Cnemidophorus lemniscatus lemniscatus* (Linnaeus)

(Map No. 35)

*Lacerta lemniscata* Linnaeus, Systema Naturae, Ed. 10:209 **Type locality:** Guinea, probably in error for Guiana.

*Cnemidophorus lemniscatus gagei* Ruthven, 1915b. Occ. Pap. Mus. Zool. Univ. Mich., 16:1. **Type locality:** Sierra Nevada de Santa Marta, Colombia. Ruthven, 1922, Misc, Publ. Mus. Zool. Univ. Mich., 8:61.

*Cnemidophorus lemniscatus lemniscatus:* Barbour and Loveridge, 1946. Bull. Mus. Comp. Zool., 96(2):93.

**Description:** A lizard with a short head, nasals divided; 4 supraoculars and 2 to 4 supraciliaries; 4 to 5 large supralabials and 4 to 6 infralabials; mental followed by one large chin shield and four pairs of smaller size, the first in contact, gular scales small. A collar of enlarged scales and a conspicuous collar fold on the gular region. Dorsal scales granular, smooth; ventrals enlarged, smooth, in 8 longitudinal rows and 30-33 transversal rows. Three preanal scales, 16 to 25 femoral pores; one spine on each side of the vent in males, absent in females. Lateral sides of the limbs with enlarged, smooth scales. Caudal scales oblique and keeled.

Dorsum in males has a vertebral olive stripe running from the nape to the base of the tail, which is bordered on each side by narrower black stripes; the latter are outlined by light blue lines. In females, the vertebral stripe is sometimes interrupted by a blue line similar to those bordering the black paravertebral bands. The top of the head is unicolor dark olive, with a blue line that begins on the posterior corner of the supraciliar region. The sides of the head and the flanks are bluish olive, spotted with bright blue or white. The upper surfaces of the limbs have whitish dots. The gular region is bluish or yellow, spotted with white. The venter is light blue, sometimes with dark or blackish blue on the belly.

The S-V length in adults ranges from 77 to 99 mm.

**Distribution:** Tropical Central and South America, including the Caribbean islands of Trinidad, Tobago, Margarita, Old Providence, Coche, Cubagua, St. Thomas, Swan and Milford. In Sierra Nevada de Santa Marta it is found around the massif from sea level up to 1500 m

**Ecology:** This is a very common lizard inhabiting the lowland xerophytic scrub forest, penetrating the open and drier parts of the cloud forest.

**Material:** Sierra Nevada de Santa Marta. Without additional data (USNM 144169-70). **Cesar:** Badillo, <200 m (UMMZ 54890-1); Valledupar, 206 m (UMMZ 54892-5, 54916); Valencia, 100 m (UMMZ 54917-21). **Guajira:** Arroyo de Arenas, Rio Barbacoa, 150 m ( UMMZ 54886-7); Loma Larga, 750-900 m (UMMZ 54888) Rio-hacha, 0 m (UMMZ 54838-40, 54842-9, 54851-63, 54870-3, 54878-3) Quajavia Pen at mission (UMMZ 54874-6, 54884-5); Rio Rancheria (UMMZ 54889). **Magdalena:** Aracataca, 60 m (ANSP 19718); Bonda, 45 m (CM 923 missing, 1053); Curva del Tigre, below Minca, <600 m (UMMZ 45341, 45353); Don Diego, 0 m (UMMZ 48091-3); Fundación, 60 m (UMMZ 45322, 45326-7, 45344, 45352 holotype of *C. l. gaigei*, 45354, 45358, 45367, 48243-4); La Concepción, 1000 m (MCZ 6548 paratype of *C. l. gaigei*); La Tigrera, 180 m (UMMZ 45345); between Mamatoco and La Tigrera, (UMMZ 45320-1 45323-4, 45329, 45332- 5, 45339-40, 45343,45351, 45357, 45360, 45362-3, 45365-6 , 45368, 45370, 45610); between Mamatoco and Tamocal (UMMZ 45361); Minca, 625 m (UMMZ 45318-9, 45325, 45328, 45331, 45342, 45347); Palomina, 1500 m (MCZ 6558, 6570-1, paratypes of *C. l. gaigei*); Río Frío, 50 m (MCZ 29716-9); Salamanca coast, (UMMZ 45337-8); Santa Marta, 0 m (UMMZ 45364,

45369); Santa Marta, Punta de Betín, 0 m (AMNH 97389-93); Tamocal river, (UMMZ 45330, 45359); Tucurínca 50 m (ANSP 19720).

*Gymnophthalmus speciosus speciosus* (Hallowell)

(Map No. 35)

*Blepharictisis speciosus* Hallowell, 1861 "1860". Proc. Acad. Nat. Sci. Phila., 1860:484.

**Type locality:** Nicaragua.

*Gymnophthalmus sumichrastii*: Ruthven, 1922. Misc. Publ. Mus. Zool. Univ. Mich., 8: 64.

*Gymnophthalmus speciosus speciosus*: Mertens, 1952. Abh. Senckenberg. Naturforsch. Ges., 487:56. Medem, 1968. Rev. Acad. Col. Cienc. Exac. Fis. Nat. 13(50): 174.

**Description:** A large frontonasal, followed by a small frontal, pentagonal in shape; interparietal longer than the parietal; one loreal; 1 supraocular; 5 to 8 supralabials and 6 to 7 infralabials. Body scales smooth, 13-15 dorsal scales around the body, and caudals keeled; 29-40 scales from nape to the base of the tail, and 25 to 31 ventrals. Three to 4 femoral pores in males, absent in females.

Dorsum is dark yellowish or olive brown with metallic gloss. Laterally a dark wide band is present, outlined by blue lines.

The S-V length in adults ranges from 28 to 40 mm.

**Distribution:** Honduras and Nicaragua to northern South America; Margarita island. In Sierra Nevada de Santa Marta, it is found in northwestern and eastern part of the massif, from sea level to about 900 m.

**Ecology:** This species is found in the xerophytic and semidesertic zones below 200 m or in savannas and open sites of the cloud forest between, 200 to 900 m. It is a secretive species that lives on the ground under the leaves of herbaceous plants. It is active only during sunny hours.

**Material:** Sierra Nevada de Santa Marta. No additional data, (MCZ 16838).

**Cesar:** Badillo, < 200 m (UMMZ 54707); Valencia, 100 m (UMMZ 54706, 54708, 54709 exch CAS). **Magdalena:** Bolívar, 45 m (UMMZ 54704, MCZ); Minca, 600-900 m (ICN 624-5); Río Frío, < 50 m (MCZ 25985).

***Leposoma rugiceps* (Cope)**

(Map No. 36)

*Loxopholis rugiceps* Cope, 1869. Proc. Acad. Nat. Sci. Phila., 1868:305. **Type locality:** Rio Magdalena, Colombia.

*Leposoma dispar*: Ruthven, 1922. Misc. Publ. Mus. Zool. Univ. Mich., 8: 63.

*Leposoma rugiceps*: Ruthven, 1922. Misc. Publ. Mus. Zool. Univ. Mich., 8: 63. Ruibal, 1952. Bull. Mus. Comp. Zool., 106: 487. Medem, 1968. Rev. Acad. Col. Cienc. Exac. Fis. Nat. 13(50): 174.

**Description:** Frontonasal single; 2 prefrontals and 1 large frontal. Interparietals larger than the parietals; 2 loreals; 4 to 6 supralabials and 5 to 6 infralabials. All cephalic scales striated; the scales of the side of the neck smaller than the dorsals and keeled. Dorsal scales in 20 to 25 rows in the middle of the body, strongly keeled, and in 27 to 31 rows from parietals to posterior margin of hind limbs. The ventrals wider than dorsals, squarish and usually keeled, sometimes smooth and in 20 to 24 transversal rows and in 4 longitudinal rows; 3 to 4 femoral pores, only present in males; 6-5 preanal plates.

Dorsum is light brown, sometimes slightly spotted with brown. The dorsum is bordered by dark brown scales with white apical tips that form a wide paravertebral stripe extending from the tip of the snout to almost half of the tail, on each side of the body. The top of the head is uniformly dark brown, except for the supralabials which are yellowish with dark brown vertical or diagonal stripes. The head below is yellowish with many irregular dark brown markings that are more conspicuous on the throat. The venter is usually immaculate bordered with dark brown.

The S-V length in adults ranges from 36 to 42 mm.

**Distribution:** Colombia, north and east of Andes; Panama. In Sierra Nevada de Santa Marta, it is found in the lowlands in the northern, northwestern and southeastern part.

**Ecology:** Although this small lizard inhabits dry environments in Sierra Nevada, it is usually found in humid environments associated with streams, rivers, plantations or with the cloud forest. Usually it occurs in small, isolated populations of up to 6 individuals within a given habitat.

**Material:** Sierra Nevada de Santa Marta. No additional data, (UMMZ 48214-16). **Cesar:** Las Pavas, < 500 m (MCZ 16836- 7); Valencia, 100 m (UMMZ 54736). **Magdalena:** near Bolívar, 45 m (UMMZ 54738); Fundación, 60 m (MCZ 16834-5); Río Frío, 50 m (MCZ 29720-2, 29724-5); Tucurínca, 50 m (ANSP 19729, UMMZ 55721).

*Ptychoglossus sp. A*

(Map No 37)

**Description:** Dorsum black with a well defined golden (white in preservative) vertebral stripe that covers almost completely the upper part of the head, and gets reduced backward. The venter is light yellowish. Gular region blackish gray, and the tail is grey spotted with black. The S-V length in adults ranges from 35 to 62 mm.

**Distribution:** Restricted to Sierra Nevada de Santa Marta

**Remarks:** Pending description by D. Harris

**Material:** Colombia, Sierra Nevada de Santa Marta. **Magdalena:** Cuchilla Yerbabuena, 10 54'N & 74 00' W. 2000- 2600 m.

*Tretioscincus bifasciatus bifasciatus (Dumeril)*

(Map No. 36)

*Heteropus bifasciatus* Dumeril, 1851. Cat. Meth. Coll. Rept. Mus. Paris: 182. **Type localiiio** Magdalena valley, Colombia.

*Tretioscincus bifasciatus:* Ruthven, 1922. Misc. Publ. Mus. Zool. Univ. Mich., 8: 63.

Medem, 1968. Rev. Acad. Col. Cienc. Exac. Fis. Nat. 13(50): 175.

**Description:** A large frontonasal that separates the nasal plates; 1 frontal, smaller than the frontonasal; one loreal; 6 to 8 supralabials. Dorsal scales keeled in 27-29 rows from parietals to the base of the tail. The ventrals strongly keeled; 5 to 6 femoral pores; 5-6 preanal plates.

Dorsum is brownish with a light blue longitudinal band on each side of the body, beginning from the tip of the snout. Venter is yellowish, spotted with grey. In some specimens the tail is bright blue. The S-V length in adults ranges from 43 to 53 mm.

**Distribution:** Caribbean Colombia. In Sierra Nevada de Santa Marta it is found in the northern and southeastern part.

**Ecology:** This species inhabits sunny sites such as grasslands, as well as humid forests, from sea level to about 300 m. Usually found "among fallen leaves, on and in logs and on the trees" (Ruthven, 1922).

**Material:** Sierra Nevada de Santa Marta. No additional data (UMMZ 47613-6, 47618, 47621-2, 46724-5) **Cesar:** Las Pavas, < 500 m (UMMZ 54724); Valencia, 100 m (UMMZ 5472-3); Valledupar, (UMMZ 54725-6). **Guajira:** Arroyo de Arenas, río Barbacoa, 150 m (UMMZ 54713-7); Fonseca, rio Rancheria, (UMMZ 54718-20) **Magdalena:** Don Diego, (UMMZ 48096); between La Tigra and Bolívar (UMMZ 54710-2).

***Tupinambis teguixin* (Linnaeus)**

(Map No. 36)

*Lacerta teguixin* Linnaeus, Systemae Naturae, Ed. 10:208. **Type locality:** Indiis.

*Tupinambis nigropunctatus:* Ruthven, 1922, Misc. Publ. Mus. Zool. Univ. Mich., 8: 60. Medem, 1968. Rev. Acad. Col. Cienc. Exac. Fis. Nat. 13(50): 176.

**Description:** Nasals in contact behind the rostral; 1 large internasal; 2 small prefrontals and 1 frontal, 2 small frontoparietals, 2 parietals and 1 interparietal; 2 large loreals; 8 to 10 supralabials, separate from the orbit by small suboculars; 8 or 9 infralabials. Gular scales granular. Body covered with small, flat dorsal scales. Ventrals larger than dorsals, in 20 to 30 transversal rows and in 32 to 36 longitudinal rows. Preanal scales granular; 20 to 23 femoral pores.

Dorsum is dark olive with light spots dorsolaterally and tan patch overall. Top of the head is black. The venter is yellowish, with black transversal bands. The S-V length in adults ranges from 270 to 410 mm.

**Remarks:** I follow Presch (1973) in placing *nigropunctatus* Spix, 1825, in the synonymy of *T. teguixin* (Linnaeus, 1758).

**Distribution:** Tropical South America to northern Argentina

**Ecology:** Usually found in clearings of forests.

**Material:** Sierra Nevada de Santa Marta. Magdalena: Don Diego, 0 m (UMMZ 46681); Pozos Colorados, ca. 11 Km S of Santa Marta, <50 m (AMNH 106231).

## 5. Family Amphisbaenidae

### *Amphisbaena fuliginosa varia Laurenti*

(Map No. 37)

*Amphisbaena varia* Laurenti, 1768. Synop. Rept.: 66. **Type locality:** America, restricted to Barro Colorado Island, Canal Zone, Panama, by Vanzolini, 1951., Bull. Mus. Comp. Zool., 106:61.

*Amphisbaena fuliginosa varia:* Vanzolini, 1951., Bull. Mus. Comp. Zool., 106:61.

**Description:** No limbs present, the scales are not imbricate of regular size forming rows. At midbody each row has 45-48 segments. Dorsal scales indistinct from ventrals; 8 cloacal pores.

**Coloration:** black and pink forming very irregular bars or . light brownish somewhat spotted or barred with light yellow or cream. Total length 395-410 mm;

**Distribution:** Panama to near Villavicencio, Colombia and to near Trinidad, in Venezuela; also, pacific slopes of Ecuador and Colombia. In Sierra Nevada de Santa Marta, it has been reported from the northern and northwestern part.

**Ecology:** This species occurs in the cloud forest of San Lorenzo and Parque Tayrona. The specimen collected at San Lorenzo was found "crawling along the ground in the forest at daybreak" (Ruthven 1922).

**Material:** Sierra Nevada de Santa Marta. Magdalena: Parque Nacional Tayrona, La Frontera-Río Buritaca, (IND 2284); San Lorenzo, 1200 m (UMMZ 45397).

## D. Snakes

### 1. Family Anomalepididae

#### *Liotyphlops albirostris* (Peters)

(Map No. 38)

*Rhinotyphlops albirostris* Peters, 1857, Monats. Akad. Wiss. Berlin. 1857:402. **Type locality:** "Veragua" Panama. *Helmintophis bondensis* Griffin, 1916, ["1915"]. Mem. Carneg. Mus., 7:165. **Type locality:** Bonda, Colombia.

*Helmintophis petersii*: Ruthven, 1922., Misc. Publ. Mus. Zool. Univ. Michigan., 8:64.

*Liotyphlops albirostris*: Medem, 1968., Rev. Acad. Colomb. Cienc. Fis. Nat. 13(50):178.

**Description:** Rostral in contact with the frontal, and the prefrontal in contact with the frontal and ocular; preocular absent, 4 supralabials, first three in contact with the only subocular; 22 to 24 body scale rows; 385 to 458 dorsals; proportion of total length to tail length ranges from 53 to 71. Body light brown, slightly spotted with dark. The venter lighter than the dorsum, and the snout is light.

The largest measured specimen is 182 mm long with 3 mm of tail length.

**Distribution:** Southern Central America and northern South America in Colombia, Venezuela and Ecuador.

In Sierra Nevada de Santa Marta it has been found on the northwestern and southwestern lowland dry forest, usually below 300 m.

**Ecology:** According to Ruthven, the specimen collected at Fundacion was found under logs in dry forest, and the one from Valencia was collected in the flood-plain forest.

**Material:** Sierra Nevada de Santa Marta. Cesar: Valencia, 100 m (UMMZ 54937). Magdalena: Bonda, 45 m (CM 216, holotype of *H. bondensis*); Fundación, 60 m (48173); Gaira, close to Santa Marta, sea level, (FMNH 165215); Tucurinca, < 50 m (MCZ 33927).

## 2. Family Leptotyphlopidae

### *Leptotyphlops macrolepis*

(Map No. 38)

*Stenostoma macrolepis* Peters, 1857. Monastber. Akad. Wiss. Berlin, 1857:402. **Type locality:** Caracas and Puerto Cabello, Venezuela, restricted to Puerto Cabello, Venezuela by Orejas-Miranda (1967).

*Leptotyphlops macrolepis*: Ruthven, 1922. Misc. Publ. Mus. Zool. Univ. Michigan, 8:64.

**Description:** Head round; rostral extends to the level of the eyes, in contact with the frontal; the latter indistinguishable from the dorsals; supranasal larger than the infranasal; supraocular larger than the frontal. Three supralabials, the ocular in contact with the mouth between the second and third supralabials; six infralabials and two pairs of genials; 14 rows of scales around the body; 215 to 231 total ventrals, including 19 to 21 subcaudals. Proportion of total length to diameter, 39 to 52; of total length to tail length, 12 to 16.

**Coloration:** the seven dorsal rows dark grey or grey purplish and the seven ventral (lower part of the body) rows somewhat lighter due to lighter borders of the scales.

**Distribution:** From Panama, Colombia and Venezuela to the Guianas and northern Brazil. In Sierra Nevada de Santa Marta it is found in northern and northwestern part from sea level to about 200 m.

**Ecology:** Found in xerophytic lowland and dry scrub forest, perhaps also in irrigated areas that are more humid. Ruthven (1922) reports a specimen found in "dry woods".

**Material:** Sierra Nevada de Santa Marta. Magdalena. Cesar: Valledupar, 206 m (CAS 116307); Magdalena: Bolivar, 45 m (Ruthven, 1922); Cienaga, 0 m (USNM 144172-4); Gaira road to Cienaga (FMNH 165214); Mamatoco, <20 m (UMMZ 48175; Pozos Colorados, <50 m (CAS 113736); Río Frío, 0 m (FMNH 33928); Santa Marta, 0 m (AMNH 103683, BM 53.24.33); Rodadero de Santa Marta (AMNH 109848).

### 3. Family Boidae

#### *Boa constrictor constrictor* Linnaeus

(Map No. 39)

*Boa constrictor* Linnaeus, 1758. Syst. Nat. Ed. 10: 214. Type locality: India (in error)  
*Constrictor constrictor*: Griffin, 1916, ["1915"]. Mem. Carneg. Mus. VIII: 168. Ruthven, 1922. Misc. Publ. Mus. Zool. Univ. Mich., 8: 64. Amaral, 1928., Bull. Antiven. Inst. Amer. 2(1):7.

**Description:** This is one of the largest known snakes in Santa Marta, with 21 to 23 upper labials, without sensory pits, and 20 to 25 infralabials. The head covered by small scales; the nasals in contact; 18 to 24 scale rows between the supraoculars and 16 to 20 ocular scales around the eye. The ocular scales separated from the upper labials by 2 to 3 scale rows. Dorsals 81 to 95 rows, without apical pits and smooth.

Males with 232-246 (238.7) and females 235-251 (245.3) ventrals. Subcaudals undivided, 53-57 (55.0) in males and 45- 62 (53.5) in females. Anal single.

The dorsum is grayish with 15 to 20 darker grey or brown irregular, interconnected, H-shaped blotches, outlining light grey ellipsoidal patches. Dorsally, there are black annular patches with white centers. The head has a supracephalic black stripe, narrow in the front but wider posteriorly, which runs from the snout to the nape. Laterally, on the head there is a pre-postocular band. Black bands are also present below the eye and on the infralabials. The tail is yellow or white with large irregular black and red or brown patches. The venter is light yellow spotted with black.

The longest measured specimen is 1600 mm long, with 175 mm of tail length. The ratio of tail length/total length ranges from 0.101 to 0.123 in males and from 0.110 to 0.119 in females.

**Distribution:** Colombia, Venezuela to Brazil; also Trinidad Tobago and Margarita Island. In Sierra Nevada de Santa Marta it has been reported from the northern and northwestern part below 700 m.

**Ecology:** This is an arboreal and nocturnal snake found under fallen trees and on the forest floor. Ruthven, 1922, reported a specimen taken in the forest from San Lorenzo at 660 m. It feeds mostly on rodents and other small mammals.

**Material:** Sierra Nevada de Santa Marta. Magdalena: Bonda, 45 m (CM 1782 skin); Cacagualito, 450 m (CM 2022); Minca, 625 m (UMMZ 45605); Pozos Colorados, ca. 11 Km S Santa Marta, < 50 m (AMNH 106235); Río Frío, banana belt (Amaral, 1928). San Lorenzo, 660 m (Ruthven, 1922).

***Corallus enydris cookii* Gray**

(Map No. 39)

*Corallus cookii* Gray, 1842., Zool. Misc., 1842: 42. **Type locality:** America.

*Boa cookii*: Griffin, 1916, ["1915"]. Mem. Carneg. Mus. VIII:167.

*Boa hortulana*: Amaral, 1928. Bull. Antiven. Inst. Amer. 2(1): 7.

**Description:** This a large snake with triangular head that has 12 to 15 upper labials, all with deep sensory pits, and 16 to 18 infralabials. The nasals divided and usually in contact. 2 loreals; 1 preocular and 3 to 4 postoculars. 9 to 18 scale rows between the supraoculars and 11 to 14 ocular scales around the eye. The oculars separated from the upper labials by one scale row. Dorsals 39 to 49 rows, smooth without apical pits.

Males with 269-271 (270.) ventrals and females 272. Subcaudals undivided, 114-116 (114.5) in males and 115 in females. Anal single.

The dorsum and head are greenish beige or yellowish green spotted with white. The venter is immaculate white or light yellow anteriorly but with irregular black patches posteriorly.

The longest measured specimen is 1593 mm, with 328 mm of tail length. The ratio of tail length/total length ranges from 0.185 to 0.207 in males and around from 0.197 in females.

**Distribution:** From Nicaragua to Colombia, northern and central Venezuela and Trinidad. In Sierra Nevada de Santa Marta it is found on the northern and northwestern part of the Sierra, below 300 m.

**Ecology:** A very aggressive non-venomous snake of arboreal and nocturnal habits that lives in mangroves or near rivers or small streams. It feeds on birds and lizards (*Basiliscus*).

**Material:** Sierra Nevada de Santa Marta. Cesar: Rio Guaimaral (USNM 117498-9, 117501). Magdalena: Bonda, 45 m (CM 137, 139, 142, 204, MCZ 11861); Rio Frio < 50 m (MCZ 11861).

*Epicrates cenchria maurus* Gray

(Map No. 39)

*Epicrates maurus* Gray, 1849. Cat. Sn. Brit. Mus: 96. **Type locality:** Venezuela.

*Epicrates cenchria* var. *fusca*: Griffin, 1916, ["1915"]. Mem. Carneg. Mus. VIII: 169.

*Epicrates cenchria*: Griffin, 1916, ["1915"]. Mem. Carneg. Mus. 7: 168. Ruthven, 1922. Misc. Publ. Mus. Zool. Univ. Mich., 8: 65. *Epicrates cenchrus*: Amaral, 1928., Bull. Antiven. Inst. Amer. 2(1):7.

**Description:** Vertical pupil; loreal present in contact with one or two supralabials; 1+4 oculars; one large frontal separated from the internasals by 2 small scales. 11(6,7) to 13(7,8) supralabials, and 13 to 16 infralabials. Both supralabials and infralabials with sensory pits. Dorsals in 45 to 53 rows, without apical pits and smooth.

Males have 243 to 247 (245.) ventrals and females 250. Subcaudals undivided, 49 to 53 (51.0) in males and 47 in females. Anal single.

The dorsum and head are dark brownish purple sometimes with weakly marked dorsal blotches. The venter is creamy or white immaculate.

The longest measured specimen is 1790 mm with 160 mm of tail length. The ratio of tail length/total length ranges from 0.089 to 0.110 in males and around from 0.090 in females.

**Distribution:** From Costa Rica to northern Colombia and Venezuela, Trinidad Tobago and Margarita Island.

In Sierra Nevada de Santa Marta it is found in northwestern part from sea level to 700 m.

**Ecology:** A nocturnal large snake of slow movements found in the lowland xerophytic scrub forest and humid evergreen seasonal forest. It feeds mostly on small rodents.

**Material:** Sierra Nevada de Santa Marta. Magdalena: Cacagualito 450 (CM 2025); Fundación, 60 m (Ruthven, 1922); Minca, 600 m (CM 136); Rio Frio < 50 m (Amaral, 1928); 23 Km E of Santa Marta (UF 57242).

#### 4. Family Colubridae

##### Key to the species of *Atractus*

1. Males have 153-153 and females have 155-170 ventrals ..... *A. sanctaemartae*  
 1' Males have 144-149 and females have 145-147 ventrals ..... *A. species A*

##### *Atractus sanctaemartae* Dunn

(Map No. 40)

*Atractus badius*: Griffin, 1916, ["1915"]. Mem. Carn. Mus., 7:172.

*Atractus irridescens*: Ruthven, 1922, Misc. Publ. Univ. Mich., 8:66.

*Atractus sanctaemartae* Dunn, 1946. Occ. Pap. Mus. Zool. Univ. Mich., 493:2. **Type locality:** San Sebastian, Sierra Nevada de Santa Marta, Colombia. Medem, 1968., Rev. Acad. Colomb. Cienc. Fis. Nat. 13(50):181.

**Description:** 7(3,4) upper labials; no preocular; a very elongate and narrow loreal; usually 2, occasionally one or 3, postoculars; temporals 1+2, the posterior temporal reaching the tip of the parietals in most specimens. Usually 7, occasionally 8, rarely 6, infralabials, three or four in contact with the only pair of genials; the first pair of lower labials in contact; 17-17 dorsal scale rows.

Males with 153 to 157 (154.3), and females, 155-170 (162.1) ventrals; subcaudals: 34 to 36 (35.0) in males and 24 to 29 (25.8) in females; anal single.

The coloration is variable but the predominant pattern consists of light brown dorsum with irregular blackish spots or incomplete crossbars that, in turn, have a few irregular light spots. Ventrally, pale yellow, irregularly spotted with dark markings. The

head is dark brown or grayish brown, with some irregular darker markings. Most of the specimens have a light lower border of the upper labial.

This species seems to be larger than the sympatric *Atractus sp. A*. The longest specimen (ICN 5665) measures 650 mm but it has an incomplete tail. The ratio of tail length/total length varies from 0.135-0.146 in males and 0.087-0.106 in females.

**Distribution:** Restricted to the Sierra Nevada de Santa Marta. Known in the northwestern part between 900 and 2400 m and in the southern part between 1800 and 2000 m. Probably, this species has a continuous range above 900 m from the northwestern side to the southern face of the mountain. The locality for MCZ 32766 from Rio Frio is ambiguous, since this locality could be the river, the town or the paramo. Probably, the specimen was collected above 1000 m because no *Atractus* was reported by Amaral (1928) who studied a large collection of snakes from the banana belt of Rio Frio. Moreover, Darlington mentioned Paramo de Rio Frio (over 3000 m) as locality for *Atelopus*. This species has the highest known altitudinal distribution of the snakes of Santa Marta.

**Ecology:** This species is found in the cloud forest of the Sierra Nevada and, together with *Erythrolamprus bizona*, has the highest known altitudinal range of any snake of Santa Marta. Juveniles are known to be preyed upon by *Erythrolamprus bizona*, an ophiophagous litter-dwelling snake.

**Material:** Sierra Nevada de Santa Marta. Cesar: San Sebastián, 1950 m (UMMZ 48298 holotype, MCZ 6525, 6531-3); 1800 m (UMMZ 85595). Magdalena: Municipio Cienaga, Cuchilla Yerbabuena, 1700 m (ICN 5665); Serranía San Lorenzo, 1200- 1950 m (UMMZ 47739-41, found in the stomach of *Erythrolampus bizona*, UMMZ 55675); La Tagua, 1590 m (UMMZ 54946); Vista Nieve, 900-2400 m (UMMZ 63774); La Frontera, río Buritaca, (IND 2290); Río Frío, without additional data, (MCZ 32766).

*Atractus sp. A*

(Map No. 39)

*Atractus sanctaemartae* Dunn, 1946. (Part) Occ. Pap. Mus. Zool. Univ. Mich., 493:2

**Description:** 7(3,4) supralabials, the second and third in contact with the loreal; no preoculars; a loreal about three times longer than high; 1+2 temporals, in some specimens the upper posterior temporal long. Usually 7, occasionally 6 or 8, infralabials; the

first pair in contact behind the mental. The genials followed by 2 to 4 prementals. Dorsals smooth, in 17-17 rows.

Males with 144 to 149 (146.8) and females, 145 to 147 (146.0) ventrals; subcaudals, 29 to 35 (33.0) in males and 22 to 29 (25.0) in females. Anal single; adult males with small supraanal tubercles.

The coloration of most males is unicolor, uniformly light gray or brown above, including the supracephalic region, except for the lower border of all the supralabials, which are light yellow. Ventrally, the chin and most of the infracephalic region are light creamy yellow with gray or dark brown spots of variable size. All the ventrals are light yellowish, partially covered by darker patches, which tend to increase toward the tail. In most specimens, the subcaudals are almost unicolor gray or brown, similar to the dorsum, with or without light yellow spots.

This species is smaller than *A. sanctaemartae*. The largest specimen is 423 mm of total length, but most adults measure between 282 to 400 mm. The tail length/total length ratio varies from 0.135-0.146 in males and 0.091-0.118 in females.

**Distribution:** Known from the northwestern part of the Sierra Nevada including the Serranía San Lorenzo, and Cuchilla Yerbabuena, between 1800 and 2000 m. A specimen reported from Minca, 600 m might be an error, as the species probably occurs only above the 1800 m.

**Ecology:** Two individuals were found under stones. The species seems to be restricted to the cloud forest on the north and northwestern parts of the Sierra Nevada, between 1500-1800 m. In the area of San Lorenzo and Cuchilla Yerbabuena the species is sympatric with *A. sanctaemartae*. The species seems to be relatively common. In April 1976, P. Ruiz collected a total of 12 individuals. The sample consisted of 10 males and only 2 females. A question should be asked: does this sample represent a natural sex ratio (5:1) of the population?

If the answer is yes, what is the cause of this condition?

**Material:** Sierra Nevada de Santa Marta. Magdalena: Serranía San Lorenzo, 1700 m (ICN 2756); Serranía San Lorenzo, 1700-2000 m (AMNH 109842, ICN 2757-67); Municipio Ciénaga, Cuchilla Yerbabuena, 1800 m (ICN 5663-64); Minca, 600 m (CM 201 paratype of *A. sanctaemartae*); El Líbano, 1800 m (CM 215, paratype of *A. sanctaemartae*).

**Remarks:** The two species of *Atractus* found in Santa Marta do not differ markedly from each other except for the larger number of ventral and subcaudal scales in *A. sanctaemartae*, a feature that is in turn reflected in the size of the individuals. A slight difference between both species is shown in the lack of any sexual difference in *A. sp.* contrasting with the well defined sexual dimorphism observed in *A. sanctaemartae*. On the contrary, the males on *Atractus sp. A* have a tendency to be unicolor while the females are spotted or with irregular incomplete crossbars. No sexual difference of this type is observed in *A. sanctaemartae*.

***Chironius carinatus* (Linnaeus)**

(Map No. 40)

*Coluber carinatus* Linnaeus, 1758. Systema Naturae, Ed. 10: 223. **Type locality:** "Indis".

*Herpetodryas carinatus*: Griffin, 1916, ["1915"]. Mem. Carn. Mus., 7:183.

*Chironius carinatus*: Ruthven, 1922. Misc. Publ. Mus. Zool. Univ. Mich., 8: 65. Amaral. 1928., Bull. Antiv. Inst. Am., 2(1):8.

**Description:** One loreal, 1+2 oculars and 1+2 temporals; 8(4,5), sometimes 9(5,6), supralabials; 9 to 10 infralabials. Dorsals in 12-10(8)-8 rows, with apical pits, except the larger scales of the vertebral rows after the 30th ventral. Vertebral scales strongly keeled.

Males from Santa Marta with 154 to 157 (155) ventrals and from 120 to 128 (125) subcaudals, no females reported; anal divided, except in one specimen.

Dorsum is greenish or light blue, sometimes with 2 paravertebral light brown stripes. Head is slightly darker than the dorsum, except the upper labials. The latter, and the head below, are creamy yellow. The venter is lighter than the dorsum, blue or greenish.

Total length of the longest measured specimen is 1,605 mm, with 521 mm of tail length. The ratio of tail length/total length is 0.31-0.34 in males.

**Ecology:** This is a very common and widely distributed terrestrial snake, highly aggressive. It feeds mostly on small rodents.

**Distribution:** Central America, tropical South America and the Lesser Antilles. In Santa Marta it is found from sea level to 1500 m on the northern and northwestern part.

**Material:** Sierra Nevada de Santa Marta: *Magdalena*: Bonda, 45 m (CM 150); Mamatoco, Mamatoco river, <20 m (UMMZ 45545); Palomina, 1500 m (MCZ 6574); Río Frío (banana belt) (MCZ 145283-95 heads only, MCZ 25049).

*Clelia clelia clelia* (Daudin)

(Map No. 40)

*Coluber clelia* Daudin, 1803, Hist. Nat. Rept., 6:330. **Type locality:** Surinam.

*Pseudoboa cloelia*: Amaral, 1928. Bull. Antiv. Inst. Am. 2(1):8.

**Description:** 1+2 oculars and usually 2+2, sometimes 2+3 temporals; usually 7(3,4), occasionally 8, supralabials; 8 infralabials. Dorsals in 19-17 rows, smooth with 2 apical pits.

Ventrals, 198 to 231 and from 71 to 93 subcaudals; anal entire.

The adults are brown or black grayish dorsally, the belly is white, but the subcaudals are spotted with black grayish. Head and nape darker than the body, sometimes with a light transversal band on the occipital region. The juveniles are red above and the nape and head are black.

**Distribution:** From Central America to Colombia, Venezuela, Guyanas Brazil and Trinidad. In Sierra Nevada de Santa Marta, it has been found in the northwestern part below 100 m

**Ecology:** An ophiophagous snake that feeds exclusively on other snakes such as *Botrops*. Widely distributed in Colombia.

**Material:** Sierra Nevada de Santa Marta. Magdalena: Río Frío, <50 m (MCZ 44349, UF 24676).

***Drymarchon corais melanurus* (Dumeril, Bibron and Dumeril)**

(Map No. 41)

*Spilotes melanurus* Duméril, Bibron and Duméril, 1854, Herp. Gen. 7:224. **Type locality:** Mexico.

*Elaphe corais*: Griffin, 1916, ["1915"]. Mem. Carn. Mus. 7:174.

*Drymarchon corais melanurus*: Ruthven, 1922. Misc. Publ. Mus. Comp. Zool. Univ. Michigan., 8:65. Amaral, 1928. Bull. Antiv. Inst. Am. 2(1):8.

**Description:** 1+2 oculars and usually 2+2 temporals; usually 8(4,5), occasionally 7(3,4), supralabials; 8 infralabials. Dorsals in 17-15 rows, smooth with 2 apical pits. Males with 203 to 206 (204.5) and females with 212 to 214 (213.0) ventrals. Subcaudals, 78 to 88 (84.5) in males and 81 to 82(81.5) in females. The adults are brownish yellow anteriorly and black posteriorly. Behind the head is a black band obliquely transversal on each side of the body that fuses on the middorsal line and continues posteriorly. Head dark grey or brownish grey above, supralabials yellow. The border of the fourth, fifth and sixth supralabial have a black transversal line. The black lines sometimes also extend onto the fourth, fifth and sixth infralabials. The longest measured specimen is 1832 mm of total length with 422 mm of tail length. The ratio of tail length/total length ranges from 0.18-0.20 in males and from 0.21-0.22 in females.

**Distribution:** Central America to Veracruz, Mexico in the Atlantic side, to Nicaragua on the Pacific side. Pacific side of Colombia and Ecuador, and northern Venezuela. In Sierra Nevada de Santa Marta, it is found from sea level to 1800 m.

**Ecology:** It is usually found near small streams. It feeds mostly on frogs and toads, such as *Bufo marinus*, as well as on lizards, birds and sometimes turtles (Medem, 1968).

**Material:** Sierra Nevada de Santa Marta. Cesar: San Sebastián de Rábago, 2000 m (CAS 113896) Guajira: San Miguel, 1800 m (MCZ 25997); Magdalena: between Agua Dulce and la Victoria, 900 m (UMMZ 45547); Bonda, 45 m (CM 143-4, 149); La Concepcion, 1000 m (MCZ 6529); Palomina, 1500 m (MCZ 6553); San Lorenzo: La Tigra, 1200 m (UMMZ 45546); 10 Kms N of Valledupar, 206 m (CAS 116301)

### Key to the species of *Drymobius*

1. Dorsal pattern of rhomboid blotches..... *D. rhombifer*  
 1' Dorsal pattern of reticulate with green spots on each scale ..... *D. margaritiferus*

#### *Drymobius margaritiferus margaritiferus* (Schlegel)

(Map No. 41)

*Herpetodryas margaritiferus* Schlegel, 1837, Essai Physion. Serpens, 2: 184.

*Drymobius margaritiferus margaritiferus*: Pérez-Santos and Moreno, 1988, Mus. Reg. Sci. Nat. Torino., 6:156.

**Description:** Rostral wider than high, barely visible from above; internasals shorter than prefrontals; frontal longer than wide, about as long as its distance from the snout. Loreal as long or a little longer than high; 2+2 temporals. Usually 9(4,5,6) supralabials; first 5 infralabials in contact with the first pair of genials. 17-15 dorsals, keeled and with apical pits; 144-160 ventrals; anal divided and 100-130 divided subcaudals.

Head blackish and the body is black with yellow spots on every dorsal, giving it an appearance of reticulated color pattern. Yellowish or white below. The maximum length is about 900 mm.

**Distribution:** From Texas to northern Colombia.

**Material:** Sierra Nevada de Santa Marta. Magdalena: Cienaga, sand and Cactus belt, sea level (MCZ ).

#### *Drymobius rhombifer* (Günther)

(Map No. 41)

*Coryphodon rhombifer* Günther, 1860, Proc. Zool. Soc. London, 1860:236. **Type locality:** Esmeraldas, Ecuador. *Drymobius rhombifer*: Bocourt, 1888. Miss. Sci. Mex., Rept., pl. 43, fig. 1. Griffin, 1916. Mem. Carn. Mus., 7:178. Ruthven, 1922. Misc. Publ. Mus. Zool. Univ. Mich., 8: 65. Amaral. 1928. Bull. Antivenin Inst. Am. 2(1):8. Pérez-Santos and Moreno, 1988, Mus. Reg. Sci. Nat. Torino., 6:158.

**Description:** One loreal, 1+2 oculars and 2+2 temporals; normally 9(4,5) supralabials; 8 to 10 infralabials. Dorsals in 17-17-15 rows, keeled, with apical foselets. Posterior maxillary teeth not grooved. Males with 150 to 170 (154.2) ventrals and females, 154 to 160 (158.1); subcaudals, 100 to 106 (103.8) in males and 97 to 108 (102.6) in females; anal divided.

Light brownish or grayish dorsally with about 26 rhomboidal blotches that are brown and darker than the rest of the body. The venter is whitish or yellowish, mottled with blackish spots.

The total length of the largest measured specimen is 1,080 mm, with 345 mm of tail length. The ratio of tail length/total length is 0.27-0.40 in males and 0.21-0.30 in females.

**Distribution:** From Nicaragua to Peru, Venezuela, Colombia and Ecuador. It is widely distributed in Colombia.

In Sierra Nevada de Santa Marta it has been found in the northern and northwestern part, from 50 to 1500 m.

**Ecology:** This species is distributed in the lowland xerophytic scrub to humid evergreen seasonal forest to cloud forest. Ruthven, (1922) mentioned that it is a common ground snake in the wet forest. He found one specimen taken from an egg in the stomach of a *Bothrops atrox*. The stomach contents include frogs, *Colostethus* and *Eleutherodactylus*.

**Material:** Sierra Nevada de Santa Marta, 1350-1650 m without additional data (UMMZ 54959-60). Magdalena: Bonda, 50 m (CM 213); Ciudad Perdida, 1100 m (IND 3232-6); Don Diego (UMMZ 48197); La Concepción, 1000 m (MCZ 6539 skull, 6540, 6543); La Frontera, río Buritaca (IND 2293); Minca, 625 m (CM 188, UMMZ 45560); Palomina, 1500 m (MCZ 6756, 6576); near Río Frío (MCZ 33929); San Lorenzo, 1350 m (UMMZ 45555-9, 45561- 4).

*Enulius flavitorques flavitorques* (Cope)

(Map No. 42)

*Liophis flavitorques* Cope, 1868. Proc. Acad. Nat. Sci. Phila., 1868:307. **Type locality:** Rio Magdalena, Colombia.

*Leptocalamus torquatus*: Ruthven, 1922. Misc. Publ. Mus. Zool. Univ. Mich., 8:65.

Amaral, 1928. Bull. Antiv. Inst. Am. 2(1):8.

*Enulius flavitorques flavitorques* Pérez-Santos and Moreno, 1988, Mus. Reg. Sci. Nat. Torino., 6:161.

**Description:** 0+2 oculars, the loreal and the prefrontal enter the orbit; 1+2 temporals; usually 7(3,4); 7 lower labials, three in contact with the only pair of geneiales. Dorsals in 17-16-17 rows, smooth, with one apical pit.

The only known male from Sierra Nevada de Santa Marta has 176 ventrals and 107 subcaudals, anal divided.

The body is dark brown olive dorsally, and pearly white below. The head is dark brown as the body, with a light collar from the middle of the parietals to the second and third dorsals. Ruthven (1922) observed that it was yellow in life.

The total length of the specimen is 305 mm, with 109 mm of tail length. The ratio of tail length/total length is 0.37.

**Distribution:** Guatemala to Colombia. In Sierra Nevada it has been reported from the eastern and northwestern part of the massif.

**Ecology:** According to Medem (1969) this species is rare in Colombia. The only specimen known from Santa Marta was collected by Ruthven in a log in a dry forest. Amaral (1928) reported one specimen from Río Frío (banana belt).

**Material:** Sierra Nevada de Santa Marta: **Guajira:** Río Ranchería, Fonseca 150 m (Ruthven reports Valencia 100 m as the locality, which is more toward the southeastern part than Fonseca) (UMMZ 54939).

### **Erythrolamprus bizona** Jan

(Map No. 42)

*Erythrolamprus aesculapii* var. *bizona* Jan, 1863. Arch. Zool. Anat. Phys. 2(2):104.

**Type locality:** "Bahia Messico, Popayán, Cayenne, Brasile, Montevideo, Colombia"; restricted to Colombia, by Dunn and Bailey (1939).

*Erythrolamprus aesculapii*: Griffin, 1916. Mem. Carneg. Mus., 7:207. Ruthven, 1922. Misc. Publ. Mus. Zool. Univ. Mich., 8: 67. Amaral, 1928, Bull. Antivenin Inst. Am., 2(1):8.

*Erythrolamprus bizona*: Dunn and Bailey, 1939. Bull. Mus. Comp. Zool. 86: 12. Pérez-Santos and Moreno, 1988, Mus. Reg. Sci. Nat. Torino., 6:166.

**Description:** Loreal present; 1+2 oculars, 1+2 temporals, 7(3, upralabials and 8 to 9 infralabials. Two pairs of genials, the first the longest; 15-15 dorsals, smooth. Males with 179 to 192 (187.8) ventrals, and females, 188 to 194 (187.3), and 3 to 4 preventrals; subcaudals, 51 to 63 (59.6) in males and 50 to 54 (52.2) in females. Anal divided.

The coloration consists of red and black bands, the latter in 12 to 15 pairs, including the first nuchal band. Pairs of black bands are separated by a white or yellowish white band of about the same size as the black bands. The red bands that separate them are twice or more longer than the black bands. The red and white scales have black apical pits. The black bands are complete ventrally and there are 3 black bands on the tail. The head is black or somewhat lighter with heavy dark border on the scales; the upper labials are light with some black spots. The lower part of the head is creamy or yellow.

The longest measured specimen is 845 mm long, with 135 mm of tail length. The ratio of tail length/total length ranges from 0.15-0.17 in males and 0.14-0.16 in females.

**Distribution:** Costa Rica to Colombia and northern Venezuela. In Sierra Nevada de Santa Marta it is found in the northern and northwestern part, from sea level to 2400 m.

**Ecology:** This species is distributed in the xerophytic scrub forest all the way up to the upper limit of the cloud forest. Ruthven (1922) remarks "a specimen taken from San Lorenzo had eaten two small individuals of *Atractus irridescens* (= *Atractus* sp. A). Another had eaten two frogs *Eleutherodactylus cruentus* (= *E. tayrona*) and *Geobatrachus walkeri*". I found a specimen of *Tantilla melanocephala* in the stomach of one of the specimens from Ciudad Perdida, swallowed tail first; and in a specimen from Bonda a juvenile of *Leptodeira annulata*, swallowed head first.

**Material:** Sierra Nevada de Santa Marta, 1800 m, no additional data (UMMZ 54961-2). **Magdalena:** Bonda, 45 m (CM 130-35); Cacagualito, 450 m (CM 2035); Ciudad Perdida, 1100 m (IND 3242-5); La Concepción, 1000 m (MCZ 6522, 6534); 1800 m (UMMZ 45607); Palomina, 1500 m (MCZ 6578) Pueblo Viejo 2400 m (MCZ 6581); Río

Frío (banana belt) (MCZ 25042, 32755-7); San Lorenzo, 1350 m (UMMZ 45550-4), Valparaíso, 1530 m (CM 129).

***Helicops danieli* Amaral**

(Map No. 42)

*Helicops scalaris*: Amaral, 1928. Bull. Antivenin Inst. Am. 2(1): 8. Perez-Santos and Moreno, 1988, Mus. Reg. Sci. Nat. Torino., 6:178.

*Helicops danieli* Amaral, 1937. Mem. Inst. Butantan, 11: 232. **Type locality**: Carare, Santander, Colombia.

**Description**: 1+2 oculars; 2+2 temporals; 8 supralabials and 9 infralabials. Dorsals in 19 rows, strongly keeled. Dorsum is reddish brown, with some black patches. The head is black, except the upper labials which are light, spotted with black. Venter is whitish with two parallel series of black spots.

**Remarks**: The present description is based on three heads deposited by Amaral (1928) at the MCZ. The validity of this species could not be either confirmed or denied. However the available data fit Amaral's description; therefore, I include this species until more reliable information is obtained.

**Distribution**: Atrato and Magdalena valleys, and the Caribbean coast to Barrancabermeja, Colombia. In Sierra Nevada it has been reported from the northwestern part.

**Ecology**: Reported from the banana plantation at 50 m.

**Material**: Sierra Nevada de Santa Marta, Magdalena: Río Frío, (banana belt), < 50 m (MCZ 25041, 3 heads).

***Imantodes cenchoa cenchoa* Linnaeus**

(Map No. 43)

*Coluber cenchoa* Linnaeus, 1766, Syst. Nat., ed. 12: 389. **Type locality**: America.

*Himantodes cenchoa*: Griffin, 1916. Mem. Carn. Mus. 7:208.

*Imantodes cenchoa*: Ruthven, 1922. Misc. Publ. Mus. Comp. Zool. Univ. Mich., 8:67.  
Amaral, 1928. Bull. Antivenin Inst. Am. 2(1):8.

*Imantodes cenchoa cenchoa*: Smith, 1942. Proc. U.S. Natl. Mus., 92: 384.

**Description:** A long, slender snake with laterally compressed body and conspicuous head. The vertebral scales greatly enlarged; 1+2 oculars; loreal present; temporals variable, usually 1+3; 8(4,5) supralabials and 9 or 10 infralabials; 17-17 dorsals, smooth with apical pits. Males with 236 to 260 (252.6) and females, 239 to 258 (247.4) ventrals; subcaudals, 142 to 168 (159.7) in males and 145 to 169 (156.1). Anal divided.

The body is pale brown or ochraceous with 34 to 56 solid dark brown rhomboidal or irregularly saddle-like dorsal spots that usually extend to the ventrals or continue as broken spots. In some specimens, the saddle spots are fused over the middorsal line or more roundish than angular. Venter is light with small dark spots or dots that sometimes form an irregular median ventral line. Head is brown with irregular dark spots, lines or blotches. Slender snakes that reach over one meter of length.

**Distribution:** From Panama to Argentina, most of South America. In Sierra Nevada de Santa Marta it is found in the northern and northwestern part from sea level about 100 m reaching about 500 m.

**Ecology:** This species is distributed in the xerophytic scrub forest and semiarid coastal belt; also in swampy coastal forest, and, probably, penetrates the low humid forest. It is one of the most common tree snakes, active day and night. It feeds on lizards, such as *Anolis* (?*auratus*) that was found in a specimen from La Frontera, Rio Buritaca.

**Remarks:** I follow Smith (1942) in recognizing the subspecific subdivision of *I. cenchoa*; Myers (1982), in revising the Panamanian *Imantodes*, suggested that it was not advisable to distinguish subspecies for the Panama region.

**Material:** Sierra Nevada de Santa Marta. Magdalena: Aracataca, 60 m (ANSP 19759); Bonda, 50 m (CM 189-90); La Frontera, Río Buritaca (IND 2294); Río Frío (banana belt) (Amaral, 1928).

*Lampropeltis triangulum micropholis* Cope

(Map No. 43)

*Lampropeltis micropholis* Cope, 1860., Proc. Acad. Nat. Sci. Phila., 1860: 257.

**Type locality:** Panama.

*Coronella micropholis*: Griffin, 1916. Mem. Carn. Mus., 7:176.

*Lampropeltis micropholis*: Ruthven, 1922. Misc. Publ. Mus. Zool. Univ. Michigan, 8:66.

[*Lampropeltis triangulum*] *micropholis*: Dunn, 1937a. Occ. Pap. Mus. Zool. Univ. Mich., 353: 3.

**Description:** 8(3,4) supralabials; loreal present, 1+2 oculars and 2+3 temporals; 8 infralabials. Dorsals in 21-23- 19 rows, smooth with apical pits; anal single. The only known male from Santa Marta has 226 ventrals and 44 subcaudals.

The coloration consists of black, white and red bands. The black rings are arranged in 14 1/2 pairs separated by a narrow white band. The red bands are longer than the black bands but decrease gradually in size toward the posterior part of the body so the last red bands are about the same size as the black bands. The red and white scales have black tips. There are 3 black bands on the tail. The head is light and has a black upper band from the frontal to parietals and a black nuchal collar.

The only specimen is 530 mm long, with 62 mm of tail length. The ratio of tail length/total length is 0.116.

**Distribution:** Costa Rica and Panama, northwestern and Caribbean Colombia; northwestern Ecuador, and northwestern Venezuela.

In Sierra Nevada de Santa Marta it is found in northwestern part about at an altitude of 300 m.

**Ecology:** This species has been reported from the xerophytic lowland forest.

**Material:** Sierra Nevada de Santa Marta. Magdalena: Cacagualito, 300 m (CM 2036).

***Leptodeira annulata ashmeadi* (Hallowell)**

(Map No. 44)

*Coluber ashmeadi* Hallowell, 1845. Proc. Acad. Nat. Sci. Phila., 1845: 244. **Type locality:** "200 miles of Caracas, Venezuela". restricted by Duellman, (1958) to vicinity of Caracas, Distrito Federal, Venezuela. Duellman, (1958).

*Leptodeira annulata*: Griffin, 1916. Mem. Carn. Mus., 7:210. Ruthven, 1922. Misc. Publ. Mus. Zool. Univ. Michigan., 8:67. Amaral, 1928, Bull. Antivenin Inst. Am. 2(1):7.

*Leptodeira annulata ashmeadi*: Duellman, 1958. Bull. Am. Mus. Nat. Hist. 114:44. Medem, 1968., Rev. Acad. Colomb. Cienc. Fis. Exac. Nat. 13(50):188.

**Description:** 8(4,5) supralabials; 2+2 oculars and 1+2 temporals; 9 to 10 infralabials. Dorsals in 19-15 rows, smooth, with 2 apical pits. Males with 174 to 175 (174.5) ventrals. Subcaudals, 85 to 95 (90.0) in males. No females have been reported from Sierra Nevada de Santa Marta.

The dorsum is brownish, with 31 to 36 dark brown blotches along the body outlined with darker brown, and 17 to 18 dorsal tail blotches decreasing in size toward the tip of the tail. The head is light brown, irregularly spotted with blackish brown. A dark postocular stripe extends along the upper border of the supralabials toward the posterior part of the head. The first body blotch extends from the posterior tip of the parietals to the first 12-13 dorsals and is divided along the center by a light brown stripe. The venter is immaculate.

The longest measured specimen is 480 mm of total length, with 133 mm of tail length. The ratio of tail length/total length 0.28. According to Duellman, (1958) individuals from Santa Marta region are smaller and have lower number of ventrals, subcaudals and body blotches.

**Distribution:** From northeastern of Santa Marta mountains, Colombia, through coastal northern Venezuela, to rio Orinoco; Trinidad, Tobago and Margarita Island.

**Remarks:** In the northern and northwestern part of the Sierra occurs an intergrade form between *L. a. rhombifer* x *ashmeadi*. This form presents 175-180 ventrals in males and 180-188 in females. The number of subcaudals ranges from 85- 90 in males and from 78-83 in females. The first dorsal blotch is usually divided longitudinally by a single yellowish scale and does not present the U shape figure characteristic of *L. a. rhombifer*, and the stripe of light color is not complete as it is typical of *ashmeadi*.

**Ecology:** This species has been reported from the semi- arid belt in the northeastern part of Sierra Nevada de Santa Marta, below 500 m. This is a nocturnal snake that

feeds on frogs, and juvenile *Bothrops*. Medem (1968) observed this species in Santa Marta near small streams.

**Material:** Sierra Nevada de Santa Marta. Guajira: Río Ranchería (UMMZ 54043); Arroyo de Arenas, 150 m (UMMZ 54944). The locality records for the inter-grade form are: Magdalena: Bolívar, 45 m (UMMZ 54942); Bonda, 45 m (CM 191-192, 194, 205, MCZ 11858); Cacagualito, 450 m (CM 2023); Cienaga, (AMNH 20396); Fundación, 60 m (UMMZ 45598-45604); Río Frío, <50 m (MCZ 25054, 32761-32763).

### Key to the species of *Leptophis*

1. Males with 163-177, and females with 166-181 ventrals ..... *L. a. occidentalis*  
 1' Males have around 151 and females, around 157 ventrals ..... *L. species A*

### *Leptophis ahaetulla occidentalis* (Günther)

(Map No. 44)

*Ahaetulla occidentalis* Günther, 1859., Proc. Zool. Soc., London, 1859: 412. **Type locality:** Guayaquil and western Ecuador.

*Leptophis occidentalis*: Griffin, 1916. Mem. Carneg. Mus., 7:185. Ruthven, 1922. Misc. Publ. Mus. Zool. Univ. Mich., 8:66. Amaral, 1928 Bull. Ant. Inst. Amer. 2(1): 7.

*Leptophis bocourti*: Griffin, 1916. Mem. Carneg. Mus., 7:184.

*Leptophis depressirostris*: Amaral, 1928. Bull. Ant. Inst. Amer. 2(1):8.

*Thalerophis richardi occidentalis*: Oliver, 1948. Bull. Amer. Mus. Nat. Hist., 92(4):241.

*Leptophis ahaetulla* [*occidentalis*]-Int. Comm. Zool. Nomen., Op. 524: 270. Medem, 1968., Rev. Acad. Colomb. Cienc. Fis. Exac. Nat. 13(50):185.

**Description:** A long slender snake; loreal absent, 1+2 temporals; usually 8 (4,5), sometimes 9 supralabials; 10, sometimes 9 infralabials. Dorsals with one apical pit, in 15- 15-11 rows, keeled, except those of the first two rows. Oliver, (1948) observed that "large adults males have the keels well developed, whereas juveniles females have them least developed or rarely absent entirely".

According to Oliver, (1948) the males from the Atlantic side have 163-177 (171.36) ventrals and females, 166- 181(174.83). In the males from Santa Marta the

range is 166- 180 (173.0) and the number of subcaudals is 153-189 (171.47); no females have been reported from Santa Marta. Oliver reported the range of subcaudals 161-175 (168.20) for females. Anal plate divided.

Dorsum is uniformly dark blue, greenish, or sometimes brownish. Top of the head is of same color as the dorsum, except the upper labials and rostral which are light blue. A black, narrow stripe runs from the superior border of the 2 upper labials anterior to the preocular. The stripe is interrupted by the orbit but extends backward covering the lower postocular, the anterior temporal, and the superior border of the last three upper labials. The head below is whitish or creamy. This color extends from lower part of the head to the first 15-20 ventrals. The rest of the venter is light greenish blue

The largest measured specimen is 1,424 mm, with 530 mm of tail length. The ratio tail length /total length is 0.36- 0.38 for males.

**Distribution:** Central America from Nicaragua on the Caribbean Coast and Costa Rica on the Pacific coast to western Venezuela and to the Pacific Colombia and Ecuador. In Sierra Nevada de Santa Marta it has been found in the northwestern part below 100 m.

**Ecology:** This is a common and widespread snake that has been recorded from cloud forest as high as 2410 m in the Central Andes of Colombia, but it is also known to exist in many harsh environments. In Sierra Nevada de Santa Marta the species is restricted to the lowland xerophytic scrub, but, probably it has a more continuous range. Oliver (1948) considered it to be strictly arboreal due to the common name "tree snake" but its habits seem to be semi-arboreal.

The food habits, as indicated from stomach content data, consist primarily of frogs of the family Hylidae, which suggests it forages in bushes, shrubs and trees. Oliver (1948) found in the stomach of specimens of this species: *Agalychnis*, bird egg, Hylid frogs, *Thecadactylus* sp., and young birds. Ruthven (1922) reported a lizard (*Polychrus spurrelli* = *Polychrus guttuosus guttuosus*) in the stomach of a specimen taken in Aracataca. Nearly all the organisms that make up the diet of these snakes are nocturnal or crepuscular. Mertens (1946) (cited by Oliver, 1948) observed that as defensive behavior this species as well as some other members of the genus "inflate the neck sufficiently to expose the skin between the scales, at the time that it opens its enormous mouth." It rarely bites.

**Material:** Sierra Nevada de Santa Marta. Magdalena: Aracataca, 60 m (ANSP

19784); Bonda, 45 m (MCZ exch CM 11859); Río Frío, < 50 m (MCZ 25046 heads only, 32764).

***Leptophis sp. A***

(Map No. 44)

**Description:** 8(4.5) upper labials; 1+2 oculars and 1+2 temporals; 10 infralabials, the first pair in contact behind the mental. First five infralabials in contact with the first pair of geneiales. Dorsals in 15-15-11 rows, keeled, except those of the first two rows. Males with 151 ventrals and 142 subcaudals, and females with 157 ventrals and 149 subcaudals. Anal divided.

Dorsum is uniformly light gray. On each side of the body, a lighter inconspicuous lateral stripe runs from head to the anal region. Top of the head is slightly lighter than the dorsum. The upper labials and rostral are white. There is a black, narrow stripe that runs from the superior border of the 2 first upper labials. The stripe is interrupted by the orbit but extends backward covering the lower postocular, temporals, the superior border of the last three upper labials and 10-12 dorsals. The head below is white. The white color extends from lower part of the head over the first 1/3 of the body. The rest of the venter is grayish blue. The total length of the largest measured specimen is 764 mm., with 292 mm. of tail length.

**Distribution:** Known from Ciudad Perdida (1100 m), Sierra Nevada de Santa Marta.

**Ecology:** This species has been reported from the cloud forest on the northern part of the Sierra at 1100 m.

**Material:** Sierra Nevada de Santa Marta. Magdalena: Ciudad Perdida, 1100 m (IND 3240-1).

**Key to the species of *Liophis***

1. Three black dorsal stripes, one vertebral ..... *L. melanotus*  
 1' Two lateral black stripes only ..... *L. "ephinephelus" sp. A*

*Liophis "epinephelus" sp A.*

(Map No. 45)

*Leimadophis epinephelus* Amaral, 1929. Mem. Inst. Butantan, 4:165.*Leimadophis albiventris* Ruthven, 1922. Misc. Publ. Mus. Zool. Univ. Michigan., 8:66.*Leimadophis epinephelus epinephelus*: Dixon, 1983. Advanc. Herpetol. Evol. Biol: 137.

**Description:** 1+2 oculars; usually 1+2, sometimes 1+3 temporals. 8(4,5) upper labials; normally 9, sometimes 10 infralabials, second to fifth in contact with the first pair of geniales. The dorsals in 17-17-15 rows, smooth and without apical pits; 3 to 4 paraventrals. The males with 140 to 144 (142.5) and females with 141 to 144 (142.5) ventrals; 60 to 68 (64) divided subcaudals in males and 62 to 64 (63) in females; anal divided.

Dorsum in adults is unicolor, blackish brown. Laterally, there are black spots on the anterior part of the body, almost inconspicuous in some specimens, that fuse on the posterior third of the body to form a continuous, narrow (less than one scale wide) black paravertebral line that runs to the tip of the tail. The top of the head is of the same color as the dorsum, except the rostral and the upper labials, which are white and slightly spotted with brown. A black, narrow stripe runs along the upper border of all the supralabials. The head below, and the venter are immaculate. In juveniles the dorsum is light brown spotted with black anteriorly and with a series of conspicuous black lateral spots that fuse posteriorly to form the paravertebral line posteriorly. The top of the head is uniformly black, with a black nuchal band. The narrow black band at the level of the upper borders of the supra labials is also present, but posteriorly it fuses with the nuchal band. The mental, the supralabials, the head below, and the venter are immaculate.

The longest measured specimen has 577 mm of total length with 136 mm of tail length. The ratio tail length/total length ranges from 0.21 to 0.24 for both sexes.

**Distribution:** Restricted to northern and northwestern part of the Sierra Nevada de Santa Marta, from 1000 to 1500 m.

**Ecology:** This species has been found on the cloud forest of the northern and northwestern part of the Sierra. In a specimen from La Frontera-Rio Buritaca, I found a semidigested frog, swallowed head first. It was also infested with nematodes.

**Material:** Sierra Nevada de Santa Marta. Magdalena: Ciudad Perdida, 1100 m (IND 3228-30); Parque Nacional Tayrona, La Frontera-Río Buritaca (IND 2289); Serranía San Lorenzo, Vista Nieve, 1500 m UMMZ 63776, (3).

*Liophis melanotus* (Shaw)

(Map No. 45)

*Coluber melanotus* Shaw, 1802., General Zool., 3: 534. **Type locality:** Cape of Good Hope, Africa (error).

*Liophis melanotus*: Griffin, 1916, ["1915"]. Mem. Carneg. Mus., 7:189. Dixon, 1980. Contr. Biol. Zool. Milwaukee Publ. Mus., 31:11.

*Leimadophis melanotus*: Ruthven, 1922. Misc. Publ. Mus. Zool. Univ. Mich., 8:66. Amaral, 1928. Bull. Antivenin. Inst. Amer. 2(1):8.

**Description:** Oculars 1+2 and 1+2 temporals; 8(4,5) supralabials and normally 9 infralabials. Dorsals in 17-17-15 rows, smooth, with apical pits. Males with 144 to 154 (148.0), and females, 150 to 152 (151.3) ventrals; subcaudals, 55 to 65 (58.6) in males and 54 to 59 (56.5) in females.

The coloration in life is brilliant yellow or pale yellow, with three black dorsal bands: one vertebral, about 4 to 5 dorsals wide and two lateral bands, about one dorsal wide. In the anterior part, behind the head, the lateral bands are represented by a series of black spots that fuse posteriorly to form the lateral lines, and the black vertebral band is narrower and irregular. Venter is yellow. The head is grayish with dark or black spots. Supralabials and chin are yellow. The longest measured specimen is 472 mm of total length, 96 mm of which is tail length. The ratio of tail length/total length is 0.20-0.23 in males and 0.20-0.22 in females.

**Distribution:** Northern South America, Colombia, Venezuela, Trinidad and Tobago. In Sierra Nevada de Santa Marta it is perhaps the most widely distributed snake, found around the massif from sea level to about 200 m, but occasionally its distribution extends to 1650 m.

**Ecology:** This species is abundant in the lowland xerophytic scrub forest and semiarid coastal belt, but occasionally it is also found in high savanna and cloud forest.

Ruthven (1922) mentioned that this species was collected at the edge of marshes and ditches and in the forest at an altitude of 1650 m. One specimen has eaten a frog.

**Material:** Sierra Nevada de Santa Marta, without additional data, 1650 m (USNM 54964). **Cesar:** Ariguaní (UMMZ 54968); Guamaral (USNM 117500); Valencia, 100 m (UMMZ 54967); **Guajira:** Arroyo de Arenas, hacienda entre Riohacha y Fonseca, 150 m (UMMZ 54966); Don Diego, San Miguel, 1650 m (UMMZ 48176); **Magdalena:** Bolívar, 30 m (UMMZ 54965); Bonda, 45 m (CM 214); Ciudad Perdida, 1100 m (IND 3246); Fundación, 62 m (UMMZ 48016); Mamatoco, <20 m (UMMZ 48015); Pozos Colorados, <50 m (CAS 113728); Río Frío, <50 m (MCZ 32753-4); Santa Marta, <50 m (BM 58.11.22.13, MHNP 3595-6).

*Lygophis lineatus lineatus* (Linnaeus)

(Map No. 46)

*Coluber lineatus* Linnaeus, 1758, Systema Naturae, Ed. 10:221. **Type locality:** "Asia".  
*Aporophis lineatus* Amaral, 1928. Bull. Antivenin, Inst. Amer. 2(1):8.

**Description:** Usually 1, occasionally 2 preoculars, and 2 postoculars; 1+2 temporals; 8(4,5) supralabials and 9 to 10 infralabials. Dorsals in 19-17 rows, smooth and without apical pits; anal divided. There are 159 to 178 ventrals and 75 to 93 divided subcaudals.

Dorsum and top of the head are grayish brown, with three stripes, one vertebral and two paravertebral. The vertebral begins on the internasals, and continues on the dorsum covering 3-4 dorsals. It ends on the tip of the tail. The paravertebral stripes begin on the nasals and extend to the tip of the tail. They are 2-3 dorsals wide. The head below, and the venter are immaculate.

**Distribution:** Colombia, Venezuela, Guyana and Brazil. In Sierra Nevada de Santa Marta, it has been found on the northwestern part.

**Ecology:** Apparently this species is not common in Sierra Nevada de Santa Marta; only four specimens have been reported from this region. They were found on the banana plantation at Rio Frio, near sea level.

**Material:** Sierra Nevada de Santa Marta. **Magdalena:** Rio Frio, < 50 m (MCZ

25050, 32758-60).

***Masticophis mentovarius centralis* (Roze)**

(Map No. 45)

*Coluber (Masticophis) mentovarius centralis* Roze, 1953. *Herpetologica*, 9: 117. **Type locality:** Maicao, Guajira, Colombia.

**Description:** 7(4) upper labials and 8 large and 2 small infralabials, two pairs of genials; 1+2 oculars, one subocular and 2+3 temporals. Dorsals in 17-17-12 rows, smooth, without apical pits. Anal plate divided. Ventrals, around 189 and around 119 subcaudals in males. No females collected.

Dorsum is yellowish brown but the anterior part of the body is almost uniform dark grey with poorly defined narrow, light longitudinal lines. Posteriorly, the dorsum becomes beige with dark brown scale tips. The head above is dark brown. The upper labials, the inferior part of the head and the venter are immaculate yellowish white.

The only measured specimen has a total length of 1560 mm of which 470 mm is the tail length. The ratio tail length/total length is 0.30.

**Distribution:** Panama, northern Colombia to northwest Venezuela. In Sierra Nevada it has been found in the northern part, below 100 m.

**Ecology:** This species is found in the lowland xerophytic scrub forest.

**Material:** Sierra Nevada de Santa Marta. Magdalena: Pozos Colorados, 10 Km W of Santa Marta, < 50 m (AMNH 106243, CAS 116178).

**Key to the species of *Mastigodryas***

1. Two lateral light stripes; the upper one, outlined by black, runs from head to anus on scale rows 4 and 5, and the lower is only light on the scale rows 1 and 2 and runs from the anterior part of the body to midbody ..... *Mastigodryas boddaerti ruthveni*
- 1' Three black dorsal stripes and two black lateral stripes. All stripes have light centers; posteriorly, on the body the dorsal stripes fuse to produce one dorsal and two lateral light stripes bordered by black ..... *Mastigodryas pleei*

***Mastigodryas boddaerti ruthveni* (Stuart)**

(Map No. 46)

*Eudryas ruthveni* Stuart, 1933. Occ. Pap. Mus. Zool. Univ. Mich., 254:4. **Type locality:** Slopes of San Lorenzo, Sierra Nevada de Santa Marta, Colombia, 1500 m.

*Dryobius boddaerti*: Griffin, 1916, (in part). Mem. Carneg. Mus., 7:177. Ruthven, 1922. (in part) Misc. Publ. Mus. Zool. Univ. Mich., 8:65.

*Dryadophis [ruthveni]*: Stuart, 1939. Copeia. 1939:55.

*Dryadophis boddaerti ruthveni*: Stuart, 1941. Misc. Publ. Mus. Zool. Univ. Mich., 49:4. Barbour and Loveridge, 1946, Bull. Mus. Comp. Zool., 59(2):112.

**Description:** Usually 9(5,6), sometimes 8 supralabials; 1+2 oculars and 2+2 temporals; 9 or 10 infralabials. Dorsals in 17-17-15 rows, smooth with apical pits; anal divided. Males with 183 to 189 (187.10), and females, 190 to 198 (193.6) ventrals; subcaudals, 102 to 121 (114.5) in males and 117 to 123 (120.75) in females.

Dorsum is brown or grayish brown. Laterally, 2 light stripes are present on each side of the body. The upper one, outlined by black, runs from the posterior part of the head to the anus on scale rows 4 and 5, and the lower is only light on the scale rows 1 and 2. The latter runs from the anterior part of the body to mid-body. The head above is also brown, lighter laterally, and the supralabials are whitish gray. The infralabials, the chin, and the throat are immaculate, seldom spotted with gray. The venter is white, slightly mottled with gray.

The longest measured specimen is 1352 mm of total length, with 402 mm of which is tail length. The ratio of tail length/total length is from 0.25-0.40 in males and 0.29- 0.30 in females.

**Distribution:** Restricted to the Sierra Nevada de Santa Marta, Colombia, at altitudes above 660 m.

**Ecology:** A species restricted to cloud forest from 1000 to 1650 m. This species feeds mostly on lizards; one specimen from Ciudad Perdida had eaten an *Anolis solitarius*. Ruthven (1915c) reported that a specimen from San Lorenzo had eaten a lizard (*Pseudogonatodes furvus*).

**Material:** Sierra Nevada de Santa Marta, with only altitudinal data, 1050 m (UMMZ 54950); 1200 m (UMMZ 54951); 1500 m (UMMZ 54952); 1650 m (UMMZ 54949, 54953, 54954 holotype, 545955) (CM 1873). Magdalena: Bonda, 45 m locality in error, probably above 1000 m (CM 176, 183); Ciudad Perdida, 1100 m (IND 3239); Ciudad Perdida, 5 Km Se San Pedro de la Sierra, 1050 m (ANSP 28221); La Concepción, 1000 m (MCZ 6521, 6544-6547 paratypes); between La Tagua and Macho Solo, 1100 m (observed); Palomina, 1500 m (MCZ 6554-55, 6575, 6577), San Lorenzo, 1350 m (UMMZ 45591-5, 45597), 1200 m (UMMZ 45596), 1500 m (UMMZ 55674 paratype), 1350 m (UMMZ 149872); Valparaíso, 1530 m (CM 203); Vista Nieve (UMMZ 63775).

*Mastigodryas pleei* (Dumeril, Bibron & Dumeril)

(Map No. 46)

*Dryadophis pleei* Duméril, Bibron & Duméril, 1854, Ersp. Gen.7:661. **Type locality:** Venezuela. Stuart, 1941. Misc. Publ. Mus. Zool. Univ. Mich., 49:53.

*Drymobius boddaerti*: Griffin, 1916,(in part). Mem. Carneg. Mus. 7:177. Ruthven, 1922 (in part). Misc. Publ. Mus. Zool. Univ. Mich., 8:65.

*Dryadophis pleei*: Stuart, 1941. Misc. Publ. Mus. Zool. Univ. Mich., 49:53.

**Description:** 1+2 oculars and 2+2 temporals; usually 9(5,6), sometimes 10 supralabials and normally 9, rarely 11, infralabials. Dorsals in 17-17-16(15) rows, smooth, with 2 apical pits. Males with 172 to 185 (177.25), and females, 172 to 189 (184.8) ventrals; subcaudals, 93 to 96 (95) in males and 86 to 102 (93.5) in females.

The coloration is very variable; however, it basically may be described as dark gray dorsum, which on the anterior part of the body has 3 black dorsal stripes and 2 black lateral stripes. All stripes have light centers; posteriorly, on the body the dorsal stripes fuse to produce one dorsal and two lateral light stripes bordered by black. The head above is gray sometimes with black patches. Laterally, the head is light with some black borders on the first upper labials anterior to the orbit. The infralabials, the chin, the throat and the venter are light gray mottled with dark.

The longest measured specimen is 1138 mm of total length, with 297 mm of which is tail length. The ratio of tail length/total length varies from 0.25-0.28 in males and 0.25-0.29 in females.

**Distribution:** Panama, Colombia, Venezuela and Los Testigos Islands.

In Sierra Nevada de Santa Marta this species occurs around the massif on the northern, northwestern and southwestern part from sea level to 1600 m.

**Ecology:** Stuart (1941) suggested that the actual distribution of this species in the arid regions is the result of ecological displacement by the *boddaerti* and *bifossatus* groups which occupy the most favorable environments in South America. In Santa Marta region, this species occurs in xerophytic lowland forest and cloud forest below 1000 m while *M. b. ruthveni* is found at elevations above 1000 m.

**Material:** Sierra Nevada de Santa Marta. Cesar: Valencia, 100 m (UMMZ 54956); Valledupar, 16 Km SW 80 m (KU 169961); Magdalena: Bonda, 45 m (CM 177-82, 186); Cacagualito 450 m (CM 2020, 2009); Pozos Colorados < 50 m (AMNH 106236-41, 109840); Río Frío (MCZ 33930); Santa Marta, 10 Km S < 50 m (CAS 113873, 116168-72); Valparaíso 1530 m (probably below 1000 m) (CM 202).

*Ninia atrata atrata* (Hallowell)

(Map No. 46)

*Coluber atratus* Hallowell, 1845. Proc. Acad. Nat. Sci. Phila., 1845: 245. **Type locality:** Within 200 miles of Caracas, Venezuela.

*Ninia atrata:* Amaral, 1928. Bull. Antivenin Inst. Amer. 2(1):8.

**Description:** Preocular absent, loreal in contact with the orbit; 1 or 2 postoculars, and 1+2 temporals; 7(3,4) or 8(4,5) supralabials and 8 infralabials. Two pairs of genials. Dorsals in 19-17 rows, keeled and with apical pits. In both sexes ventrals vary from 147 to 157 and subcaudals, 44 to 63. Anal entire.

Dorsum and head are uniformly dark grey or blackish in adults, and the belly is white. Juveniles are reddish or brownish with a light nuchal band.

**Distribution:** Southern Central America, to Ecuador, Venezuela and Trinidad.

In Colombia it is widely distributed; in Sierra Nevada de Santa Marta it has been found below 500 m.

**Ecology:** This is a small snake of secretive fossorial habits that lives in humid environments. In Santa Marta the only known specimen was reported by Amaral (1928), possibly from the banana plantation.

**Material** Sierra Nevada de Santa Marta. Magdalena: Río Frío, 45 m (banana belt) (MCZ 25051).

### Key to the species of *Oxybelis*

1. Snout pointed; dorsum and venter uniformly brown; usually less than 190 ventrals in both sexes ..... *Oxybelis aeneus*  
 1' Snout normal; body and tail green above, including head; more than 195 ventrals .....  
 ..... *Oxybelis fulgidus*

### *Oxybelis aeneus* (Wagler)

(Map No. 47)

*Dryinus aeneus* Wagler, 1824. in Spix, Sp. Nov. Serp. Bras.:12. **Type Locality:** "Habitat in sylvis adjacentibus flumini Solimoens, prope Ega." Ega is an older name for Tefe, Amazonas, Brazil.

*Oxybelis acuminatus*: Griffin, 1916. Mem. Carn. Mus. 7:211. Ruthven, 1922. Misc. Publ. Mus. Zool. Univ. Mich., 8:67. Amaral, 1928. Bull. Antiv. Inst. Amer. 2(1):8.

**Description:** Long, slender snake with pointed snout, loreal absent; usually 9(4,5,6), occasionally 8 or 10 upper labials, two or three entering the orbit; 8-9 lower labials; 1+2 temporals and 1+2 oculars, three or four in contact with the first pair of genials. Dorsals smooth or slightly keeled, in 17-13 rows. Anal divided.

Males with 179-184 (181.5), and females, 176-189 (182.1) ventrals; subcaudals 149-171 (163.9) in males and 146-161 (155.7) in females.

Dorsum and venter are uniformly brown. In many specimens, a white or cream latero-ventral stripe (one or two scales in width) extends from labials to the anterior half of the body. The head is light brown, with a black, narrow stripe that runs from the tip of the snout to the posterior temporal.

The longest specimen from Santa Marta has 1390 mm total length and a tail length of 455 mm. The ratio of tail length/total length ranges from 0.33-0.41 in males and 0.37- 0.40 in females.

**Distribution:** From western Mexico, throughout Central America, and east and west of Andes in northern half of South America.

In Santa Marta it is found in the northern and northwestern part from sea level to 500 m.

**Ecology:** This species is distributed in the xerophytic lowlands and humid seasonal forest. Among the most usual species preyed upon by *Oxybelis aeneus* are: *Anolis* (Alvarez del Toro, 1960); *Iguana* (Greene et. al, 1978); *Cnemidophorus*, and small rodents. In defensive behavior the mouth is widely opened presenting the aggressor with a dark blue cavity (Henderson and Binder, 1980).

**Material:** Sierra Nevada de Santa Marta. Magdalena: Bonda, 45 m (CM 171-5, 184); Cacagualito, 300 m (CM 2010); Fundación, 60 m (UMMZ 45589); Mamatoco, <20 m (UMMZ 45585-8, 45590); between Mamatoco and La Tigra, < 30 m ( UMMZ 45584); Parque Nacional Tayrona, Cañaveral (LACM 114637); Pozos Colorados, ca 11 Km S of Santa Marta, <50 m (AMNH 106246-8); Río Frío, < 50 m (MCZ 32765 ); Santa Marta, < 50 m (AMNH 109845, MHNP 3649).

*Oxybelis fulgidus* (Daudin)

(Map No. 47)

*Coluber fulgidus* Daudin, 1803. Hist. Nat. Rept., IV:352. **Type locality:** Port-au-Prince, Santo Domingo (error), restricted to Chichen-Itza, Yucatán, Mexico by Smith and Taylor, 1950.

*Oxybelis fulgidus:* Griffin, 1916. Mem. Carnegie Mus., VII,3: 212.

**Description:** The loreal absent; 1+2 oculars and 1+2 temporals, the first long; 9(4,5,6) supralabials and 10 infralabials. Dorsals in 17-13 rows, feebly keeled and with apical pits. Anal divided. The only reported female has 208 ventrals and 158 subcaudals.

Body and tail are green above, including head, and greenish yellow below; supralabials yellow. A latero-ventral light yellow line extends from head to the tail.

The only reported specimen is 1708 mm of total length and 592 tail length which gives the ratio of tail length/total length of 0.346.

**Distribution:** From Mexico, Central and South America to northern Argentina. In Sierra Nevada de Santa Marta it has been reported from Cacagualito which lies in the semiarid coastal belt. This is an unlikely locality for this species, known from wet tropical forest. It is possible that the specimen has been mislabeled in the Carnegie Museum and actually comes from a different locality, perhaps outside the Sierra Nevada range.

**Ecology:** This is the largest member of the genus, with a varied diet consisting of lizards, birds and small rodents.

**Material:** Sierra Nevada de Santa Marta. Magdalena: Cacagualito, 450 m (CM 2027).

***Oxyrophus* sp A.**

(Map No. 47)

*Clelia petola:* Ruthven, 1922, Misc. Publ. Mus. Zool. Univ. Mich. No. 8: 67.

**Description:** 8 (4,5) supralabials; 2+3 temporals on the left side and 2+3 on the right side. One preocular on the left side. 2 postocular, the lower a little larger than the preocular. 10 infralabials. The first pair of labials that are in contact behind the mental are rhomboidal. Dorsals are 19-19-17 rows, with two apical pits. Anal single.

The only known male has 208 ventrals, four irregular preventrals and 90 divided subcaudals.

On the anterior part of the body are four large, irregular black bands, 15-12-9, and 5 dorsals long, follow by 5 irregular spots on alternating sides of the dorsum, diminishing in size. The head is all black followed by a irregular light postparietal band about three dorsals long, which also covers the last supralabial. Below, the head is white. The rest of the body, including the tail, is reddish dorsally but all the scales have black or dark tips. Ventrally, the body and tail are light, presumably white.

The specimen measures 842 mm of total length with 192 mm. of tail length. The ratio tail length/total length is of 0.23.

**Distribution:** Restricted to Sierra Nevada de Santa Marta, known only from Don Diego around 1500m.

**Ecology:** The known specimen was collected by Ruthven on the ground of a cacao plantation. According to this author, the region is heavily forested and rich in animal life.

**Material:** Sierra Nevada de Santa Marta. Magdalena: Don Diego, 1500 m (UMMZ 48198); Río Frío, no additional data, (25043, heads only).

*Phimophis guianensis* (Troschel)

(Map No. 48 )

*Heterodon guianensis* Troschel, 1848. In Schomburgk, Reise in Britisch-Guiana: 653.

**Type locality:** Savannah near Pirara, Guyana.

*Rhinostoma guianense*: Griffin, 1916. Mem. Carnegie Mus., VII, 3:214. Amaral, 1928. Bull. Antiven. Inst. Amer. 2(1): 8.

*Phimophis guianensis*: Dunn, 1944g. Caldasia, 3:202.

**Description:** This species is easy to distinguished by the rostral tip raised into sharp ridge; usually 7(4,5), sometimes 8, upper labials, 1+2 oculars; 2+3, sometimes 1+3, temporals; 7-8, occasionally 9 infralabials. Dorsals in 21-17 rows. smooth, with apical tips. Males with 182-206 (193.6) and the females 194-200 (197.5) ventrals; subcaudals 55-73 (63.8) in males and 57-62 (59.25) in females. Anal single.

Adults have dark dorsal scales outlined by yellow or white; top of the head is also dark brown except the upperlabials; a darker brown nuchal band is present. Ventrally, the individuals are immaculate yellow or white, which extends laterally to the first two or three dorsals and to the upper labials. There is a considerable ontogenetic change in coloration. Juveniles have reddish, yellow or cream coloration and the tips of the dorsals are black or brown. As the individual grows up, the brown color of the dorsals becomes more conspicuous and covers almost the entire scale. The head in juveniles is brown with a nuchal dark brown band, 10 scales wide.

The longest measured specimen has 956 mm of total length and 157 mm. of tail length. The ratio tail length/total length is 0.15-0.23 in males and 0.16-0.17 in females.

**Distribution:** Central Panama to Surinam. In Santa Marta it is found in the northern and northwestern part below 500 m.

**Ecology:** This is a lowland snake, restricted in Santa Marta to the xerophytic region below 500 m. Some of the examined specimens were parasitized by ticks. This species feeds on lizards, small snakes and small rodents.

**Material:** Sierra Nevada de Santa Marta. Highlands of Santa Marta, without additional data (MCZ 28081), Santa Marta, (UMMZ 85594 locality data emended March 1957 from Bakewell's field notes and from Cabot (1939). Magdalena: Bonda, 45 m (CM 163-70; 211-12), (FMNH 022579, MCZ 11851); Cacagualito 300 m (CM 2021); Parque Nacional Tayrona, western end (LACM 114653), Pozos Colorados, < 50 m (CAS 113727), ca 11 Km South of Santa Marta, (AMNH 106249-52); Río Frío (banana belt) < 50 m (MCZ 25045); Rodadero (Santa Marta), < 50 m (AMNH 109847); Santa Marta, < 50 m (AMNH 109846), (FMNH 165626, MHNG 58.6.1.23, MHNP 3772).

*Pseudoboa newwiedii newwiedii* (Dumeril, Bibron & Dumeril)

(Map No. 48)

*Scytale newwiedii* Duméril, Bibron and Duméril, 1854: Erp., Gen., 7: 1001. **Type locality:** Cote Ferme and Brazil, restricted to Cumana, Venezuela through lectotype selection by Hoge and Lancini, 1962.

*Pseudoboa newwiedii:* Amaral 1928. Bull. Antiven. Inst. Amer. 2(1):8.

*Pseudoboa petola:* Amaral 1928. Bull. Antiven. Inst. Amer. 2(1):8.

**Description:** Small eyes, long loreal; 19-17 dorsal rows, smooth, with apical pits. There are 177 to 198 ventrals, and 64 to 96 entire subcaudals. Anal single.

Coloration is brown or grey dorsally in adults, reddish in juveniles. The anterior part of the head is darker than the body. A nuchal band of the same color as the upper head is also present.

**Distribution:** From Panama and Colombia to Surinam and to Brazil, along Amazon river; Trinidad and Tobago. In Sierra Nevada de Santa Marta it is found in the northwestern part up to 100 m above sea level.

**Ecology:** It is distributed in the semiarid coastal belt.

**Material:** Sierra Nevada de Santa Marta. Magdalena: road near Río Aracataca, no additional data (FMNH 165869); Río Frío, <50 m (MCZ 25044).

*Pseustes poecilonotus polylepis* (Peters)

(Map No.48 )

*Ahaetulla polylepis* Peters, 1867., Monats. Akad. Wiss. Berlin, 1867: 709. **Type locality:** Surinam.

*Phrynonax fasciatus:* Griffin, 1916. Mem. Carneg. Mus., 7:194.

*Phrynonax poecilonotus:* Ruthven, 1922: Misc. Publ. Mus. Zool. Univ. Mich., 8:65.

*Pseustes poecilonotus:* Amaral, 1928. Bull. Antiven. Inst. Amer. 2(1):8.

**Description:** 1+2 oculars, and usually 2+2, sometimes 1+2 temporals; 8(4,5), supralabials and 11 infralabials. Dorsals in 24(23)-15 rows. All the dorsals with one apical pit and rows 5-11 are keeled. Anal entire.

Ventrals 195 to 199 (197.5) in males, around 205 in females; subcaudals, 123 to 120 (121.5) in males and 116 in females.

Dorsum is yellowish brown, with lighter spots in the center of some scales on the anterior part of the body. The posterior half part of body tends to be darker than the anterior. The head is of the same color as the body, a black postocular stripe. Ventrally, yellowish brown.

The longest measured specimen is 1097 mm of total length, with 297 mm of which is tail length. The ratio of tail length/total length is from 0.23-0.27 (0.25) in males and 0.24 in females.

**Distribution:** Venezuela, Trinidad Guianas, the Amazon region to Brazil, Ecuador, Peru and Bolivia.

**Ecology:** This is a semiarboreal snake. The specimen taken at San Lorenzo was found in a coffee tree, and the one from Don Diego was found in a cacao plantation. The specimen from San Lorenzo had eaten a bird.

**Material:** Sierra Nevada de Santa Marta. Magdalena: Cacagualito, 450 m (CM 2026); Cincinnati, 1524 m (UMMZ 48279); Don Diego, approx 1500 m (UMMZ 48280); Río Frío, < 50 m, (MCZ)

***Sibon nebulata nebulata* (Linnaeus)**

(Map No. 48)

*Coluber nebulatus* Linnaeus, 1758, Syst. Nat., ed. 10: 383. **Type locality:** America.

*Coluber sibon* Linnaeus, 1758, Syst. Nat., ed. 10: 383. **Type locality:** Africa.

*Sibynomorphus mikanii*: Ruthven, 1922. Misc. Publ. Mus. Zool. Univ. Mich., 8:69.

*Sibynomorphus leucomelas* : Amaral 1928. Bull. Antiven. Inst. Amer. 2(1):8.

*Sibon nebulata nebulata*: Peters, J., 1960. Misc. Publ. Mus. Zool. Univ. Mich., 114:119.

Medem, 1968., Rev. Acad. Colomb. Cienc. Fis. Nat. 13(50):186.

**Description:** Preocular absent, usually 2, sometimes 3, postoculars; 1+2 temporals; normally 7(4,5) supralabials and 8 infralabials; three pairs of genials. Dorsals in 15-15 rows, smooth without apical pits; anal entire.

Males with 159 to 193 (176.5), and females, 162 to 193 (177.5) ventrals; subcaudals, 79 to 92 (85.5) in males and 75 to 114 (94.5) in females.

Dorsum is brown or grayish brown, spotted with dark brown and white, and with many narrow, darker blotches irregularly distributed. Some of the blotches are complete extending onto the ventrals. The ground color of the ventrals is yellowish white, sometimes spotted with black. The head is of the same color as the dorsum, irregularly spotted with dark brown.

The longest measured specimen is 525 mm of total length, with 146 mm of which is the tail length. The ratio of tail length/total length is from 0.24 to 0.28 in males.

**Distribution:** From Nayarit and Veracruz, through lowlands of Central America, including Yucatán Peninsula, northern South America, east and north of the Andes; Trinidad and Tobago.

In Sierra Nevada de Santa Marta it has been found on the northwestern part, below 1200 m.

**Ecology:** A nocturnal, arboreal snake, found in the lowland banana belt and the cloud forest.

**Material:** Sierra Nevada de Santa Marta. **Magdalena:** La Concepción, 1000 m (MCZ 6542, 25047 (skeleton)), (UMMZ 55682); Río Frío, <50 m (MCZ 25047).

***Spilotes pullatus pullatus* (Linnaeus)**

(Map No. 49)

*Coluber pullatus* Linnaeus, 1788. Syst. Nat. ed. 10:225. Type locality: Asia (in error).

*Spilotes pullatus*: Griffin, 1916, Mém. Carnegie Mus., 7:197.

**Description:** Usually 8(4,5), sometimes 7, supralabials; 1+2 oculars and 1+1, sometimes 1+2, temporals; 6 or 7 infralabials. Dorsals in 16-16-10 rows, keeled with apical pits; anal entire. Males with 210 to 215 (212.6), and females, 220 to 231 (225) ventrals; subcaudals, 117 to 129 (121.3) in males and 117 to 122 (118.6) in females.

Dorsum is covered by black and yellow oblique transversal bands, running from the vertebral region backward. The yellow bands are frequently invaded by black. The yellow color diminishes toward the posterior part of the body so that the latter is almost completely black. The head is yellow or light brown, with irregular black spots that are more conspicuous on the borders between the supralabials and infralabials. Ventrally, yellow, with some lateral black markings, that sometimes cover all the ventrals.

The longest measured specimen is 2135 mm long and has a tail length of 571 mm. The ratio tail length/total length is 0.23 to 0.28 in males and 0.22 to 0.24 in females.

**Distribution:** From Costa Rica, to the northern part of South America to Argentina.

In Sierra Nevada de Santa Marta it is found in the northwestern part, from sea level up to 700 m.

**Ecology:** This is a common semiarboreal snake, highly aggressive and fast moving, distributed in the xerophytic lowlands and humid seasonal forest. It feeds on frogs, lizards, and small mammals.

**Material:** Sierra Nevada de Santa Marta. Magdalena: Bonda, 45 m (CM 146-148, 187, 2039); Minca, 625 m (CM 2040); Masinga, 600 m (CM 1781).

***Stenorrhina degenhardtii degenhardtii* (Berthold)**

(Map No. 49)

*Calamaria Degenhardtii* Berthold, 1846b, Abh. K. Ges. Wiss. Göttingen, 3: 8, pl.1, 3-4.

*Stenorhina degenhardtii*: Ruthven, 1922, Misc. Publ. Mus. Zool. Univ. Mich., 8:69.  
Amaral, 1928. Bull. Ant. Inst. Amer. 2(1):8.

**Description:** Head hardly distinguishable from the body; eye small with round pupil. Rostral wider than high, clearly visible from above; internasals fused with anterior nasal, prefrontals twice as long as high; frontal pentagonal, longer than wide, as long as or longer than its distance from the snout. No loreal; preocular shorter than frontal; two postoculars; usually 1+2 temporals; 7(3,) supralabials and 8(94) or 9(4) infralabials; the anterior genial larger than the second; 17-15 dorsals, smooth, without apical pits; 140- 152 ventrals; divided anal, and 32-41 divided subcaudals, some occasionally undivided.

Coloration is uniform gray above with a dark temporal stripe, light uniform below.

The maximum length of this species is about 750 mm.

**Distribution:** From Panama, northern and western Colombia and western Ecuador.

In Sierra Nevada de Santa Marta it is found on eastern, western and southern lowlands around the massif, from sea level up to 100 m.

**Ecology:** In Sierra Nevada de Santa Marta it is present in lowland xerophytic and dry forest, active at night. Ruthven (1922) reported the specimens taken on ground in dense woods.

**Material:** Sierra Nevada de Santa Marta: Cesar: Valencia, 100 m. (UMMZ 54941); Guajira: Arroyo de Arenas, Río Barbacoa, 0 m. (UMMZ 54940); Magdalena: Río Frío (Amaral, 1928)

#### Key to the species of *Tantilla*

1. Body with irregular dark brown and light yellow bands. more than 170 ventrals in both sexes .....  
..... *Tantilla semicincta*  
1' Dorsal pattern with two or more longitudinal black stripes; no more than 157 ventrals in both sexes .....  
..... *Tantilla m. melanocephala*

*Tantilla melanocephala melanocephala* (Linnaeus)

(Map No. 49)

*Tantilla melanocephala* Linnaeus, 1758. Syst. Nat., ed.10:218. **Type Locality:** America.

*Tantilla longifrontale*: Ruthven, 1922. Misc. Publ. Mus. Zool. Univ. Mich., 8:68.

*Tantilla melanocephala*: Ruthven, 1922., Misc. Publ. Mus. Zool. Univ. Mich., 8:68.

Amaral, 1928. Bull. Ant. Inst. Amer. 2(1):8.

**Description:** A small snake; 1+2 oculars, usually 1+2, sometimes 1+1, temporals. The loreal is absent; 7(3,4) supralabials, and 6 infralabials. Dorsal scales in 15-15 rows, smooth and without apical pits. Anal divided. Males have 156 to 157 (156.5), and females, 154 ventrals; subcaudals, 55 to 74 (59.75) in males and 74 in females.

Dorsally coffee brown or brown yellowish with a black middorsal stripe, less than one scale wide, running along the body from nuchal region to the tip of the tail. A lateral narrow stripe (one scale wide) of brown color outlined by black spots, extends from head to tail and is separated from dorsal brown color by a light band one scale wide. A second light band is present on dorsal scales one and two, with the lower border also outlined by black. The top of the head is dark brown or black, interrupted only by a transversal lighter band one scale wide on the internasal scales and by two cream spots on the posterior border of parietals. Laterally, the black color of the head is interrupted by a white or cream spot anterior and posterior to the orbit. The infralabials are spotted with brown. The chin, throat and belly are white.

The longest measured specimen is 358 mm total length, including a tail of 90 mm long. The ratio tail length/total length ranges from 0.22 to 0.27 in males, and of 0.23 in females.

**Distribution:** Central America throughout South America east of the Andes, including northern Argentina and Uruguay.

In Sierra Nevada de Santa Marta it is found northwestern and southwestern part from 60 to 1600 m.

**Ecology:** A small snake of secretive fossorial habits that lives in a variety of environments. Of the specimens collected by Ruthven one was found in a swamp and a second one in the cloud forest.

**Material:** Sierra Nevada de Santa Marta. Without additional data (ICN 6321); Quebrada, Santa Marta mountains, possibly it refers to Q. Viernes Santo, 1524 m, a locality visited by Ruthven on the same date of collection of this specimen (UMMZ 54957). Cesar: Valencia, 100 m (UMMZ 54958). Magdalena: Fundación 60 m

(UMMZ 48174); Ciudad Perdida, 1100 m (a specimen found in the stomach of *E. bizona*). La Concepción, 1000 m (MCZ 6552); Palomina, 1500 m (Ruthven, 1922); Río Frío 60 m (Amaral, 1928); San Lorenzo, 1200 m (Ruthven, 1922).

***Tantilla semicincta* (Dumeril, Bibron and Dumeril)**

(Map No. 49)

*Homalocranion semicinctum* Duméril, Bibron and Duméril, 1854, *Erp. Gen.* 7: 862.

**Type locality:** Colombia.

*Tantilla semicincta*: Griffin, 1916. *Mem. Carn. Mus.* VII:209. Ruthven, 1922. *Misc. Publ. Mus. Zool. Univ. Mich.*, 8:68.

**Description:** A small snake, 1+2 oculars, and 1+1 temporals. 7(3,4) supralabials and 7 infralabials. Two pairs of genials. Dorsals in 15-15 rows smooth and without reduction. Anal divided.

Males with 171 to 179 (174.0), and females, 172 to 174 (173.5) ventrals; subcaudals, 57 to 91 (71.3) in males and 54 to 67 (59.5) in females.

Coloration consists of incomplete and irregular dark brown and light yellow bands. The head is black with a white nuchal band, frequently interrupted by black in the mid-section. The venter is immaculate.

The longest measured specimen is 455 mm of total length, including a tail, of 140 mm long. The ratio tail length/total length ranges from 0.196 to 0.22 in males, and from 0.194 to 0.29 in females.

**Distribution:** Panama, to Colombia and Venezuela. In Sierra Nevada de Santa Marta it has been found in the northwestern and southeastern part from sea level to 500 m.

**Ecology:** A small ground snake of fossorial habits. A specimen from Bonda had eaten a centipede 150 mm long, swallowed tail first.

**Material:** Sierra Nevada de Santa Marta. Cesar: Valledupar, 206 m Magdalena: Bonda, 45 m (CM 200, 210, 1094,) Cacagualito, 450 m (CM 2024, 2037); Santa Marta < 50 m (AMNH 109843-4).

***Thamnodynastis strigilis* (Thunberg)**

(Map No. 50)

*Coluber strigilis* Thunberg, 1787. Mus. Nat. Acad. Upsaliensis, 2: 22. **Type locality:** none given.

**Description:** Usually 1+2, sometimes 2+2 oculars; and 2+2 or 2+3 temporals; 8 (4,5) supralabials, and 9 to 10 infralabials. Dorsals in 19-19-17 rows, keeled and with apical tips. Anal divided.

The number of ventrals is 139 to 160 and 55 to 78 subcaudals for both sexes.

Dorsally, grayish with numerous white and black spots irregularly distributed. The head is dark grayish irregularly spotted with black, and some of the supralabials have darker borders. The head below and the venter are light yellowish with many black spots that on the belly form four irregular stripes which fuse into three on the tail.

**Distribution:** Colombia, Venezuela, Guyana, to Brazil and Argentina.

In Sierra Nevada de Santa Marta it has been collected in the lowlands of the northwestern part.

**Ecology:** Found in the xerophytic scrub forest.

**Material:** Sierra Nevada de Santa Marta. Magdalena: Río Frío, < 50 m (MCZ 32752); Santa Marta, < 50 m (CD 287).

***Xenodon severus* (Linnaeus)**

(Map No. 50)

*Coluber severus* Linnaeus, 1758, Systema Naturae, Ed. 10: 219. **Type locality:** Asia (in error).

*Ophis colubrinus*: Amaral, 1928. Bull. Ant. Inst. Amer. 2(1):8.

**Description:** 1+ 2(3) oculars, usually 1+2, occasionally 1+3 temporals. 8(4,5) supralabials 4 to 5 infralabials in contact with the first pair of geneials. Dorsals in 21 rows in oblique arrangement, smooth and with apical tips.

The number of ventrals ranges from 128 to 149 and the subcaudals from 33 to 42 on both sexes.

The dorsum in adults is unicolor, blackish brown or dark olive, but sometimes the transversal bands present on the juveniles may still be present. Ventrally somewhat lighter than dorsally.

**Distribution:** Colombia, Venezuela, Guayanas, Brazil, Peru and Ecuador. In Sierra Nevada de Santa Marta, it has been reported from Rio Frio, (Banana belt) on the northwestern part of the mountain.

**Ecology:** A snake that lives in humid environments near streams or in swampy areas. It feeds on frogs and toads.

**Material:** Sierra Nevada de Santa Marta. Magdalena: Río Frío, (banana belt) (MCZ); Santa Marta, (MHNP 698).

## 5. Family Elapidae

### Key to the species of *Micrurus*

1. Patterns of triads with red bands on body ..... 2
- 1' Color pattern without triads; red bands restricted to head and tail; more than 220 ventrals .....  
..... *M. mipartitus anomalus*
2. Head all black; more than 30 subcaudals in both sexes ..... 3
- 2'. Black and white parietal band, followed by a single black band; 21-22 subcaudals in males  
and 17-19 in females ..... *M. dissoleucus melanogenys*
3. 179-192 caudals in males, and 198-207 in females; head all black to parietals; central band  
on a triad longer than the outer bands ..... *M. dumerilii colombianus*
- 3' 197-206 caudals in males, and 208-220 in females; head all black; central band of a triad of  
similar size to the outer bands ..... *M. dumerilii dumerilii*

### *Micrurus dissoleucus melanogenys* (Cope)

(Map No. 51)

*Elaps melanogenys* Cope, 1860a. Proc. Acad. Nat. Sci. Philadelphia, 12:72. **Type locality:** South America, restricted to Santa Marta region, Colombia by K.P. Schmidt, K. (1955).

*Elaps hollandi* Griffin, 1916. Mem. Carnegie Mus., 7:218. **Type locality:** Bonda, Colombia.

*Elaps hollandi:* Ruthven, 1922, Misc. Publ. Mus. Zool. Univ. Michigan, No. 8:69

*Micrurus dissoleucus melanogenys*: K.P. Schmidt, 1936. Field Mus. Nat. Hist., Zool. Ser., 20:203. Nicéforo Maria, 1942. Rev. Acad. Colomb. Cienc. Nat., K. P. Schmidt, 1955. Fieldiana, zool. 34:347. Roze, 1967. Amer. Mus. Novitates, 2287:17. Medem, 1968. Rev. Acad. Colomb. Cienc. Nat., 13(5):192.

**Description:** A small snake with head barely distinguishable from the body. No loreal; 15-15 dorsal rows, smooth, without pits.

Males with 185-193 (190.0), and females with 196-207 (198.4) ventrals; subcaudals, 21-22 (21.6) in males and 17-19 (17.3) in females. Anal divided.

Coloration consists of red and black bands; the latter form sets of three (triads), separated by white or yellow bands. The head is black with a white parietal band, which is followed by a single black band. Counting the triads, males have 7 to 9 complete body triads, excluding the single nuchal band, and females have 7 to 9 triads.

This is probably the smallest coral snake; the longest specimen measures only 366 mm of total length, while the smallest specimen is only 162 mm. long.

**Distribution:** Endemic to the northern and northwestern part of Sierra Nevada de Santa Marta, from sea level to about 50 m.

**Ecology:** This species is distributed in dry xerophytic lowland forest.

**Material:** "South America" (ANSP 6807, holotype). Sierra Nevada de Santa Marta, no additional data, (FMNH 2050, MHNG 1068.18; SMF 68485); Magdalena: Bonda (CM 206, holotype of *E. hollandi*, 207); Pozos Colorados, <50 m, (AMNH 106262, CAS 116165-7, 116172); Santa Marta, 0 m (MCZ 15967).

***Micrurus dumerilii colombianus* (Griffin)**

(Map No. 51)

*Elaps colombianus* Griffin, 1916, Mem. Carnegie Mus., 7:216. **Type locality:** Minca, Departamento de Magdalena, Colombia.

*Micrurus dumerilii*: Ruthven, 1922, Misc. Publ. Mus. Zool. Univ. Michigan, No. 8:69

*Micrurus corallinus dumerilii*: Amaral, 1928, Bull. Antivenin Inst. Amer., vol II, No. 1:7.

*Micrurus carinicauda colombianus*: Roze, 1967 Amer. Mus. Novitates, 2287 p. 13.

Medem, 1968, Rec. Acad. Colomb. Cien. Nat., vol. XIII, No. 50:192.

*Micrurus dumerilii colombianus*: Roze, 1970, Bull. U. S. Natl. Mus., 297:207. Roze, 1983, Mem. Inst. Butantan, 46:322.

**Description:** No loreal; 15-15 rows of dorsals, smooth, without apical pits. Males with 179-192 (185.2), and females with 198-207 (203.5) ventrals; subcaudals, 44-51 (47.1) in males and 31-37 (34.4) in females. Anal divided; males have supraanal tubercles.

The color pattern consists of red and black bands, the latter form poorly formed triads in which the central band of a triad is much longer than the outer bands. Head is all black to the parietals. The first triad consists of 2 bands. Males have 10 to 13 (11.4) complete triads on the body and females, 11 to 14 (12.5). The males have 6 to 10 and females have 4 to 6 irregular black tail bands.

The longest measured specimen is 623 mm long, 56 mm of which constitute the tail length. Most adults range between 400 and 600 mm of total length.

**Distribution:** Restricted to northern and northwestern part Santa Marta Mountains, between 300 and 2200 m.

**Ecology:** This species is found in dry low altitude forest to cloud forest.

**Material:** Sierra Nevada de Santa Marta. Highlands of Santa Marta, no other data (MCZ 20082, 13 heads). Magdalena: Bonda (MCZ 11865, paratype); Cacagualito, 300 m (CM 199, 2031-2); La Concepción, 1000 m (MCZ 6535-7; UMMZ 47796); Macotama, (MCZ 6582); Minca, 600-625 m (CM 197, holotype; INC 032); Río Frío banana belt, (MCZ 26042, 20 heads).

*Micrurus dumerilii dumerilii* (Jan)

(Map No. )

*Elaps dumerilii* Jan, 1858. Rev. Mag. Zool., (2)10:522. **Type locality:** Cartagena, Colombia.

*Micrurus dumerilii*: Ruthven, 1922, Misc. Publ. Mus. Zool. Univ. Michigan, No.8:69 (in part).

*Micrurus carinicauda dumerilii*: Medem, 1968., Rev. Acad. Colomb. Cienc. Fis. Nat. 13(50):192.

*Micrurus dumerilii dumerilii*: Roze, 1970, Bull. U. S. Natl. Mus., 297:206.

**Description:** Loreal absent; dorsals in 15-15 rows, smooth, without apical pits. Males with supraanal tubercles.

The only known specimen from the region, a male, has 199 ventrals and 50 subcaudals, but the known variation for this subspecies outside the Santa Marta range is 197 to 206 ventrals in males and 208 to 220 in females, while subcaudals range from 49 to 53 in males and from 35 to 41 in females.

The color pattern consists of red and black bands, the latter in poorly marked triads; the head all black. The male specimen has 9 triads on the body. The known variation in number of triads for this subspecies is from 7 to 10 in males and from 9 to 13 in females.

The only specimen from Santa Marta has an incomplete tail.

**Distribution:** Lower Magdalena Valley in Colombia from sea level to about 200 m.

The only known specimen from Santa Marta comes from Fundacion, northwestern part of the Sierra, 62 m of altitude.

**Ecology:** This subspecies is found in xerophytic lowland scrub forest from sea level up to 70 m high.

**Material:** Sierra Nevada de Santa Marta. Magdalena: Fundación, 62 m (UMMZ 45548).

*Micrurus mipartitus anomalus* (Boulenger)

(Map No. 51)

*Elaps anomalus* Boulenger, 1896. Cat. Sn. Brit. Mus., 3: 41. **Type locality:** Colombia.

*Elaps mipartitus*: Griffin, 1916. Mem. Carnegie Mus. 7:219.

*Micrurus mipartitus*: Ruthven, 1922. Misc. Publ. Mus. Zool.

Univ. Mich., 8:68. Amaral, 1928. Bull. Antivenin Inst. Amer., 2(1):7.

*Micrurus mipartitus anomalus*: Roze, 1967. Amer. Mus. Novitates, 2287:37. Medem, 1968., Rev. Acad. Colomb. Cienc. Fis. Nat. 13(50):193.

**Description:** A long coral snake without loreal and 15-15 rows of dorsals, smooth, without apical pits.

Males with 224-240 (231.6), and females, 240-260 (252.9) ventrals; subcaudals, 28 to 29 (28.6) in males and 25 to 29 (24.2) in females. Anal divided.

Body covered with black and white or yellow bands; only on the head is one red band and several more on the tail. The number of black body rings in both sexes range from 55 to 66.

The longest measured specimen has a total length of 766 mm, 52 mm of which is tail length. The ratio of tail length/ total length vary from 0.073-0.083 in males and from 0.0622- 0.073 in females.

**Distribution:** From Santa Marta mountains and Cordillera Oriental in Colombia to Andes of Merida, western Venezuela.

In Santa Marta it is found throughout the massif from 1100 to 1600 m.

**Ecology:** This species is distributed in the cloud forest. One specimen had in its stomach a lizard, *Lepidoblepharis sanctamartae*, and another, a partially digested ground snake, *Atractus sanctaemartae*.

**Material:** Sierra Nevada de Santa Marta. Santa Marta mountains, no additional data, (UMMZ 47795); 1500 m (UMMZ 54948). **Cesar:** San Sebastián, 1800 m (MCZ 6590, 6592-3). **Magdalena:** Ciudad Perdida, 1100 m (IND 3227, 3237-8); Las Nubes, 1350 m (CM 209); Valparaíso, 1350 m (CM 208); Vista Nieve, 1500 m (UMMZ 63768-2).

## 6. Family Viperidae

### Key to the species of Bothrops

1. Snout normal; dorsals in 23 to 29 rows, keeled; more than 190 ventrals in both sexes..... *B. atrox atrox*
- 1' Snout raised sharply upward; dorsals in 18 to 25 rows, keeled, with keels as large as the scale; less than 160 ventrals in both sexes ..... *B. langenbergii langenbergii*

### *Bothrops atrox atrox* (Linnaeus)

(Map No. 52)

*Coluber atrox* Linnaeus, 1758, Syst. Naturae. Ed. 10:222. **Type Locality:** "Asia"; restricted to Surinam by Hoge, 1966.

*Bothrops lanceolatus*: Griffin, 1916. Mem. Carnegie Mus. 7:222. Ruthven, 1922. Misc. Publ. Mus. Zool. Univ. Mich., 8:69.

*Bothrops atrox*: Amaral, 1928, Bull. Antivenin Inst. Amer., 2(1):7.

**Description:** A deep pit between nostril and eye; Orbit separated from the supralabials by two or three rows of small scales. Usually 7, sometimes 8 supralabials and 9 to 10 infralabials. Dorsals in 23 to 29 rows, keeled. Supracephalic scales also keeled and of the same size as the dorsals.

Males with 190-214 (198.3), and females, 212-215 (213.5) ventrals. Subcaudals, 70-73 (72.0) in males and around 75 in females, mostly divided. Anal single.

The color pattern in adults is very variable. The dorsum is grayish or brownish with darker brown irregular, diamond-shaped blotches outlined by black, on sides, they appear triangular shaped with the bases meeting or not at the middorsal line while the apex of each triangle starts near the ventrals. Venter is light gray with darker gray or brown spots.

**Distribution:** Tropical forest of South America from Colombia, Venezuela, and the Guianas to Brazil, Ecuador, Peru and Bolivia; also Misiones, Argentina.

In Sierra Nevada de Santa Marta it has been found in the northern and northwestern part, but, most probably, it is present throughout the Sierra, from sea level to 1700 m.

**Ecology:** It is distributed in all the environmental from desert to cloud forest. The juveniles feed predominantly on frogs, while the adults feed mostly on rodents.

In regard to this species, Amaral (1928), wrote: "the 'Fer-de-lance' (*B. atrox*) which is the main problem in the plantations in Central America, seems to be comparatively uncommon in Santa Marta, its place been taken by another venomous species seldom found elsewhere but surprisingly common in the Santa Marta district. This is the dry-land Hog- Nosed Viper (*Bothrops lansbergii*)..."

**Material:** Sierra Nevada de Santa Marta. Magdalena: Alto de Mira, Cano Julepia, 780 m (ICN, Uncatalog specimens); Bonda, 45 m (CM 159); Buritaca, 700 m (ICN 2619-2620); Cacagualito, 450 m (CM 2019); Cuchilla entre los Ríos Buritaca and Junacha, flanco transecto Buritaca, 700 m (ICN 2619-21); El Pueblito, Parque Nacional Tayrona, 360-400 m (AMNH 106253); Fundación, 60 m (UMMZ 45539); Palomina, 1500 m (MCZ 6573); Río Frío, banana belt <50 m (MCZ); Río Piedras, Calabozo

(FMNH 165355-6); San Lorenzo, 1500 m (UMMZ 45541-4), 1650 m (UMMZ 54963); San Lorenzo, Aguadulce, (UMMZ 45540); San Lorenzo, alto Río Córdoba (IND 029); San Lorenzo, La Victoria, 1524-1530 m (UMMZ 45538); Vista Nieve, 1500 m (UMMZ 63773);

***Bothrops langbergii langbergii* (Schlegel)**

(Map No. 52)

*Trigonocephalus langbergii* Schlegel, 1841., Mag. Zool.Rept., (1-3), pl. 1. **Type Locality:** Turbaco, Colombia.

*Lachesis langbergii*: Griffin, 1916., Mem. Carn. Mus. 7:223.

*Bothrops langbergii*: Ruthven, 1922. Misc. Publ. Mus. Zool. Univ. Mich., 8:69. Amaral, 1928. Bull. Antivenin Inst. Amer., 2(1):7.

**Description:** Snout raised sharply upward; internasals in contact. Usually 9, sometimes 10 supralabials, and 8 to 11 infralabials. Dorsals in 18 to 25 rows, keeled, with keels as large as the scale. The head scales small and keeled, except the supraoculars which are considerably larger;

Males with 145-158 (151.5), and females, 147-160 (153.5) ventrals. Subcaudals undivided, 31-38 (34.7) in males and 28- 35 (31.23) in females. Anal single.

Dorsal color is light brown with darker brown squarish blotches extending from the ventral side up to the middorsal region usually in pairs and with lighter regions between the darker blotches. A narrow light middorsal line is present. The ground color of the head is also light brown with a large darker brown patch in the center running from the snout, between the supraoculars to the occipital region, where it fuses with the first body blotch. Laterally, the head has a dark brown stripe, from the tip of the snout to the post- temporal region, covering the supralabials and suborbitals. Ventral side creamy with brown spots.

The longest measured specimen has a total length of 570 mm, 62 mm of which is tail length. The ratio of tail length/ total length varies from 0.090-0.130 in males and from 0.094- 0.127 in females.

**Distribution:** Caribbean coast of Colombia. In Sierra Nevada de Santa Marta it

has been found on the northern and northwestern part from sea level to 800 m.

**Ecology:** A venomous common snake, inhabiting arid and semiarid regions. The species is nocturnal and feeds mostly on frogs and lizards. A specimen from Pozos Colorados had eaten a small rodent; and in another specimen from the same locality I found a semidigested frog (*Pleuroderma brachyops*).

Amaral (1928) referred to this species as "dry-land Hog-Nose Viper (*Bothrops lansbergii*) which constitutes about 50 per cent of the Rio Frio catch. This species has been found among leaves in dry forests and also under bushes, dead trees, etc., so that it is anticipated that with the progressive clearing of the jungle, it will probably invade the banana plantations and may become dangerous to the laborers in that section." He received a total of 394 specimens of *B. lansbergii* from Rio Frio, as compared to only 19 *B. atrox*.

**Material:** Sierra Nevada de Santa Marta. Highlands of Santa Marta, no other data (MCZ 83). Cesar: Valledupar, Atanquéz, 800 m (ICN 069). Guajira: Río Ranchería, Fonseca, 150 m (UMMZ 54938). Magdalena: Bonda, 45 m, (CM 151-158, 160, 185, 1093; MCZ 11852); Cacagualito, 450 m (CM 2016-8); Mamatoco, < 20 m (UMMZ 45536-7); Pozos Colorados, 11Km S Santa Marta, < 50 m (AMNH 106254-56, 109839; 106258; CAS 116158-60, 116209-10; SMF 68380); Río Frío, <50 m (MCZ 25039); Calabozo, Rio Piedras, 1 1/2 hrs. east of Bonda (FMNH 165867).

## 7. Family Crotalidae

### *Crotalus durissus cumanensis* Humboldt

(Map No.52)

*Crotalus cumanensis* Humboldt, 1833. in Humboldt and Bonpland, Recueil d'Obs.

Zool. Anat. Comp., 2: 6. **Type locality:** Cumaná, Venezuela.

*Crotalus terrificus*: Griffin, 1916. Mem. Carn. Mus. 7:226. Ruthven, 1922. Misc. Publ.

Mus. Zool. Univ. Mich. 8:69. Amaral, 1928. Bull. Antivenin Inst. Amer., 2(1):8.

**Description:** A large rattle snake with slightly raised snout. 2 large supraoculars and 2 to 3 large scales between them. Usually 14, sometimes 13 or 15 supralabials, and

13 to 15 infralabials. Dorsals in 23 to 29 rows, those of the vertebral rows strongly keeled. The posterior part of the head is covered by smaller keeled scales.

Males with 161-174 (166.7), and females, 168-179 (173.6) ventrals. Subcaudals undivided, 23-31 (28.7) in males and 23- 30 (27.0) in females. Anal single.

Dorsal ground color is grayish beige with dark brown or blackish rhomboid blotches with light centers. Each blotch is outlined with dark and white, separated from each other by dark accessory spots. On the tail, the diamond-shaped blotches turn into transversal dark brown bands. The head has the same ground color as the dorsum, but with dark brown irregular patches on the snout, and a pair of prefrontal and postsupraocular dark brown spots or bands. Usually a light supraocular band is present. Two dark brown or black stripes, two or more dorsals wide, extend from the postsupraocular band on the anterior part of the body, covering 18 to 30 dorsals. These stripes are separate by light ground color. A short postocular and an oblique supratemporal stripes diverge from the main stripes on each side of the head. Below, head and belly are whitish.

The longest measured specimen has a total length of 1180 mm, 178 mm of which is tail length. The ratio of tail length/ total length varies from 0.080-0.117 in males and from 0.080- 0.104 in females.

**Distribution:** Lowlands of northern Venezuela, and Colombia. In Sierra Nevada de Santa Marta it is found in the northern and northwestern part, from the sea level to 500 m.

**Ecology:** This is a ovoviviparous species that inhabits the lowland xerophytic forests. It feeds mostly on small rodents and birds. Amaral (1928) concluded that this is not a common venomous snakes in the Rio Frio plantations; from 693 specimens only 5 belonged to this species.

**Material:** Sierra Nevada de Santa Marta. Highlands of Santa Marta, no additional data (MCZ 28084). Magdalena: Bonda, 45 m (CM 151-8, 160, 185, 1093); Cacagualito 450 m (CM 2016-8); Pozos Colorados, 11 km S. Santa Marta, <50 m (AMNH 106259-60; CAS 116208); Río Frío, <50 m (MCZ 25038, 32751-2); Santa Marta, <50 m (AMNH 106261).

## E. TURTLES

### 1. Family Geochelonidae

#### *Geochelone carbonaria* (Spix)

(Map No. 53)

*Testudo carbonaria* Spix, 1824, Spec. Nov. Testud. Ranar. Brasil, p. 22.

*Testudo denticulata*: Ruthven, 1922, Misc. Publ. Mus. Zool. Univ. Michigan, 8: 69.

*Geochelone carbonaria*: Williams, 1960, Breviora, 120: 10. Medem et al, 1979, Castaño and Lugo, 1981, Cespedesia, 10: 55. Pritchard and Trebbau, 1984, Turtles of Venez.,

**Description:** Head longer than wide, anterior part triangular from above. Upper jaw somewhat curved with a finely dentate surface. External nares between rostral and upper maxillary rhamphotheca. Cephalic scales variable, with a large frontal scale, partially or completely divided and bordered by a pair of small prefrontals that are also in contact with the rostral. Small polygonal scales around the eyes and on the back of the head; 3-4 supraoculars, separated from the orbit by small superciliaries. Supratympanic touching orbit; numerous small scales under the chin in linear series of 4 or 5; shoulders and neck covered with finely granular and wrinkled skin.

**Shell:** carapace flattopped, elongate and straight-sided or indentated in adults; nuchal absent; 5 vertebrae, anterior pentagonal; high points usually on vertebrae II, III and IV; vertebrae II-IV nearly equal, V much larger, with curved posterior border, about one half the width of the carapace; 4 pairs of costals, II the smallest; 11 pairs of marginals, the VIII narrowed dorsally. Rear of carapace vertical or slightly overhanging, ending with a large rectangular supracaudal plate. All carapace plates slightly conical with concentric annuli and aerolae.

**Plastron** thickened anteriorly behind the gulars, also on the outer margin at inguinal-femoral seam. Excavation on the visceral surface behind the gular eminence. Gulars truncated anteriorly with a front face notch on anteriolateral corner; abdominals very large with longest midventral seam. Interfemoral and interhumeral seams subequal and intergular sea half or less the length of the interabdominal seam; interpectoral and inter-

caudal seams very short; inguinal plate large and prominent; usually 2 (1-4\_axillary plates, the inner is the smallest.

Forelimbs flattened, with 5 claws, can be completely withdrawn into the anterior shell opening; forelimbs covered with roundish or polygonal scales, the anterior slightly imbricate and with osteoderms. Hindlimbs columnar, with 4 claws, covered with small scales; scales enlarged on soles; flat polygonal scales on thighs. Tail relatively flat, covered with flat scales, usually arranged lineary.

Coloration: top of head is bright yellow, with a clearly marked yellow or orange postorbital. The rest of the head, neck limbs are dull black. Carapace is blackish above with yellow aerolae; plastron yellowish brown, usually with diamondshaped dark markings in the center of belly; and a dark triangle on femoral plates.

In adults carapace ranges from 250 to 360 mm.

**Distribution:** Northern and eastern Colombia, north and central Venezuela and the Guianas, and northeastern, eastern to southern Brazil, Bolivia, Paraguay and northern Argentina. In Sierra Nevada de Santa Marta it has been found in the lowlands in east, south and west.

**Ecology:** This terrestrial species is found in semixerophytic and dry forest up to 350 m.

**Remarks:** This species is actively hunted for food, and its shell is used as container. Around Santa Marta, as well as in other parts of South America, the species is becoming scarce.

**Material:** Cesar: Las Pavas, Valencia, Valledupar (Ruthven, 1922; Pritchard and Trebbau, 1984). Guajira: Arroyo de Arenas, Fonseca, San Juan de Cesar (Ruthven, 1922). Magdalena: Fundación (Ruthven, 1922), Rio Frio (Williams, 1960).

## 2. Family Kinosternidae

*Kinosternon scorpioides scorpioides* (Linnaeus)

(Map No.53 )

*Testudo scorpioides* Linnaeus, 1766, Syst. Nat., ed. XII: 352.

*Kinosternon scorpioides:* Gray, 1831, Syn. Rept., 1 Turt. 1:34.

*Kinosternon integrum*: Ruthven, 1922, Misc. Publ. Mus. Zool. Univ. Michigan, 8: 69.

*Kinosternon scorpioides scorpioides*: Pritchard and Trebbau, 1984, Turtles of Venez., p. 239.

**Description:** Head large with blunt point; upper jaw sinuous in profile, hooked in females and with ramaphotheca prominent. No scales on head and neck, except a bell-shaped scale on top of head. Lower jaw strong and hooked, with non-serrated cutting edge and flat surface. Up to 8 barbels on throat.

Carapace elongate, deep and carinate, smooth or with rough aerolae; sides of carapace parallel; 5 vertebrals, highest point on II or III vertebral; Vertebrals II - IV hexagonal with slightly concave anterior border. Nuchal small and rectangular; 4 pairs of costal plates, II the largest; 11 pairs of marginals. Plastron with intergular plate and an outer hinge across humeral plates, and posterior hinge along posterior margin of humeral plate. Pectoral and abdominal plates absent; axillary and inguinal plates in contact or separated; inguinal larger than axillary; posterior plastral lobe longer than anterior, gular plates convex laterally.

Feet small, adapted for walking and swimming; forefeet with 5 and hindfeet with 4 claws and with slightly interdigital webbing; palmar and plantar surfaces with discernible scales and large curved scales on anterior part of forelimbs. Tail tipped, with a spur and with small inner papillae.

**Coloration:** head with variable markings, but with brownish spots on cheeks and some vertical streaks on ramaphothecae; skin otherwise dark. The carapace is brown from olive brown to black. The borders of carapace are usually black and plastron is light yellow with dark plate borders.

**Distribution:** From north, central and eastern Colombia, east of the Andes, western Ecuador and northern Peru, also in most of Venezuela, northern Guyana and northeastern Brazil. In Santa Marta it is found in and around lowland waters up to 500 m. in western and southern slopes.

**Ecology:** This predominantly aquatic species is versatile and found in standing and moving waters and in marshlands in dry regions on the slopes of the mountain, even in temporary waters.

**Material: Magdalena:** Caracolicito, near quebrada Caracolicito (AMNH 97346-7), Fundación (UMMZ 45609; Ruthven, 1922; Pritchard and Trebbau, 1984).

## **F. Crocodylia**

### **1. Family Crocodylidae**

#### *Crocodylus acutus* Cuvier

(Map No. 53)

*Crocodylus acutus* Cuvier, 1807...Ruthven, 1922, Misc. Publ. Mus.Zool. Univ. Michigan, 22(8): 69.

**Description:** Snout moderately long; preocular moderate; fourth mandibular tooth fits into an indentation of the maxilla, moderately visible when mouth closed; fourth maxillary moderately developed. Interocular ridge inconspicuous; palpebral triangular bone present; dorsal and ventral scales partially ossified. Several rows of cervical plates. Dorsum brownish grey, light below.

Adult size reaches up to 2.5 meters.

**Distribution:** From Mexico to Brazil, especially in the Caribbean coast, also on several Caribbean islands.

In Santa Marta it is found in rivers in the northern part near or at the sea.

**Ecology:** This euryhaline species frequently is found in salty waters. One specimen was actually collected on ocean beach at Don Diego river, other was observed by Ruthven (1922) in Rio Fundacion.

**Material:** Sierra Nevada de Santa Marta. **Magdalena:** Don Diego, 0 m (UMMZ 46680).

### **2. Family Alligatoridae**

#### *Caiman sclerops fuscus* (Cope)

(Map No. 53)

*Perosuchus fuscus* Cope, 1868, Proc. Acad. Nat. Sci. Philadelphia, 1868:203. **Type locality:** Rio Magdalena, New Granada (=Colombia).

*Caiman sclerops*: Ruthven, 1922, Misc. Publ. Mus.Zool. Univ. Michigan, 22(8):69.

*Caiman sclerops fuscus*: Medem, 1981, Los Crocodylia de Sur America, 1:81.

**Description:** Snout wide and short; the width of the snout at the first maxillary tooth is less than the anterior border of the cranial table; fourth mandibular tooth perforates the premaxilo-maxillar suture, forming a socket, and almost invisible when mouth closed; fourth maxillary tooth most developed. Interocular ridge in half-moon shape; without longitudinal maxillary ridges; palaberal triangular bone small or rudimentary in adults, occasionally absent; two to three rows of occipital scales. Dorsal and ventral scales strongly ossified. Usually five rows of cervical plates; lateral scales small, oval and strongly keeled. Dorsum brownish olive, light below.

Medem (1981) mentions a female 140 cm long.

**Distribution:** From Chiapas, Mexico to the Caribbean coast of Colombia and northwestern Venezuela.

In Sierra Nevada de Santa Marta it is found in rivers and lagoons in the northern and northwestern part near the sea, at low elevations.

**Ecology:** It is an aquatic species that lives in fresh and slightly salty waters, rivers as well as lagoons and other standing waters. Medem (1981) found a nest in a thicket at a salty lagoon, near Rio Buritaca, 165 m from the seashore. The female emerged soon thereafter from the lagoon and covered the nest with her body in defense posture, with open mouth. The nest contained 30 eggs. Another specimen was also collected in a stagnant lagoon in low forest at Don Diego by Carriker (Ruthven, 1922).

**Material:** Sierra Nevada de Santa Marta. Magdalena: Don Diego, 0 m (UMMZ 46680); Mamatoco, 4 miles east of Santa Marta (CM 39999); Rio Buritaca, <10 m (Medem, 1981).

## **2. Summary of the composition of the herpetofauna of Sierra Nevada de Santa Marta**

The herpetofauna of the Sierra Nevada de Santa Marta consists of a total of 132 species: 46 species of amphibians and 86 species of reptiles. The amphibians represent 8 families and 20 genera; while the reptiles represent 16 families and 63 genera 43 species (32.5%) of the herpetofauna are endemic, including the monotypic genus *Geobatrachus* (See Table 2). Two species are represented by two subspecies each (a toad, *Bufo granulatus humboldti* and *Bufo granulatus beebeyi*, and a coral snake, *Micrurus dumerilii dumerilii* and *Micrurus dumerilii colombianus*).

**Table 2.- Taxonomic composition of the herpetofauna of Sierra Nevada de Santa Marta by major groups.**

Group	Families	Genera	Species	% Endemics
Caecilians	1	1	1	0
Salamanders	1	1	1(1*)	100%
Anurans	6	18(1)	44(25)	57%
Lizards	5	23	36(12)	33%
Snakes	7	36	46(5**)	11%
Turtles	2	2	2	0
Crocodylians	2	2	2	0
<b>TOTAL</b>	<b>24</b>	<b>83(1)</b>	<b>132(43)</b>	<b>32.5</b>

\*Boldfaced numbers in parenthesis represent the endemic taxa

\*\* There are also 3 subspecies of snakes that are endemic.

It is evident from these data that i) the degree of endemism in amphibians (Salamander and anurans) is high. Almost 58 % of the species occurring in the Sierra Nevada de Santa Marta are endemic; (ii) there are almost 7 times more endemic species of amphibians than snakes, even though there are more snake species than amphibian species; and (iii) endemism among lizards is higher than in snakes but lower than in amphibians.

### 3. Altitudinal distribution of the herpetofauna

The distribution of the species of herpetofauna in SNSM is the result of successful adaptations to different environments, and their altitudinal ranges frequently coincide with the plant distribution or belts of vegetation. Appendix III lists all the species with their altitudinal ranges and habitats. Table 3 shows the number of species inhabiting each zone and the number of species (in parenthesis) which are restricted to a particular habitat.

**Table 3 Altitudinal Distribution of the Species of the Herpetofauna from SNSM**

Altitude(m) Habitat	0-1000		1000-2300	2300-3400	3400-4500	>4500
	XSF	LMWF	CF	AF	PA	SP
Amphibians	19(15)	5(1)	23(20)	3(0)	5(2)	3(0)
Lizards	24(15)	8(1)	14(9)	0(0)	1(1)	0(0)
Snakes	31(21)	11(7)	19(7)	0(0)	0(0)	0(0)
Turtles	2(2)	0(0)	0(0)	0(0)	0(0)	0(0)
Crocodylia	2(2)	0(0)	0(0)	0(0)	0(0)	0(0)

Below 1000 m is a life-zone that Todd and Carriker (1922) reporting on the avifauna of SNSM, called the tropical zone. It has a large diversity of habitats, such as mangroves, deserts, marshes, and banana belts. Within this zone, I distinguished the xerophytic scrub forest (XSF) and the low montane wet forest (LMWF) as well-defined faunal areas. This lower zone harbors a large diversity and richness of species (about 89 species); most of them (about 68.5%) are widely distributed lowland species occurring in other regions as well. They have reached the foothills of the massif due to absence of effective geographical barriers. In the upper zones, from 1000 m up to the summits of the range, the composition of the herpetofauna changes markedly. The life zones recognized here are: 1000 m to 2300 m cloud forest; 2300 m to 3400 m, Andean forest; 3400 m to 4500 m, paramo; and 4500 m to snow line, superparamo. In these zones, the species have narrower distributions, and 60% are restricted to a given altitudinal range. Todd and Carriker (1922) found that the avifauna of SNSM has a large number of species confined to one zone, especially those present in the lowlands, and that only a few species are known to range beyond two adjacent zones.

The number of species occurring above 1000 m decreases sharply with altitude. This inverse relationship between the number of species and altitude is more accentuated in SNSM than in the Andes. The same phenomenon was also observed by Todd and Carriker (1922) for the birds of SNSM and it is illustrated in table 4. The avifauna of SNSM has been updated taxonomically by F. Vuilleumier (1970, 1972), and Haffer (1974). According to Todd and Carriker (1922), the abrupt decrease in the number of species with altitude is an indication of the insular character of SNSM. The insular character of the fauna in SNSM as a part of the paramo system in northern Andes was confirmed by F. Vuilleumier (1970). Table 4 also shows that in the case of the herpetofauna

there are fewer species in the Andean forest than in the paramo. This is suggestive of a condition of herpetofaunal ecological vacuum in the Andean forest in SNSM: there are less number of species in the latter than in paramo. This ecological vacuum of the SNSM might have originated due to rapid elevation or temporally variable climatological and ecological conditions, that made the intermediate zone of the Andean forest less favorable for the process of adaptation and speciation.

**Table 4.- Comparison of number of species and percentages of the avifauna and herpetofauna occurring in different zones in SNSM and Colombian Andes.**

<b>A. Herpetofauna</b>				
<b>Habitat</b>	<b>Santa Marta Mountain</b>		<b>Colombian Andes *</b>	
	<b>No Species</b>	<b>%</b>	<b>No Species</b>	<b>%</b>
Tropical zone	89	57.7	183	40.4
Cloud Forest	56	36.6	175	38.7
Andean Forest	3	1.9	78	17.2
Paramo	6	3.8	16	3.5

<b>B. Avifauna**</b>				
<b>Habitat</b>	<b>Santa Marta Mountain</b>		<b>Colombian Andes</b>	
	<b>No Species</b>	<b>%</b>	<b>No Species</b>	<b>%</b>
Tropical zone	337	76.4	685	63.4
Cloud Forest	75	17.0	273	25.2
Andean Forest	22	5.0	104	9.6
Paramo	7	1.6	19	1.8

\* Data for Colombian Andes, taken from Duellman, 1979

\*\* Data from Todd and Carriker, 1922.

Comparing the ratio of the number of species in the Colombian Andes/ number of species in SNSM (for both herpetofauna and avifauna) in the same life zones (see table 5), it is noteworthy that a considerable similarity exists between the ratios for both groups.

**Table 5.- Ratio of number of species of Colombian Andes/SNSM for herpetofauna and avifauna occurring at different life-zones**

	<b>Herpetofauna</b>	<b>Avifauna</b>
Tropical zone	2.05	2.0
Cloud Forest	3.12	3.6
Andean Forest	26.0	4.7
Paramo	2.66	2.71

In spite of the considerably larger area of the Colombian Andes, the latter have only about twice the number of species of Santa Marta on the tropical level (2.05 vs. 2.0); about three times the number of species at the level of the cloud forest (3.12 vs.

3.6); and over two and a half times the number of species in the paramos (2.66 vs. 2.71). A marked difference is found at the level of the Andean forest, where the Colombian Andes have 26 times more species of amphibians and reptiles than Santa Marta (3 species in the latter vs. 78 species in the Andes) , while the ratio for avifauna is only 4.7. This difference suggests that in comparison to the Andean forest of the Colombian Andes, the same zone of Santa Marta is poorer in species. This might be an indication that the vicariant event produced by the relatively rapid uplift of the main mass of Santa Marta did not allow for effective physiological adaptation by the poikilothermic amphibians and reptiles, but since this also applies to a lesser extent, to the avifauna (22 species in Santa Marta and 104 species in the Andes, or a ratio of 4.7), the evidence is not conclusive. A similar situation is found also in the Venezuelan paramos (Rivero, 1979). There are 5 amphibian genera (*Eleutherodactylus*, *Atelopus*, *Colostethus*, *Bolitoglossa* and *Hyla* with a total of 11 species), compared to the sole genus *Atelopus* but with 6 species found in SNSM; thus the ratio of the number of species between the two systems is almost 2 (1.83). This is comparable to the 2.6 ratio of paramo species between Andes and Santa Marta.

A further illustration of the differences in the altitudinal distribution of the herpetofauna is found in comparing the highland and lowland genera and species. Species occurring below 1000 m are considered here as lowland inhabitants, and those present above 1000 m (the altitude that coincides in most localities with the lower limit of the cloud forest) are considered as highland species. Table 6 summarizes the distribution of herpetofaunal taxa by their altitudinal distribution.

**Table 6.- Summary of the number of highland and lowland taxa of amphibians and reptiles.**

	Amphibians			Reptiles		
	Families	Genera	Species	Families	Genera	Species
Lowland	6	13	20	15	58	70
Highland	6	8	26	6	10	16

In amphibians, the same number of families (6) occurs in both altitudinal groups. However, *Plethodontidae* and *Centrolenidae* have no representatives below 1000 m, whereas *Caecilidae* and *Microhylidae* are not present in the highlands.

The lowland predominance of reptiles is clearly indicated by the 15 families represented by 70 species, as compared to only 6 families and 16 species found above 1000 m.

The relative species richness of some families is indicated by the Species-genus ratio (see Vuilleumier, 1986) as shown in Table 7.

**Table 7.- Numerical distribution and species/genus ratio of families of amphibians and reptiles in SNSM**

Family	genera	species	species/genus ratio
<b>LOWLANDS</b>			
Caeciliidae	1	1	1.0
Leptodactylidae	5	8	1.6
Bufo	1	3	3.0
Dendrobatidae	1	1	1.0
Hylidae	3	6	2.0
Microhylidae	2	2	1.0
Gekkonidae	7	9	1.28
Iguanidae	5	7	1.40
Scincidae	1	1	1.00
Teiidae	7	9	1.28
Anomalepididae	1	1	1.00
Leptotyphlopidae	1	1	1.00
Boidae	3	3	1.00
Colubridae	26	30	1.15
Elapidae	1	2	2.00
Viperidae	1	2	2.00
Crotalidae	1	1	1.00
Testudinidae	1	1	1.00
Kinosternidae	1	1	1.00
Alligatoridae	1	1	1.00
Crocodylidae	1	1	1.00
<b>Mean</b>	<b>3.38</b>	<b>4.33</b>	<b>1.32</b>
<b>HIGHLANDS</b>			
Plethodontidae	1	1	1.0
Leptodactylidae	2	11	5.5
Bufo	2	10	5.0
Dendrobatidae	1	1	1.0
Hylidae	2	2	1.0
Centrolenidae	1	2	2.0
Gekkonidae	2	2	1.0
Iguanidae	2	8	4.0
Teiidae	4	5	1.25
Amphisbaenidae	1	1	1.00
Colubridae	11	14	1.27
Elapidae	1	1	1.00
Viperidae	1	1	1.00
<b>MEAN</b>	<b>2.38</b>	<b>4.54</b>	<b>2.0</b>

In the lowlands, the numerically dominant families are Colubridae, Gekkonidae, Leptodactylidae, Iguanidae and Hylidae. In the highlands the dominant families are Leptodactylidae, Bufo and Iguanidae, as well as Colubridae.

For the highlands, these 4 families represent 30.8% of the 13 families found above 1000 m. They are: the large snake family Colubridae with 11 genera and 14 species; one lizard family, Iguanidae, with 2 genera and 8 species; and two frog families, Leptodactylidae, with 2 genera and 11 species, and Bufonidae, with 2 genera and 10 species. The latter two have the highest species/genus ratio of the entire herpetofauna: 5.5 and 5.0 respectively, followed by 4.0 for Iguanidae and 1.27 for Colubridae. The latter family however includes several euryoecious, otherwise lowland species that are able to live in the cloud forest only marginally, above 1000 m, or even higher. The species/genus ratio of Leptodactylidae, Bufonidae and Iguanidae is twice as high or higher than the mean ratio (2.0) for the entire highland herpetofauna. The fact that the two frog families, Leptodactylidae and Bufonidae have a large percentage of endemic species and a high species/genus ratio -10 or more species within only two genera- suggests a high *in situ* speciation and adaptive radiation (for high altitude birds, see Vuilleumier, 1986).

For Santa Marta, Duellman (1979) recognized 21 highland species of amphibians and reptiles with 16 endemics. For Santa Marta in general, Vanzolini (1988) mentions and comments on 25 lizard species, of which 22 are widely distributed lowland species and only 3, found in the cloud forest, are endemic. The present study records 42 species of amphibians and reptiles occurring above 1000 m, and 40 of these are endemic. In my analysis, 26 amphibian species occur at the highland level and 21 species in the lowlands. The better represented genera are *Atelopus* with 10 species and *Eleutherodactylus* with 8 species, all species being restricted to high altitudes. Diversity of species is almost the same in both groups. Two widely distributed, otherwise euryoecious lowland species, *Bufo marinus* and *Hyla crepitans*, are considered lowland species here even though they are found in Santa Marta from 0-1350 m and from 50-2000 m respectively. *Colostethus* sp. A. occurs in the cloud forest and therefore it is considered as a highland species in spite of one record at 600 m.

The high diversity in genera and species of reptiles in the lowlands is a good indication that this is a more favorable environment for this group. In lowlands, there are 14 families of reptiles representing 58 genera and 70 species but not all species within this category are restricted to altitudes below 1000 m. About 17 species, including the endemic subspecies *Lepidoblepharis s. sanctamartae* have a wider altitudinal distribution

from the sea level up to 2000 m. The number of species of reptiles decreases with altitude. Among the lizards only *Anadia altaserrania* is found at 3452 m while the highest altitude for snakes is 2400 m where *Atractus sanctamartae* and *Erythrolamprus bizona* occur.

#### 4. Ecological distribution of the amphibians and reptiles

Sierra Nevada de Santa Marta displays very diverse ecological environments made up of very high cliffs separated by deep valleys and rivers producing a mosaic of habitats that is reflected in the diversity of its fauna and flora. The environments inhabited by the herpetofauna are shown in Appendix III.

Very little is known about the life histories, specific ecological adaptations, reproduction, partition of resources, limiting factors, and behavior of the amphibians and reptiles occurring in Santa Marta and therefore it is difficult to present a complete analysis of the ecological adaptations and distribution patterns of its herpetofauna. However it is noteworthy that among the amphibians the less specialized forms are present at lower altitudes, whereas the more specialized ones occur above 1000 m. Genus *Atelopus* is a good example. The 10 species of this genus in Santa Marta can be divided into two clearly defined groups (see also Peters, 1973). The first, represented by *A. walkeri* (*A. longirostris* group), is characterized by slender bodies, long limbs, aerolate, thin skin and usually light color. They inhabit lower altitudes, and are essentially restricted to the ecologically more benign cloud forest. As much as the slow moving *Atelopus* can be, they are more active and agile, with walking-jumping movements. The species of the second group (*A. ignescens* group), represented by *A. carrikeri*, possess stocky bodies, short and stout limbs, thickened, smooth skin and generally dark color. This group is restricted to high altitudes in the paramo and superparamo. *Atelopus carrikeri* is the highest living frog in Santa Marta and perhaps in the whole South America. It has been found at an altitude of 4950 m along small streams produced by melting snow. The fleshy appearance of the highland forms, the thickened skin as well as the shortened limbs, the stocky body and dark coloration represent adaptive changes influenced by strong winds, high evaporation rates, and low temperatures. These high altitude ecological adaptations provide heat-saving features with slow, walking, not jumping movements and reduced activity

periods during colder seasons. McDiarmid (1971) pointed out that the ability to utilize fast moving streams for breeding, instead of the ponds or still waters, has triggered behavioral changes such as depositing eggs under rocks, and structural adaptations such as the reduction in the number of eggs. Moreover, eggs with larger yolk content allow a more complete development of the larvae before hatching. These changes are the main factors that have helped in the speciation of *Atelopus* in the high montane habitats. It will be interesting to compare the *Atelopus* frogs from northern Andes with the southern Andean *Telmatobius* frogs since they have parallel evolutionary histories. Thus, adaptive radiation and adaptations to physical and biotic environments are quite related to the orogeny of the montane habitats where both type of frogs live. The dark coloration as heat budget mechanism has also been observed in most species of Andean butterflies as an adaptive melanism produced by the physiological response to highland environments (Descimon, 1986).

The second most successful genus of frogs is *Eleutherodactylus* with 8 species, restricted to the cloud forest. Since humidity in cloud forest is very high, this could be the most important ecological factor for these and many other amphibians that require humid sites for laying eggs and development of the larvae (Rivero, 1979). According to Lynch (1979c), the high humidity of the cloud forest provides the best conditions for those species depositing eggs out of water where all the water required is obtained from the air. This is the case of *Eleutherodactylus* whose eggs are deposited out of water and there is a direct tadpole; and of *Centrolenella*, where the eggs are deposited on vegetation above water and the free swimming aquatic larvae hatch and fall into water. As noted by Ruthven (1922), in the cloud forest the presence of ponds and still waters decreases considerably (Ruthven 1922) but the constantly high air humidity provides new habitats for species with different types of development. He observed that on the slopes of San Lorenzo the altitudinal distribution of the fauna is due not only to temperatures but that " ... the environment as whole controls the distribution of each species." Bromelids, for example, are important microhabitats for some species of frogs (*Eleutherodactylus tayrona*) and salamanders (*Bolitoglossa savagei*), these plants are not found at low altitudes. Thus, the discontinuity in the altitudinal distribution of the herpetofauna reflects diverse adaptive mechanisms to different environments and the presence of different forces that shape the actual ranges of the different species, such as

competition exclusion, environmental discontinuities or ecotones and physical or biological conditions (Terborgh, 1971). A similar phenomenon was reported by Adams (1973) for Santa Marta butterflies. He found that climate, type of vegetation, and behavior (active and powerful fliers, families Danaidae, Nymphalidae, Heliconidae, Pieridae and Hesperidae) have a somewhat wider zonal distribution and greater tolerance to ecological conditions. On the other hand, a large number of the butterfly species are restricted to a specific ecological zone, in part due to the availability of food plants for the larval stages but also to the fact that they are weaker fliers, and have a tendency to be colonial.

On the other hand, sunlight and temperature are important factors in determining ecological distribution of many lizards and snakes. These factors are predominant in the xerophytic scrub forest and in the cloud forest but practically absent from upper habitats. The altitudinal patterns of distribution of amphibians and reptiles is probably correlated with the rainfall patterns that increase with altitude, favoring amphibians in the upper part of the mountain, especially in the cloud forest, and lizards and snakes in the lower, drier environments (Schall and Pianka 1978).

The faunal resemblances among the principal habitats of Santa Marta were measured by Simpson's (1960) index (based on data in Appendix III and IV) and the results are shown in Table 8.

Table 8.- Indices of similarity between the principal habitats of Sierra Nevada de Santa Marta.

	XSF	LMWF	CF	AF	P	SP
XSF	<b>78</b>	<b>54.2%</b>	<b>30.3%</b>	<b>0%</b>	<b>0%</b>	<b>0%</b>
LMWF	<b>13</b>	<b>24</b>	<b>29.2%</b>	<b>0%</b>	<b>0%</b>	<b>0%</b>
CF	<b>17</b>	<b>7</b>	<b>56</b>	<b>33.3%</b>	<b>0%</b>	<b>0%</b>
AF	<b>0</b>	<b>0</b>	<b>1</b>	<b>3</b>	<b>66.6%</b>	<b>66.6%</b>
P	<b>0</b>	<b>0</b>	<b>0</b>	<b>2</b>	<b>6</b>	<b>100%</b>
SP	<b>0</b>	<b>0</b>	<b>0</b>	<b>2</b>	<b>3</b>	<b>3</b>

AF = Andean Forest; CF = Cloud Forest; LMWF = Lower Montane Wet Forest; P = Paramo; SP = Super Paramo; XSF = Xerophytic Scrub Forest. Boldfaced numbers = number of species present in each habitat; Underlined numbers = Number of species shared by two habitats; percentage = similarity

The highest resemblance is between the paramo and the superparamo (S=100%) because the three species of *Atelopus* (*Atelopus carrikeri*, *Atelopus sp. A*, and *Atelopus*

sp *B*) that represent the total of the superparamo herpetofauna occur also in the paramo. This particular case illustrates a successful vertical dispersal.

Andean forest shares with paramo as well as with superparamo 66% of its species, (*Atelopus carrikeri*, and *Atelopus sp. A*). Xerophytic scrub forest and low montane wet forest have a degree of resemblance of 54.2%, mostly represented by several euryoecious lizard and snake species and a few frogs, such as the widely distributed *Lepidodactylus insularum*, *Hyla crepitans* and *Bufo marinus*. Cloud forest exhibits a herpetofaunal composition that shares very few species with either the high-altitude or with the lower altitude zones. The herpetofaunal affinities (about 30%) between the cloud forest and both low altitude habitats are constituted by the widely distributed species with wide tolerances for different environmental conditions. They are the three amphibians, mentioned above, and some gekkonid lizards (cf. *Lepidoblepharis sanctamartae*, *Pseudogonotodes furvus*), several anoles and the sunlight loving *Cnemidophorus lemniscatus*. The latter would penetrate temporarily opened areas of cloud forest, mostly by humans, or travel along the roads, exposed to sunlight, that constitute drier expansion routes into the dense and humid cloud forest. None of the other active day time Santa Marta teiid lizards of the genus *Ameiva*, living in xerophytic scrub forest, have been observed as aggressively penetrating into other environments. In other regions (cf. Venezuela) they are known to follow some expansion routes into more humid environments where aridification is occurring (Roze, pers. comm.) Several euroecious snakes, such as *Erythrolamprus bizona*, *Spilotes pullatus* and *Liophis melanotus* are found in more than one habitat, including in cloud forest.

Uniqueness of cloud forest is characterized by its limited resemblance to the other habitats. It has about 30% similarity to the lowland ecosystems (xerophytic scrub forest and low montane wet forest) and only 8 % to the higher ecosystems (Andean forest, paramo and superparamo). All the 9 species of *Eleutherodactylus*, 4 species of *Anolis* (the slender bodied *A. walkeri* group) and the 6 cloud forest lizard species of *Anolis*, as well as the 2 species of snake genus *Atractus* comprise the bulk of species restricted to this habitat.

The Index of similarity among all the ecosystems is illustrated in fig. 4. From this figure it is evident that in SNSM there are three well defined clusters of species: the first is formed by the Andean forest, Paramo and Superparamo and the second by Xerophytic

scrub forest, and Lower wet montane forest, while cloud forest has a composition that is more restricted to that particular belt. This suggests then, that most of the herpetofauna at higher elevations in SNSM have originated within the limits of the Andean forest up to the superparamo and the remainder within the limits of the cloud forest. This agrees with what was observed in tropical high Andean birds, where "Much species-level origination in the high tropical Andean avifauna occurred in situ." (Vuillemier, 1986).

### 5. Endemism in the Sierra Nevada de Santa Marta

As mentioned before, 32.5% of the species of amphibians and reptiles occurring in the massif are endemics. How endemism is correlated with altitude and diversity of the vegetation is shown in table 9.

**Table 9.- Endemism among the different groups of the herpetofauna of SNSM at different life-zones**

	Amphibians			Lizards			Reptiles		
	S	E	%	S	E	%	S	E	%
Xerophytic scrub forest	19	-	0	24	4	16.6	34	0	0
Lower montane wet Forest	5	1	20	8	-	0	11	-	0
Cloud forest	23	20	87.0	14	8	57.1	19	5	26.3
Andean forest	3	3	100	-	-	0	-	-	-
Paramo	5	5	100	1	1	100	-	-	-
Super paramo	3	3	100	-	-	-	-	-	-

S= Number of species; E= Endemic Species; % = percent of endemics

The degree of endemism is not the same in amphibians as in reptiles. Reptiles are quite abundant (70 species) at the lowland level, but only 8 % of them are endemic to the mountain; of the 16 highlands species, 15 (94 %) are restricted to the massif. Among the amphibians, there is about the same number of species in both altitudinal zones, but 96% of the species, including one monotypic genus, occurring in highlands are restricted to the Sierra Nevada de Santa Marta, while there is only 1 (4%) endemic species in the lowlands.

As mentioned before the species endemic to the cloud forest are restricted both ecologically and geographically.

Relatively few species of amphibians and only one of lizards are able to survive in the variable conditions of the paramo and superparamo and even in the Andean forest that has a slightly more benign environment. The species (*Atelopus*) occurring there, are highly specialized and restricted to this environment (see chapters on Altitudinal Distribution and Ecological Distribution). In these habitats, all the species (100%) are endemic. Endemism of amphibians and reptiles is also high in the cloud forest: about 87 % of the amphibians, 57 % of the lizards, and 26 % of the snakes. No endemic species of amphibians occur in the xerophytic environment, and most of the species present in this habitat have wide distributions. In SNSM, endemism in amphibians increases with altitude, while there is a decrease in diversity and abundance of species.

The proportion of endemism among other groups of the fauna in SNSM is also high; for the avifauna from 3500 m up reaches 66% (Vuilleumier, 1970). For mammals, about 40% of the species known from the region are endemic (Allen, 1904).

Vuilleumier (1970) showed that the avifauna of the Andean paramos, including those of Sierra Nevada de Santa Marta, display insular characteristics. Thus such a mountain range can be considered as a "biotic island". He based his conclusion that the paramo islands can be considered as an archipelago, because the species-area curve provides a good prediction of species numbers and because the number of endemic species can be predicted with some accuracy measuring the distance between the paramo islands. Comparing avifauna of 15 paramo islands of northern South America, he found that Santa Marta has the highest percentage of endemic birds (of the 18 species found in Santa Marta paramos, 12 are endemic, representing 66%). Comparatively, the 6 species of SNSM paramo herpetofauna (represented by the sole frog genus *Atelopus*) are 100% endemic to the "island habitat" which extends 3500 m up to 4500 m and above, up to the snow line.

The existence of the relatively high degree of endemism convinced Muller (1973) to name the highlands of SNSM as a dispersal centre. This endemism suggests also that the Sierra Nevada de Santa Marta has been isolated from other adjacent regions for a considerable time.

## 6. Phylogenetic relationships of the highland herpetofauna of Sierra Nevada de Santa Marta.

Except for a few groups, only limited knowledge is available about the phylogenetic relationships of the SNSM herpetofauna, as is true also with South American species in general. I offer below summaries of phylogenetic relationships of the better known groups found in the highlands of the massif, as they could provide material for interpreting the biogeographic history and relationship of the mountain to other highland areas of South America. Also included are some comments about a few interesting groups of lowland herpetofauna, as they might provide additional interpretation for the biogeography of Sierra Nevada de Santa Marta.

The only species of salamanders known from Sierra Nevada de Santa Marta belongs to the genus *Bolitoglossa* which ranges from Central to South America, and comprises more than 60 species, 20 of which are South American. The only Sierra Nevada de Santa Marta species, *Bolitoglossa savagei*, was assigned by Brame and Wake (1963) to the *adpersa* group. Later in 1971, they divided the *adpersa* group into different subgroups and *B. savagei* was assigned to the subgroup 1 with *B. adpersa*, *hypacra*, *taylori*, *borburata*, *vallecula* and *orestes*. Of these, *B. hypacra*, a highland species found in the Cordillera Occidental in the northwestern part of Colombia, is the most primitive South American species and forms a link between the southern Central American highland forms and the four more closely related species of the *adpersa* group: *adpersa*, *borburata*, *savagei* and *vallecula*. Because of the affinity in some of the character states, it has been suggested that these five species have arisen from the same ancestral stock. The main differences between them, according to Brame and Wake (1963), are (i) degree of webbing: the primitive character is little webbing, as in *B. vallecula* and *hypacra*. Derived conditions range from moderate, as in *adpersa* and *savagei*, to completely webbed hands and feet as in *B. borburata*; (ii) Number of maxillary teeth: 30-60 are considered a primitive condition, which is present in *borburata* (57), *savagei* (48), *hypacra* (48) and *vallecula* (44), while high or low numbers are conditions considered as derived characters, as in *adpersa* (27); (iii) length of the limbs: long limbs are considered a primitive condition found in *vallecula* and *hypacra*, moderate limbs are considered as an intermediate state, present in *borburata* and *savagei*, and very short limbs are the advanced state

as in *adspersa*. The relationship of the five species considered in the present analysis is illustrated by the cladogram (partially modified from Lynch, 1986) shown in figure 6.

Thus, the distribution of the South American species of plethodontid salamanders genus *Bolitoglossa* is the result of adaptive radiation from a Central American form, and the highland species are probably derived from the lowland stock (Brame and Wake, 1963; Savage, 1966; Wake and Lynch, 1976; Lynch, 1986). The Santa Marta species, *B. savagei* is more closely related to *vallecula* of the central Andes of Colombia and to *borburata* from Venezuela than to *adspersa* from Bogota, Colombia or to *hypacra* from Antioquia, Colombia. Therefore, the evidence at hand suggests that the ancestor of *B. savagei* is the same Central American ancestor form from which *B. vallecula* has originated.

The genus *Eleutherodactylus* is one of the most prominent genera of South American frogs. It comprises more than 400 species, distributed from Mexico, Central America, and tropical South America from Colombia and Venezuela to northern Argentina and southern Brazil, and the Caribbean islands. It was introduced in Florida. This genus has a predominant Andean representation (70% of the South American species are found in the Andes), ranging from sea level to 4400 m north of the Huancabamba depression (Lynch, 1986). Therefore, the evolution of this group is closely related to the orogeny of the Andes. In Sierra Nevada de Santa Marta eight endemic and one non-endemic species are found, all nocturnal and restricted to the cloud forest. The species of *Eleutherodactylus* of Santa Marta were studied by Lynch and Ruiz (1985). On the basis of cranial and external morphology these authors concluded that eleutherodactylid frogs do not show clear affinity with species from the coastal range of Venezuela nor with species present in the West Indies, as previously suggested by Walker and Test (1955), Rivero (1961), and Lynch (1979b). Internal morphological characters common to all nine species suggest that they are closely related among themselves, even though some species are more closely interrelated than others, as is the case of *E. carmelitae* and *E. insignitus*. In the absence of more information about the species of *Eleutherodactylus* outside the SNSM, it is difficult to make definitive statements about phylogenetic relationships of the Santa Marta species. I follow Lynch and Ruiz, (1985) in their conclusion that the endemic *Eleutherodactylus* species from this region have more affinities either with species from the northern Andes of Colombia, or with other species from Santa Marta

*Geobatrachus*, the only endemic and monotypic frog genus of Sierra Nevada de Santa Marta, was initially described by Ruthven (1916) as a genus of the Dendrobatidae. Noble (1922) included the genus within the Brachycephalidae, together with the genera *Atelopus*, *Brachycephalus*, *Dendrobates*, *Hyloxalus*, *Phyllobates*, and *Rhinoderma*. He based his decision on the following shared characters: 1) bufonid type thigh muscles, 2) the procoelous pattern of the vertebral centra, 3) 5-8 presacral vertebrae, 4) firmisternal pectoral girdle and 5) unexpanded terminal tips of the digits. The different subfamilies of the Brachycephalidae were recognized by Davis (1935) as families and the genus *Geobatrachus* was included in the family Rhinodermatidae. Griffiths (1959) placed *Geobatrachus* and *Rhinoderma*, in the Rhinodermatinae, a subfamily of the Leptodactylidae because the pseudofirmisternal condition. Dunn (1944c) considered the *Rhinodermatidae* (*Geobatrachus*, *Rhinoderma* and *Sminthillus*) as derivative forms from a leptodactylid ancestor. Lynch (1971), suggested that "the presence of teeth, the firmisternal pectoral girdle, rounded sacral diapophyses, fused tarsal bones, reduced zonal elements of the pectoral girdle", were valid reasons to consider this genus within the microhylid frogs. Finally, Ardila (1979) analyzed 68 morphological characters in order to attempt to establish the phylogenetic relationship of *Geobatrachus*. In her analysis, she emphasized the following morphological characters as important for the definition of the genus: (1) reduction of the first toe, (2) generalized type of cranium without reduction or absence of bones, and without exhibiting any particular adaptations to a fossorial habitat, (3) presence of non-pedicellated maxillary teeth, (4) generalized hyoid apparatus, (5) 8 non-fused presacral vertebrae with specialized transverse processes, (6) T-shaped terminal phalanges, (7) full firmisternal condition of the pectoral girdle, (8) clavicle reduced, (9) *M semitendinosus* tendon is fused to the tendon of the *M. sartorius* and passes ventrally to the *M. gracilis*, (10) *M. adductor longus* inserts over the knee, (11) absence of the accessory tendon in the *M. glutaeus magnus*, (12) direct development without larval stages, (13) karyotype is  $2n = 20$ . She concluded that *Geobatrachus walkeri* is a rather outstanding specialized form within the tribe Eleutherodactylini, with which it exhibits a greater affinity than with any other of the previously suggested groups. The available evidence suggests that this interesting monotypic genus had an ancestral eleutherodactylid form that separated from the original stock, became isolated and evolved "in situ" in the highlands of SNSM. Myers and Ford (1986) supported the inclusion of *Geobatrachus*

in the family Leptodactylidae and noted its relationship to *Atopophrynus*, a genus described from the Cordillera Central of Colombia (Lynch and Ruiz-Carranza, 1982). The main, apparently synapomorphic features that relate both genera are the concealment of the first toe and the paired processes from the hyale of the hyoid. The eleutherodactyline relationship of *Geobatrachus* further supports the hypothesis that this tribe has had a long history associated with the biogeographically unique development of Sierra Nevada de Santa Marta, as indicated by the species of *Eleutherodactylus*.

A particularly indicative status of the endemic diversity of Sierra Nevada de Santa Marta is shown by the genus *Atelopus*. There the genus is represented by 10 species, all endemic, 8 of which represent undescribed taxa. Of the total of 46 species of this genus, the Sierra Nevada de Santa Marta harbors 22% of the total number of species. They can be divided into two clearly defined species groups. These two groups of *Atelopus* agree with the division proposed by Peters (1973) for Ecuadorian *Atelopus*. He observed that the slender form, which he called the *longirostris* group, includes the slim-bodied, long-legged taxa, while the *ignescens* group includes the taxa with short, heavy-set bodies and short limbs. McDiarmid (1971) in his revision of the genus also mentioned the long-legged and the short-legged species.

In SNSM the taxa of the slender body group are: *Atelopus walkeri*, *Atelopus* sp. C, *Atelopus* sp. D, *Atelopus* sp. E, *Atelopus* sp. F and *Atelopus* sp. H. The taxa of the stubby body group are: *Atelopus carrikeri*, *Atelopus* sp. A, *Atelopus* sp. B, and *Atelopus* sp. G. The altitudinal distribution of the two species groups is somewhat discontinuous (Fig. 7). The slender group is usually restricted to altitudes between 1500 and 2600 m that are within the approximate limits of the cloud forest. Only one species *Atelopus* sp. C., a slender form, has been reported from Paramo, but I suspect it might be found at lower altitudes. The stout-body species are distributed mostly in paramo and superparamo. The highest living frog, and the highest living herpetological species for that matter, in Santa Marta is *A. carrikeri* (4950 m).

It is probable that the highland species of *Atelopus*, living in a young geological area, are well advanced evolutionarily speaking, and might have their origin at lower altitudes. In turn, lower altitudinal species are more primitive, live in older areas, and therefore, it can be postulated that the ancestral stock from which the atelopid frogs from Santa Marta evolved was similar to that of the slender group. Peters (1973) observed for

the *Atelops* in the Ecuadorian Andes that the highland taxa could be the product of a separate successful invasion of the highlands by the lowland stock (implying polyphyletic origin for the highland species). If this is also the case for Sierra Nevada de Santa Marta, is difficult to say, until a further and more complete study is carried out. The invasion of the ancestral lowland stock into the highlands and the subsequent radiation and speciation events could be associated with the glacial and interglacial periods, as well as the uplift of the mountain (chapter I). The resulting species complex is produced by adaptive radiation in situ. In other words, the *Atelopus* species group of the high altitude is either monophyletic or polyphyletic. For the purpose of the present study, I assume that the Atelopoid frogs have originated in situ and that their common, closest relative is of Andean origin.

*Centrolenella sp. A* (*Centrolenella cf. platycephala*) is assigned to the *prosoblepon* group (Lynch, 1981) but the inadequacy of the systematics of the group makes it impossible to determine the real relationship among the species that form it. Current definition of the species of *Centrolenella* has been phenetic (Savage, 1967; and Duellman and Burrowes, 1989). Pending a revision of the species and the species groups, it is enough to say that *Centrolenella sp. A* resembles *C. antioquiensis*, a species found in Cordillera Oriental of Colombia. *Centrolenella sp. B* is an undescribed species that seems to be closely related to *Centrolenella sp. A*.

Oftedal (1974) indicated some of the phyletic relationships of the different species of *Anadia*, distinguishing 5 main groups, the most important of which for the purposes of the present study is the *bitaeniata*-group.

According to him, the *bitaeniata*-group is primarily composed of *A. pulchella*, *A. bitaeniata* and *A. bifrontalis*. Later in 1987, Harris and Ayala included within this group a new species they described from SNSM, *A. altaserrania*, and *A. pamplonensis*. The latter species, previously described by Dunn (1944e), was synonymized by Oftedal (1974) with *A. pulchella*, but recognized again as a valid species by Harris and Ayala (1987).

This group is characterized by quadrangular dorsals, slightly rounded posteriorly; the suboculars may be different or equal in size; the prefrontals may or may not be in contact; (they are absent in *A. altaserrania*); and by the lower count of the dorsals, as compared to the other groups.

Analyzing the morphological characteristics of these species, it is clear that *A.*

*bitaeniata* and *A. bifrontalis*, both from Venezuela, are the most closely related species within this group (Oftedal, 1974, Harris and Ayala, 1987) and that *A. pulchella* and *A. altaserrania* are more closely related between them than with any other Andean species of the group. On the other hand, *A. pamplonensis* is an intermediate form between the Venezuelan species and the Santa Martan species (fig 8).

Harris and Ayala (1987) suggested that the ancestor of the *bitaeniata*-group could be a form inhabiting the forest at lower elevations that during the glacial times was able to cross the Valledupar valley to invade the Sierra Nevada de Santa Marta. It is, therefore, possible that *A. altaserrania* is a species of more recent origin that became isolated after having migrated to the higher altitudes zones presently defined as the paramo. *Anadia altaserrania*, *Anadia pulchella* and *Anadia pamplonensis* appear to form a group with similar morphological biogeographic and ecological characteristics, but the taxonomic structure of the complex is not yet well known. Hypothetically, this second cluster of species is considered as a natural group.

The genus *Pseudogonatodes*, comprising small lizards, is restricted to South America where it is represented by six species (plus a seventh, described but not named by Mechler, 1968): *P. lunulatus*, *P. guianensis*, *P. amazonicus*, *P. barbouri*, *P. furvus* and *P. peruvianus*. The genus was initially described by Ruthven (1915c) to designate a species (*P. furvus*) from Sierra Nevada de Santa Marta. All the species of this genus are essentially allopatric. Thus, *P. lunulatus* occupies northern Venezuela from sea level to 1000 m.; *P. guianensis* inhabits the river valleys of northern Guyana; *P. amazonicus* occurs in the upper Amazon basin of Brazil; *P. barbouri* is found in the arid valleys of Rio Chinchipe and Río Marañon in Peru; and *P. peruvianus* is distributed along the valley of Rio Utcubamba, in the eastern Andes in Peru. *Pseudogonatodes furvus*, the species restricted to Sierra Nevada de Santa Marta, differs from other species of the genus in having the largest S-V length (42-45 mm.) and usually more than 100 granules around the body. Parker (1935) considered *P. furvus* closely related to *guianensis* as well as a probable conspecificity between *P. furvus* and *P. lunulatus*. Test *et. al* (1966) indicated that the conspecificity between *P. furvus* and *P. guianensis* is not apparent because they differ in body size, number of upper labials, shape of dorsal and ventral scales, and size of the lower labials. The latter authors concluded instead that conspecificity might be present between *P. guianensis* and *P. lunulatus*. With exception of *barbouri*, the species of

*Pseudogonatodes* are so homogeneous that Vanzolini (1967 and 1968) suggested that it is possible that they are races of a single species. Comparison of all the species of the genus show that *P. furvus* is distinct from *P. guianensis*, *P. lunulatus* and *P. amazonicus* (Test *et. al*, 1966; Huey and Dixon, 1970) and that the latter three species are closely related, whereas *P. furvus* is more closely related to *P. peruvianus* (Huey and Dixon, 1970). The latter argument is based on the large number of toe lamellae, the lack of expanded third lamellae on the fourth toe, the presence of granular dorsals and the scansorial foraging mode that allowed Huey and Dixon (1970) to group together *P. furvus* and *P. peruvianus*.

*Lepidoblepharis sanctaemartae*, a sphaerodactylid gecko, seems to be most closely related to *Lepidoblepharis miyatai*, found in the dry coastal forest of northwestern Colombia. Both species share smooth, flattened overlapping dorsal and lateral scales (Lamar, 1985).

The largest genus of lizards is *Anolis*, with over 300 species (Williams, 1988). This genus is very complex taxonomically. While clearly monophyletic, the relationship among the major species groups is still being investigated. Of the 9 species found in the Sierra Nevada de Santa Marta, three are widely distributed lowland species (*A. auratus*, *A. onca* and *A. tropidogaster*). *A. biporcatus*, found in lower fringes of cloud forest in Sierra Nevada de Santa Marta, is a large anole considered as a lowland invader from Central America (Williams, 1966 and Williams, 1970). It is distributed mostly in tropical rain forest or wet low montane forest in the Choco region of western Colombia to Ecuador and in western Venezuela. The 5 highland species represent two interesting species groups.

*A. santamartae* belongs to the *punctatus* group (Williams, 1982). All the other species of this group are distributed in the highlands of the northern Andes: *A. huilae*, found in Cordillera Central of Colombia; *A. nigropunctatus*, in Cordillera Oriental of Colombia and Andes of Merida, Venezuela; and *A. jacare* in Andes of Merida, have mostly smooth ventrals and no light labial line. Their phylogenetic relationships have not been established yet, but the condition of tendency to have weakly keeled ventral scales and light labial line, considered as a derived condition, over the smooth scales and absence of a light labial line, makes *A. santamartae* hypothetically more evolved than the other members of this subgroup.

No less than 4 species -*Anolis solitarius*, *Anolis menta*, *Anolis sp. A*, and *Anolis sp. B*- belong to the *tigrinus* group, as defined by Williams (1976). All the allospecies found in Sierra Nevada de Santa Marta are more closely related to each other than to *Anolis tigrinus*, found in Cordillera de la Costa, Venezuela. The only two other species of this group- *A. pseudotigrinus* and *A. nasofrontalis*, from southeastern Brazil- are less closely related (Ayala, Harris and Williams, 1984). Concentration of this species cluster in Sierra Nevada de Santa Marta suggests in situ speciation of the *tigrinus* group anoles from common hypothetical lowland form from northern South America that might have also given origin to *A. tigrinus* in Venezuela. The exact evolutionary relationship among the species has not been established, but presence of allospecies in Sierra Nevada de Santa Marta and Cordillera de la Costa, Venezuela, as well as of *A. punctatus* (related to *A. santamartae*) in Andes de Merida , Venezuela suggests some biogeographic relationship of Sierra Nevada de Santa Marta to the Venezuelan mountains.

The snake genus *Atractus* is widely distributed in the Neotropics from Panama, the entire northern and central South America, to the Amazonia in Bolivia and Brazil. The genus consists of rather small secretive snakes. Due to its fossorial existence, all its evolutionary trends are interpreted as adaptations or specializations to the secretive semi-fossorial habit. Examples of such features are reduction of the head scales, elongation of the snout, reduction of the size of the eyes, shortening of the tail and a slender body. The genus has been associated phylogenetically with *Carphophis*, *Geophis* and *Adelphicos* by Dunn (1928a). The same author in 1935 suggested that *Atractus*, *Carphophis*, *Farancia* and *Abacura* were closely related genera that possibly had their ancestors among some members of the genus *Geophis*, which in turn were allied forms of *Ninia*. He based his suggestion on some resemblances such as the morphology of the hemipenis, dentition, the anal single, smooth scales, and the absence of preoculars. Savage, (1960) in his study of *Atractus* from Ecuador suggested that the genus was more closely related to *Geophis* than to any other genus. Downs (1967) in her review of the genus *Geophis* agreed with Dunn's idea that *Atractus* is a specialized burrowing form that may have been derived from *Geophis*. Given the incomplete knowledge of the genus in Colombia and Venezuela, it is not possible to determine with any degree of certainty the relationships of Santa Marta *Atractus* with other species. However, the two species found in Sierra Nevada de Santa Marta agree closely with the *badius* group as defined by

Savage (1960). Savage indicated that the group is characterized by the presence of a differentiated hemipenis and color patterns. According to Savage, the *badius* line is the most primitive, and, therefore, a tentative conclusion is that the other groups may have been derived from a *badius*-like ancestor widely distributed in tropical South America before the uplift of the Andes. The original population became fragmented into smaller populations when this geological event took place at the beginning of the Quaternary.

### 7. Patterns of zoogeographical distribution

As mentioned in the section of Altitudinal Distribution, the herpetofauna of the foothills of SNSM represent to a larger extent the primitive elements of the whole assemblage and includes the contributions of other physiographic regions such as dry coastal plains, llanos and other lowland biomes to this particular region. Above 1000 m. most of the species have more restricted ranges or are endemic to the massif. In having two types of faunas, there are also two different evolutionary histories. The lowland fauna is older in origin than the upper one and its presence in this region may be explained as a result of dispersal processes as the best way to get there. A good indication of this dispersal is the almost total absence of endemic species. On the other hand, the highland group evolved and underwent speciation process after the paulatine and recent uplifts. In other words, the origin of the highland species is the result of vicariant events. This is based on the fact that most of the species above 1000 m are endemic, with few or no related forms in other physiographic areas, suggesting that they have evolved "in situ". Better knowledge of the life histories, physiology, developmental behavior and phylogenetic relationships of many components of the herpetofauna of SNSM is required in order to evaluate these conclusions. Shapiro (1977), for example, concluded that *Reliquia sanctamartae*, an endemic butterfly of Santa Marta, exhibits a phenotype of polyphenism that is convergent to most *Pieris* and has little to do with the ancestors of the Santa Martan species. This suggestion changes dramatically the explanation of phylogeny of *Reliquia*.

The isolated biogeographical situation of Sierra Nevada de Santa Marta is also illustrated by the comparison of the distribution of its herpetofauna with that of the Andes on a generic level. Of the 34 genera of amphibians and reptiles considered as predomi-

nantly Andean or of Andean origin (Duellman, 1979; Lynch, 1986), only 6 (20.4 %) are also found in Sierra Nevada de Santa Marta: 5 amphibian and one reptilian. By contrast, only one genus (*Geobatrachus*), endemic to Sierra Nevada, is not found in the Andes.

One remarkable fact is that no lizard genera considered as of Andean origin are found in Sierra Nevada de Santa Marta. Even such species as richly and widely distributed Andean genera *Proctoporus* and *Euspondylus*, both found in the northern and southern Andes, are absent from Sierra Nevada de Santa Marta. Of the 18 species of *Proctoporus* (only one is extra-Andean) at least 3 (*P. bogotensis*, *P. columbianus* and *P. striatus*) are found in the Cordillera Oriental of Colombia, adjacent to Sierra Nevada de Santa Marta. Another example is *Phenacosaurus*, an exclusively northern Andean genus found predominantly in Cordillera Oriental of Colombia. Three (*P. heterodermus*, *P. indere-nae* and *P. nicefori*) out of 4 species that comprise the genus are found in the Andes of Colombia.

Only one snake genus, *Atractus*, is found both in Sierra Nevada de Santa Marta and the Andes. However, this very large genus has only about 70 (54%) Andean species and its Andean origin is somewhat doubtful.

On the other hand, 5 amphibian genera -*Atelopus*, *Centrolenella*, *Colostethus*, *Eleutherodactylus*, and *Cryptobatrachus*- are shared by both northern Andes and Sierra Nevada de Santa Marta. *Eleutherodactylus* occupies a special place in the Andean amphibian diversity. The 167 Andean species represent about 65.% of the total of about 240 species found in South America, excluding the Central American species. Of these, only *Eleutherodactylus w-nigrum* is found both in Sierra Nevada de Santa Marta and in northern Andes.

*Atelopus* is found in all northern Andean mountain systems as well as in Cordillera de la Costa, Venezuela. It is the species-richest genus found in Sierra Nevada de Santa Marta. Its 10 Santa Marta species represent about 25% of the 41 species that constitute the South American high altitude species assemblage of this genus. Thus the currently recognized and widely distributed groups of *Atelopus longirostris* and *A. ignescens* (sensu Peters, 1973) might be more the result of ecological adaptation and of adaptation to walking and heat-saving body forms than phylogenetic relationships (see Ecological Distribution). This is one reason why all the northern Andes of South America have representatives of both groups, all essentially dependent from the altitude in

which they occur. The two groups then represent more of a phenetic than phylogenetic relationship. Within each of these, however, several natural evolutionary clusters of species can be distinguished. *Atelopus* sp C. from Sierra Nevada de Santa Marta apparently forms a sister group with *A. carbonarensis*, and *A. oxyrhynchus*, both known from Andes of Merida, Venezuela, and perhaps with *A. cruciger*, known from Cordillera de la Costa of Venezuela (Rivero, 1980). They are characterized by absence of a tarsal fold and yellow-green coloration. Other members of this group are uncertain, but the distribution of the three species suggest a historical relationship between Santa Marta and Andes of Merida.

Viewing the distribution patterns of the species, we find that of the 46 species of amphibians found in Sierra Nevada de Santa Marta, 26 are restricted to the mountain. Among the non-endemic species, 10 are lowland cosmopolitan occurring from Mexico or Central America to northern South America, as for example *Leptodactylus fragilis*, *Leptodactylus insularum* and *Physalaemus pustulosus*. Four species have more restricted South American ranges, and three, *Hyla pugnax*, *Chiasmocleis panamensis* and *Relictovomer pearsei*, have even more restricted distribution occurring only in Panama and Colombia.

Thirty five species of lizards are found in Sierra Nevada de Santa Marta and the surrounding lowlands. Of these, eleven species are endemic to the massif; about 50% are widely distributed species that occur in different regions. For instance, *Anolis biporcatus* occurs from Central America to Ecuador; *Iguana iguana* is found from Mexico to southern Brazil and Paraguay and in the Caribbean Islands. Five (14%) species have less wide ranges. Of these, *Lepidoblepharis sanctamartae* occurs also in Panama; *Phyllodactylus ventralis* and *Anolis onca* in northern Colombia and Venezuela; *Ophryoessoides erythrogaster* in the northern Andes of Colombia; and *Bachia bicolor* in Perija, Venezuela, and in eastern Colombia.

No less than 42 species of snakes inhabit the Sierra Nevada de Santa Marta, and 56.5% of them have very wide ranges that go from Mexico or Central America to the northern part of South America or even to northern Argentina. About 37% have ranges restricted to South America, from northern Colombia and Venezuela to the Amazon region; and only one species (*Micrurus mipartitus*) is present in the Andean region of Colombia, Ecuador and Venezuela. Four species are endemic to the massif and three

species have subspecies occurring and restricted to Santa Marta.

In order to establish the possible relationships of the herpetofauna of Sierra Nevada de Santa Marta with other regions I considered only those species occurring in the highlands because they characterize the region under study. Appendix IV summarizes the distribution of all the species of amphibians and reptiles found in Santa Marta at highland level. It is evident that most of the species found in highlands are restricted to the massif. Duellman (1979) found that Sierra Nevada de Santa Marta shares 4 of its species -*Amblyphrynus helonotus* (Synonym of *Eleutherodactylus helenotus*), *Eleutherodactylus prolixodiscus*, *Anadia pulchella* and *Micrurus mipartitus*- with Cordillera Oriental de Colombia; *Amblyphrynus helonotus* (Synonym of *Eleutherodactylus helenotus*), and *Micrurus mipartitus*, with Cordillera Central de Colombia; *Micrurus mipartitus*, and *Bolitoglossa savagei* with the Andes of Merida and *Micrurus mipartitus*, with both Cordillera Occidental de Colombia and Cordillera Occidental del Ecuador. However, I found that this is true only for *Micrurus mipartitus* (See Appendix V). The other species mentioned by Duellman have been either restricted to their distribution in the Sierra (i.e. *Eleutherodactylus prolixodiscus* = *E. tayrona* and *Anadia pulchella* and *Bolitoglossa savagei*) or do not occur in the massif (i.e. *Eleutherodactylus helenotus*). The four species *Eleutherodactylus w-nigrum*, *Mastigodryas boddaerti* (with one subspecies *Mastigodryas b. ruthveni*), *Liophis "epinephelus"* (with one subspecies *Liophis e. sp A* that possibly might be even an allospecies of the ephinephelus group), and *Micrurus mipartitus* (with one subspecies *M. mipartitus anomalus*) are found elsewhere. *Eleutherodactylus w-nigrum*, is found in the Ecuadorian Andes, and in Colombia, in the Cordillera Occidental, Cordillera Central and Cordillera Oriental de Colombia. *Mastigodryas boddaerti* is found in tropical South America from Colombia to western Brazil. It is interesting that the subspecies *Mastigodryas b. ruthveni* is the only subspecies within the species group that is also found in highlands. Due to its wide altitudinal and ecologically diversified distribution, this species does not seem to characterize the Sierra Nevada de Santa Marta highland region; therefore, it has been excluded from the present analysis. *Micrurus mipartitus* and *Liophis epinephelus* are found in the northern Andes.

Sierra Nevada de Santa Marta shares some highland species with the following physiographic regions: Ecuadorian Andes (2); in Colombia with Cordillera Occidental (3), Cordillera Central (3), Cordillera Oriental (3); in Venezuela with Andes of Mérida

(1), Cordillera de la Costa (1). The degree of resemblance between each of these regions and that of Sierra Nevada de Santa Marta, measured by the Simpson's index (1960) (C/NX100) ( see fig. 5) shows that the similarity between Sierra Nevada de Santa Marta and Ecuadorian Andes is of 4.87 %; 2.43% with Andes of Merida, and with Cordillera de la Costa; and 7.3% with any of the three Colombian Cordilleras, previously mentioned. Therefore, the herpetofauna of Santa Marta has more affinities with that of the northern Andes, especially those of Colombia than with that of the Andes of Merida or of the Cordillera de la Costa of Venezuela, or of the Antilles as has been suggested by some authors (Walker and Test, 1955; Rivero, 1961; Lynch, 1979a, 1979b). Most of the species occurring above 1000 m appear to have originated in situ. Ruthven (1922) suggested that "the fauna has been in large part and probably entirely derived from the lowlands." This is confirmed by the clusters of endemic species or allospecies groups in Santa Marta, such as the ones found in the genera *Anolis*, *Atelopus* and *Eleutherodactylus* and, to a lesser extent, *Atractus* and *Centrolenella*.

On the basis of the available and still tentative information, among the endemic species such as *Centrolenella A*, *Centrolenella B*, *Eleutherodactylus unistrigatus* group, *Anadia altaserrania*, *Anadia pulchella*, *Colostethus sp A*, *Cryptobatrachus boulengeri*, *Anolis santamartae* and most species of *Atelopus* have some affinities with northern Andes, especially with Cordillera Oriental, but also with Cordillera Central of Colombia, while others, such as *Bolitoglossa savagei*, *Atelopus sp C*, *Anolis menta*, *Anolis solitarius*, *Anolis sp A*, and *Anolis sp. B*. are more related to species found in Andes of Merida and to a lesser extent to Cordillera de la Costa, Venezuela. *Pseudogonatodes furvus*, and *Atractus sanctamartae* and *Atractus sp A* are more related to forms found in lowlands. A more rigorous statement about the biogeographical relationship of the herpetofauna of Sierra Nevada de Santa Marta to other mountain systems of South America can be made only when considerably more information about the evolutionary relationships of South American herpetofauna becomes available.

## 8. Possible origin of the herpetofauna of Sierra Nevada de Santa Marta

The Andean orogeny proceeded from east to west, across the South American continent. First, the rainforests of Venezuela were isolated from those of Colombia, by the up-

lift of the Venezuelan Andes in the Paleocene (Simpson, 1975). Venezuelan geological investigations of the Andes of Merida by Shagam (1975) show several early orogenies, with the last one initiated in the Oligocene and continuing to the present. According to Schubert (1974), significantly high elevations were attained only in the Late Pleistocene. The Cordillera de la Costa has a similar geological history of uplifting as the Andes of Merida (Liddle, 1946), but the Cordillera de la Costa was uplifted only little or not at all in the Quaternary.

Subsequently, the Colombian rainforests were isolated from the Amazonian rainforest when the Colombian and Ecuadorian Andes rise in Middle Eocene. The Sierra de Perija (a branch of the Colombian Andes system) was also elevated at this time, but this orogenic event did not extend to the Sierra Nevada de Santa Marta, except in its northern part. The eastern region of the Sierra was already firm land in the first part of the Tertiary. The first uplift of the Sierra Nevada de Santa Marta did not take place until the end of the Pleistocene (Gansser, 1955, 1973). These observations suggest therefore, that in its origin the Sierra Nevada de Santa Marta is an entirely distinct and independent system from the Colombian Andes. The Sierra Nevada de Santa Marta is younger, geologically speaking, than the Sierra de Perija.

Perhaps, the single most important aspect of the geology of all the Andean units is the recency of their uplift (Simpson, 1979). Van der Hammen (1974) and Van der Hammen et al. (1973) suggest that the last major upheaval of almost all units was at the Pliocene-Pleistocene boundary or within the Quaternary. In Venezuela and in Sierra Nevada de Santa Marta evidence has been established with certainty of the existence of only two glacial episodes assumed to be coincident with the last two major advances elsewhere (Shagam, 1975). This means that there have been at least two periods that facilitated faunal migration into these high elevation habitats. These periods would have occurred during the final uplift of these habitats. It should be noted that diversity of plant species in the Andes of Mérida is lower than that of the Colombian Andes. Due to fewer occasions of effective glaciations, and/ or small area size available, there were possibly fewer opportunities for speciation.

For Sierra Nevada in particular, the taxa adapted to high elevations and to cool climate appeared only at the very end of the Pleistocene. As the uplift progressed, at the end of the Pleistocene, the present herpetofauna of the Sierra Nevada de Santa Marta

had been established consisting of i) a mixture of species derived from North American genera that migrated southward (*Bolitoglossa*); ii) South temperate taxa that migrated northward along the Andes as the increasing elevations provided progressively temperate habitats (*Anadia*); and iii) As a result of vicariance, a number of endemic species were derived from the neotropical stock (*Eleutherodactylus*, *Atelopus*, and *Anolis*) by speciation within the high elevation zones. Three to four major glacial periods are postulated for the Andes, while for Sierra Nevada de Santa Marta only one glaciation period has been clearly established (Bartels, 1984). In the Andes, during the very cold dry (glacial) periods, vegetation zones were lowered about 1,200 to 1,500m and the temperatures were about 6-7 C cooler than at present. During these glacial periods migrations of high elevation elements from one peak or range to another were facilitated. Biogeographical analyses suggest that the number of species and endemisms among the birds living in the "islands" of páramo and puna vegetation, in the northern Andes have insular patterns of distribution highly influenced by these alternating arid/humid periods in the past (Chapman, 1917; Vuilleumier, 1969, 1970, Vuilleumier and Simberloff, 1980). Simpson (1979), concludes that most migrations were North to South rather than East to West, because of the orientation of the cordilleras and the barrier effects of the deep inter-Andean valleys, produced by the Magdalena, Cauca and Atrato rivers.

Van der Hammen (1974), in assessing the pollen diagrams of the Sierra Nevada de Santa Marta at 4,500 m, observed some fluctuations in the level of the timberline, with an optimum climate period at 3570+/- 60 y.b.p. There was an increase in the percentage of forest elements as a consequence of the higher forest limit, which was 300 to 400m higher than at pre-present.

During glacial periods in the tropical lowlands around the Andes and the Sierra Nevada de Santa Marta, the temperature remained "tropical" with approximately 3 C degrees lower than today. Alternating humid and arid climatic phases of the Quaternary caused vast changes in the distribution of forest and non-forest vegetation. It is possible that the areas of remnant forests during the arid phases served as "refugia" for animal populations (Haffer, 1979). Müller (1973) mentioned the rainforest at the foothills of Sierra Nevada de Santa Marta as a dispersal center, but for the herpetofaunal elements he used two subspecies (*Eupemphix pustulosus ruthveni* = *Physalemus pustulosus* and *Basiliscus basiliscus barbouri*), a fact that somehow invalidated the assessment since the

species groups of both are widely distributed. For the moment it is valid to say that the species of amphibians and reptiles occurring in Sierra Nevada de Santa Marta share more affinities (more recent connections) with species occurring in the lower altitudes of the same mountain than with species found anywhere else. This concept is illustrated in the area- cladogram of fig 9. Species of the páramo, superpáramo and Andean forest are more related among themselves than with species occurring at the xerophytic scrub-low montane wet forest. The latter form a cluster of species, different from the highland species. Herpetofauna of cloud forest is somewhat intermediate between the highland and lowland with a large percentage of endemism.

## 8. Conclusions

The actual composition of the herpetofauna of Sierra Nevada de Santa Marta is the result of many historical and environmental factors that have provided the arena for the speciation processes. Since the mountain is of relatively recent origin and younger than the Andes, the degree of endemism is impressive. The absence of older glaciations than Wurm's one proves the recentness of its uplift. Most of the species occurring at the highland have narrow ranges of distribution, and among the species of amphibians and reptiles the genera *Atelopus*, *Eleutherodactylus* and *Anolis*, and to a lesser extent *Anadia* have undergone a successful adaptive radiation. *Atelopus* in particular presents the most specialized forms that were able to invade the paramos and superparamos which are depauperated areas faunistically speaking. Predation and competition are absent in these habitats and therefore they are ideal environments for these type of frogs. Based on the actual composition of species and what is known about their phylogeny it is possible to say, with a certain degree of confidence, that most of Santa Marta species evolved in situ in quite isolated habitats. This vicariance process took place after the uplift of the massif separated formerly continuous populations. This is the case for species showing a slight degree of Andean relationship, such as members of the frog genera *Geobatrachus*, *Colosthetus*, *Cryptobatrachus*, *Centrolenella* and *Eleutherodactylus unistrigatus* group, the most common herpetofaunal element found in the northern Andes (Lynch, 1986); the lizards *Anadia*, *Anolis*, *Pseudogonatodes*; and the colubrid snake *Atractus*. These genera probably evolved in the Andes. However the altitudinal endemic species belonging to these genera that occur in SNSM have no direct relations with Andean species and prob-

ably are altitudinal forms that evolved "in situ" from lowland species. In other words, the assumption here is that the ancestor(s) for all these species occurred also in Santa Marta.

Moreover, the relatively high degree of endemism of Sierra Nevada de Santa Marta fauna indicates that this fauna has developed in situ, mostly from elements of lowland species or species that were distributed much more widely when climactic conditions of the past offered continuous areas of moister surroundings. The cloud forest extended lower than present. This permitted a wider distribution of species of moister climates and connected the tropical rain forest with cloud forest among the major, emerging mountain chains of SNSM and Andes.

The data about the herpetofauna permit the following conclusions:

1. The patterns of distribution of the highland herpetofauna of Santa Marta have insular features and are of relatively recent origin.
2. Reptiles predominate in lowlands, while amphibians are more diversified in highlands, with a high degree of endemism.
3. There is a larger number of endemic species among amphibians and lizards and thus a more diversified speciation than among snakes.
4. Of the 6 principal ecological zones, superparamo and paramo have 100% Index of similarity; the cloud forest is intermediary between the higher and lower altitude habitats, with endemic herpetofauna of its own.
5. The herpetofauna of Santa Marta has more affinities with species from the northern Andes, especially Colombian Andes, than with species found in Andes of Merida or Cordillera de la Costa of Venezuela and the Antillas.
6. Human interference in Sierra Nevada de Santa Marta has been substantial in some areas and must have influenced the present faunal distribution.

**Appendix I.- List of names, rivers and other localities in the Sierra Nevada de Santa Santa Marta mentioned in this study.**

Locality	Altitude	Vegetat.
1. Aguadulce, San Lorenzo (M)	900	LMWF
2. Alto de Mira (M)	1080	CF
3. Alto Valle, Rio Gaira	1960	CF
4. Aracataca (M)	60	XSF
5. Ariguamí (C)	300	XSF
6. Arroyo de Arenas (G)	150	XSF, FP
7. Arroyo de Arenas-río Barbacoa (G)	0	XSF, FP
8. Atanquez, Valledupar (C)	800	LMDF
9. Badillo (C)	<200	XSF, FP
10. Bahía Gairaca, ensenada de Gairaca (M)	0	XSF
11. Bellavista	3500	P
12. Bonda (M)	45	XSF
13. Bolívar (M)	45, 65	SF
14. Buritaca (M)	700	LMWF
15. Buritaca (M)	1700-2300	CF
16. Cacagualito (M)	450, 300	LMDF
17. Calabozo, río Piedras (M)	45	XSF
18. Candelaria (M)	50	XSF
19. Cañaveral, El Pueblito (M)	230-290	XSF
20. Caño La Danta (M)	800	CF
21. Caño Negro (M)	910	CF
22. Caracolicito (M)	500	LMDF
23. Casa Blanca, Ciénaga (M)	0	XSF
24. Cerro Kennedy, El Campano	1420	CF
25. Ciénaga, (M)	0	XSF
26. Ciénaga, Pedro de la Sierra (M)	1300-2500	CF
27. Ciénaga, San Pedro de la Sierra	3150-3400	AF
28. Ciénaga, Chilla Yerbabuena (M)	2500	CF
29. Cincinnati Hda. (M)	1524-1530	CF, CP
30. Ciudad Perdida (M)	1100-2250	CF
31. Cuchilla Yerbabuena (San Pedro de la Sierra) (M)	1700-2600	CF
32. Cuchilla Yerbabuena, Finca de Alfonso Vanegas (M)	2500	CF, CP
33. Cuchilla entre Ríos Buritaca and Junacha, Buritaca (M)	700	LMWF
34. Curumaní (M)	100	XSF
35. Curva del Tigre (M)	<600	LMWF
35a Dibulla	30	XSF
36. Don Diego (M)	1050	CF
37. Don Diego (M)	0	RF
38. Don Diego, San Miguel (G)	1650	CF
39. Durimena (M)	3500	P
40. Estacion Inderena (San Lorenzo) (M)	1900	CF
41. El Campano (M)	1720-2200	CF
42. El Campano (M)	1220, 1420	CF
43. El Cedro, P. Ntl. Tayrona (M)	360-400	LMWF
44. El Guachaca (M)	3500	P
45. El Líbano (M)	1800	CF
46. El Pueblito (Parque Natl Tairona	230-290	LMWF
47. Finca El Aranar, Bonda (M)	45	XSF
48. Finca de Francisco Paredes, río Guachaca, (M)	600-680	CF
49. Finca La Granja (San Lorenzo) (M)	2300-2700	CF
50. Finca Palestina, río Manso (M)	1750	CF

51.Fundación (M)	60	XSF
52.Fonseca (G)	150	LMDF
53.Fonseca, Río Barbacoa (G)	60	LMDF
54.Fonseca, Río Rancheria (G)	60, 150	LMDF
55.Gaira (M)	1960	CF
56.Gaira (M)	0	XSF
57.Gairaca (M)		
57a Guachaca	45	LMWF
58.Guaimaral (C)		
59.Hacienda Cincinnati-San Lorenzo (M)	1830	CF, CP
60.Hacienda Don Diego, Río Don Diego (M)	0	TMF
61.Hacienda Tierra Grata, S. Pedro de la Sierra (M)	1300	CF
62.Hacienda Vista Nieve, La Cumbre (M)	2700	CF
63.Heights San Miguel, Clurira (G)	1500-2100	CF
64.Heights of Taquina (M)	2400-2700	CF
65.INDERENA Station, San Lorenzo	2000	CF
66.Julepia (M)	780	CF
66a.Kuskunguena (M)	2000	CF
67.La Concepción (M)	1000, 1800	CF
68.La Cumbre (San Lorenzo) (M)	2134, 2250	CF
69.La Frontera R Buritaca (M)		
70.La Guaira (M)	0	XSF
71.La Tagua	590, 1615	LMFW, CF
72.Las Nubes (M)	1350	CF
73.Las Pavas (M)	500	LMDF
74.La Popa, San Lorenzo (M)	1525	CF
75.La Tigra (M)	180-1200	XSF, CF
76.La Victoria, San Lorenzo (M)	900, 1524-1530	CF, CP
77.Loma Larga (G)	750-900	TMF
77a. Macho solo (M)	800	CF
78.Macotama (M)	2400-4800	CF, P
79.Mamacanaca valley (G)	3270	AF
80.Mamatoco (M)	20, 600	XSF
81.Mamatoco-La Tigra (M)	700	XSF
82.Masinga (M)	600	XSF
83.Minca (M)	600	LMWF
84.Minca, río Manzanares (M)	625	LMWF
85.Minca-San Lorenzo (M)	1530-2000	CF
86.Monte Figueroa, San Sebastián de Rábago (C)	2700	Sav.
87.Palomina (M)	1000, 1500	TMF, CF
88.Páramo de Cebolleta (M)	3150-3900	AF, P
89.Páramo between Durimena-Mamancamaca (M)	3383-3452	P
90.Páramo de Macotama (G)	4950	SP
91.Páramo de Río Frio (M)	3500	P
92.Pico Simmonds (M)	4500	SP
93.Parque Natural Tayrona (M)	360-400	HESF
94.Parque Natural Tayrona (M)	230-290	HESF
95.Pozos Colorados (M)	<50	XSF
96.Pueblo Bello	900	CF
97.Pueblo Viejo (M)	2400	AF
98.Punta de Betún, Santa Marta (M)	0	XFS
99.Quebrada Hueva Santa (M)		
100.Quebrada Viernes Santo (M)	1500-2250	CF
101.Río Dunachuí. lake (C)	4632	SP
102.Río Frío (M)	<50	XSF
103.Río Frío (M)	1000	CF
104.Río Gaira, Minca (M)	660	LMWF
105.Río Manzanares between Santa Marta and Mamatoco (M)	0-60, 600	XSF
106.Riohacha (G)	0-5	XSF

107.Salamanca (M)	0	XSF
108.San Lorenzo (M)	1750-2750	CF
109.San Lorenzo, (M)	1800-2500	CF
110.San Lorenzo, Dos Quebradas (M)	2000	CF
110a.San Lorenzo, La Popa		
111.San Miguel (G)	1650, 1800	CF
112.San Miguel (G)	1800-2100	CF
113.San Pedro de la Sierra (M)	1600, 3900	AF, CF
114.San Sebastián de Rábago (C)	2000	CF
115.Santa Marta (M)	0	XSF
116.Serranía Cebolleta, San Pedro de la Sierra (M)	2460	CF
117.Serranía Cebolleta (M)	2450-3500	AF,SubP
118.Sevilla 0 (M)	0	SXF
119.Suburaká (M)	4000	P
120.Tamocol (G)	0	XSF
121.Tamocal river (G)	0-?	
122.Taquina (G)	2424-2727	CF
123.Tierra Grata, hacienda, S. Pedro de la Sierra	1300	CF
124.Tucurinca (M)	50	BB
125.Valencia (C)	100	LMDF
126.Valledupar (C)	206	LMDF
127.Valparaíso (M)(see Cincinnati)	1530	CF
128.Vista Nieve (M)	1500, 2700	CF

(C): Cesar; (G): Guajira; (M): Magdalena.

**AF = Andean Forest; BB: Banana Belt; CF: Cloud Forest; CP: Coffe Plantation; FP: Flood Plains; LMDF: Lower Montane Dry Forest; LMWF: Lower Montane Wet Forest; P: Paramo; SP: Super Paramo; SubP: Subparamo; Sav: Savanna; TMF: Tropical Moist Forest; XSF: Xerophytic Scrub Forest;**

**Appendix II. List of the species of amphibians and reptiles  
of Sierra Nevada de Santa Marta.**

**I. Amphibians**

**A. Caecilians**

**1. Family Caeciliidae**

*Caecilia tentaculata*

**B. Salamanders**

**1. Family Plethodontidae**

*Bolitoglossa savagei*

**C. Frogs**

**1. Family Leptodactylidae**

*Ceratophrys calcarata*  
*Eleutherodactylus carmelitae*  
*Eleutherodactylus cristinae*  
*Eleutherodactylus delicatus*  
*Eleutherodactylus insignitus*  
*Eleutherodactylus megalops*  
*Eleutherodactylus ruthveni*  
*Eleutherodactylus sanctaemartae*  
*Eleutherodactylus tayrona*  
*Eleutherodactylus w-nigrum*  
*Geobatrachus walkeri*  
*Leptodactylus fragilis*  
*Leptodactylus fuscus*  
*Leptodactylus insularum*  
*Leptodactylus poecilochilus*  
*Physalaemus pustulosus*  
*Pleurodema brachyops*  
*Pseudopaludicola pusillus*

**2. Family Bufonidae**

*Atelopus carrikeri*  
*Atelopus walkeri*  
*Atelopus sp. A*  
*Atelopus sp. B*  
*Atelopus sp. C*  
*Atelopus sp. D*  
*Atelopus sp. E*  
*Atelopus sp. F*  
*Atelopus sp. G*  
*Atelopus sp. H*  
*Bufo granulosis beeb i*  
*Bufo granulosis humboldti*  
*Bufo marinus*

**3. Family Dendrobatidae**

*Colostethus sp. A*  
*Dendrobates truncatus*

**4. Family Hylidae**

*Cryptobatrachus boulengeri*  
*Hyla crepitans*  
*Hyla microcephala*  
*Hyla pugnax*  
*Hyla cf. punctata*  
*Hyla sp. A*  
*Phrynohyas venulosa*  
*Phyllomedusa sp. A*

**5. Family Centrolenidae**

*Centrolenella sp. A*  
*Centrolenella sp. B.*

**6. Family Microhylidae**

*Chiasmocleis panamensis*  
*Relictovomer pearsei*

**II. REPTILES****A. Lizards****1. Family Gekkonidae**

*Gonatodes albogularis fuscus*  
*Gonatodes vittatus vittatus*  
*Hemidactylus brookii leightoni*  
*Lepidoblepharis miyatai*  
*Lepidoblepharis s. sanctamartae*  
*Phyllodactylus ventralis*  
*Pseudogonatodes furvus*  
*Sphaerodactylus heliconiae*  
*Thecadactylus rapicaudus*

**2. Family Iguanidae**

*Anolis auratus*  
*Anolis b. biporcatus*  
*Anolis menta*  
*Anolis onca*  
*Anolis sanctamartae*  
*Anolis solitarius*  
*Anolis tropidogaster*  
*Anolis sp. A*  
*Anolis sp. B*  
*Basiliscus b barbouri*  
*Iguana i. iguana*  
*Ophryoesoides erythrogaster*  
*Polychrus g. gutturosus*

**3. Family Scincidae**

*Mabuya mabuya pergravis*

**4. Family Teiidae**

*Anadia altaserrania*  
*Anadia pulchella*  
*Ameiva ameiva fischeri*  
*Ameiva bifrontata ssp*

*Bachia bicolor*  
*Bachia talpa*  
*Cnemidophorus l. lemniscatus*  
*Gymnophthalmus s. speciosus*  
*Leposoma rugiceps*  
*Ptychoglossus sp. A*  
*Tretioscincus b. bifasciatus*  
*Tupinambis teguixin*

#### 5. Family Amphisbaenidae

*Amphisbaena fuliginosa varia*

#### B. Serpentes

##### 1. Family Anomalepididae

*Liotyphlops albirostris*

##### 2. Family Leptotyphlopidae

*Leptotyphlops macrolepis*

##### 3. Family Boidae

*Boa constrictor constrictor*  
*Corallus enydris cookii*  
*Epichrates cenchria maurus*

##### 4. Family Colubridae

*Atractus sanctaemartae*  
*Atractus sp A*  
*Chironius carinatus*  
*Clelia clelia*  
*Drymarchon corais melanurus*  
*Drymobius m margaritiferus*  
*Drymobius rhombifer*  
*Enulius flavitorques*  
*Erythrolamprus bizona*  
*Helicops scalaris*  
*Imantodes cenchoa cenchoa*  
*Lampropeltis triangulum micropholis*  
*Leptodeira annulata ashmeadi*  
*Leptophis ahaetulla occidentalis*  
*Leptophis sp A*  
*Liophis "epinephalus" sp A*  
*Liophis melanotus*  
*Lygophis lineatus lineatus*  
*Masticophis mentovarios centralis*  
*Mastigodryas boddaerti ruthveni*  
*Mastigodryas pleei*  
*Ninia atrata*  
*Oxybelis aeneus*  
*Oxybelis fulgidus*  
*Oxyrhopus sp A*  
*Phimophis guianensis*  
*Pseudoboa neuwiedii*  
*Pseustes poecilonotus polylepis*  
*Sibon nebulata nebulata*  
*Spilotes pullatus pullatus*  
*Stenorrhina degenhardtii*  
*Tantilla melanocephala melanocephala*

*Tantilla semicineta*  
*Thamnodynastes strigilis*  
*Xenodon severus*

**5. Family Elapidae**

*Micrurus dissoleucus melanogenis*  
*Micrurus dumerilii colombianus*  
*Micrurus dumerilii dumerilii*  
*Micrurus mipartitus anomalus*

**6. Family Viperidae**

*Bothrops atrox*  
*Bothrops l. lansbergii*

**7. Family Crotalidae**

*Crotalus durissus cuminensis*

**C. Turtles**

**1. Family Testudinidae**

*Geochelonia denticulata*

**2. Family Kinosternidae**

*Kinosternon scorpioides scorpioides*

**D. Crocodiles**

**1. Family Crocodylidae**

*Crocodylus acutus*

**2. Family Alligatoridae**

*Caiman sclerops*

**Appendix III. Ecological and altitudinal distribution of species and subspecies of amphibians and reptiles of Sierra Nevada de Santa Marta.**

<b>Taxa</b>	<b>Altitudes (m)</b>	<b>Habitat</b>
<b>A: Amphibians</b>		
<i>Caecilia tentaculata</i>	> 100	XSF
<i>Bolitoglossa savagei</i>	780-2140	CF
<i>Ceratophrys calcarata</i>	>100	XSF
<i>Eleutherodactylus carmelitae</i>	1524-2300	CF
<i>Eleutherodactylus cristinae</i>	1524-2600	CF
<i>Eleutherodactylus delicatus</i>	1524-2600	CF
<i>Eleutherodactylus insignitus</i>	1530-2200	CF
<i>Eleutherodactylus megalops</i>	1300-2500	CF
<i>Eleutherodactylus ruthveni</i>	1800-2600	CF
<i>Eleutherodactylus sanctaemartae</i>	1100-2730	CF
<i>Eleutherodactylus tayrona</i>	1300-2700	CF
<i>Eleutherodactylus w-nigrum</i>	1830-2200	CF
<i>Geobatrachus walkeri</i>	1750-3000	CF, CF* AFAF*
<i>Leptodactylus fragilis</i>	Sea level	XSF
<i>Leptodactylus fuscus</i>	Sea level	XSF, marshes
<i>Leptodactylus insularum</i>	0-700	XSF, LMWF, LMWF*
<i>Leptodactylus poecilochilus</i>	>200	XSF
<i>Physalaemus pustulosus</i>	0-700	XSF
<i>Pleurodema brachyops</i>	>200	XSF
<i>Pseudopaludicola pusillus</i>	>200	XSF, marshes
<i>Atelopus carrikeri</i>	2400-4950	AF, P, SP
<i>Atelopus walkeri</i>	1500-2100	CF
<i>Atelopus sp. A</i>	3150-3900	AF*, P, SP
<i>Atelopus sp. B</i>	3270-4500	AF, P, SP
<i>Atelopus sp. C</i>	3000	P
<i>Atelopus sp. D</i>	1500-2250	CF
<i>Atelopus sp. E</i>	1700-2300	CF
<i>Atelopus sp. F</i>	2250-2600	CF
<i>Atelopus sp. G</i>	3500	P
<i>Atelopus sp. H</i>	2000	CF
<i>Bufo granulosis beebi</i>	Sea level	XSF
<i>Bufo granulosis humboldti</i>	Sea level	XSF
<i>Bufo marinus</i>	0-1350	XSF, LMWF, CF
<i>Colostethus sp. A</i>	600-1700	CF
<i>Dendrobates truncatus</i>	>300	XSF, LMWF
<i>Cryptobatrachus boulengeri</i>	680-1550	CF, CF*
<i>Hyla crepitans</i>	50-2000	XSF, LMWF* CF*
<i>Hyla microcephala</i>	Sea level	XSF
<i>Hyla pugnax</i>	>200	XSF
<i>Hyla cf. punctata</i>	>100	XSF, marsh
<i>Hyla sp. A</i>	1530	CF
<i>Phrynohyas venulosa</i>	Sea level	XSF
<i>Phyllomedusa sp. A</i>	Sea level	LMWF
<i>Centrolenella sp. A</i>	1200-2000	CF
<i>Centrolenella sp. B</i>	910	CF
<i>Chiasmocleis panamensis</i>	> 100	XSF
<i>Relictovomer pearsei</i>	Sea level	XSF
<b>B: REPTILES</b>		
<i>Gonatodes albogularis fuscus</i>	0-600	XSF.
<i>Gonatodes vittatus vittatus</i>	0-600	XSF.
<i>Hemidactylus brookii leightoni</i>	Sea level	XSF
<i>Lepidoblepharis miyatai</i>	Sea level	XSF
<i>Lepidoblepharis s. sanctamartae</i>	0-2200	XSF, CF

<i>Phyllodactylus ventralis</i>	45-600	XSF
<i>Pseudogonatodes furvus</i>	40-1500	XSF, CF
<i>Sphaerodactylus heliconiae</i>	Sea level	XSF
<i>Thecadactylus rapicaudus</i>	150-700	XSF
<i>Anolis auratus</i>	0-1000	XSF, LMWF
<i>Anolis b. biporcatus</i>	1000	CF
<i>Anolis menta</i>	2000	CF
<i>Anolis onca</i>	Sea level	XSF
<i>Anolis sanctamartae</i>	2000	CF
<i>Anolis solitarius</i>	780-1500	CF
<i>Anolis tropidogaster</i>	60-1500	LMWF*, CF
<i>Anolis sp. A</i>	1500-2000	CF
<i>Anolis sp. B</i>	900-1650	CF
<i>Basiliscus b barbouri</i>	0-1500	XSF, LMWF,
<i>Iguana i. iguana</i>	0-206	XSF
<i>Ophryoesoides erythrogaster</i>	Sea level	XSF, LMWF, BB
<i>Polychrus g. gutturosus</i>	Sea level	XSF
<i>Mabuya mabuya pergravis</i>	0-500	XSF
<i>Anadia altaserrania</i>	3383-3452	P
<i>Anadia pulchella</i>	2000-2700	CF
<i>Ameiva ameiva fischeri</i>	0-900	XSF
<i>Ameiva bifrontata ssp.</i>	0-700	XSF
<i>Bachia bicolor</i>	0-1500	XSF, CF
<i>Bachia talpa</i>	100-205	XSF
<i>Cnemidophorus l. lemniscatus</i>	0-1500	XSF, LMWF, *CF
<i>Gymnophthalmus s. speciosus</i>	0-900	XSF, LMWF
<i>Leposoma rugiceps</i>	0-500	XSF
<i>Ptychoglossus romalus</i>		CF*
<i>Tretioscincus b. bifasciatus</i>	0-300	XSF, LMWF
<i>Tupinambis teguixin</i>	Sea level	LMWF
<i>Amphisbaena fuliginosa varia</i>	1000-1200	CF
<i>Liotyphlops albirostris</i>	Sea level	XSF
<i>Leptotyphlops macrolepis</i>	Sea level	XSF
<i>Boa c. constrictor</i>	>700	LMWF, BB,
<i>Corallus enydris cookii</i>	Sea level	Marsh, LMWF
<i>Epichrates cenchria maurus</i>	0-700	LMWF
<i>Atractus sanctaemartae</i>	900-2400	CF
<i>Atractus sp A</i>	1500-1800	CF
<i>Chironius carinatus</i>	0-1500	XSF CF*
<i>Clelia c. clelia</i>	Sea level	XSF
<i>Drymarchon corais melanurus</i>	45-2000	XSF, CF*
<i>Drymobius m. margaritiferus</i>	Sea level	XSF
<i>Drymobius rhombifer</i>	50-1500	XSF, LMWF, CF*
<i>Enulius flavitorques</i>	0-100	XSF
<i>Erythrolamprus bizona</i>	45-2400	XSF, LMWF, CF
<i>Helicops danieli</i>	Sea level	LMWF, BB
<i>Imantodes c. cenchoa</i>	Sea level	XSF, BB,
<i>Lampropeltis triangulum micropholis</i>	>500	XSF
<i>Leptodeira annulata ashmeadi</i>	0-500	XSF
<i>Leptophis ahaetulla occidentalis</i>	>100	XSF
<i>Leptophis sp A</i>	1100	CF
<i>Liophis "epinephelus" sp A</i>	500-1500	CF
<i>Liophis melanotus</i>	40-1650	XSF, CF*
<i>Lygophis lineatus lineatus</i>	Sea level	LMWF, BB
<i>Masticophis mentovarius centralis</i>	Sea level	XSF
<i>Mastigodryas boddaerti ruthveni</i>	600-1650	CF
<i>Mastigodryas pleei</i>	0-1600	XSF, CF*
<i>Ninia atrata</i>	>500	LMWF, BB
<i>Oxybelis aeneus</i>	>500	XSF, LMWF
<i>Oxybelis fulgidus</i>	450	XSF
<i>Oxyrhopus sp. A</i>	1500	CF
<i>Phimophis guianensis</i>	>500	XSF
<i>Pseudoboa n. neuwiedii</i>	Sea level	XSF
<i>Pseustes poecilonotus polylepis</i>	50-1500	XSF, CF*

<i>Sibon n. nebulata</i>	50-1000	LMWF, BB, CF
<i>Spilotes pullatus pullatus</i>	40-700	XSF, CF
<i>Stenorrhina d. degenhardtii</i>	Sea level	XSF
<i>Tantilla m. melanocephala</i>	60-1600	XSF, SW, CF
<i>Tantilla semicineta</i>	>500	XSF
<i>Thamnodynastes strigilis</i>	Sea level	XSF
<i>Xenodon severus</i>	Sea level	LMWF, BB,
<i>Micrurus dissoleucus melanogenis</i>	Sea level	XSF
<i>Micrurus dumerilii colombianus</i>	300-1000	XSF, CF
<i>Micrurus d. dumerilii</i>	Sea level	XSF
<i>Micrurus mipartitus anomalus</i>	1100-1800	CF
<i>Bothrops a. atrox</i>	0-1700	XSF, BB, CF
<i>Bothrops l. lansbergii</i>	0-800	XSF, BB
<i>Crotalus durissus cumanensis</i>	>500	XSF, BB
<i>Geochelonia denticulata</i>	Sea level	XSF, marshes
<i>Kinosternon integrum</i>	> 100	XSF
<i>Crocodylus acutus</i>	Sea level	XSF, marshes
<i>Caiman sclerops</i>	Sea level	XSF, marshes

AF = Andean Forest; BB = Banana belt; CF = Cloud Forest; LMWF = Lower Montane Wet Forest; Marsh = Marshes; P = Páramo; SP = Super Páramo; Sw = Swampy areas; XSF = Xerophytic Scrub Forest; \* = Clearings on that particular habitat.

**Appendix.IV. Ecological distribution of species of amphibians and reptiles in Sierra Nevada de Santa Marta.**

**HABITAT**

Taxa	XSF	LMWF	CF	AF	P	SP
<b>A: Amphibians</b>						
<i>Caecilia tentaculata</i>	+	-	-	-	-	-
<i>Bolitoglossa savagei</i>	-	-	+	-	-	-
<i>Ceratophrys calcarata</i>	+	-	-	-	-	-
<i>Eleutherodactylus carmelitae</i>	-	-	+	-	-	-
<i>Eleutherodactylus cristinae</i>	-	-	+	-	-	-
<i>Eleutherodactylus delicatus</i>	-	-	+	-	-	-
<i>Eleutherodactylus insignitus</i>	-	-	+	-	-	-
<i>Eleutherodactylus megalops</i>	-	-	+	-	-	-
<i>Eleutherodactylus ruthveni</i>	-	-	+	-	-	-
<i>Eleutherodactylus sanctaemartae</i>	-	-	+	-	-	-
<i>Eleutherodactylus tayrona</i>	-	-	+	-	-	-
<i>Eleutherodactylus w-nigrum</i>	-	-	+	-	-	-
<i>Geobatrachus walkeri</i>	-	-	+	+	-	-
<i>Leptodactylus fragilis</i>	+	-	-	-	-	-
<i>Leptodactylus fuscus</i>	+	-	-	-	-	-
<i>Leptodactylus insularum</i>	+	+	-	-	-	-
<i>Leptodactylus poecilochilus</i>	+	-	-	-	-	-
<i>Physalaemus pustulosus</i>	+	-	-	-	-	-
<i>Pleurodema brachyops</i>	+	-	-	-	-	-
<i>Pseudopaludicola pusillus</i>	+	-	-	-	-	-
<i>Atelopus carrikeri</i>	-	-	-	+	+	+
<i>Atelopus walkeri</i>	-	-	+	-	-	-
<i>Atelopus sp. A</i>	-	-	+	+	+	+
<i>Atelopus sp. B</i>	-	-	-	-	+	+
<i>Atelopus sp. C</i>	-	-	-	-	+	-
<i>Atelopus sp. D</i>	-	-	+	-	-	-
<i>Atelopus sp. E</i>	-	-	+	-	-	-
<i>Atelopus sp. F</i>	-	-	+	-	-	-
<i>Atelopus sp. G</i>	-	-	-	-	+	-
<i>Atelopus sp. H</i>	-	-	+	-	-	-
<i>Bufo granulosus</i>	+	-	-	-	-	-
<i>Bufo marinus</i>	+	+	+	-	-	-
<i>Colostethus sp. A</i>	-	-	+	-	-	-
<i>Dendrobates truncatus</i>	+	+	-	-	-	-
<i>Cryptobatrachus boulengeri</i>	-	-	+	-	-	-
<i>Hyla crepitans</i>	+	+	+	-	-	-
<i>Hyla microcephala</i>	+	-	-	-	-	-
<i>Hyla pugnax</i>	+	-	-	-	-	-
<i>Hyla cf. punctata</i>	+	-	-	-	-	-
<i>Hyla sp. A</i>	-	-	+	-	-	-
<i>Phrynohyas venulosa</i>	+	-	-	-	-	-
<i>Phyllomedusa sp. A</i>	-	+	-	-	-	-
<i>Centrolenella sp. A</i>	-	-	+	-	-	-
<i>Centrolenella sp. B</i>	-	-	+	-	-	-
<i>Chiasmocleis panamensis</i>	+	-	-	-	-	-
<i>Relictovomer pearsei</i>	+	-	-	-	-	-
<b>B REPTILES</b>						
<i>Gonatodes albogularis fuscus</i>	+	-	-	-	-	-
<i>Gonatodes vittatus vittatus</i>	+	-	-	-	-	-
<i>Hemidactylus brookii leightoni</i>	+	-	-	-	-	-
<i>Lepidoblepharis miyatai</i>	+	-	-	-	-	-
<i>Lepidoblepharis s sanctamartae</i>	+	-	+	-	-	-
<i>Phyllodactylus ventralis</i>	+	-	-	-	-	-
<i>Pseudogonatodes furvus</i>	+	-	+	-	-	-
<i>Sphaerodactylus heliconiae</i>	+	-	-	-	-	-
<i>Thecadactylus rapicaudus</i>	+	-	-	-	-	-

<i>Anolis auratus</i>	+	+	-	-	-	-
<i>Anolis b. biporcatus</i>	-	-	+	-	-	-
<i>Anolis menta</i>	-	-	+	-	-	-
<i>Anolis onca</i>	+	-	-	-	-	-
<i>Anolis sanctamartae</i>	-	-	+	-	-	-
<i>Anolis solitarius</i>	-	-	+	-	-	-
<i>Anolis tropidogaster</i>	-	+	+	-	-	-
<i>Anolis sp. A</i>	-	-	+	-	-	-
<i>Anolis sp. B</i>	-	-	+	-	-	-
<i>Basiliscus b barbouri</i>	+	+	-	-	-	-
<i>Iguana i. iguana</i>	+	-	-	-	-	-
<i>Ophryoesoides erythrogaster</i>	+	+	-	-	-	-
<i>Polychrus g. guttuosus</i>	+	-	-	-	-	-
<i>Mabuya mabuya pergravis</i>	+	-	-	-	-	-
<i>Anadia altaserrania</i>	-	-	-	-	+	-
<i>Anadia pulchella</i>	-	-	+	-	-	-
<i>Ameiva ameiva fischeri</i>	+	-	-	-	-	-
<i>Ameiva bifrontata ssp.</i>	+	-	-	-	-	-
<i>Bachia bicolor</i>	+	-	+	-	-	-
<i>Bachia talpa</i>	+	-	-	-	-	-
<i>Cnemidophorus l. lemniscatus</i>	+	+	+	-	-	-
<i>Gymnophthalmus s. speciosus</i>	+	+	-	-	-	-
<i>Leposoma rugiceps</i>	+	-	-	-	-	-
<i>Ptychoglossus romalus</i>	-	-	+	-	-	-
<i>Tretioscincus b. bifasciatus</i>	+	+	-	-	-	-
<i>Tupinambis teguixin</i>	-	+	-	-	-	-
<i>Amphisbaena fuliginosa varia</i>	-	-	+	-	-	-
<i>Liotyphlops albirostris</i>	+	-	-	-	-	-
<i>Leptotyphlops macrolepis</i>	+	-	-	-	-	-
<i>Boa c. constrictor</i>	-	+	-	-	-	-
<i>Corallus enydris cookii</i>	-	+	-	-	-	-
<i>Epichrates cenchria maurus</i>	-	+	-	-	-	-
<i>Atractus sanctaemartae</i>	-	-	+	-	-	-
<i>Atractus sp A</i>	-	-	+	-	-	-
<i>Chironius carinatus</i>	+	-	+	-	-	-
<i>Clelia c. clelia</i>	+	-	-	-	-	-
<i>Drymarchon corais melanurus</i>	+	-	+	-	-	-
<i>Drymobius m. margaritifera</i>	+	-	-	-	-	-
<i>Drymobius rhombifer</i>	+	+	+	-	-	-
<i>Enulius flavitorques</i>	+	-	-	-	-	-
<i>Erythrolamprus bizona</i>	+	+	+	-	-	-
<i>Helicops danieli</i>	-	+	-	-	-	-
<i>Imantodes c. cenchoa</i>	+	-	-	-	-	-
<i>Lampropeltis t. micropholis</i>	+	-	-	-	-	-
<i>Leptodeira annulata ashmeadi</i>	+	-	-	-	-	-
<i>Leptophis a. occidentalis</i>	+	-	-	-	-	-
<i>Leptophis sp A</i>	-	-	+	-	-	-
<i>Liophis "epinephelus" bp A</i>	-	-	+	-	-	-
<i>Liophis melanotus</i>	+	-	+	-	-	-
<i>Lygophis lineatus lineatus</i>	-	+	-	-	-	-
<i>Masticophis m. centralis</i>	+	-	-	-	-	-
<i>Mastigodryas b. ruthveni</i>	-	-	+	-	-	-
<i>Mastigodryas pleei</i>	+	-	+	-	-	-
<i>Ninia atrata</i>	-	+	-	-	-	-
<i>Oxybelis aeneus</i>	+	+	-	-	-	-
<i>Oxybelis fulgidus</i>	+	-	-	-	-	-
<i>Oxyrhopus sp. A</i>	-	-	+	-	-	-
<i>Phimophis guianensis</i>	+	-	-	-	-	-
<i>Pseudoboa n. newwiedii</i>	+	-	-	-	-	-
<i>Pseustes poecilonotus polylepsis</i>	+	-	+	-	-	-
<i>Sibon n. nebulata</i>	-	+	+	-	-	-
<i>Spilotes pullatus pullatus</i>	+	-	+	-	-	-
<i>Stenorrhina d. degenhardtii</i>	+	-	-	-	-	-
<i>Tantilla m. melanocephala</i>	+	-	+	-	-	-
<i>Tantilla semicincta</i>	+	-	-	-	-	-
<i>Thamnodynastes strigilis</i>	+	-	-	-	-	-
<i>Xenodon severus</i>	-	+	-	-	-	-

Micrurus d. melanogenis	+	-	-	-	-	-
Micrurus d. dumerilii	+	-	+	-	-	-
Micrurus mipartitus anomalus	-	-	+	-	-	-
Bothrops a. atrox	+	-	+	-	-	-
Bothrops l. lansbergii	+	-	-	-	-	-
Crotalus durissus cumanensis	+	-	-	-	-	-
Geochelonia denticulata	+	-	-	-	-	-
Kinosternon integrum	+	-	-	-	-	-
Crocodylus acutus	+	-	-	-	-	-
Caiman sclerops	+	-	-	-	-	-

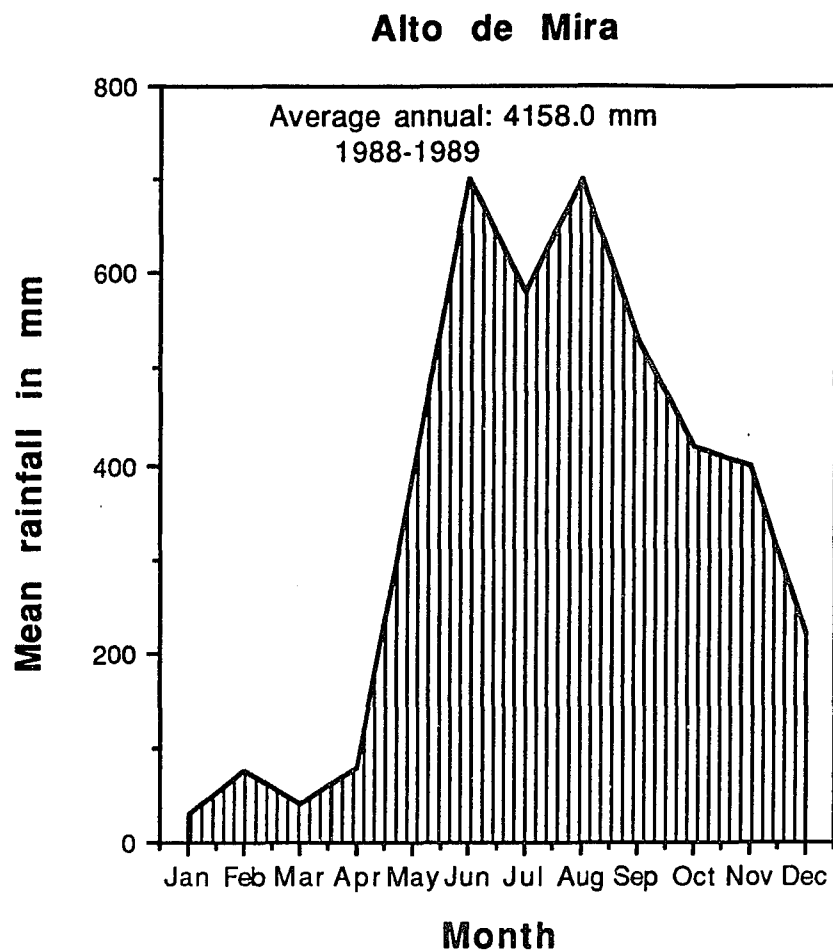
**AF** = Andean Forest; **CF** = Cloud Forest; **LMWF** = Lower Montane Wet Forest; **P** = Páramo; **SP** = Super Páramo; **XSF** = Xerophytic Scrub Forest;

**Appendix V. Geographic distribution of the species of amphibians and reptiles from SNSM**

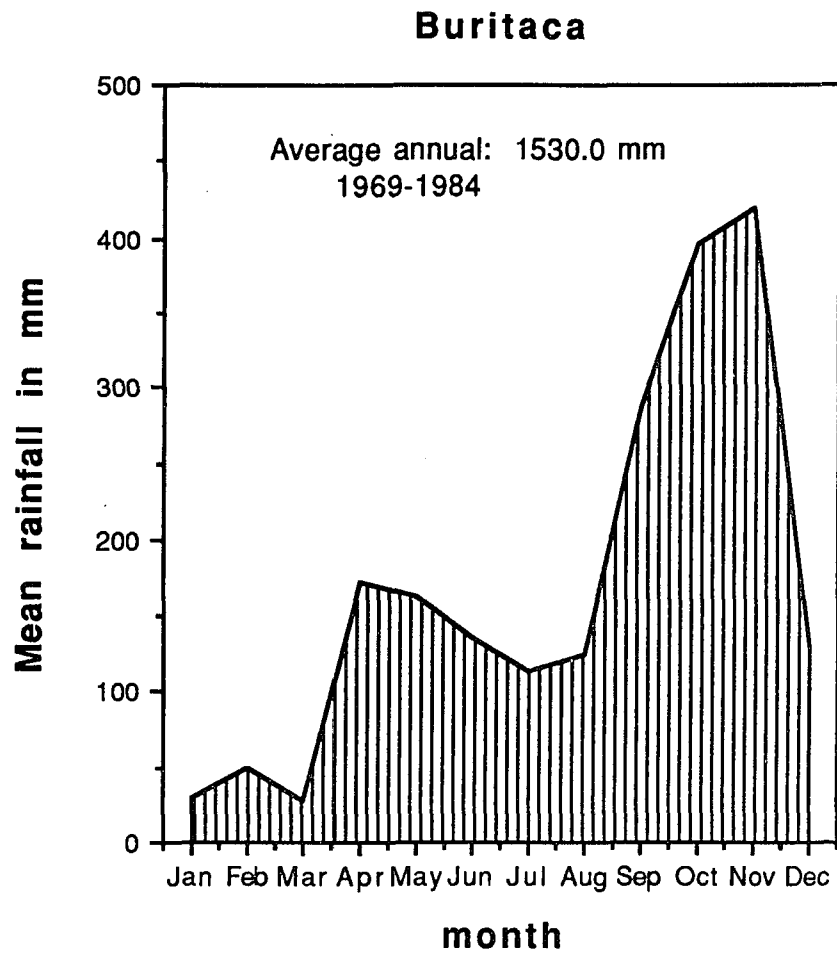
	SM	EA	COC	CC	COR	AM	CCV
<i>Bolitoglossa savagei</i>	+	-	-	-	-	-	-
<i>Eutherodactylus carmelitae</i>	+	-	-	-	-	-	-
<i>Eleutherodactylus cristinae</i>	+	-	-	-	-	-	-
<i>Eleutherodactylus delicatus</i>	+	-	-	-	-	-	-
<i>Eleutherodactylus insignitus</i>	+	-	-	-	-	-	-
<i>Eleutherodactylus megalops</i>	+	-	-	-	-	-	-
<i>Eleutherodactylus ruthveni</i>	+	-	-	-	-	-	-
<i>Eleutherodactylus sanctaemartae</i>	+	-	-	-	-	-	-
<i>Eleutherodactylus tayrona</i>	+	-	-	-	-	-	-
<i>Eleutherodactylus w-nigrum</i>	+	+	+	+	+	-	-
<i>Geobatrachus walkeri</i>	+	-	-	-	-	-	-
<i>Atelopus carrikeri</i>	+	-	-	-	-	-	-
<i>Atelopus walkeri</i>	+	-	-	-	-	-	-
<i>Atelopus sp. A</i>	+	-	-	-	-	-	-
<i>Atelopus sp. B</i>	+	-	-	-	-	-	-
<i>Atelopus sp. C</i>	+	-	-	-	-	-	-
<i>Atelopus sp. D</i>	+	-	-	-	-	-	-
<i>Atelopus sp. E</i>	+	-	-	-	-	-	-
<i>Atelopus sp. F</i>	+	-	-	-	-	-	-
<i>Atelopus sp. G</i>	+	-	-	-	-	-	-
<i>Atelopus sp. H</i>	+	-	-	-	-	-	-
<i>Colostethus sp. A</i>	+	-	-	-	-	-	-
<i>Cryptobatrachus boulengeri</i>	+	-	-	-	-	-	-
<i>Hyla sp. A</i>	+	-	-	-	-	-	-
<i>Centrolenella sp. A</i>	+	-	-	-	-	-	-
<i>Centrolenella sp. B</i>	+	-	-	-	-	-	-
<i>Pseudogonatodes furvus</i>	+	-	-	-	-	-	-
<i>Anolis menta</i>	+	-	-	-	-	-	-
<i>Anolis sanctamartae</i>	+	-	-	-	-	-	-
<i>Anolis solitarius</i>	+	-	-	-	-	-	-
<i>Anolis sp. A</i>	+	-	-	-	-	-	-
<i>Anolis sp. B</i>	+	-	-	-	-	-	-
<i>Anadia altaserrania</i>	+	-	-	-	-	-	-
<i>Anadia pulchella</i>	+	-	-	-	-	-	-
<i>Ptychoglossus sp. A</i>	+	-	-	-	-	-	-
<i>Atractus sanctaemartae</i>	+	-	-	-	-	-	-
<i>Atractus sp. A</i>	+	-	-	-	-	-	-
<i>Leptophis sp. A</i>	+	-	-	-	-	-	-
<i>Liophis "epinephelus" sp. A</i>	+	-	+	+	+	-	-
<i>Mastigodryas boddaerti</i>	*						
<i>Oxyrhopus sp. A</i>	+	-	-	-	-	-	-
<i>Micrurus mipartitus</i>	+	+	+	+	+	+	+

SM= Sierra Nevada de Santa Marta; EA= Ecuadorian Andes; COc= Cordillera Occidental; CC= Cordillera Central; COR= Cordillera Oriental; AM= Andes of Mérida; CCV= Cordillera de la Costa, Venezuela.

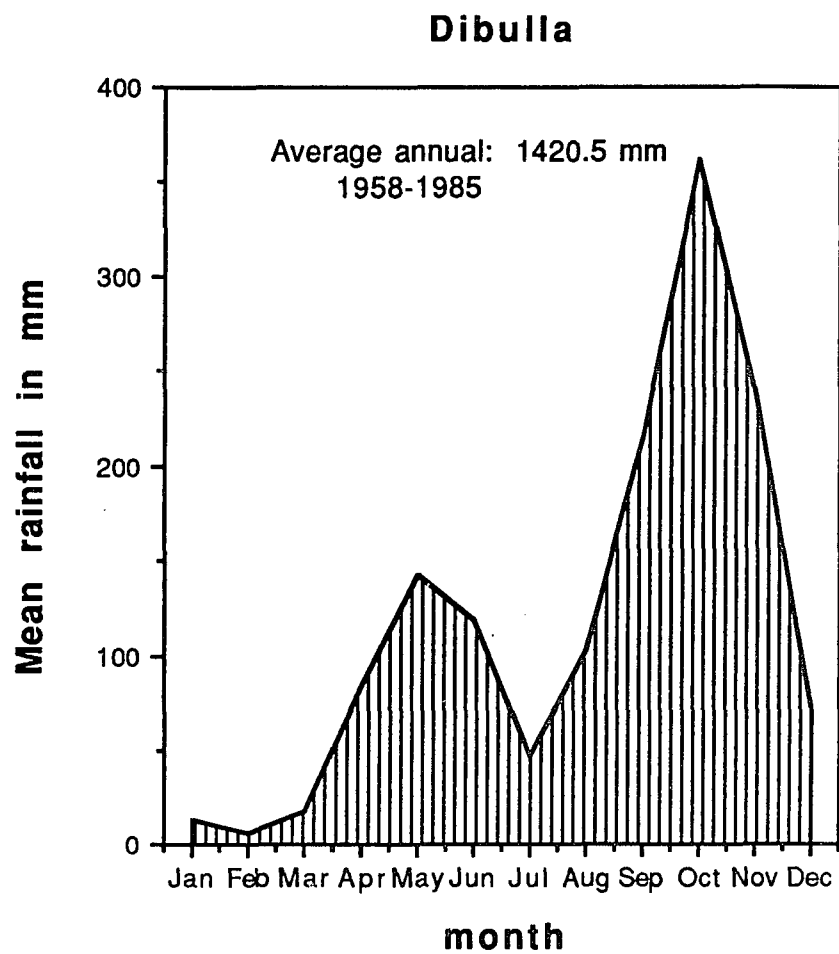
+ = presence; - = absence; \* See Text.



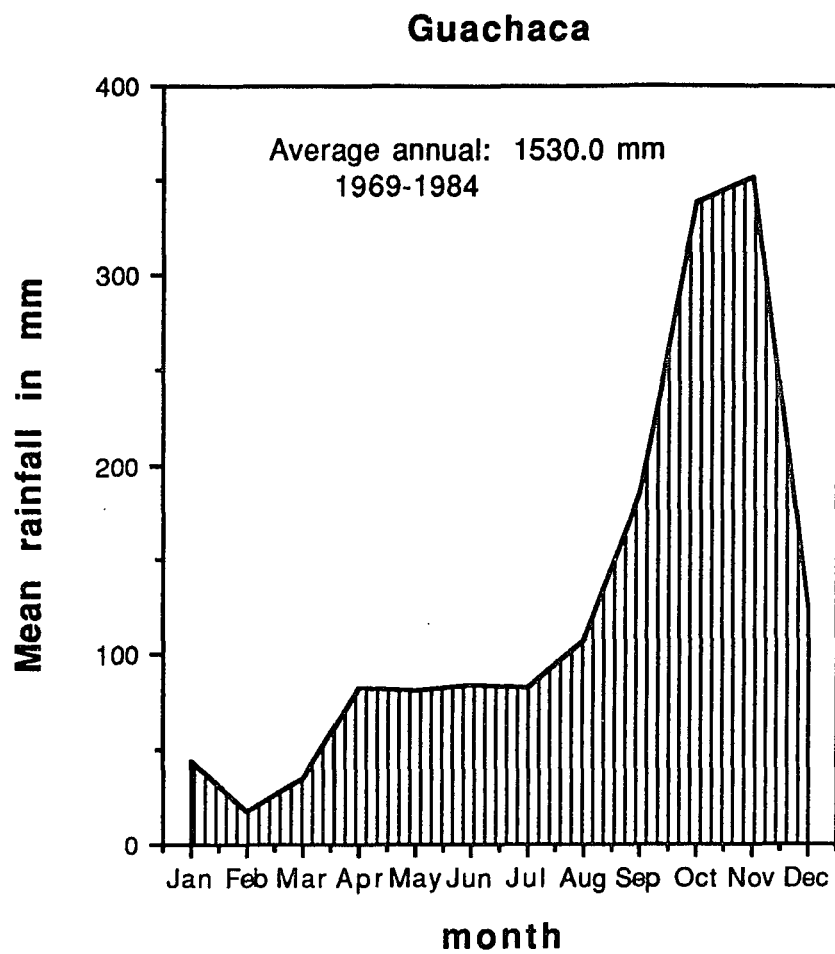
**Figure 1a.** Patterns of rainfall of Alto de Mira, Sierra Nevada de Santa Marta (1080 m).



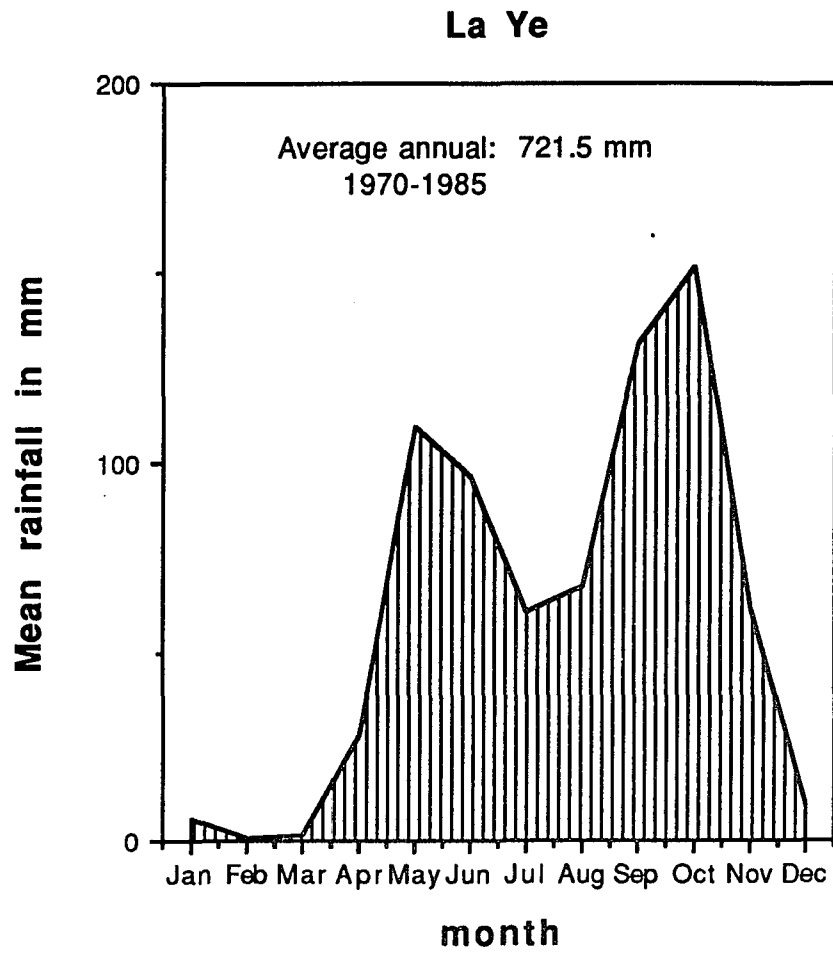
**Figure 1b.** Patterns of rainfall of Buritaca, Sierra Nevada de Santa Marta (1080m).



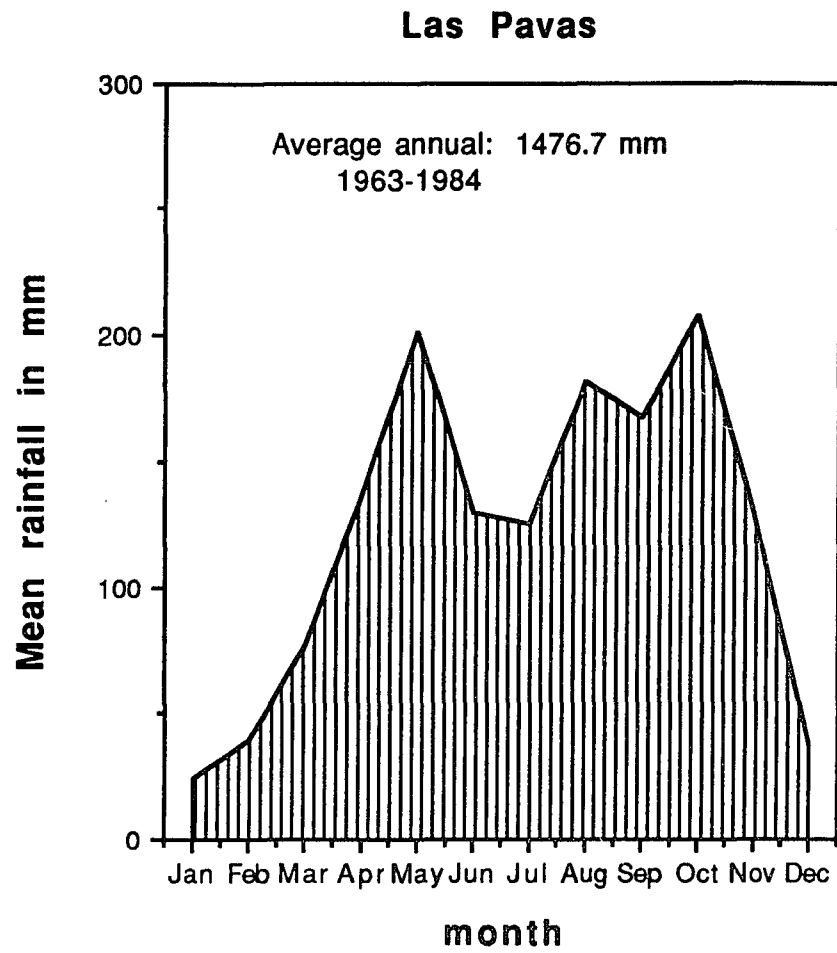
**Figure 1c.** Patterns of rainfall of Dibulla, Sierra Nevada de Santa Marta (5 m).



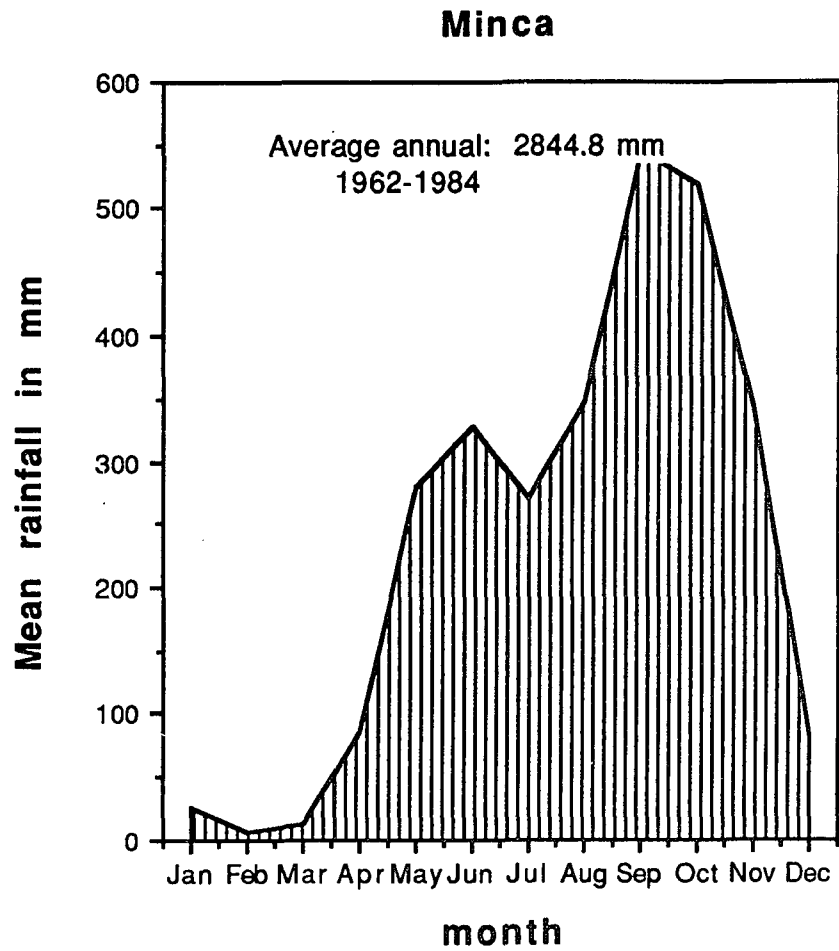
**Figure 1d.** Patterns of rainfall of Guachaca, Sierra Nevada de Santa Marta (45 m).



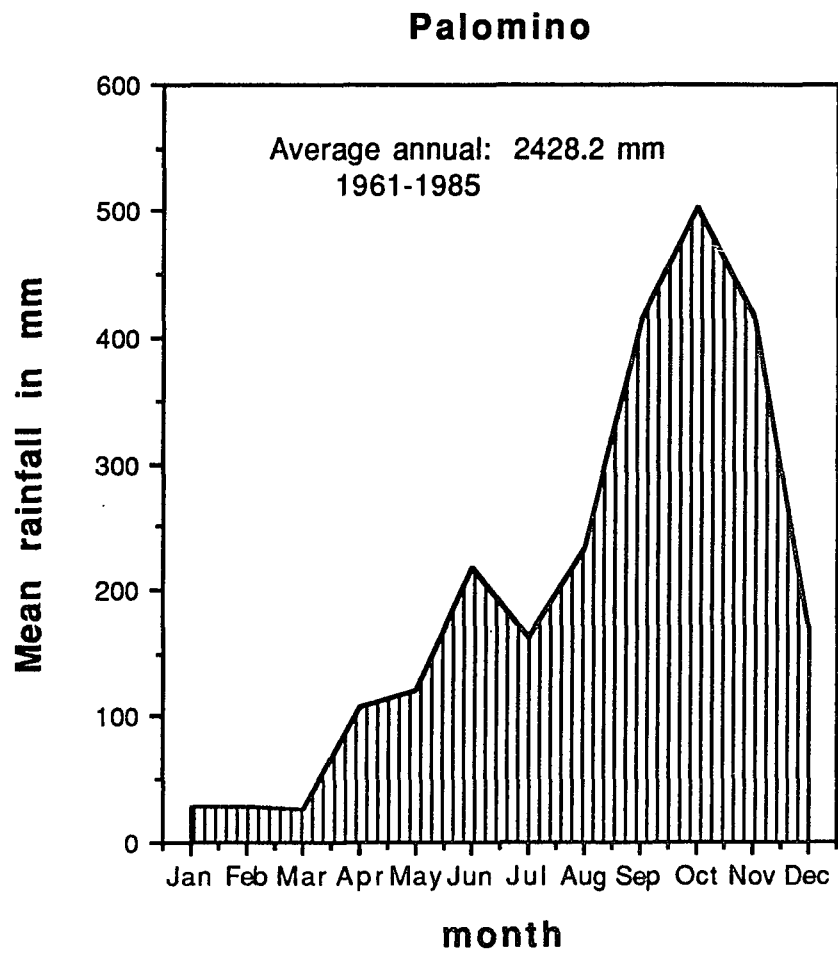
**Figure 1e.** Patterns of rainfall of La Ye, Sierra Nevada de Santa Marta (20 m).



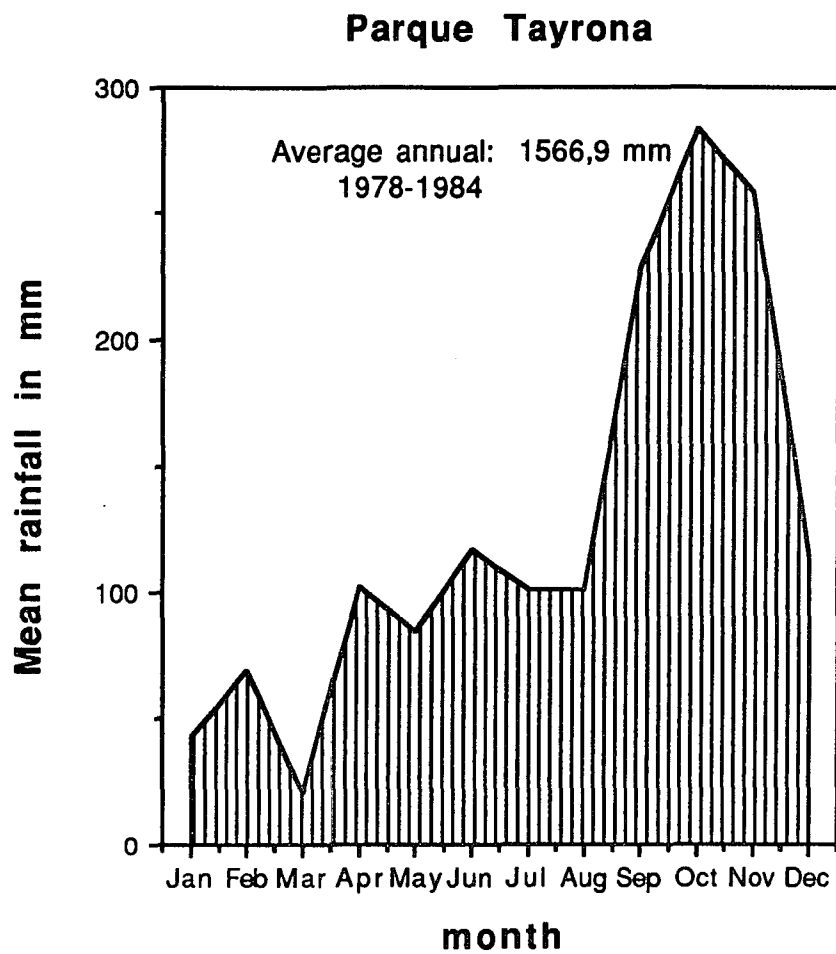
**Figure 1f.** Patterns of rainfall of Las Pavas, Sierra Nevada de Santa Marta (150 m).



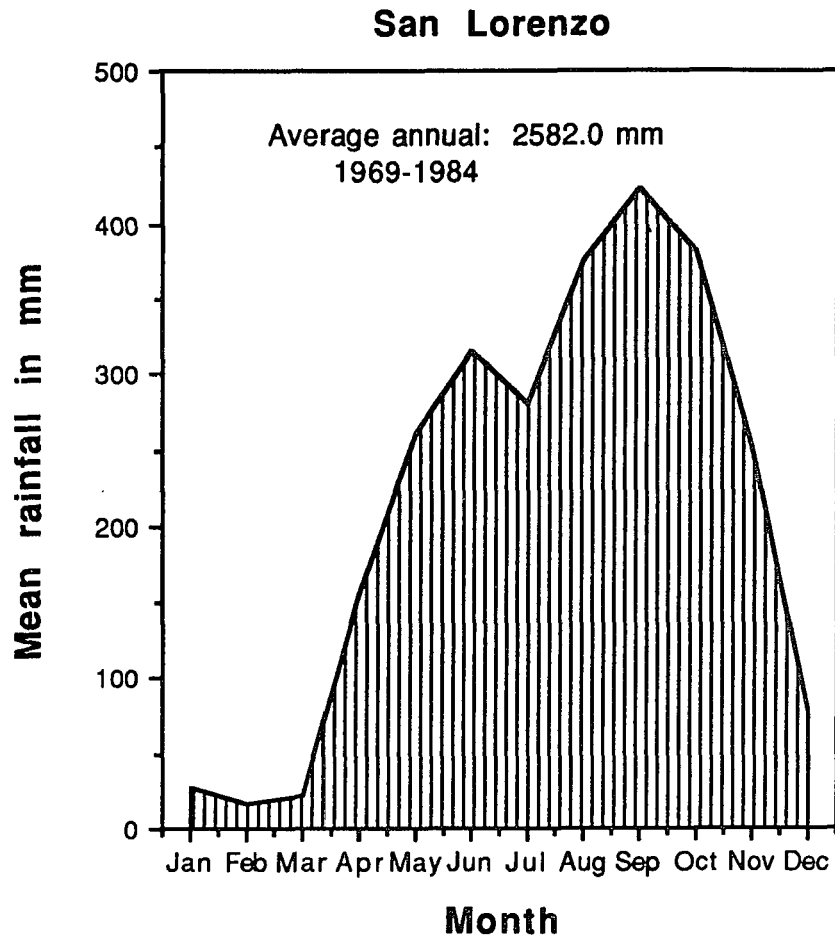
**Figure 1g.** Patterns of rainfall of Minca, Sierra Nevada de Santa Marta (640 m).



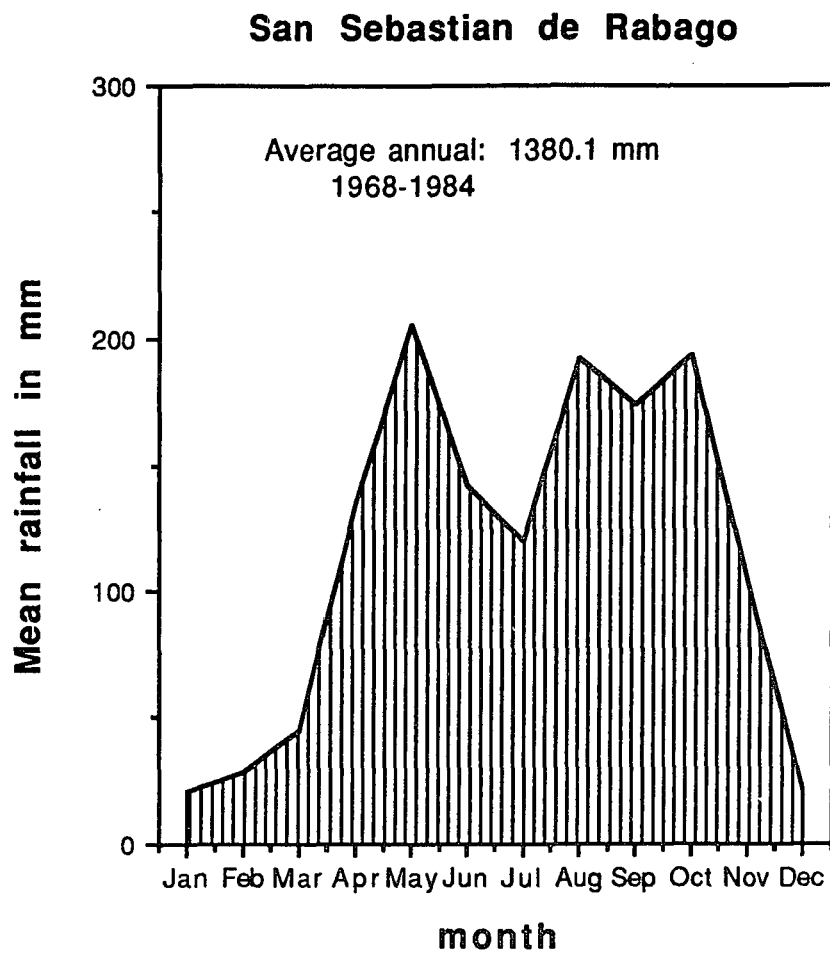
**Figure 1h.** Patterns of rainfall of Palomino, Sierra Nevada de Santa Marta (30 m).



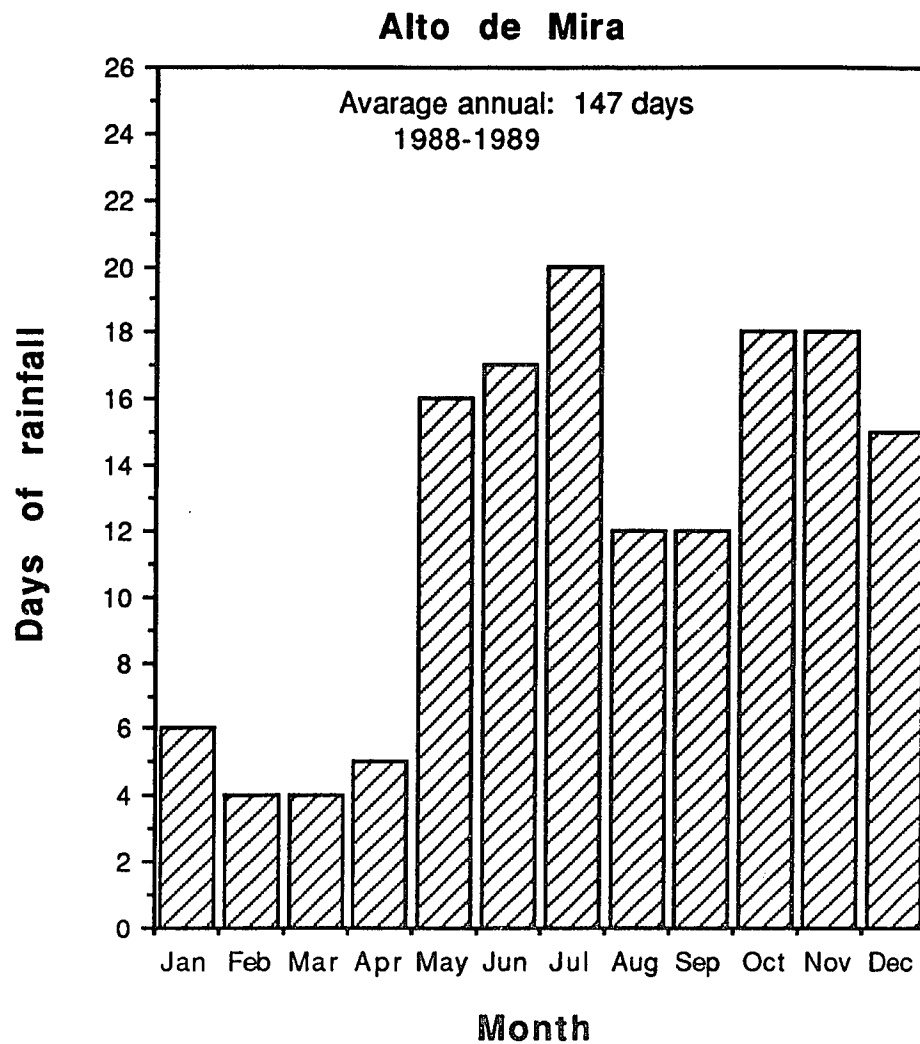
**Figure 1i.** Patterns of rainfall of Parque Tayrona, Sierra Nevada de Santa Marta (1080m).



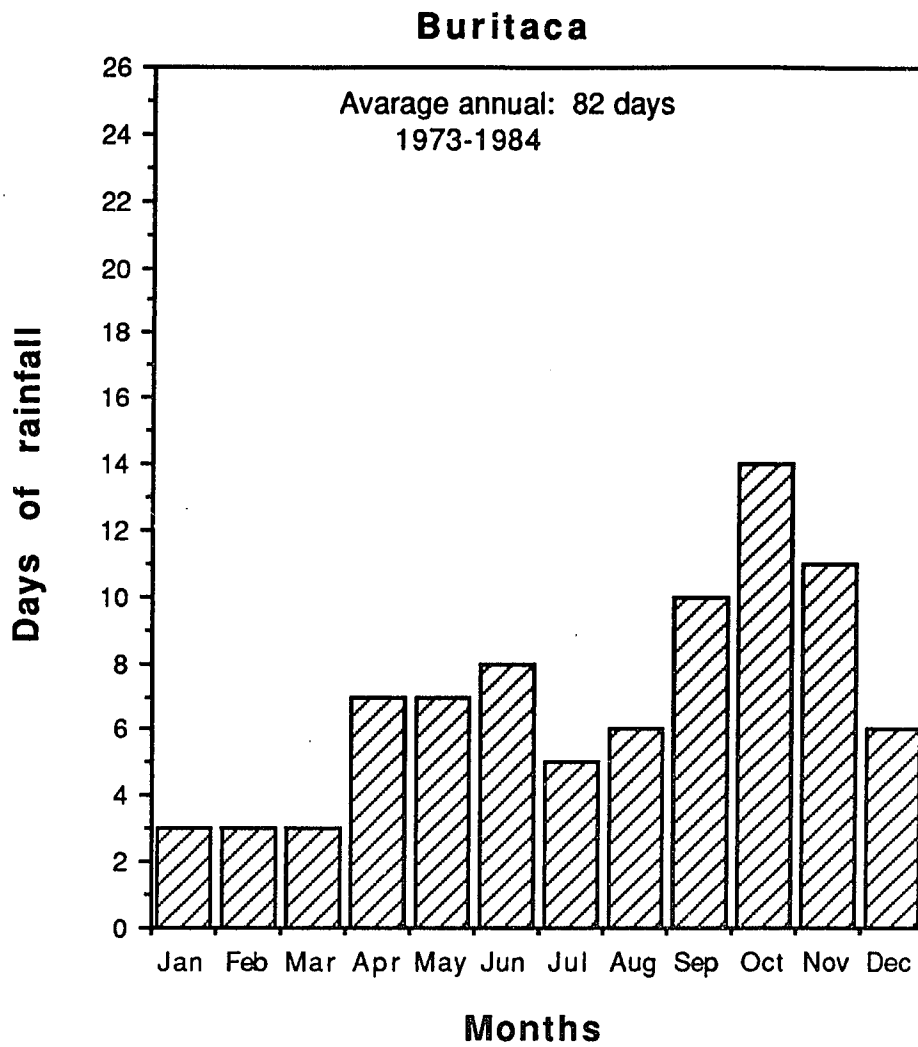
**Figure 1j.** Patterns of rainfall of San Lorenzo, Sierra Nevada de Santa Marta (2200 m).



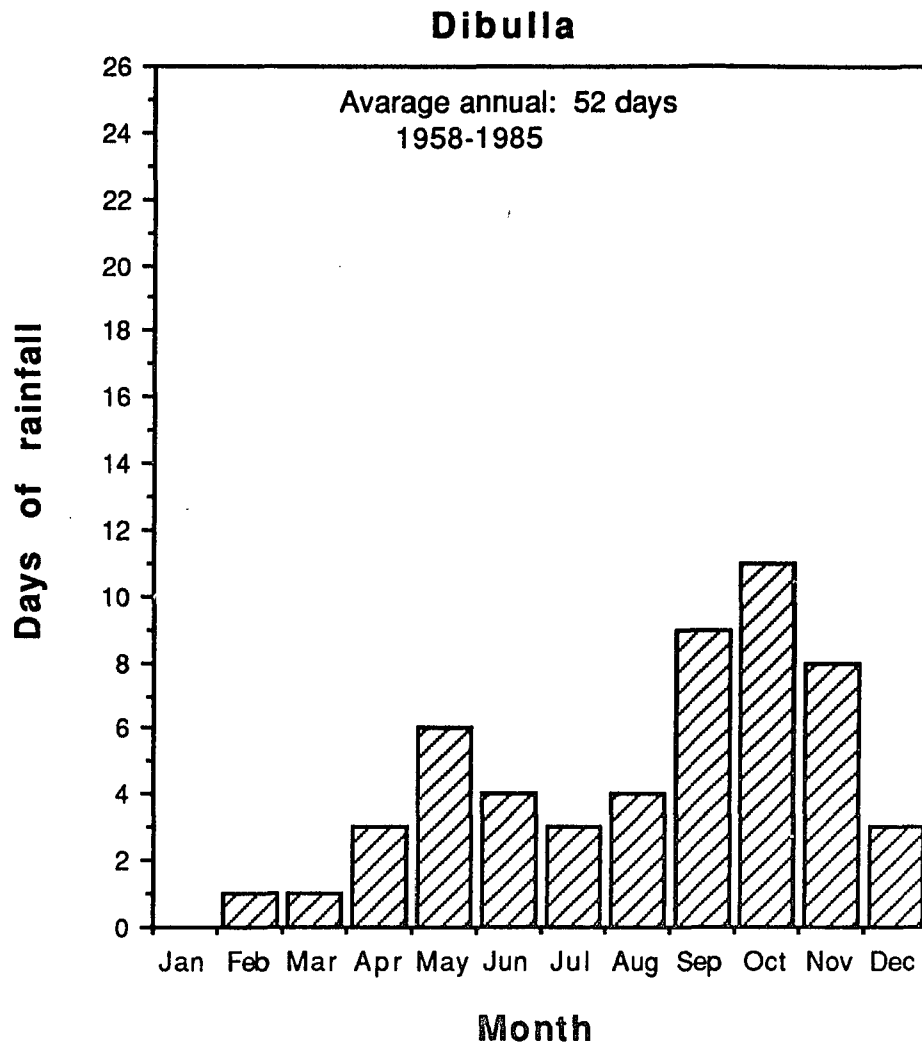
**Figure 1k.** Patterns of rainfall of San Sebastian de Rabago, Sierra Nevada de Santa Marta (1080m).



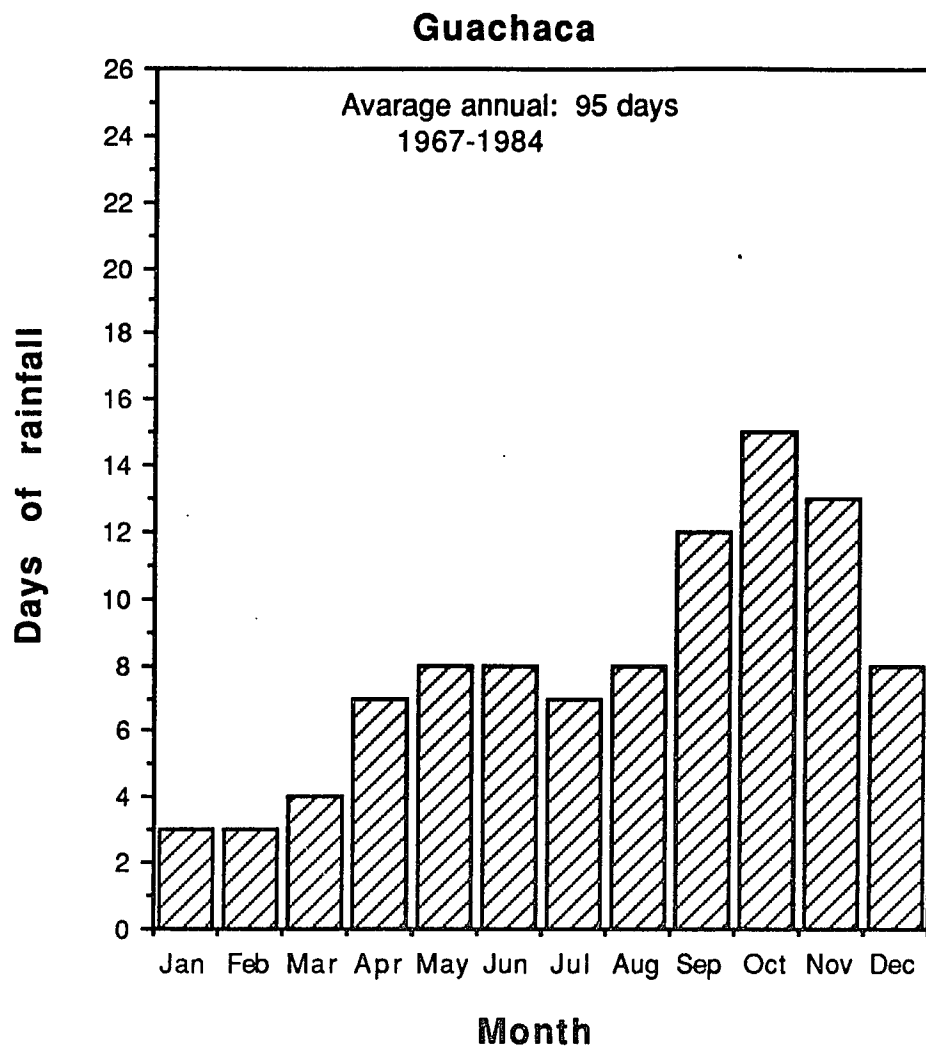
**Figure 2a.** Number of days of rainfall per month in Alto de Mira, Sierra Nevada de Santa Marta (1080 m).



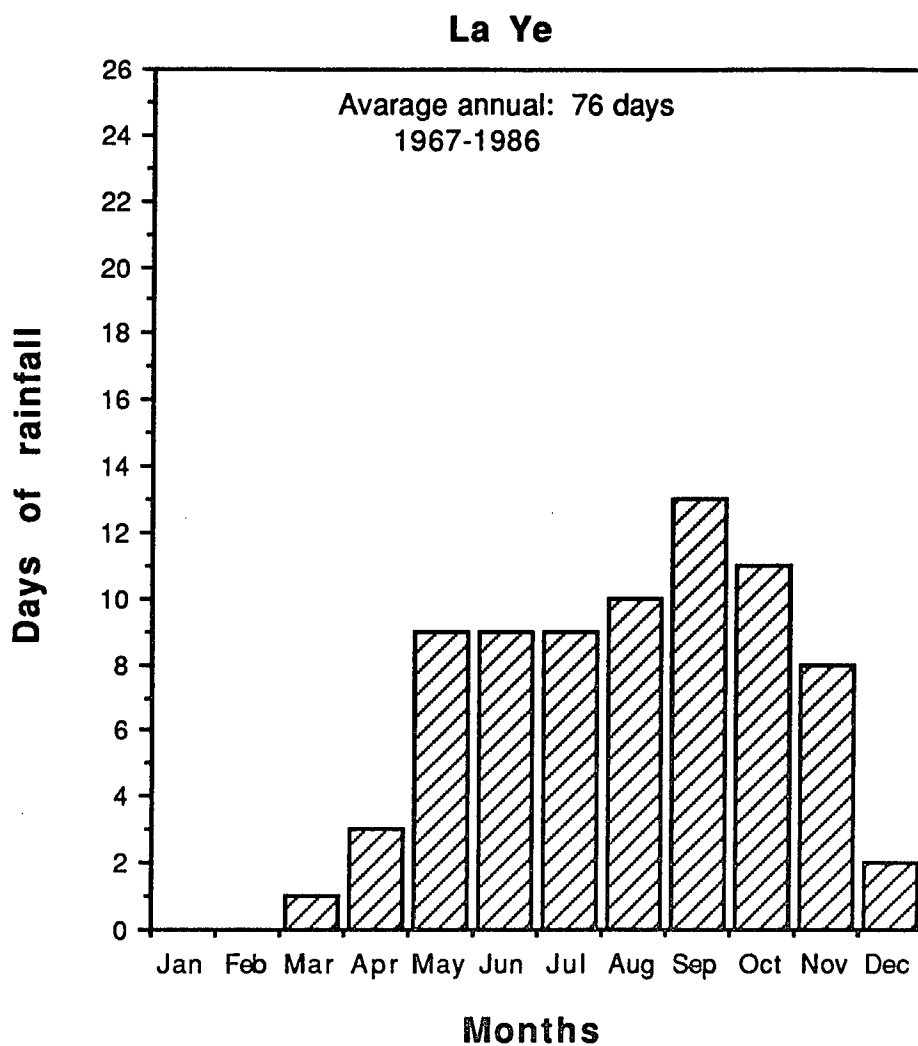
**Figure 2b.** Number of days of rainfall per month in Buritaca, Sierra Nevada de Santa Marta (30 m).



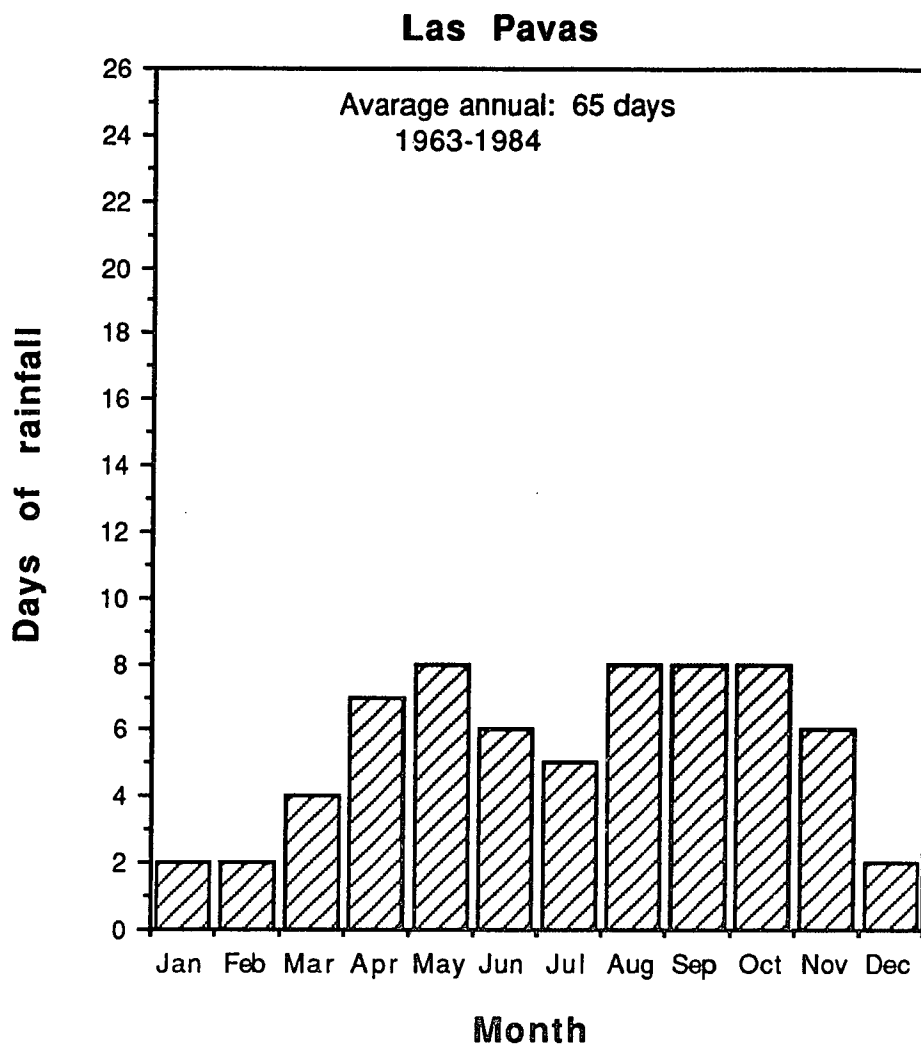
**Figure 2c.** Number of days of rainfall per month in Dibulla, Sierra Nevada de Santa Marta (5 m).



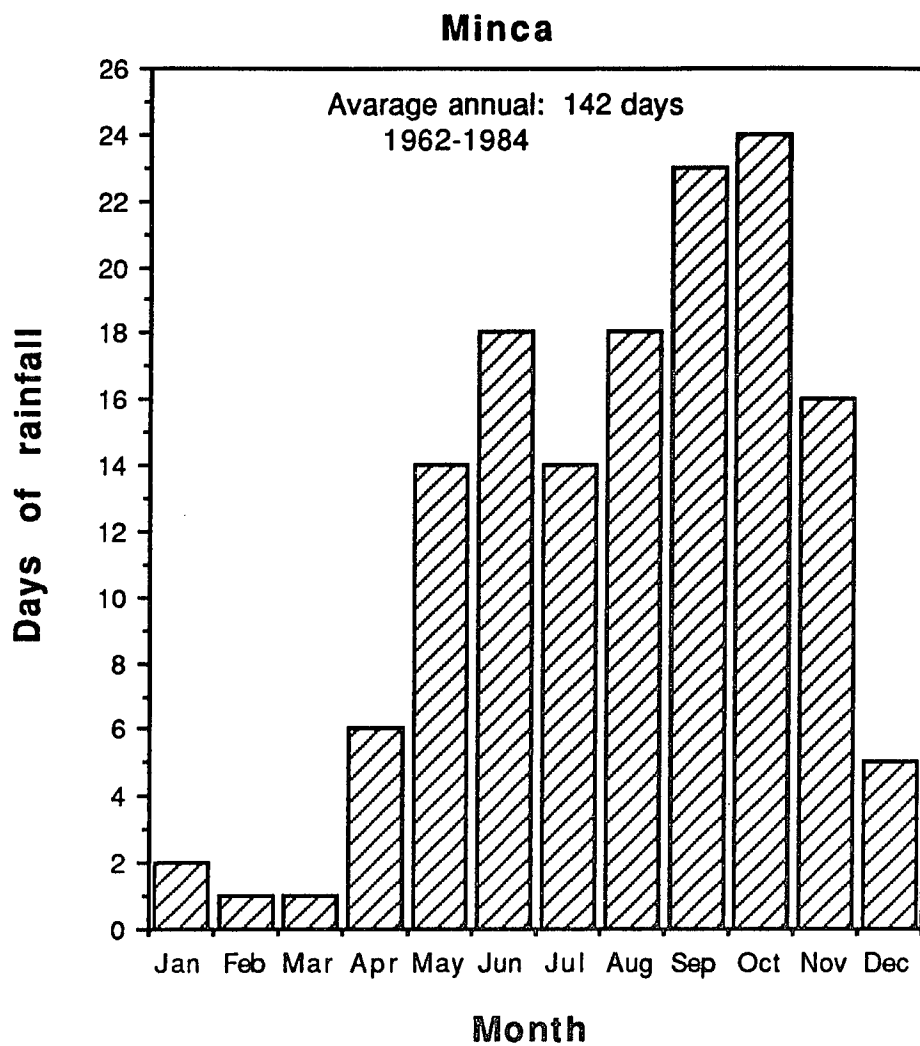
**Figure 2d.** Number of days of rainfall per month in Guachaca, Sierra Nevada de Santa Marta (45 m).



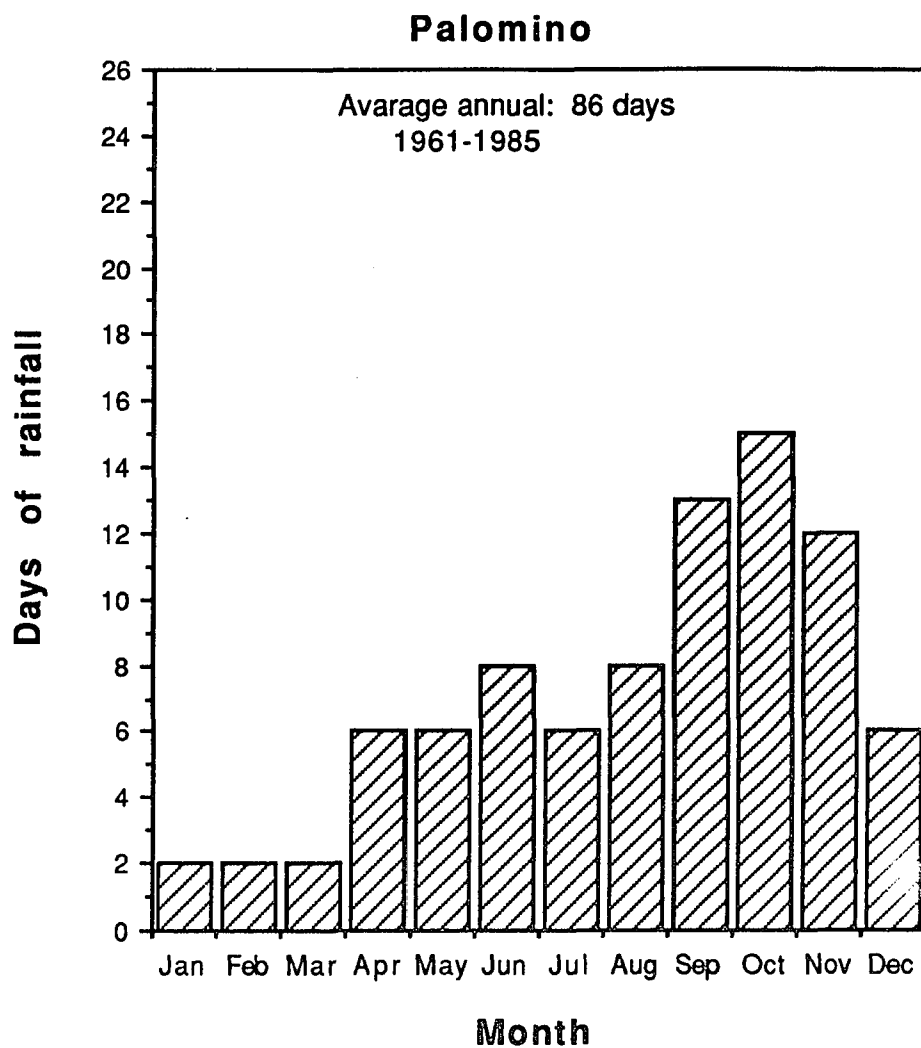
**Figure 2e.** Number of days of rainfall per month in La Ye, Sierra Nevada de Santa Marta (20 m).



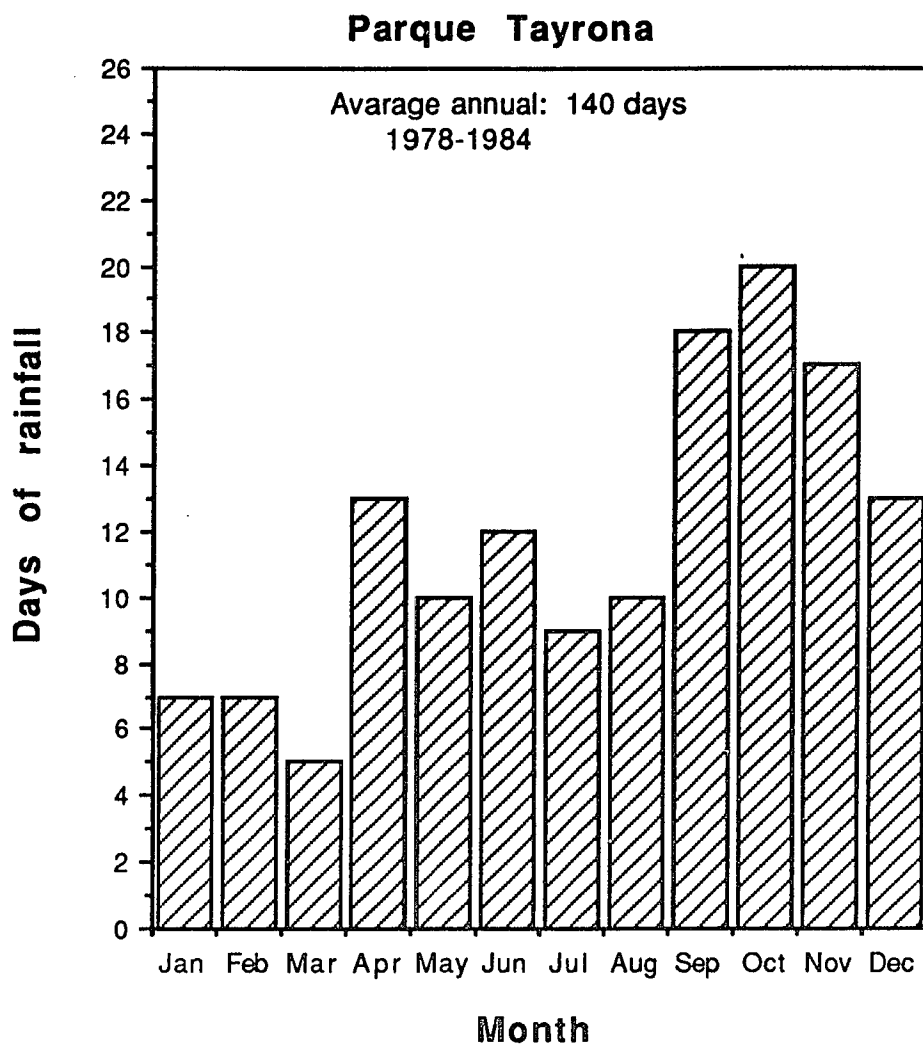
**Figure 2f.** Number of days of rainfall per month in Las Pavas, Sierra Nevada de Santa Marta (150 m).



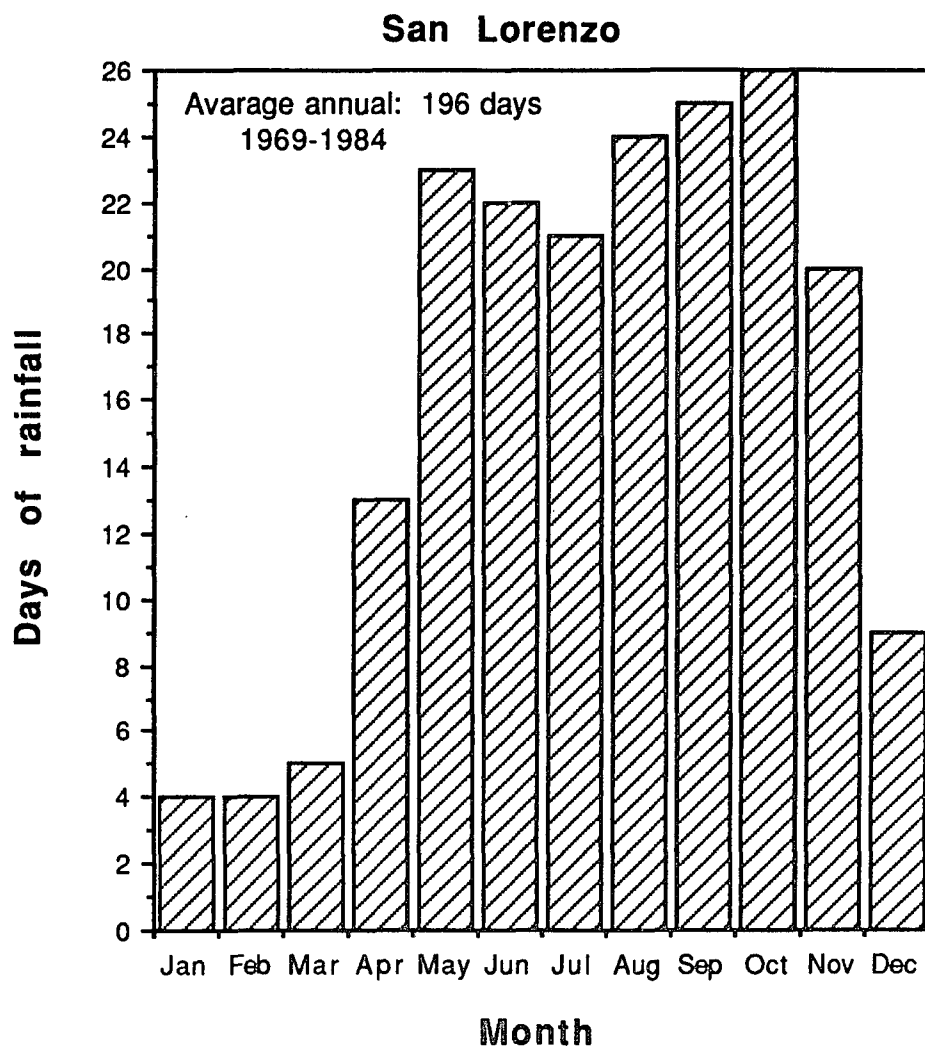
**Figure 2g.** Number of days of rainfall per month in Minca, Sierra Nevada de Santa Marta (640 m).



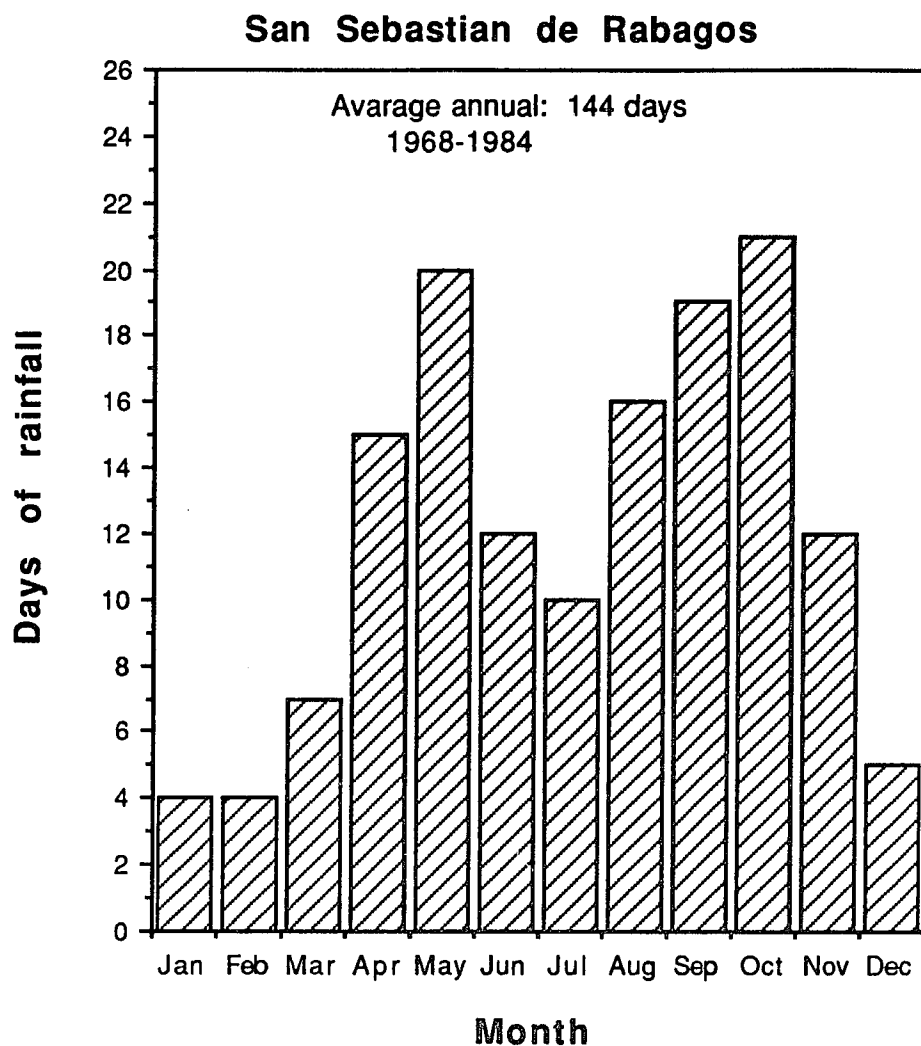
**Figure 2h.** Number of days of rainfall per month in Palomino, Sierra Nevada de Santa Marta (30 m).



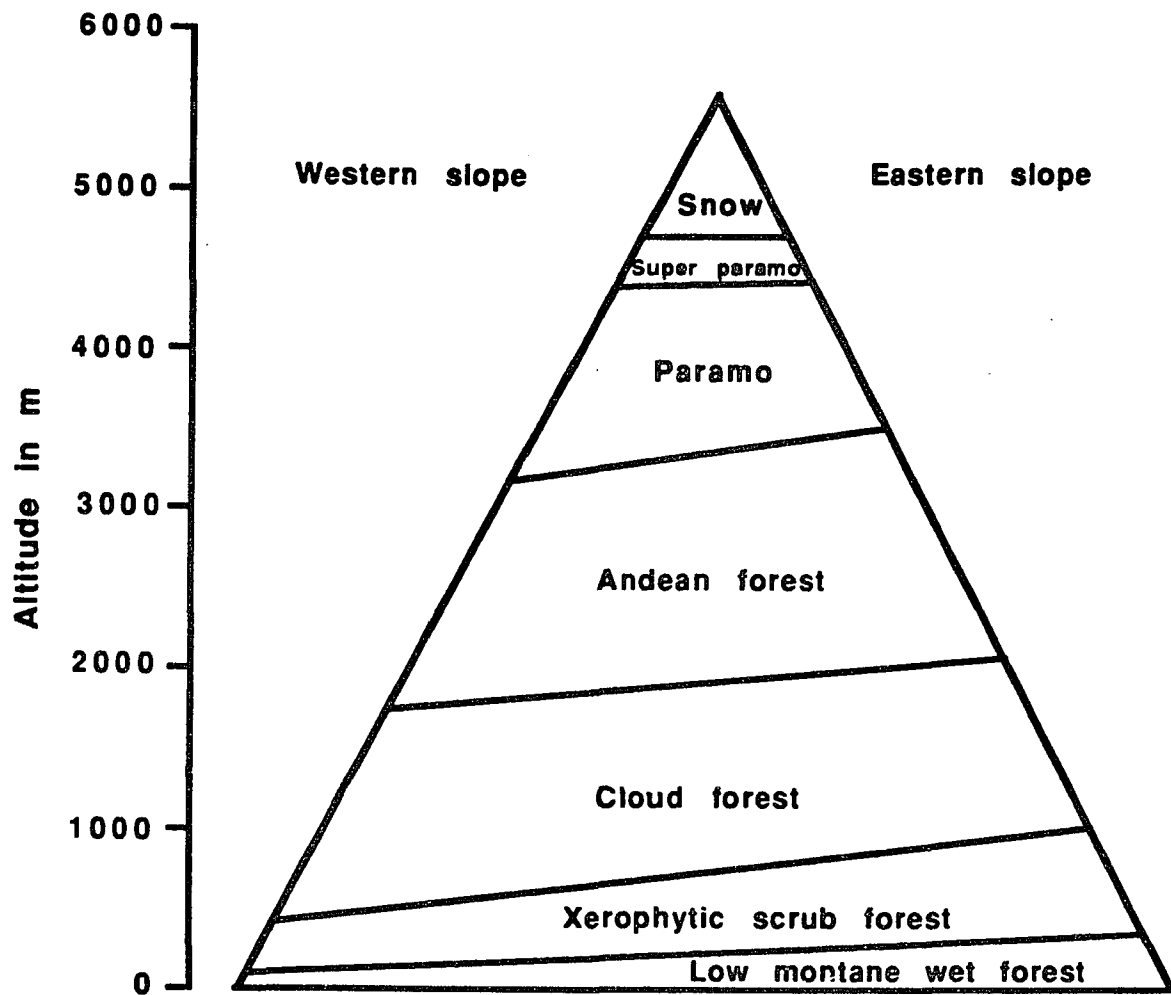
**Figure 2i.** Number of days of rainfall per month. in Parque Tayrona, Sierra Nevada de Santa Marta (30 m).



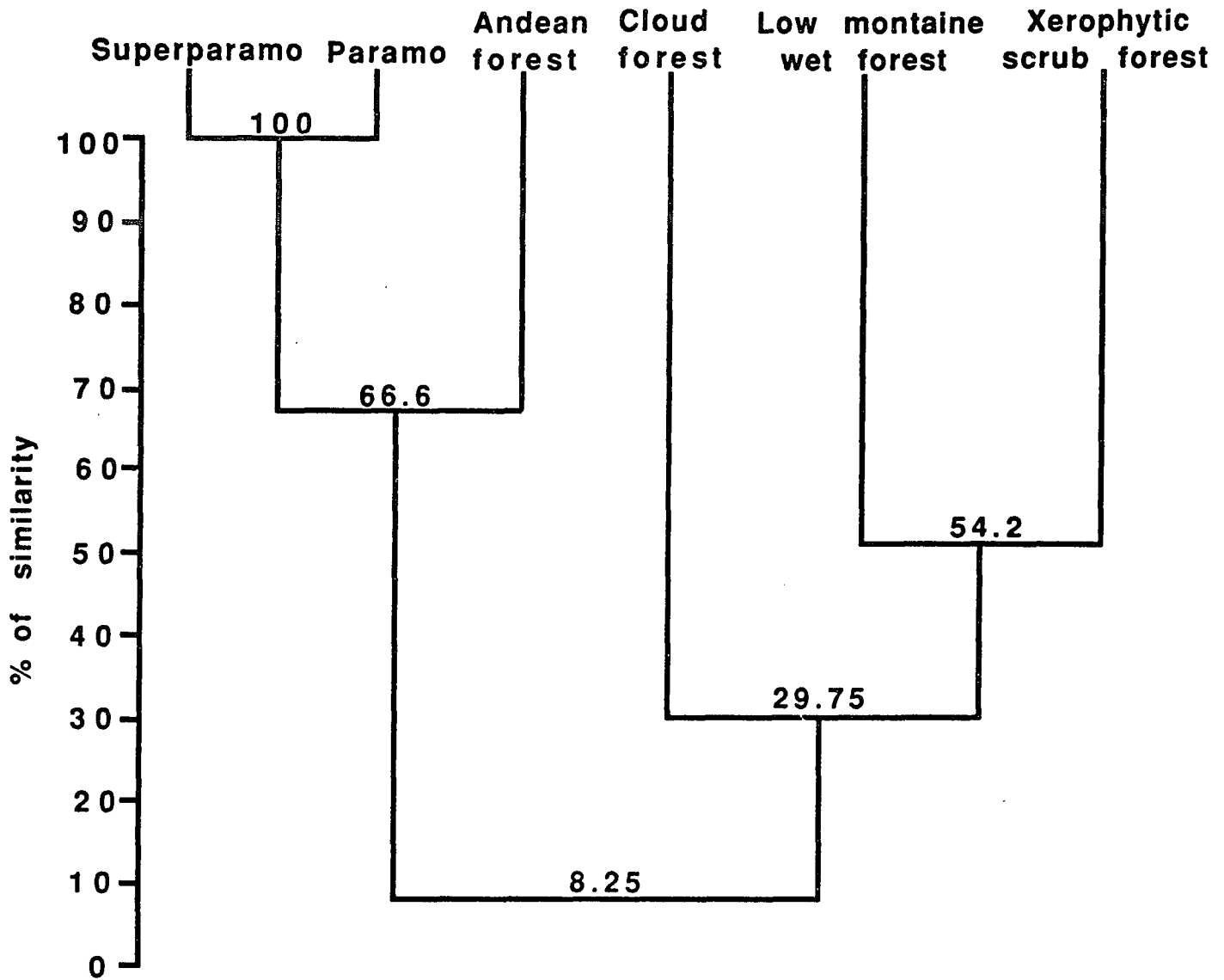
**Figure 2j.** Number of days of rainfall per month in San Lorenzo, Sierra Nevada de Santa Marta (2200 m).



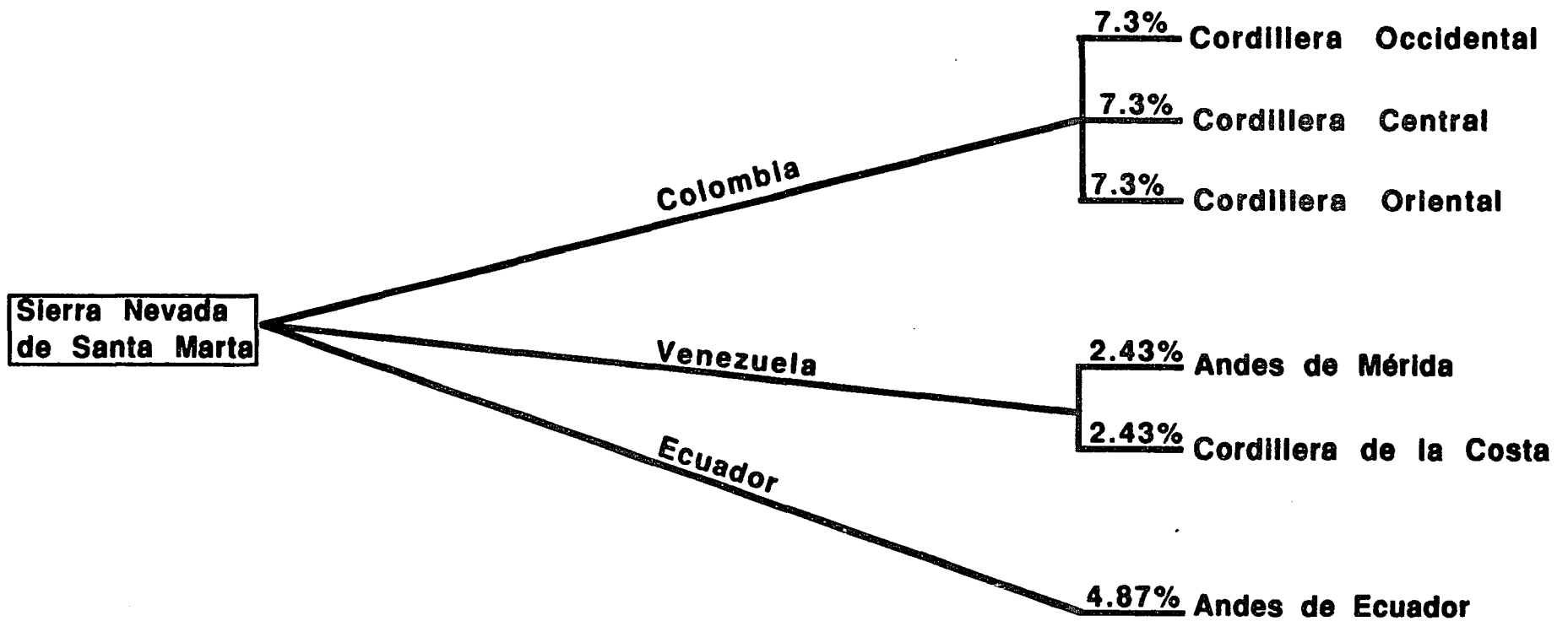
**Figure 2k.** Number of days of rainfall per month in San Sebastian de Rabagos, Sierra Nevada de Santa Marta (2000 m).



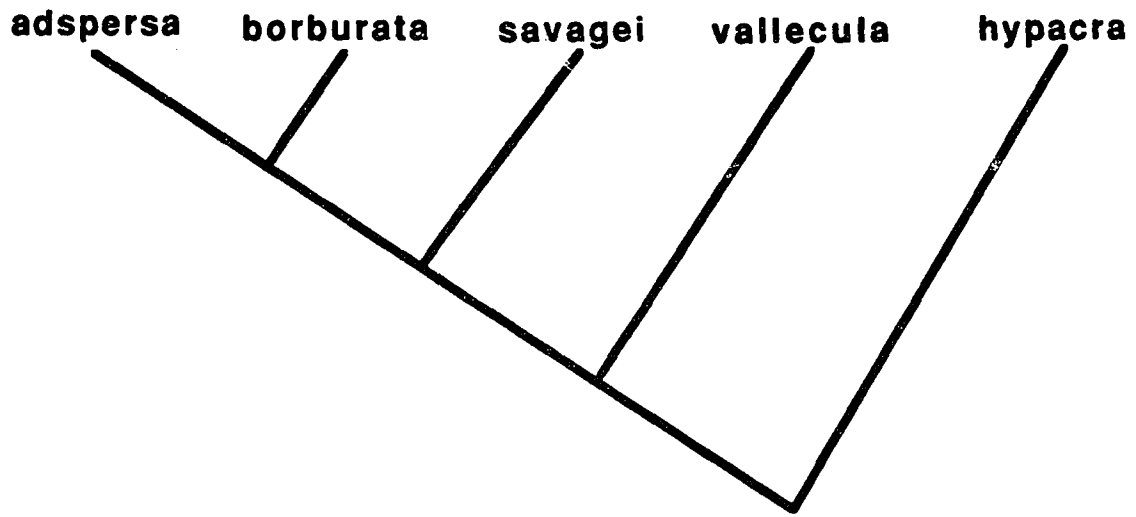
**Figure 3.** Vertical zonation of natural vegetation of Sierra Nevada de Santa Marta.



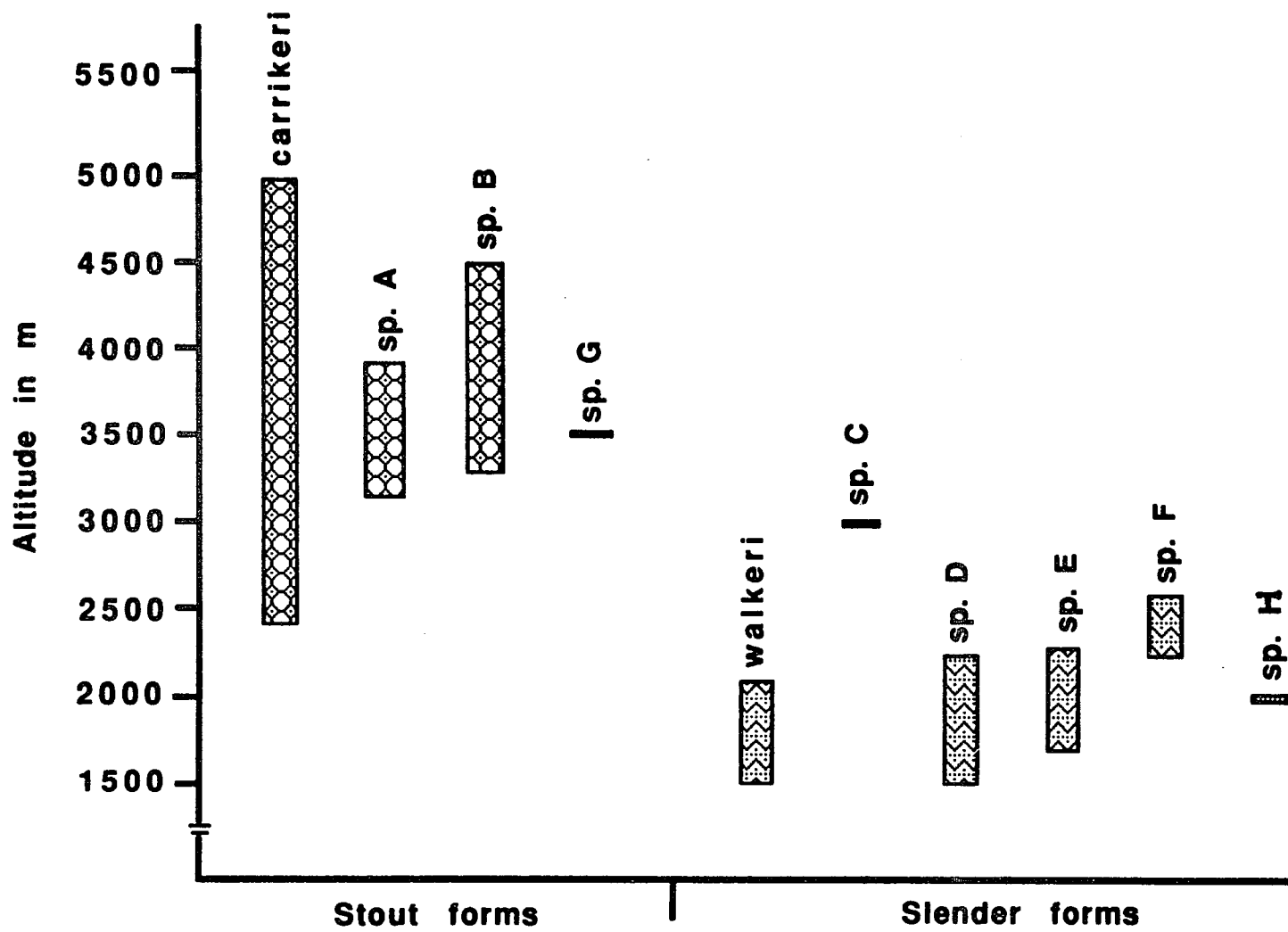
**Figure 4.** Degree of similarity among the principal ecosystems of Sierra Nevada de Santa Marta.



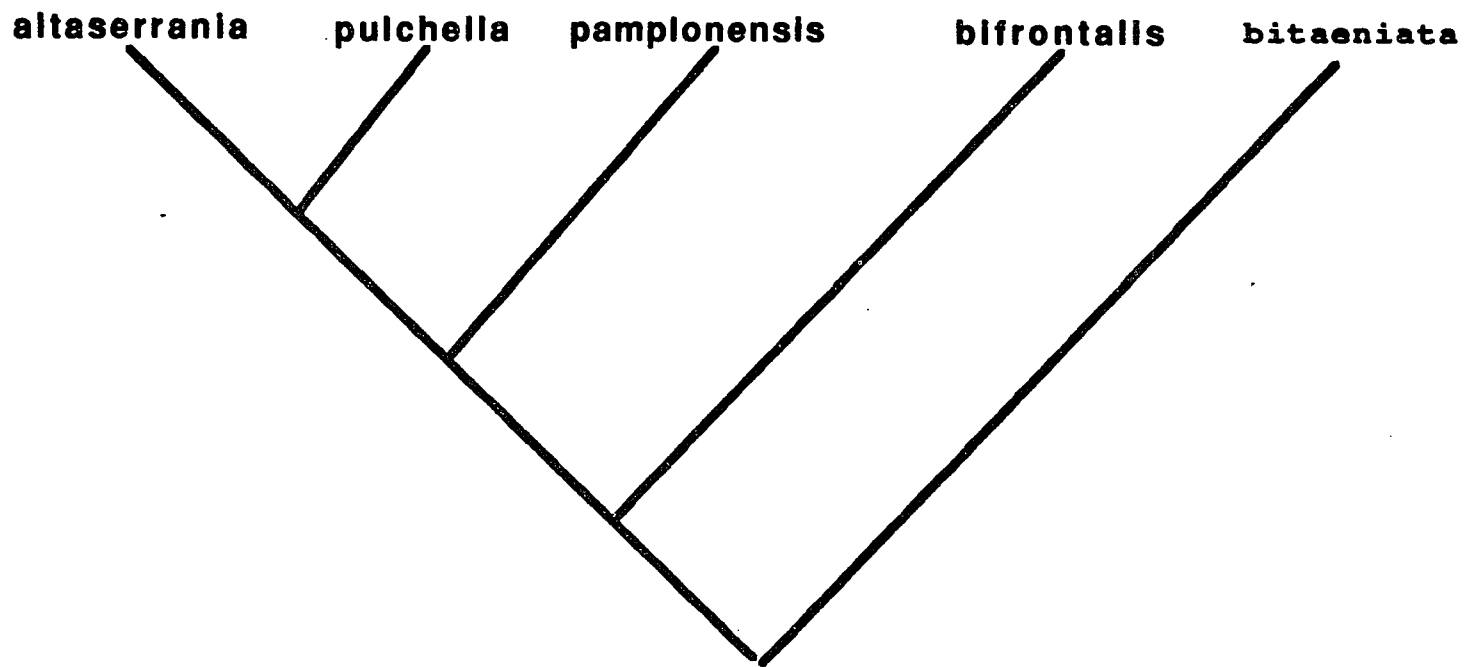
**Figure 5.** Degree of resemblance between Sierra Nevada de Santa Marta and Cordillera Occidental, Cordillera Central and Cordillera Oriental of Colombia; Andes de Mérida and Cordillera de la Costa of Venezuela; and Andes of Ecuador.



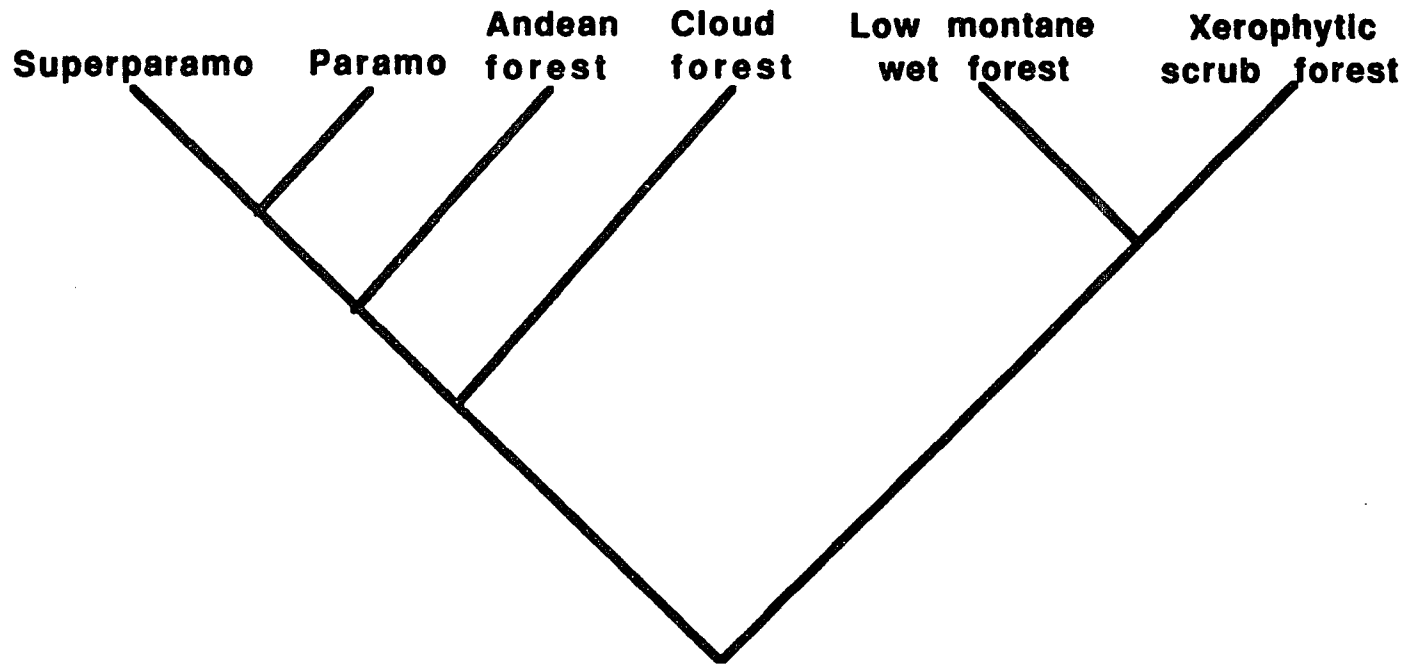
**Figure 6.** Relationships of *Bolitoglossa savagei* with other species of the *adspersa* group.



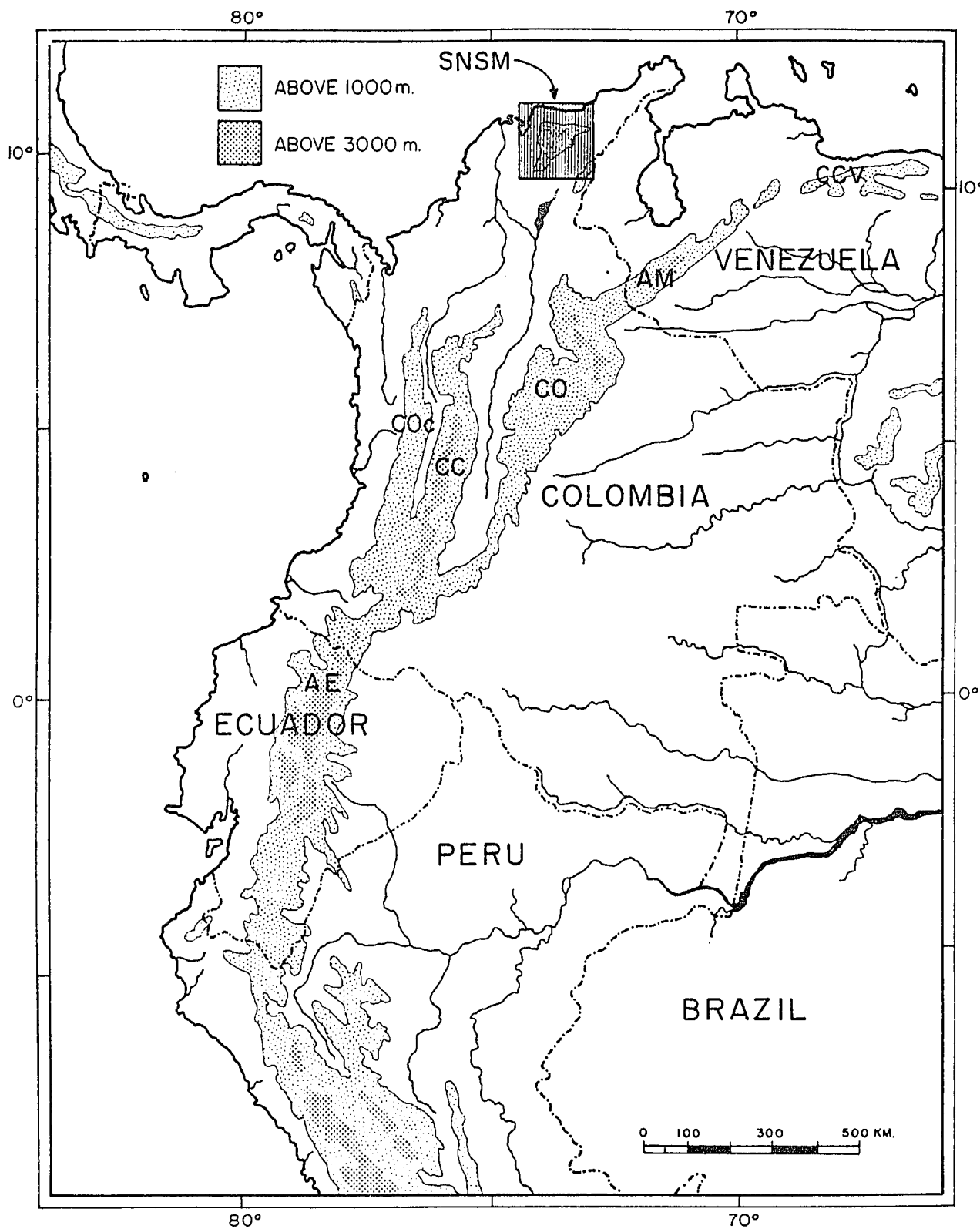
**Figure 7.** Altitudinal distribution of the two species groups of *Atelopus* of Sierra Nevada de Santa Marta, *A. carrikeri* (Stout forms) and *A. walkeri* (Slender forms).



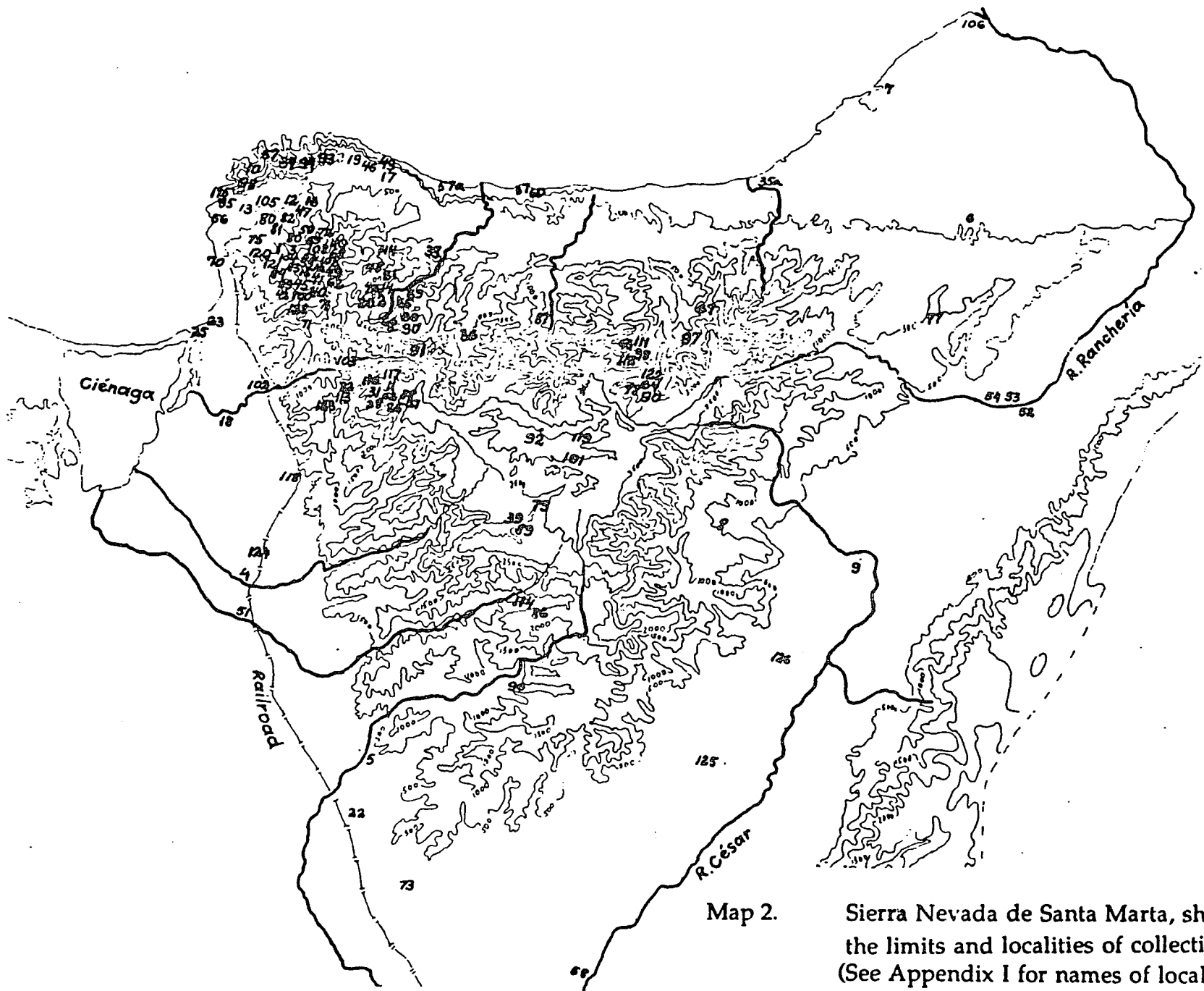
**Figure 8.** Relationships of the species of *Anadia* of Sierra Nevada de Santa Marta with other species of the *bitaeniata*-group.



**Figure 9.** Area cladogram illustrating the relationships of the herpetofauna of the principal ecosystems of the Sierra Nevada de Santa Marta.

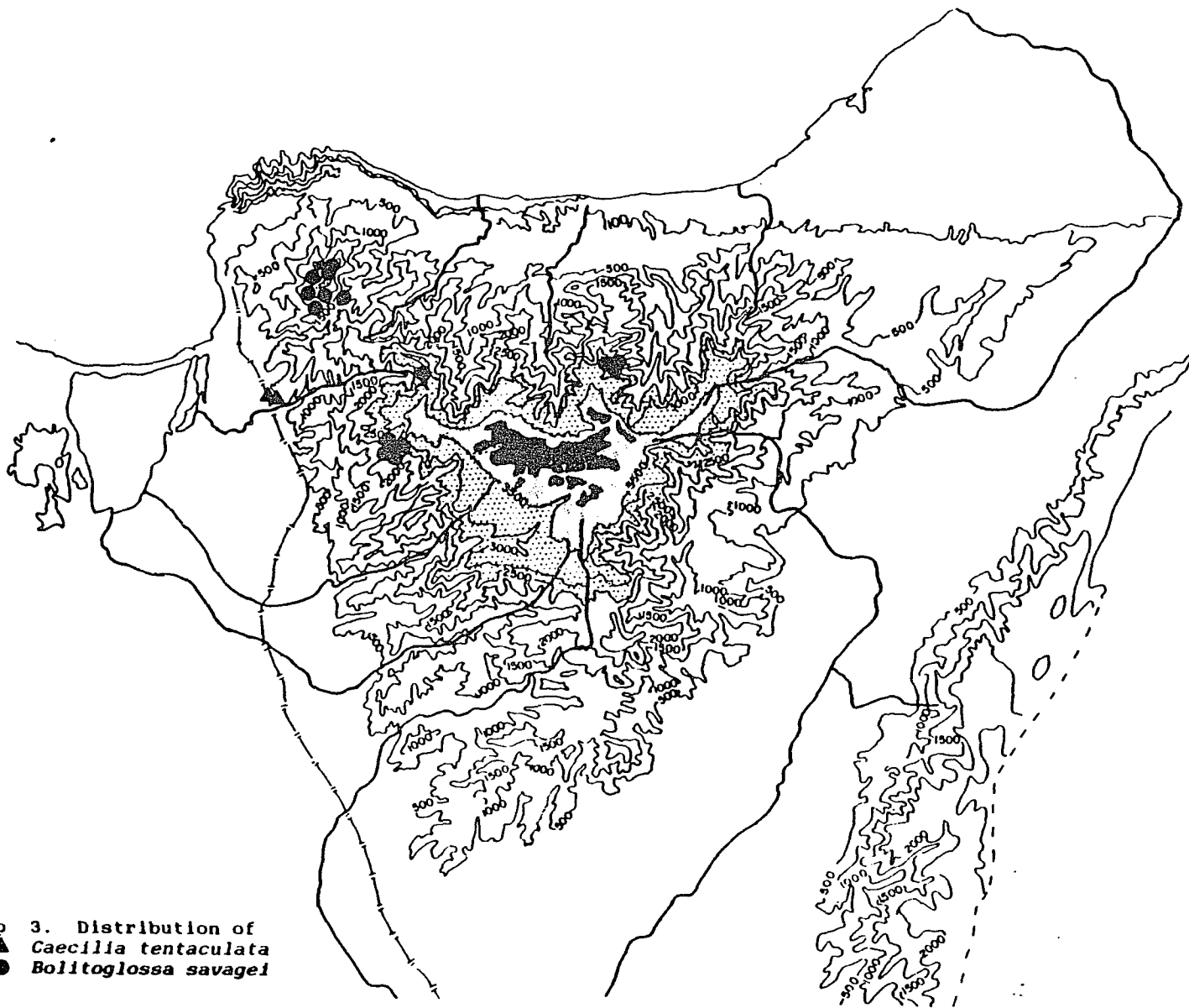


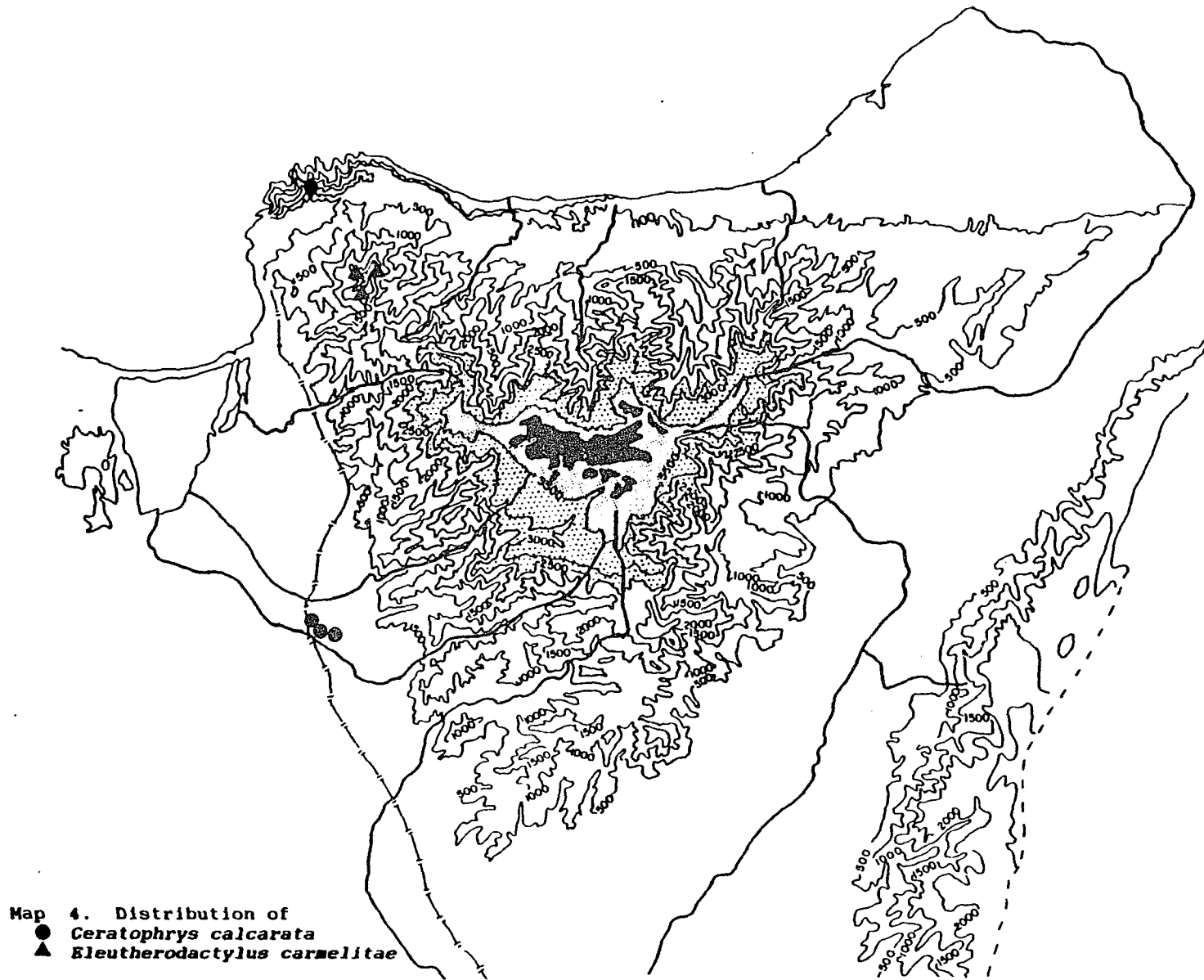
Map 1. Northwestern South America showing the location of Sierra Nevada de Santa Marta (SNSM).

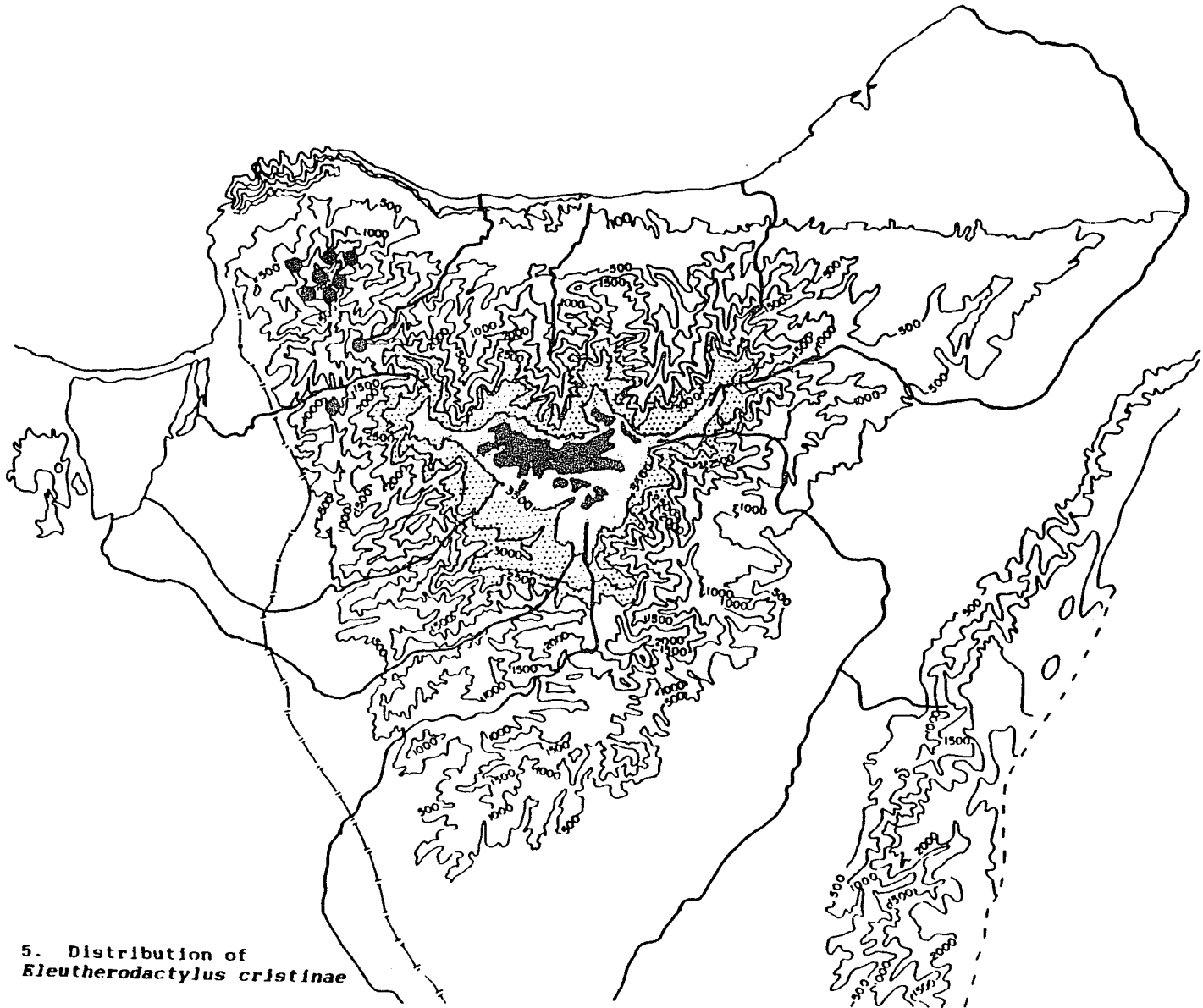


Map 2. Sierra Nevada de Santa Marta, showing the limits and localities of collection. (See Appendix I for names of localities).

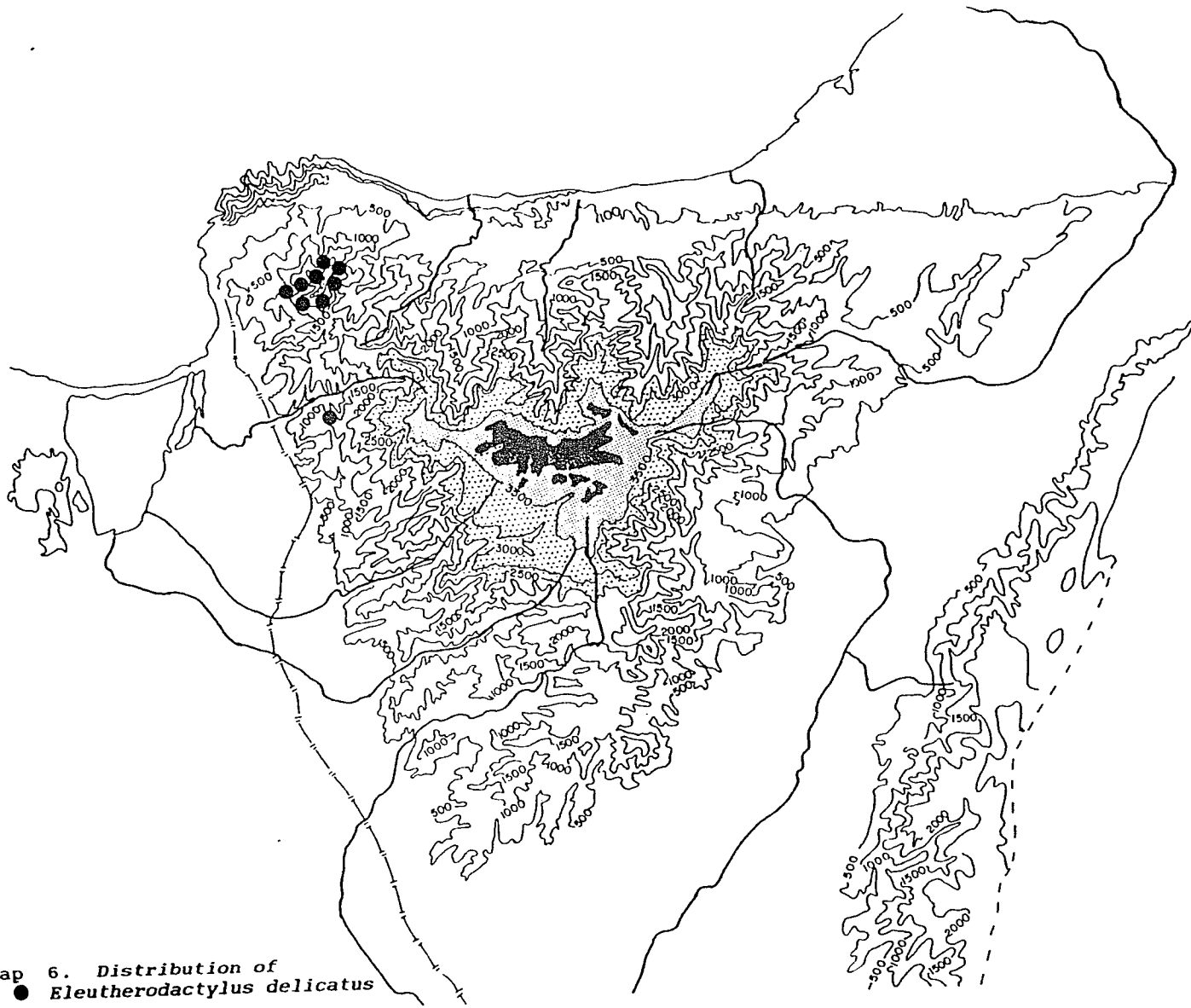
Map 3. Distribution of  
▲ *Caecilia tentaculata*  
● *Bolitoglossa savagei*

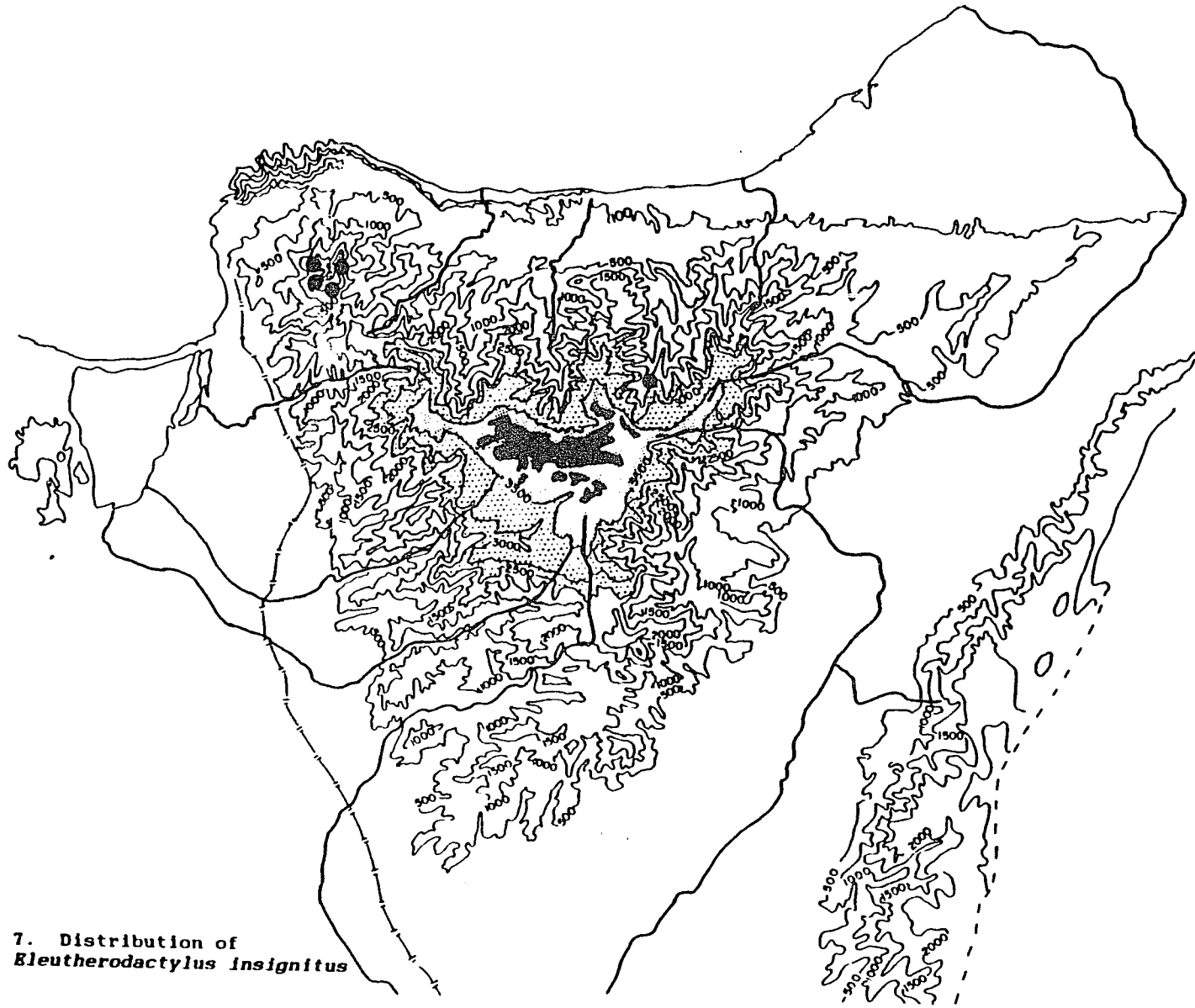






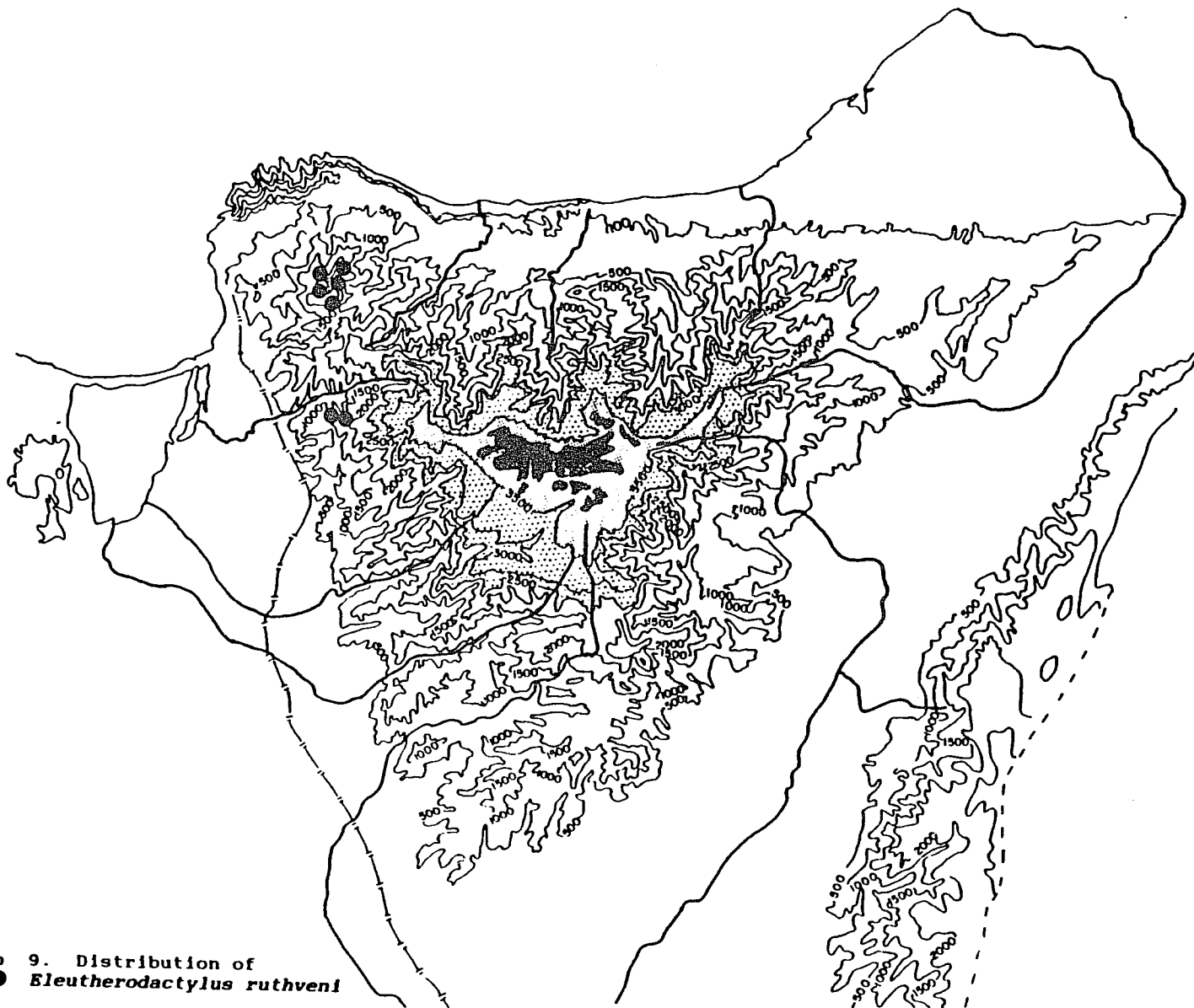
Map 5. Distribution of  
● *Eleutherodactylus cristinae*



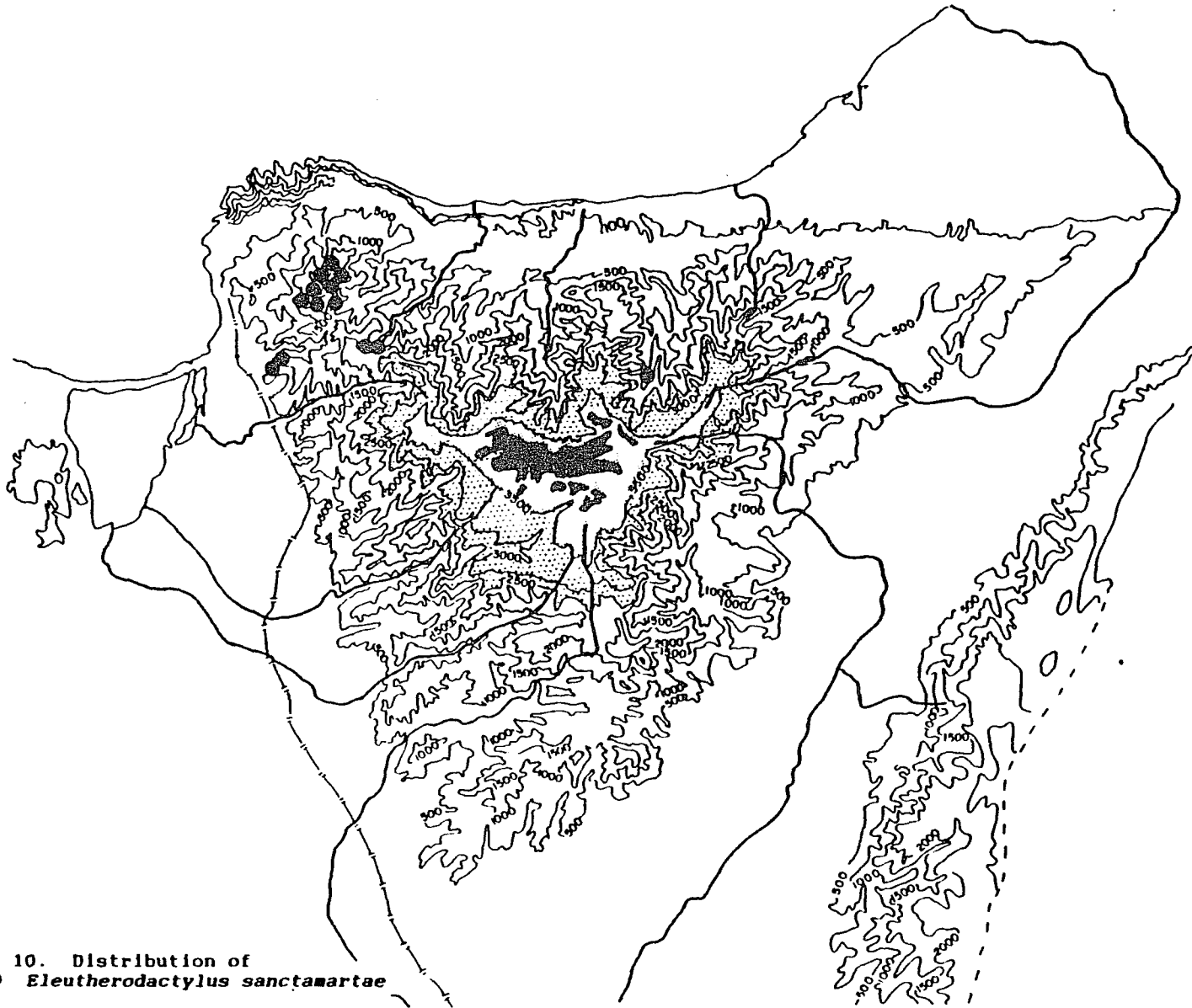


Map 7. Distribution of  
● *Eleutherodactylus insignitus*

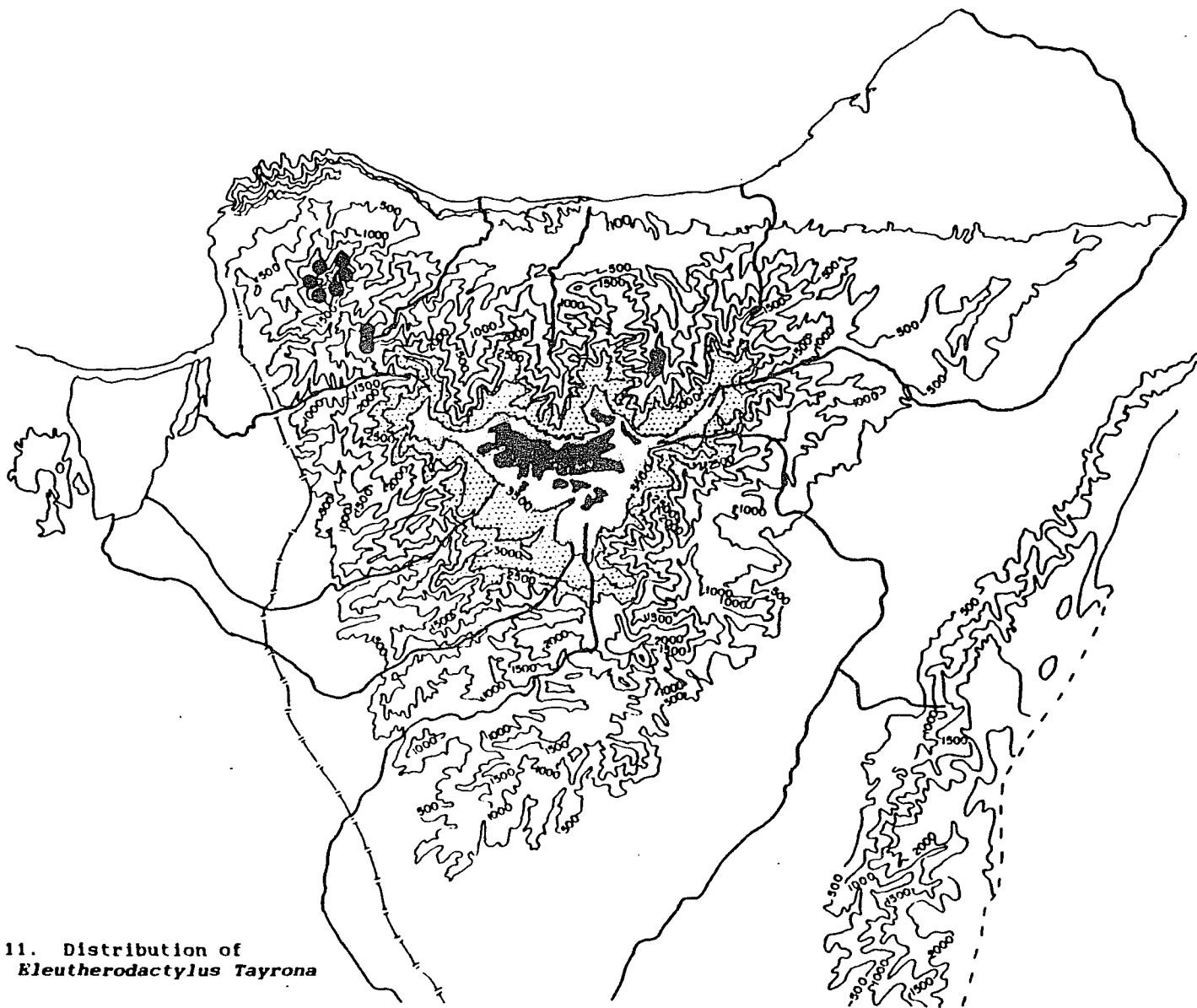




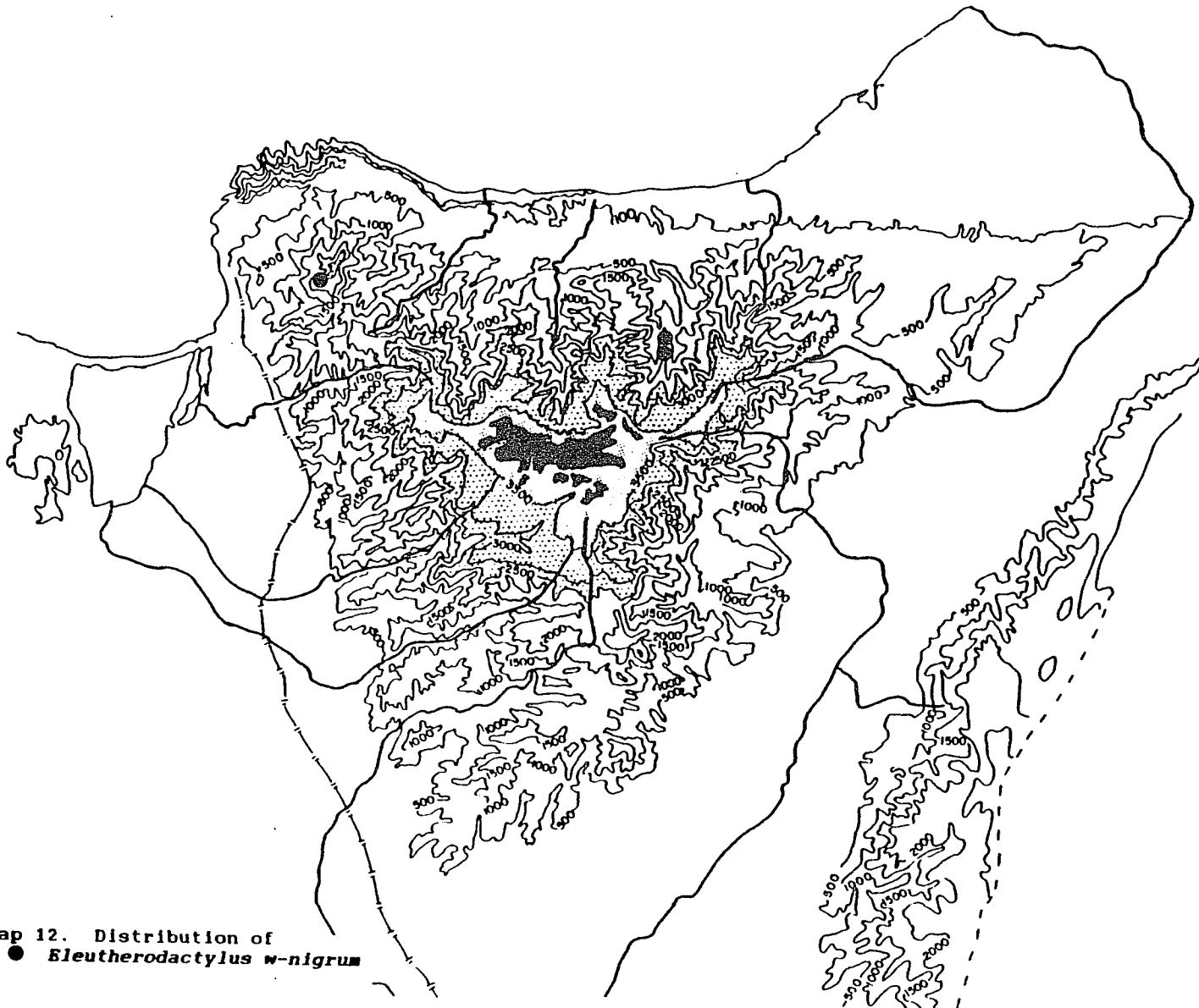
Map 9. Distribution of  
● *Eleutherodactylus ruthveni*



Map 10. Distribution of  
● *Eleutherodactylus sanctamartae*

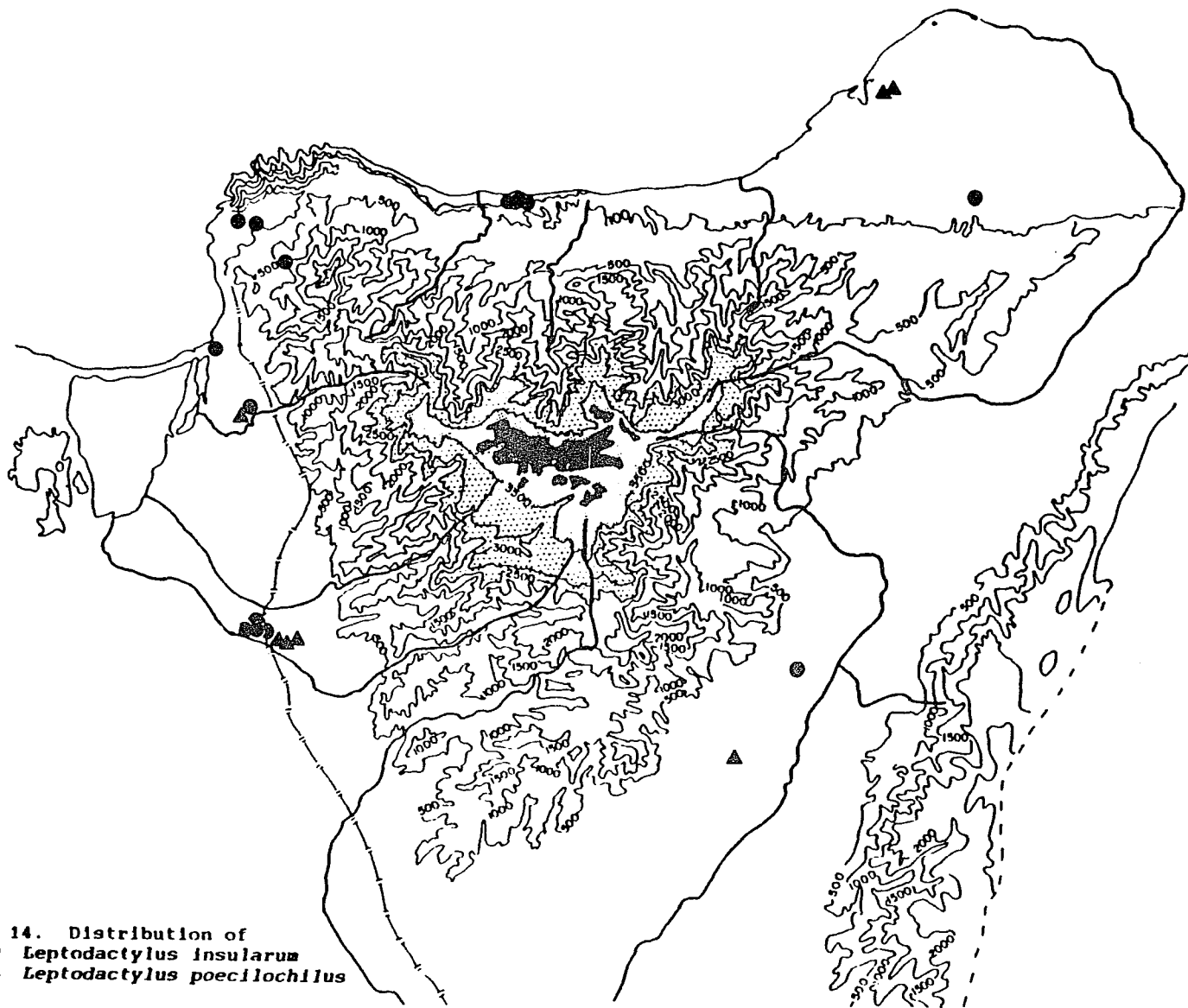


Map 11. Distribution of  
● *Eleutherodactylus Tayrona*

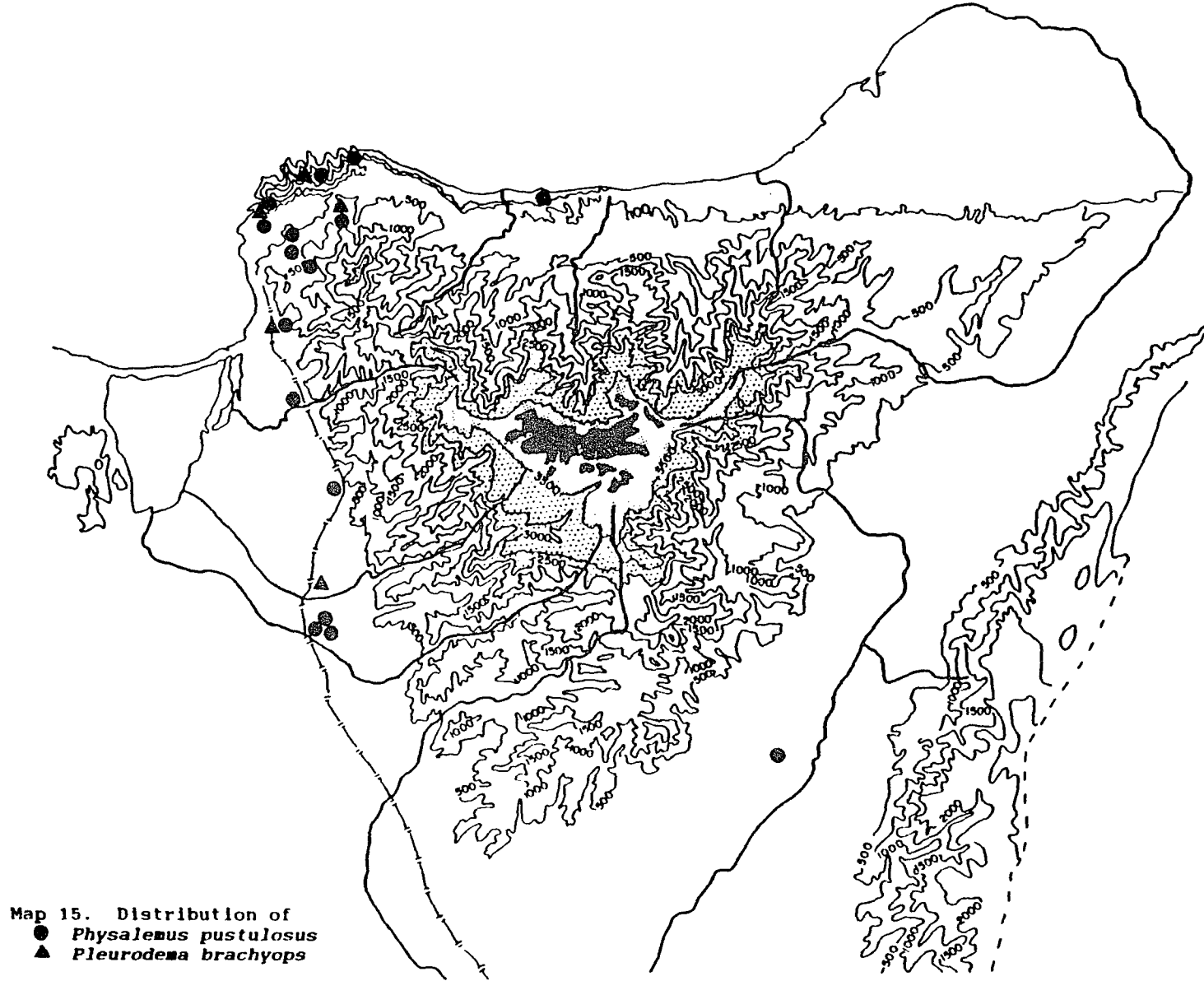


Map 12. Distribution of  
● *Eleutherodactylus w-nigrum*

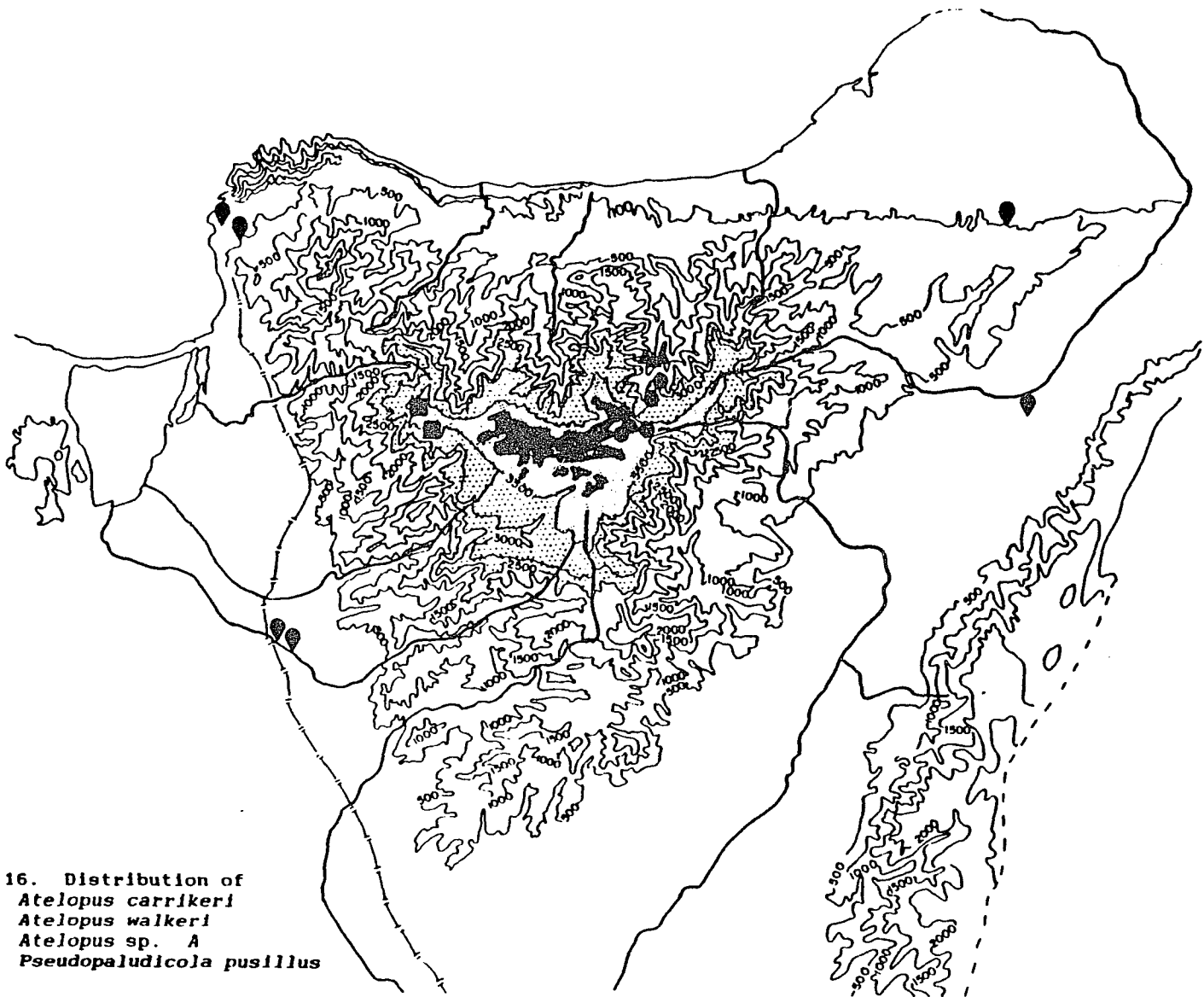


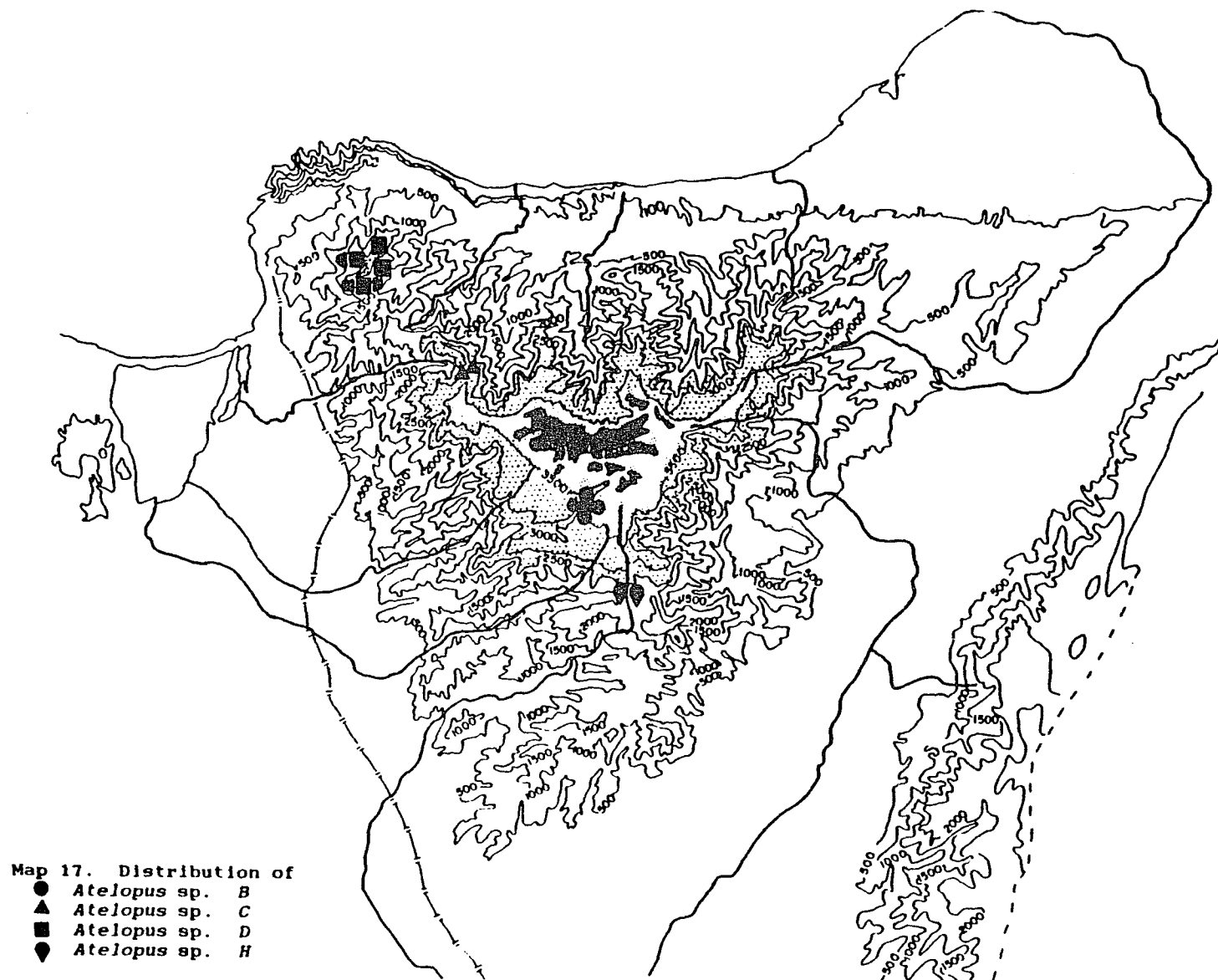


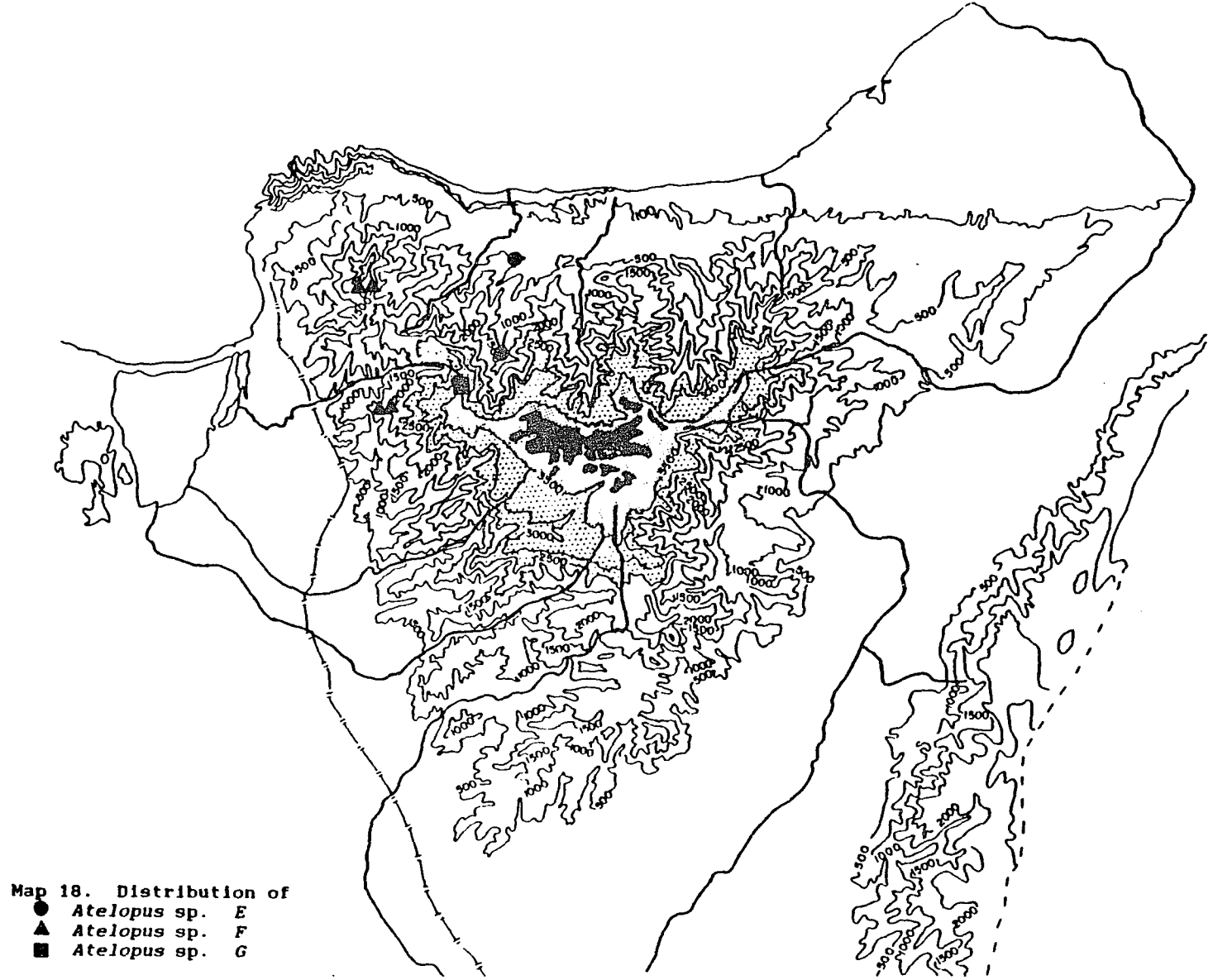
Map 14. Distribution of  
● *Leptodactylus insularum*  
▲ *Leptodactylus poecilochilus*



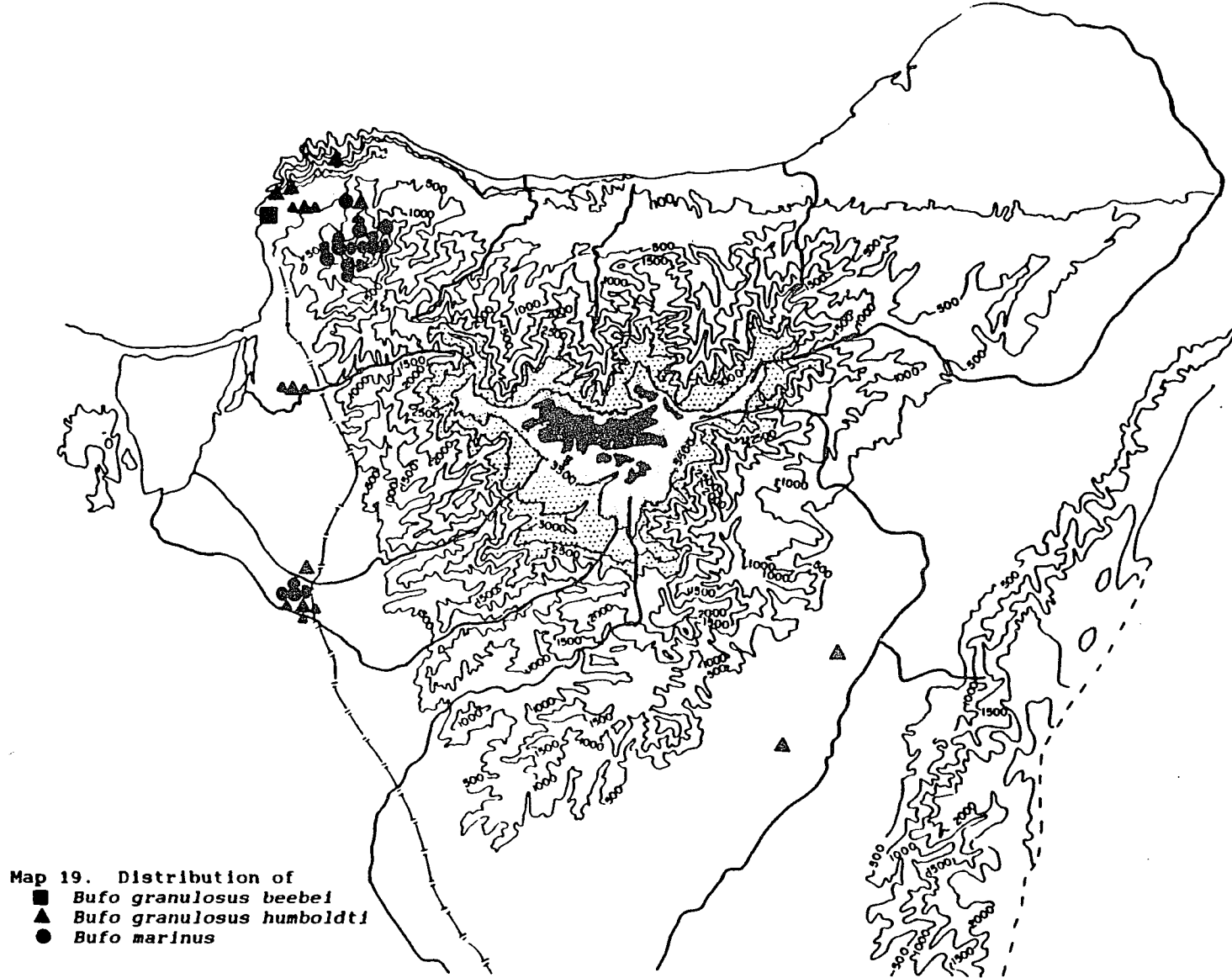
Map 16. Distribution of  
● *Atelopus carrikeri*  
▲ *Atelopus walkeri*  
■ *Atelopus* sp. A  
◆ *Pseudopaludicola pusillus*

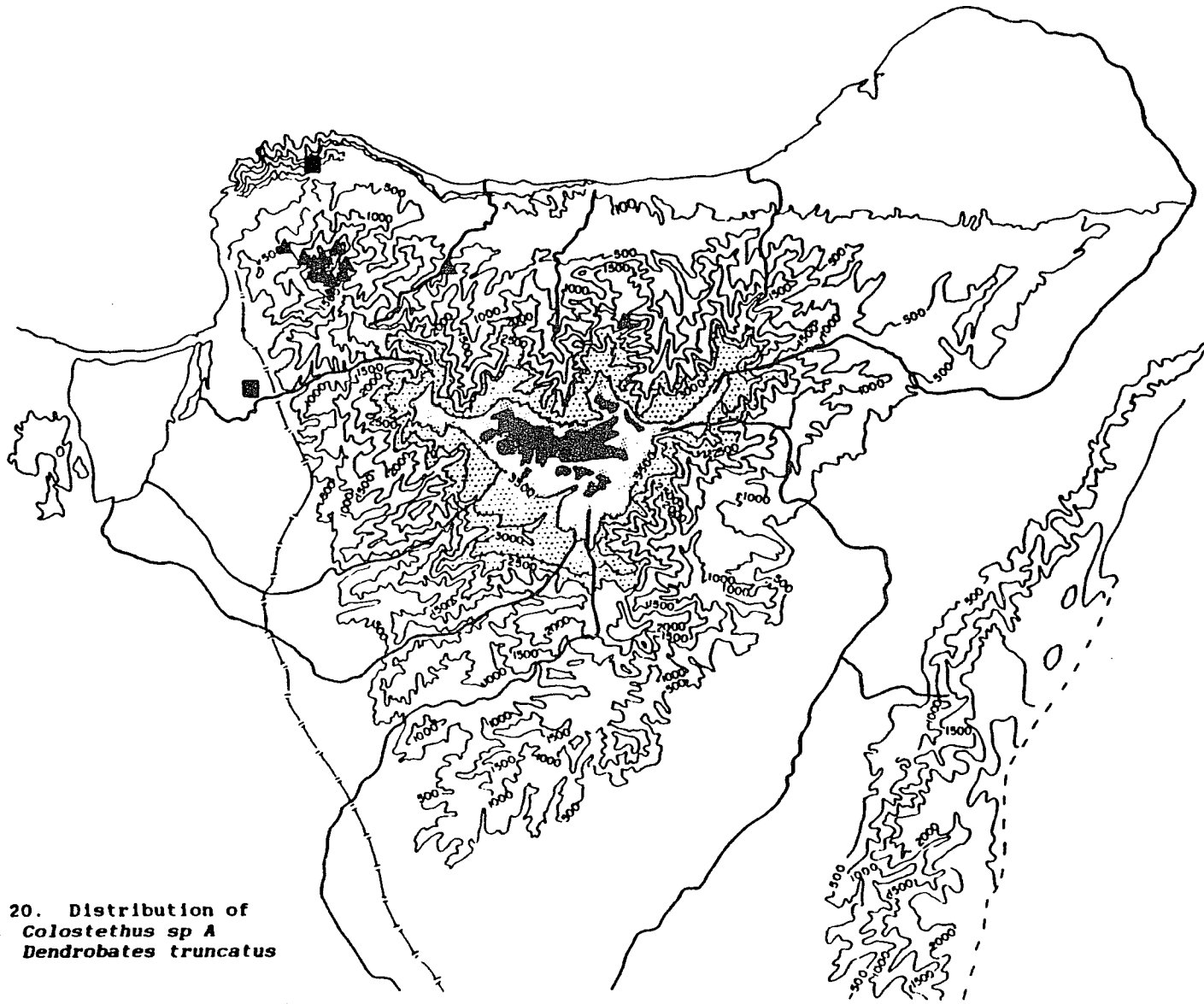




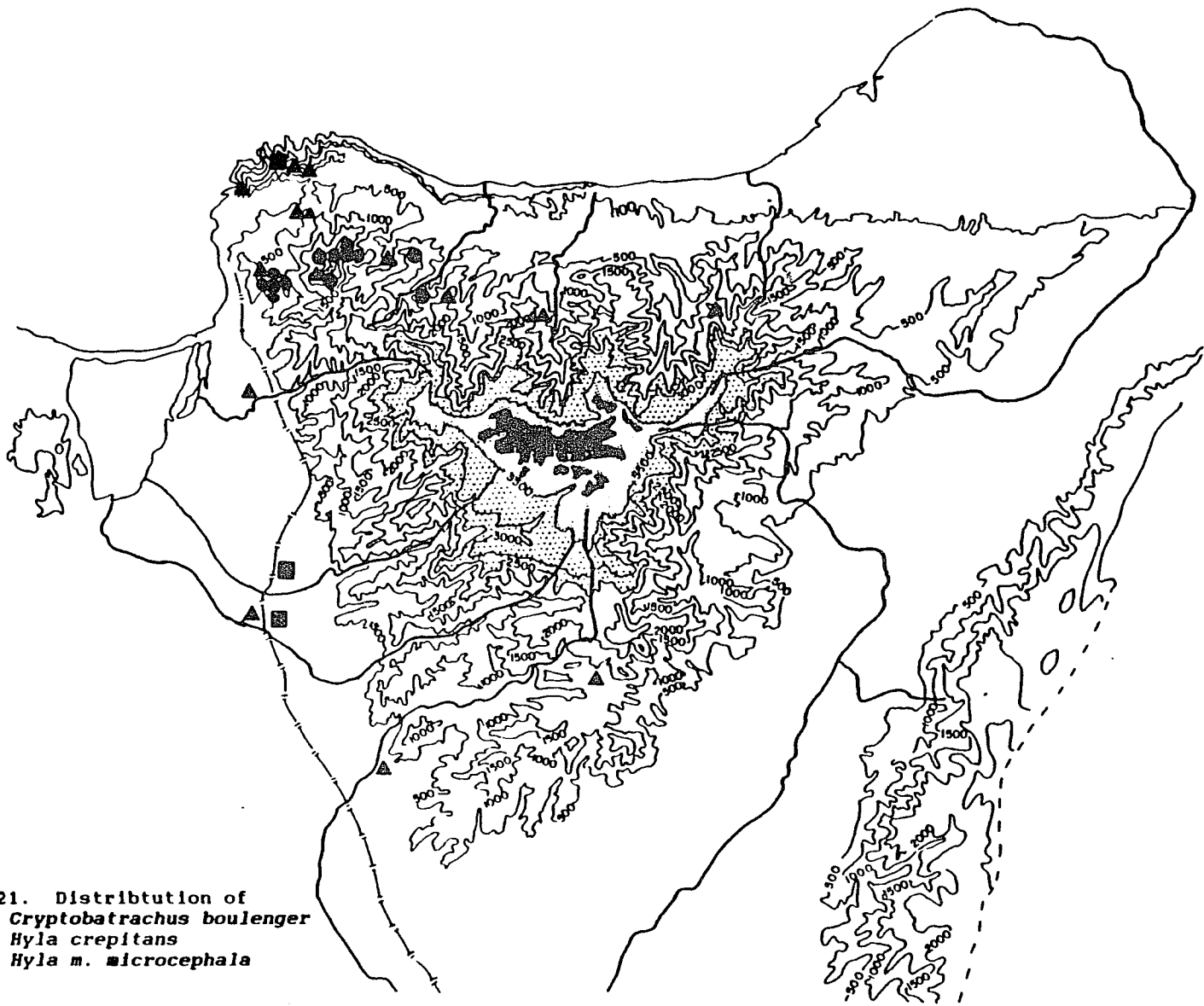


Map 18. Distribution of  
● *Atelopus* sp. E  
▲ *Atelopus* sp. F  
■ *Atelopus* sp. G

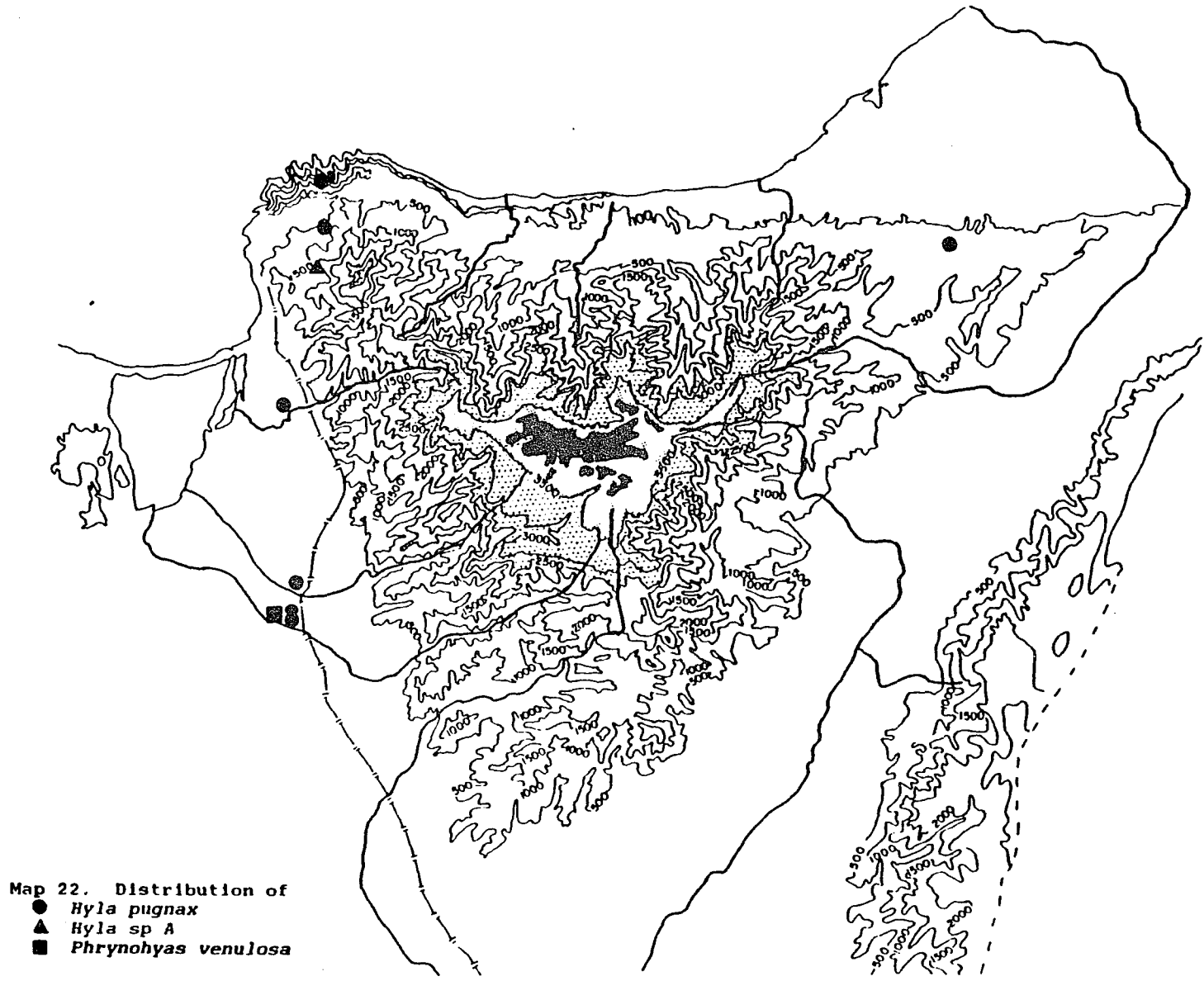




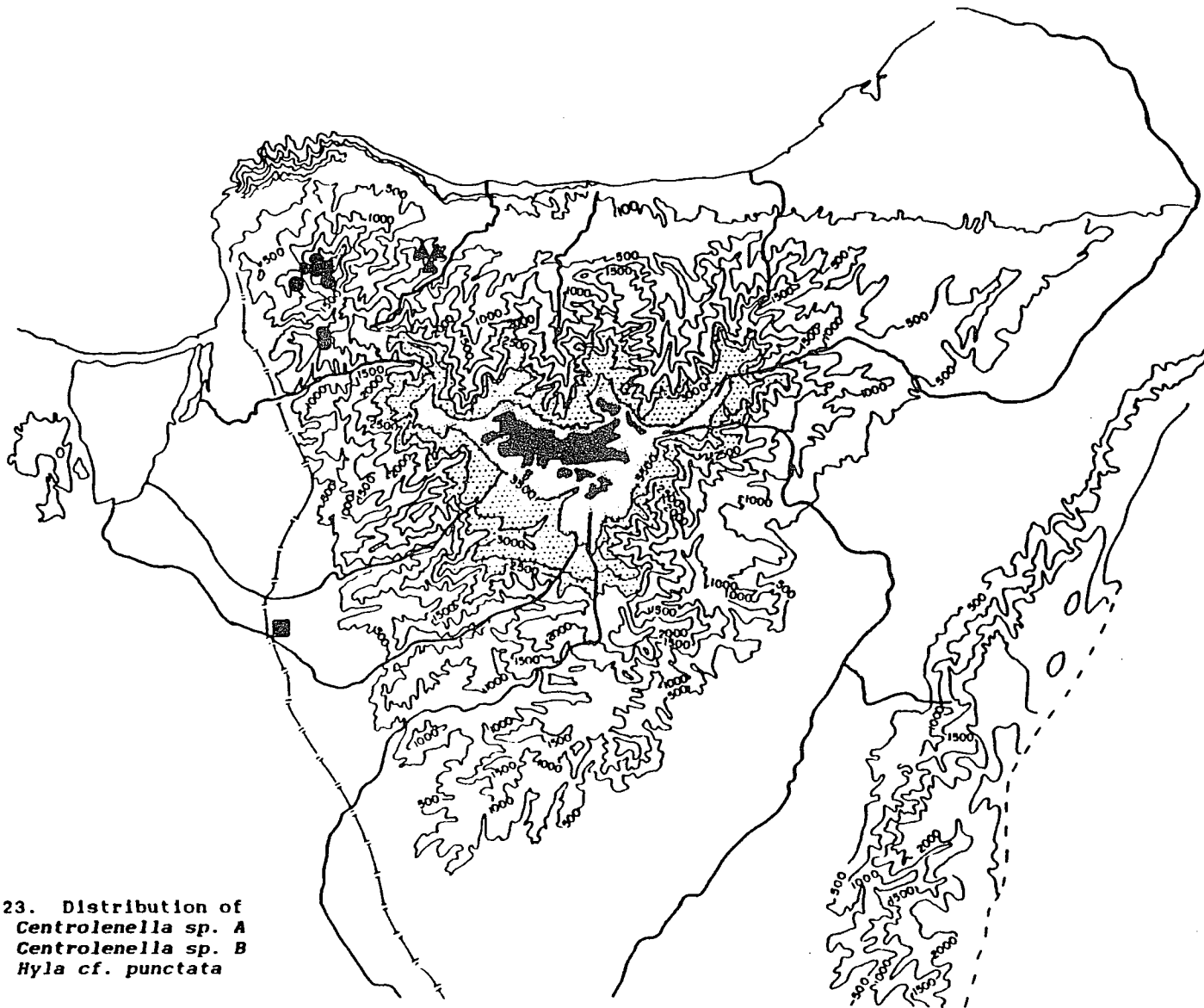
Map 20. Distribution of  
▲ *Colostethus sp A*  
■ *Dendrobates truncatus*



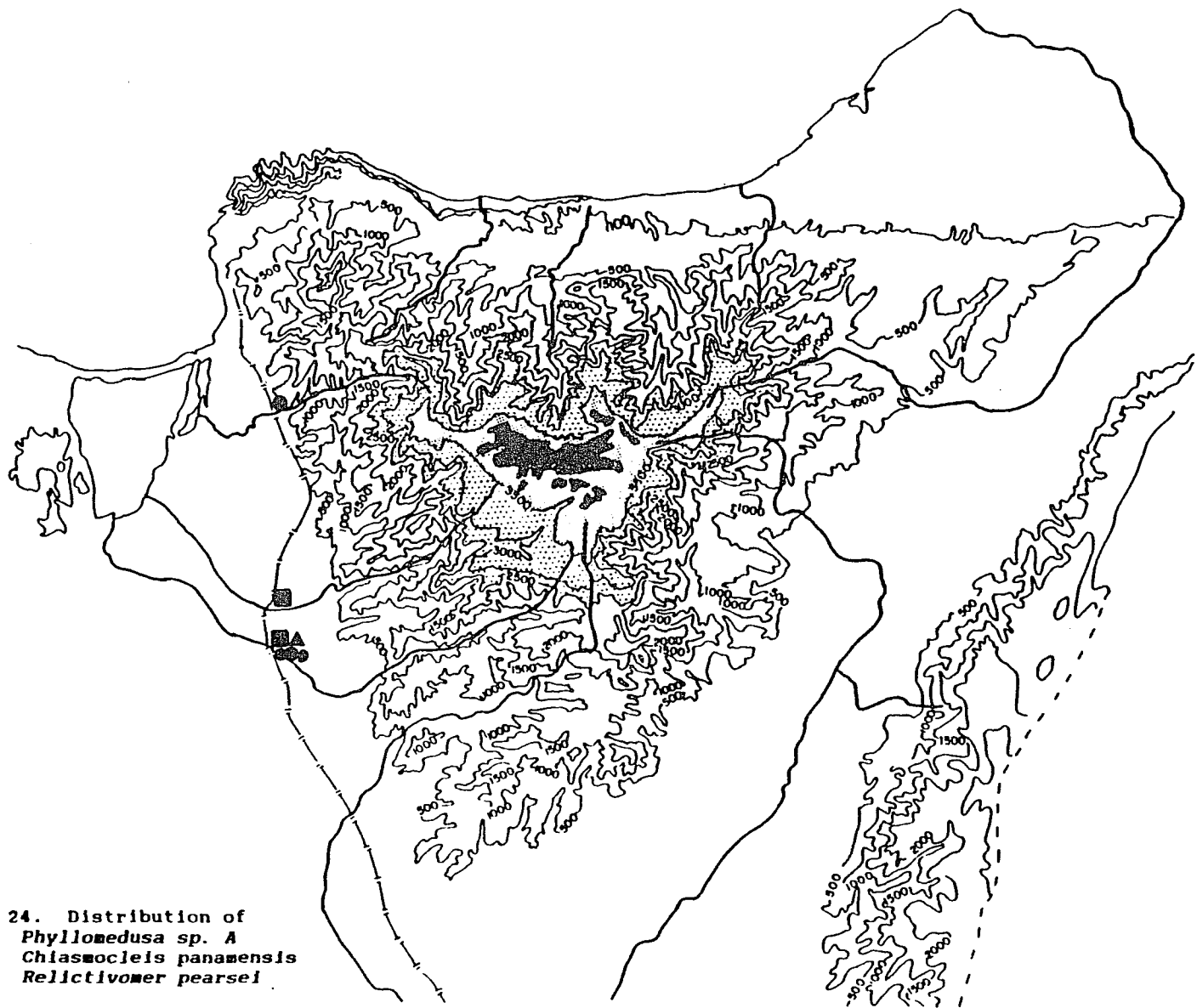
Map 21. Distribution of  
● *Cryptobatrachus boulenger*  
▲ *Hyla crepitans*  
■ *Hyla m. microcephala*



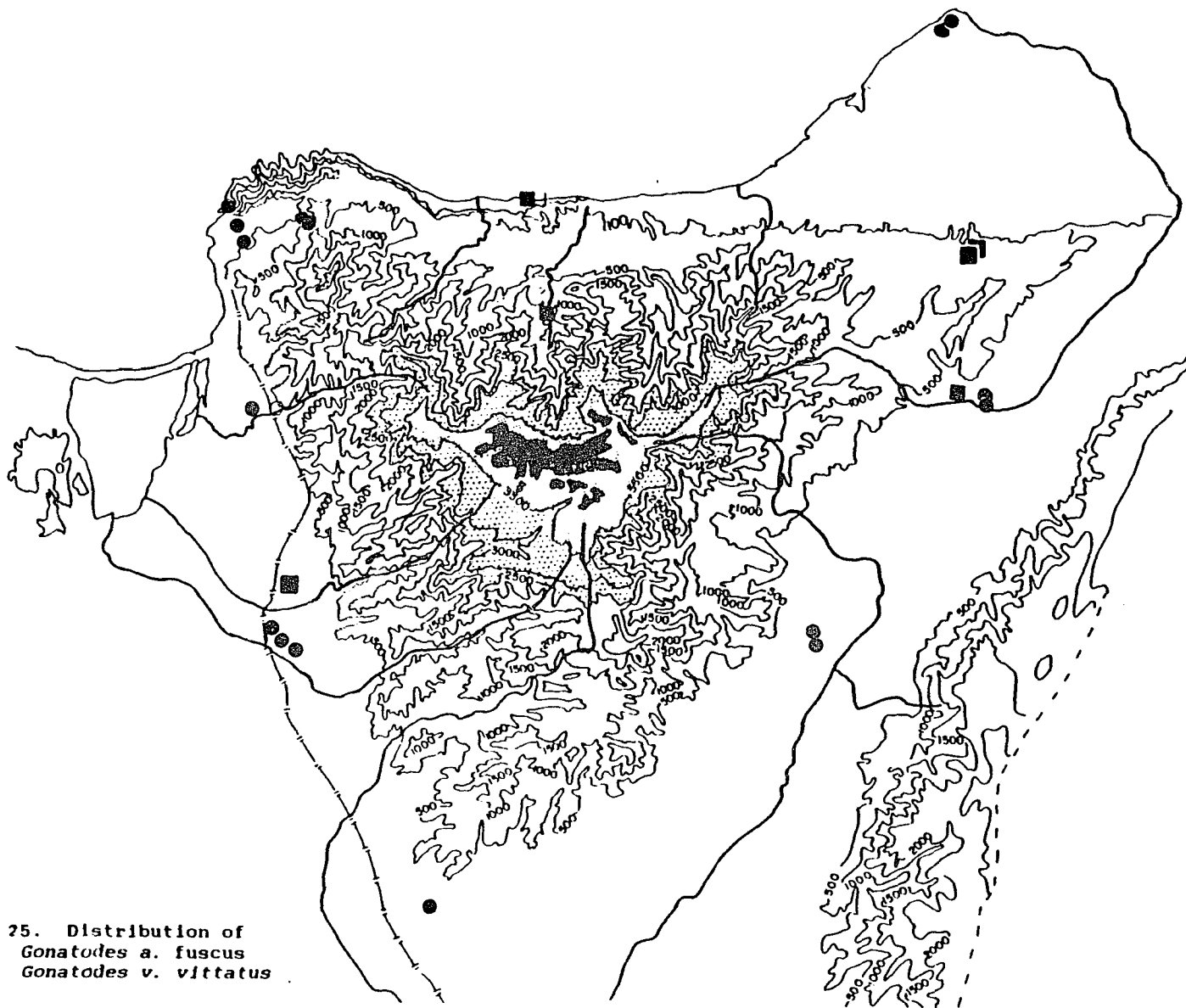
Map 22. Distribution of  
 ● *Hyla pugnax*  
 ▲ *Hyla sp A*  
 ■ *Phrynohyas venulosa*



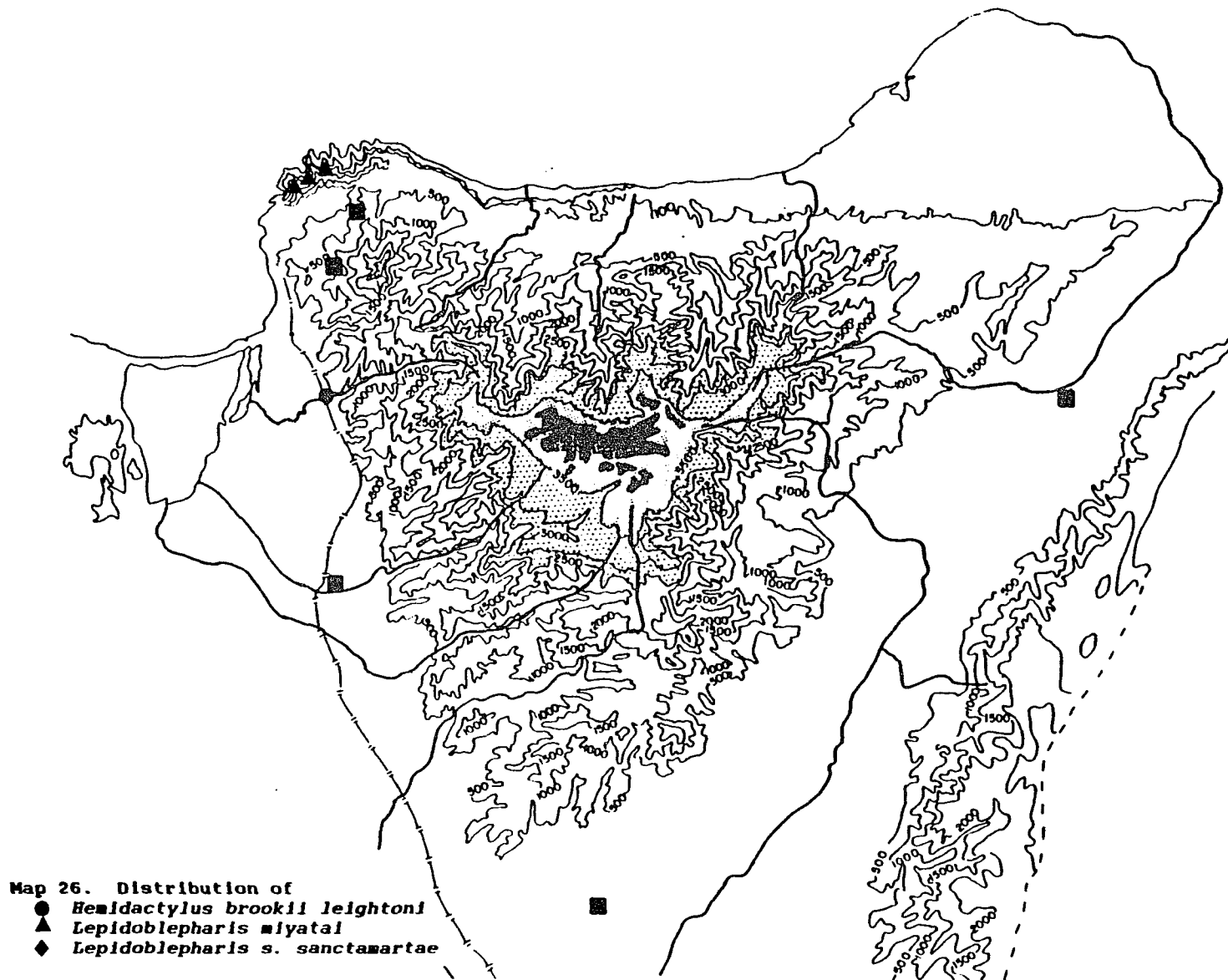
Map 23. Distribution of  
● *Centrolenella* sp. A  
▲ *Centrolenella* sp. B  
■ *Hyla* cf. *punctata*



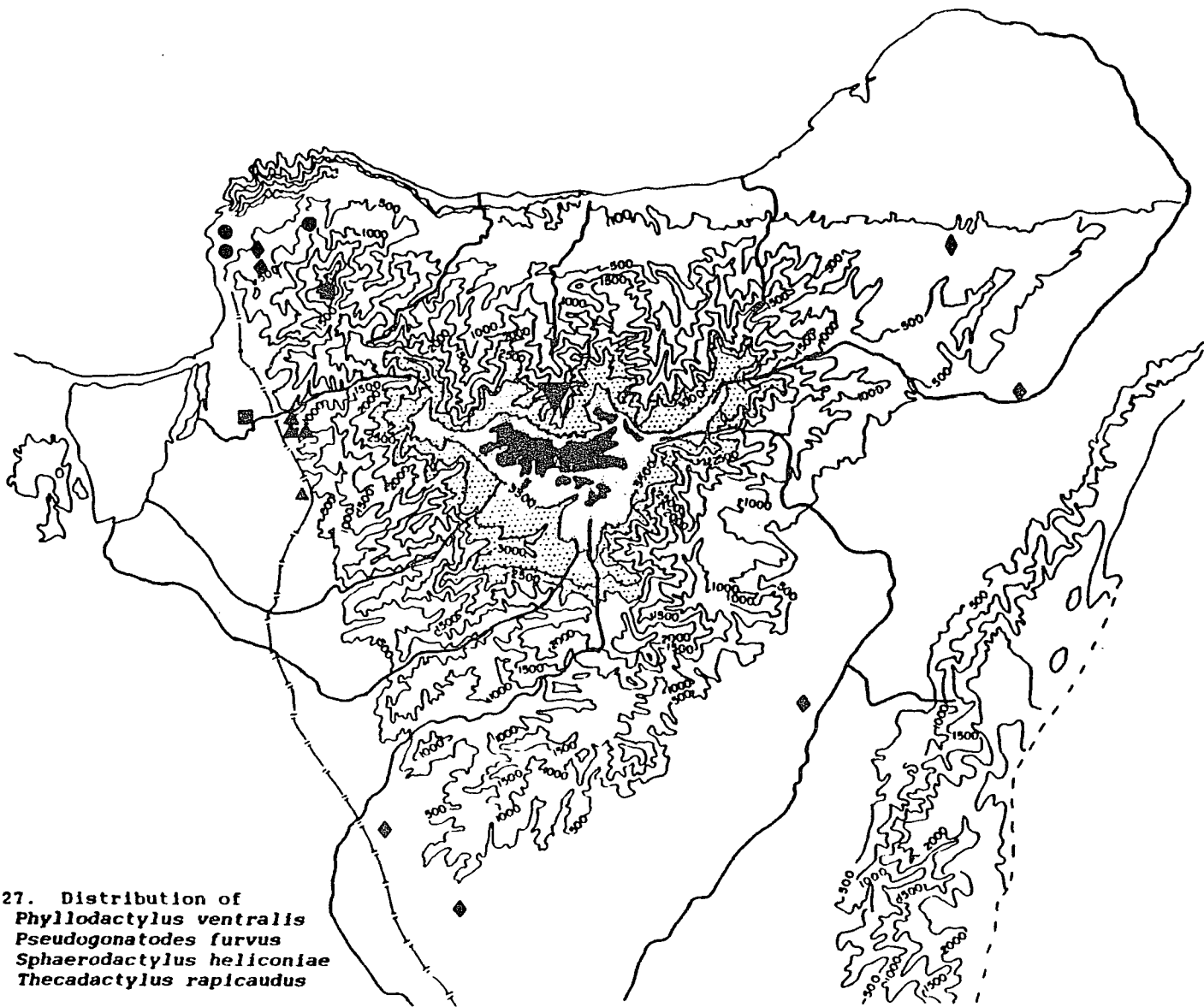
Map 24. Distribution of  
■ *Phyllomedusa* sp. A  
▲ *Chiasmocleis panamensis*  
● *Relictivomer pearsei*



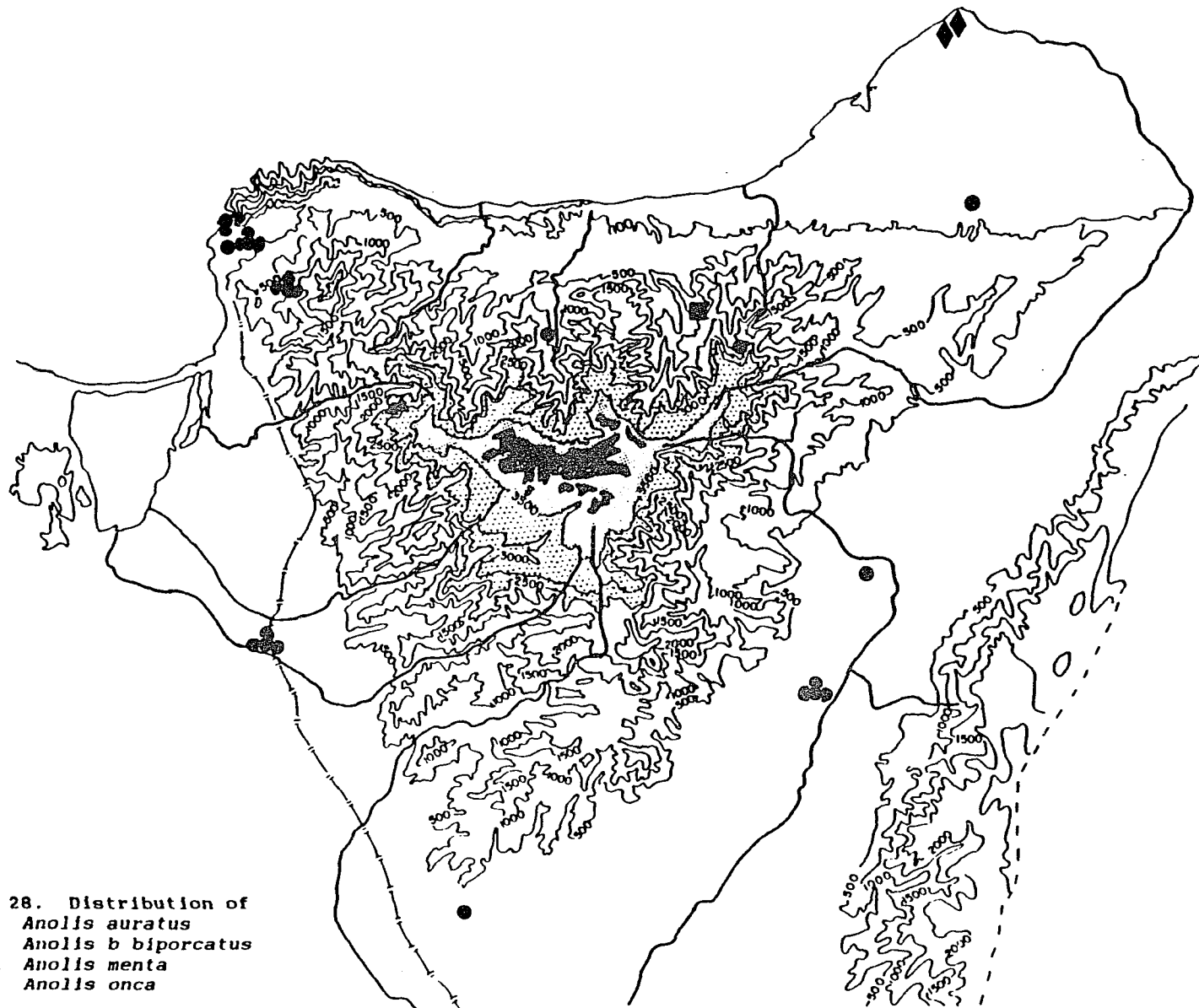
Map 25. Distribution of  
● *Gonatodes a. fuscus*  
■ *Gonatodes v. vittatus*

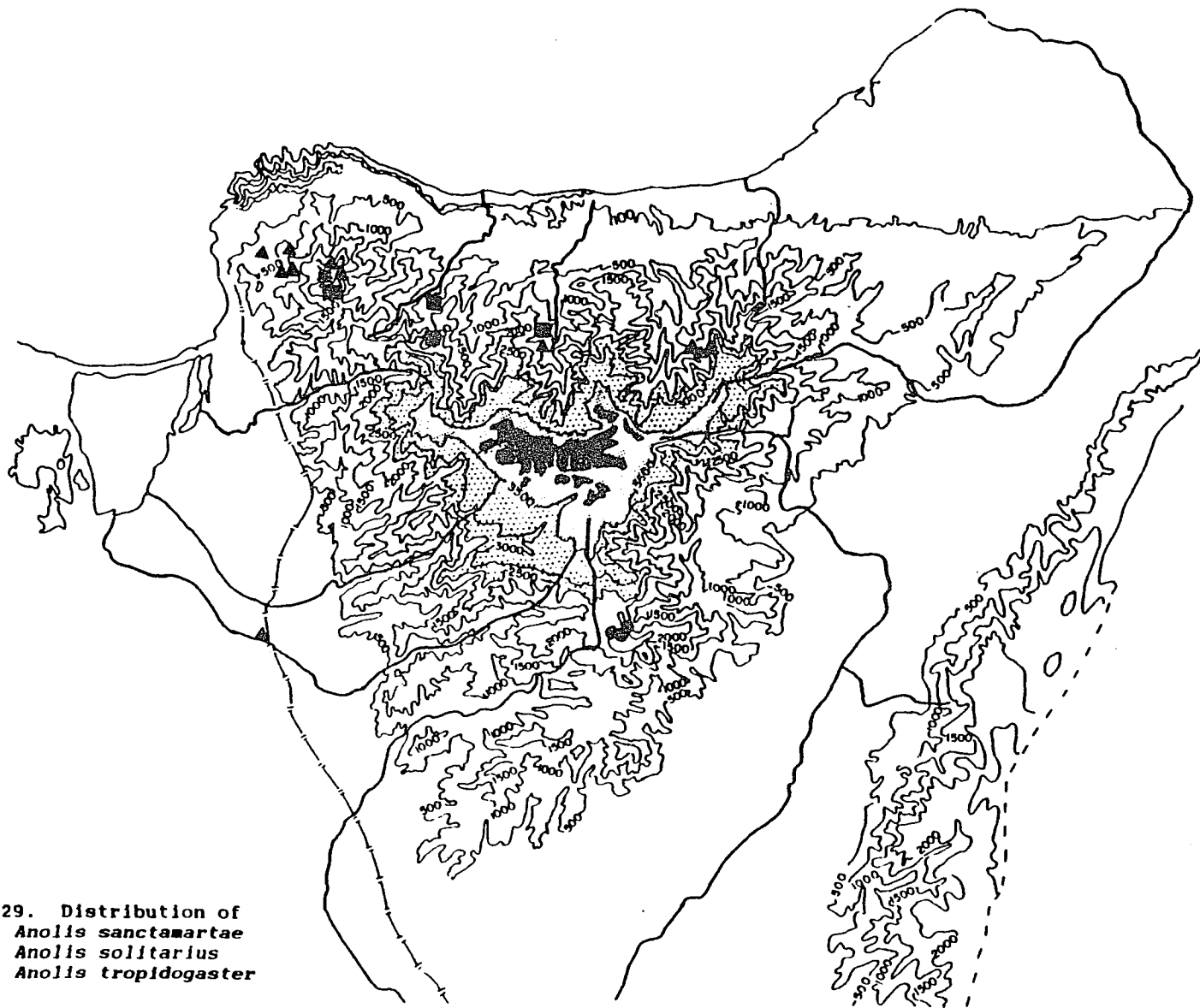


Map 27. Distribution of  
● *Phyllodactylus ventralis*  
■ *Pseudogonatodes furvus*  
▲ *Sphaerodactylus heliconiae*  
◆ *Thecadactylus rapicaudus*

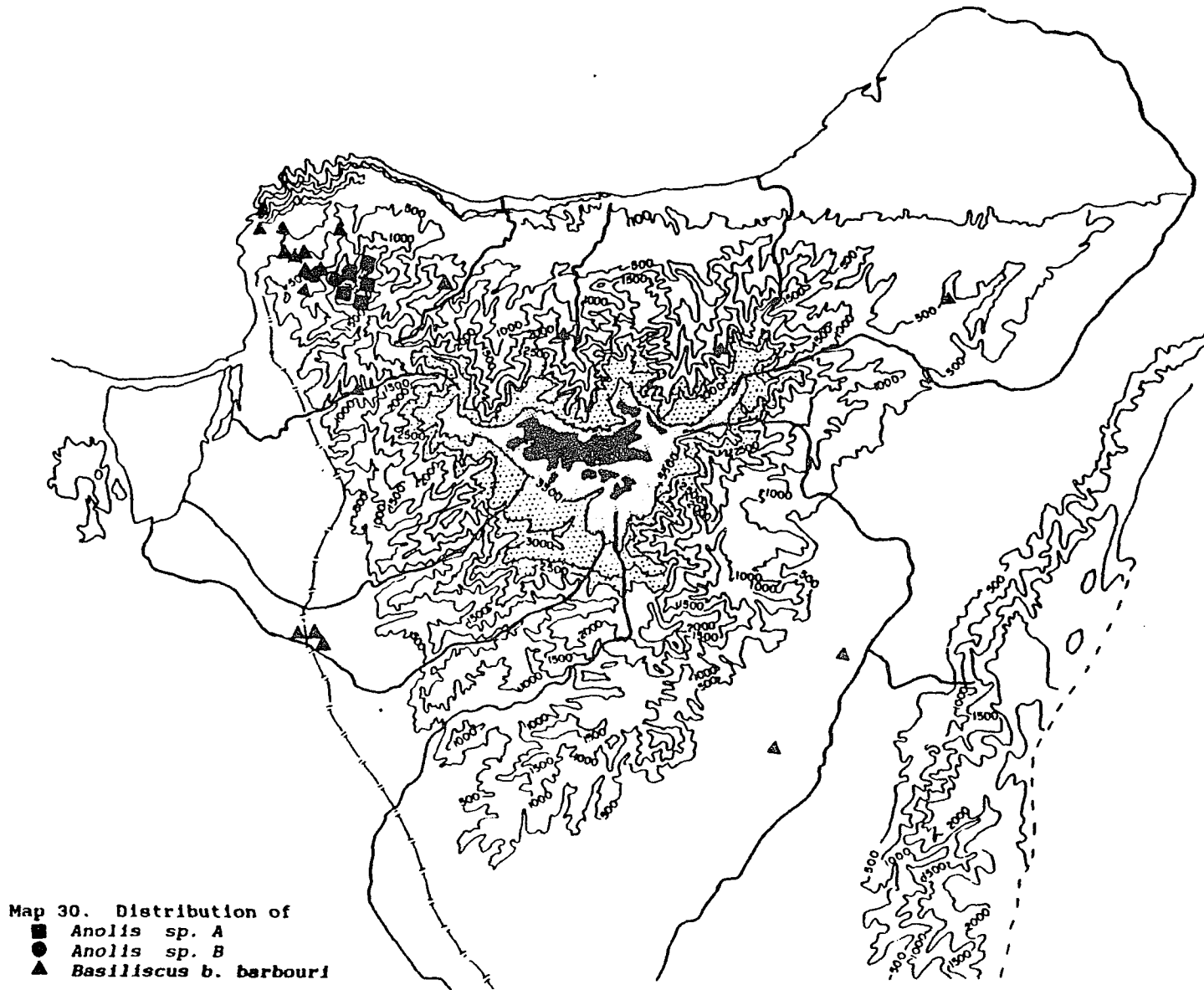


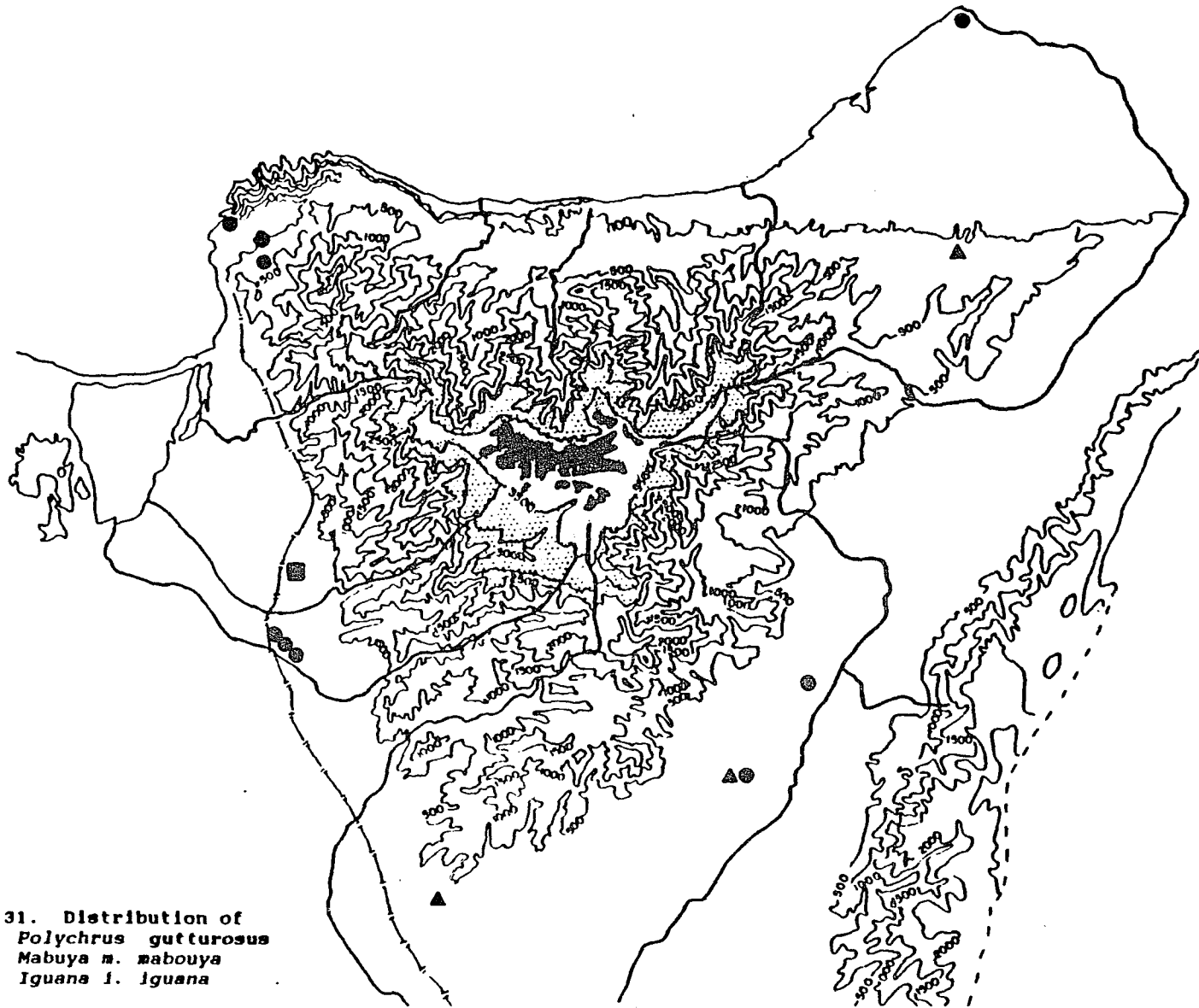
Map 28. Distribution of  
● *Anolis auratus*  
■ *Anolis b biporcatus*  
▲ *Anolis menta*  
◆ *Anolis onca*





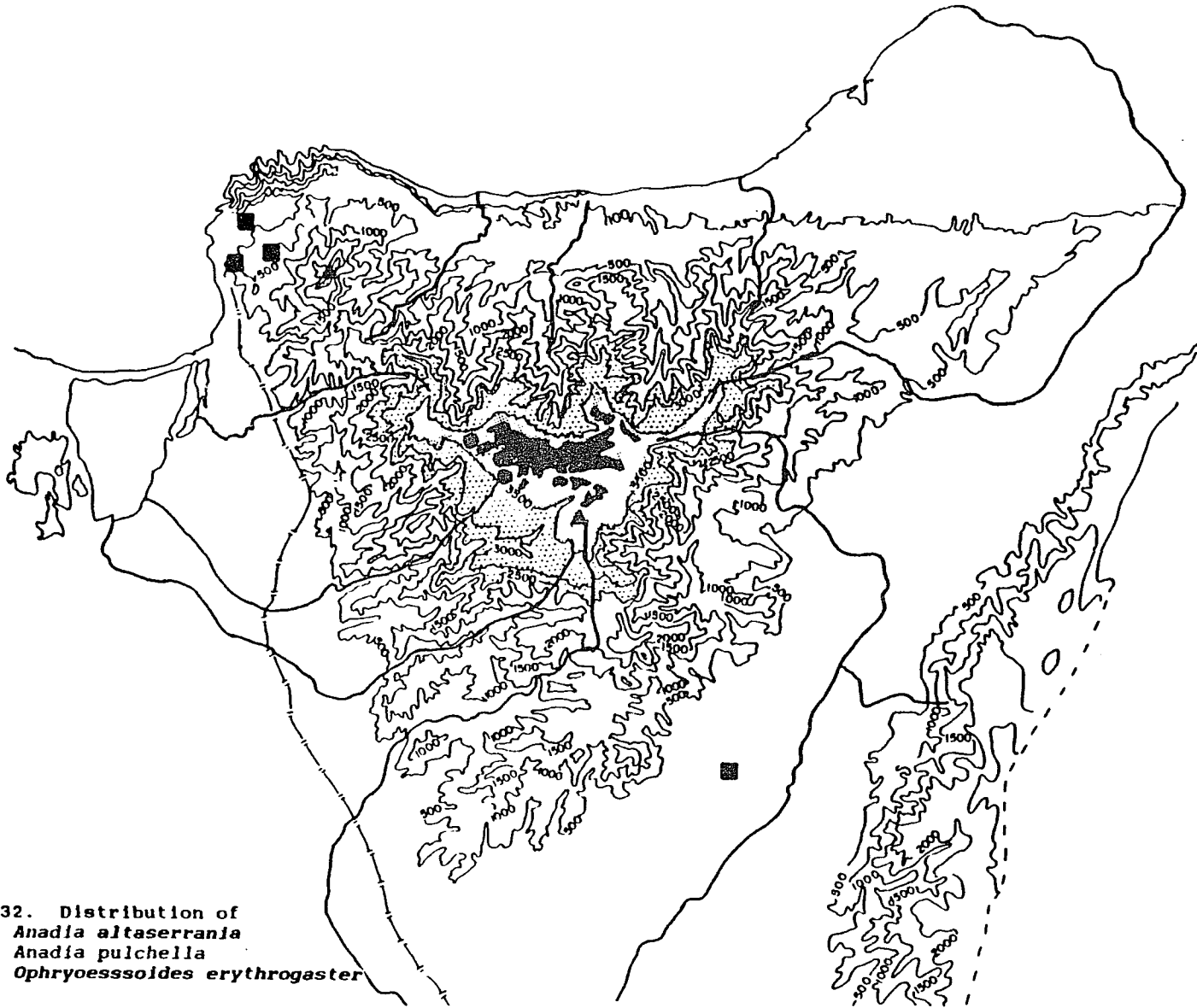
Map 29. Distribution of  
● *Anolis sanctamartae*  
■ *Anolis solitarius*  
▲ *Anolis tropidogaster*

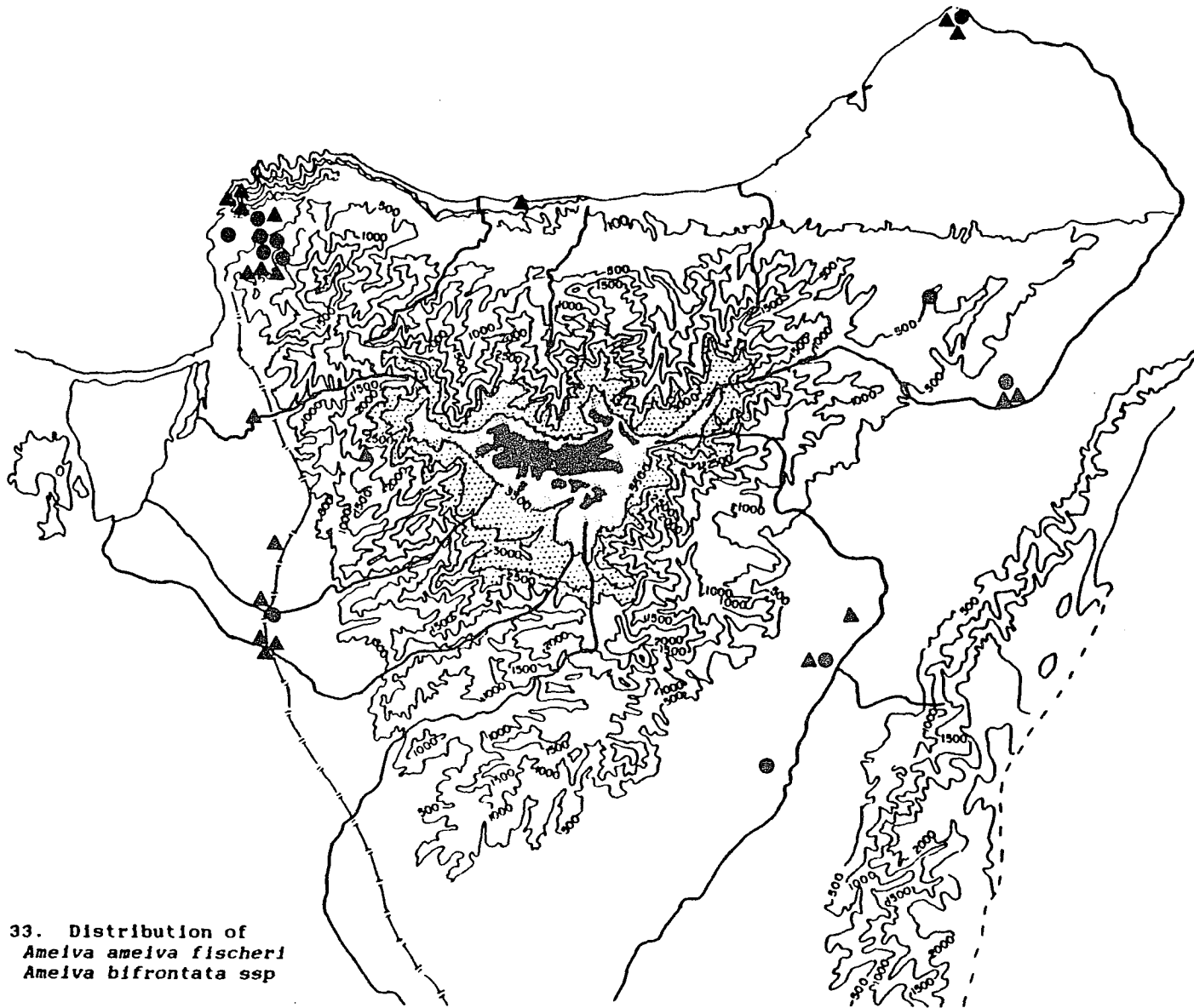




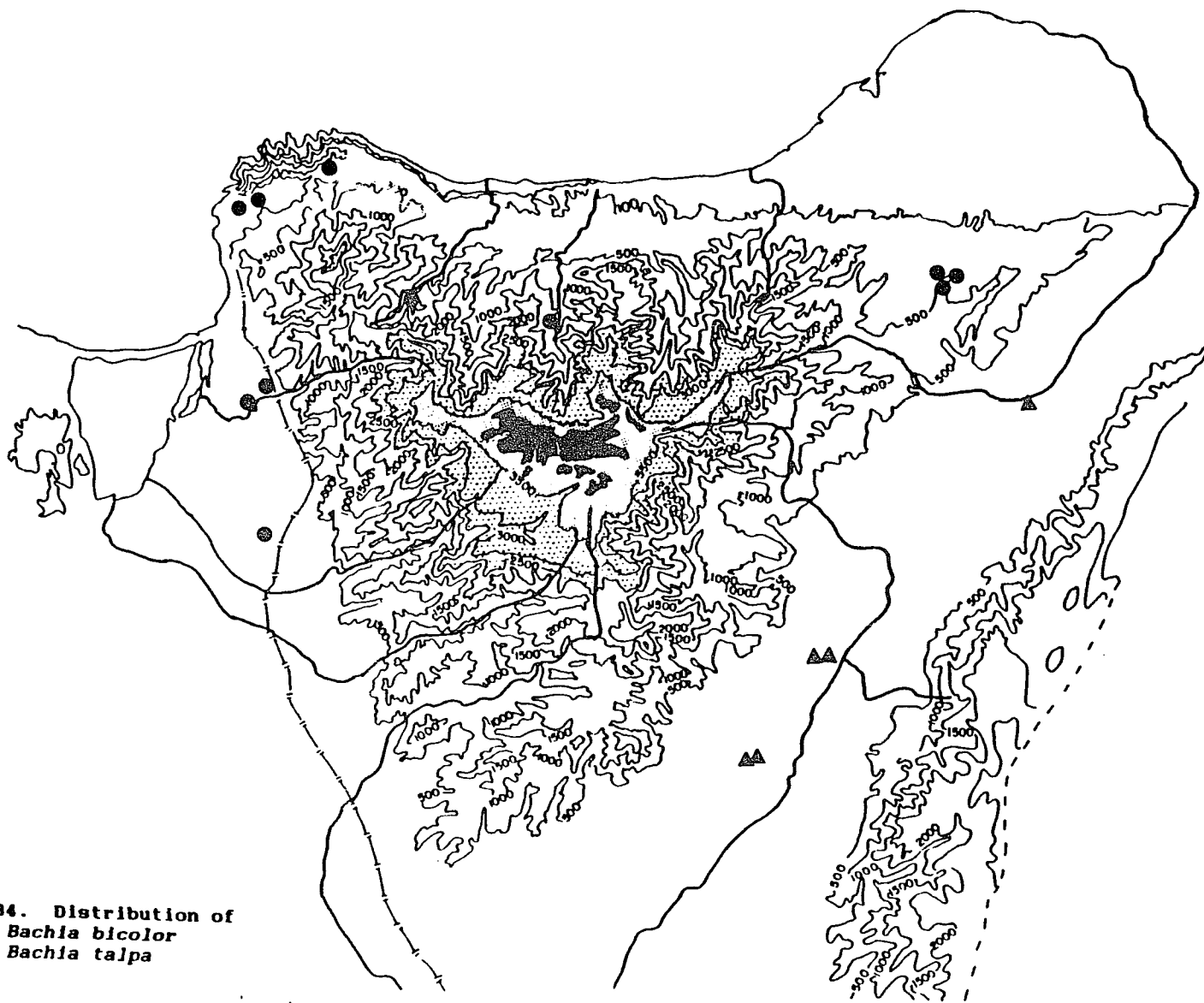
Map 31. Distribution of  
 ■ *Polychrus gutturosus*  
 ▲ *Mabuya m. mabouya*  
 ● *Iguana l. iguana*

Map 32. Distribution of  
● *Anadia altaserrania*  
▲ *Anadia pulchella*  
■ *Ophryoessoides erythrogaster*

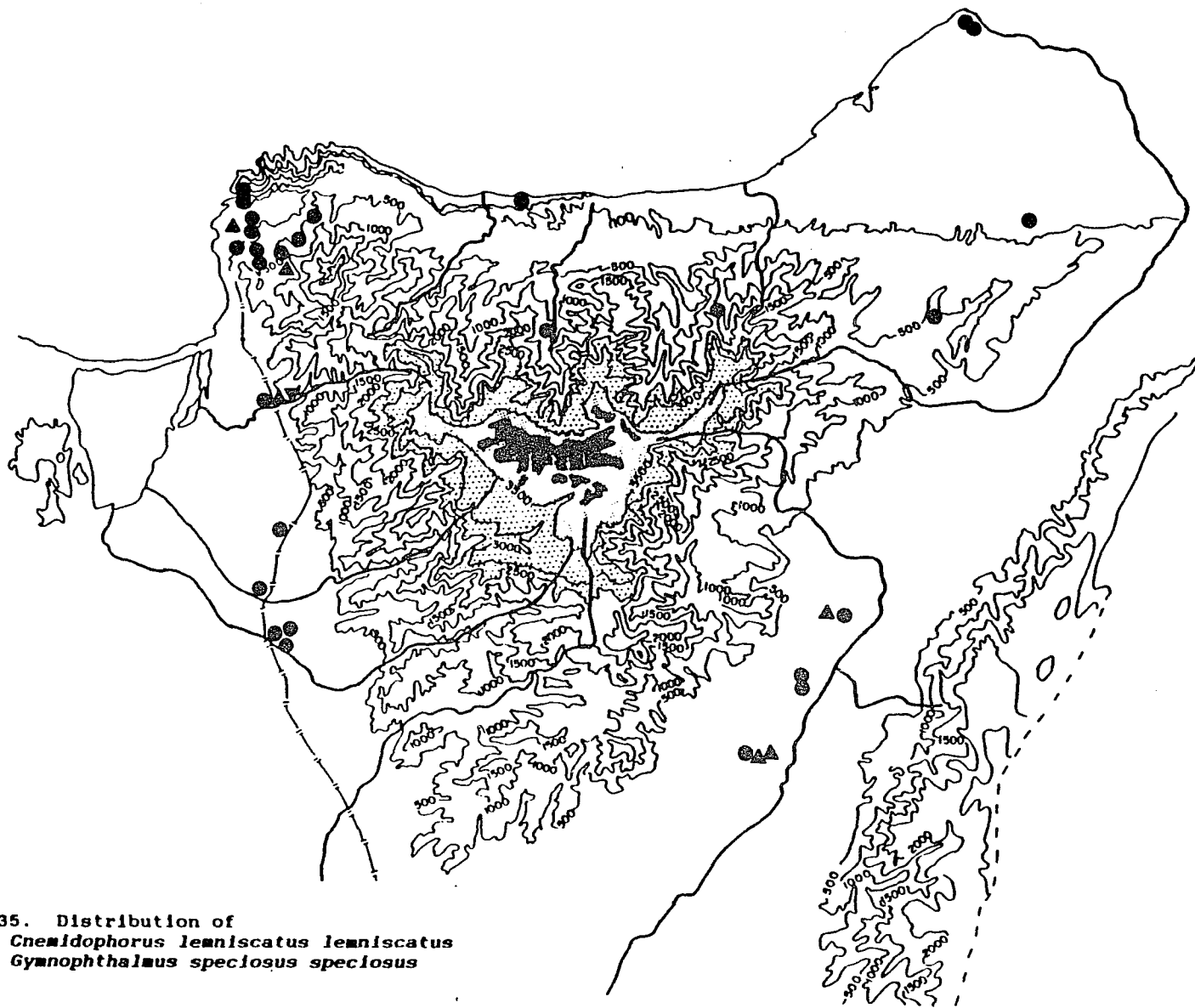


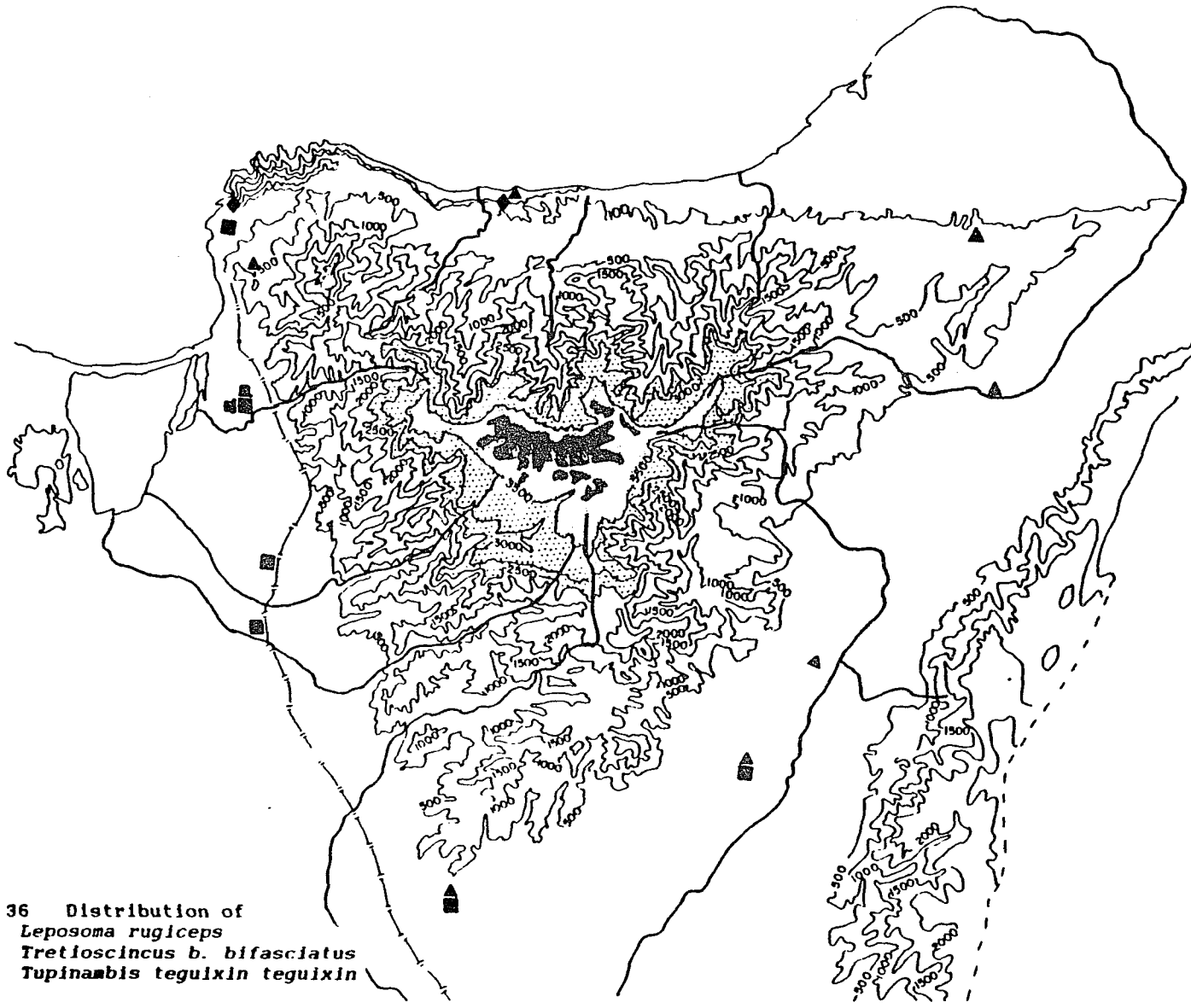


Map 33. Distribution of  
● *Ameiva ameiva fischeri*  
▲ *Ameiva bifrontata* ssp

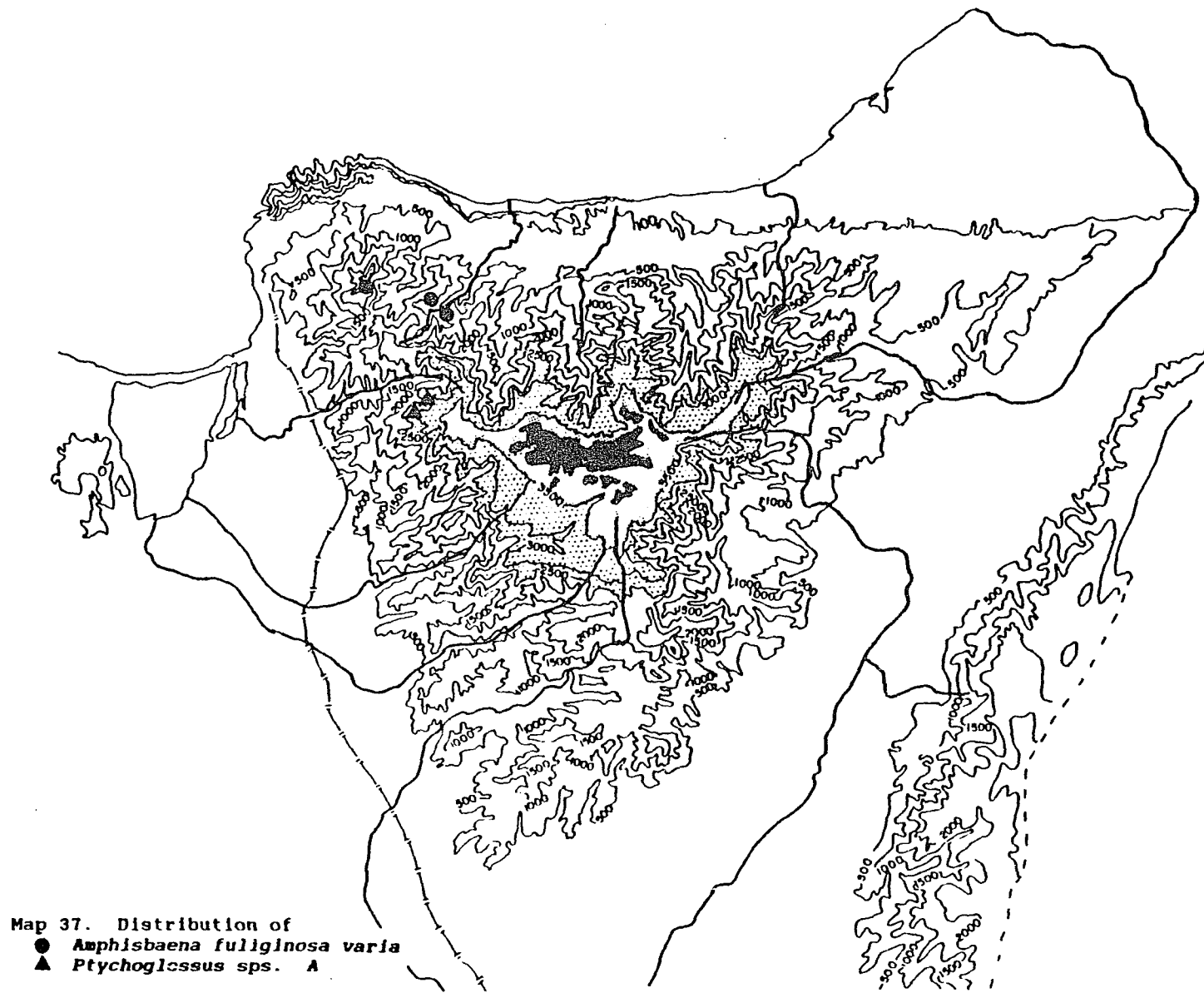


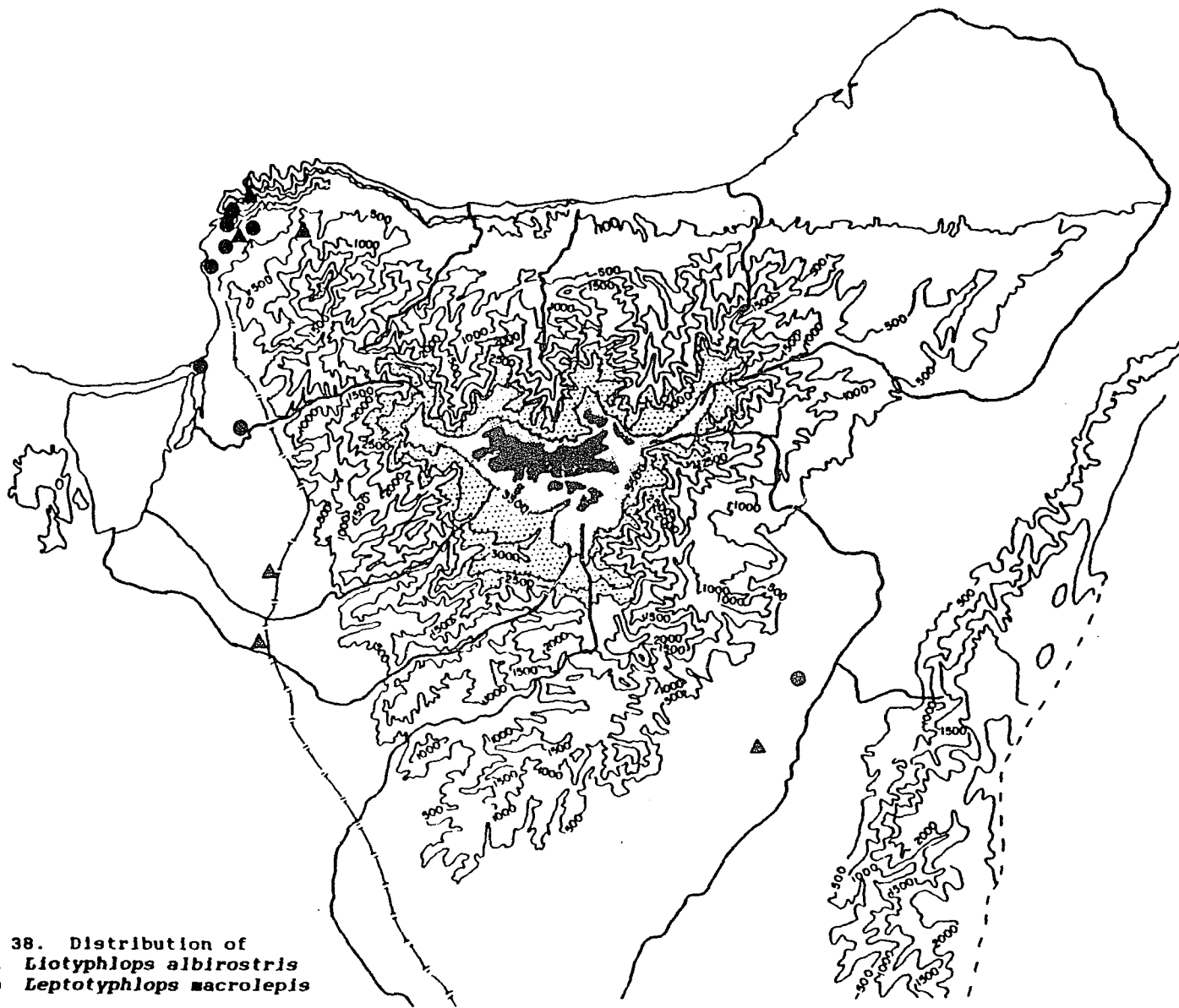
Map 34. Distribution of  
● *Bachia bicolor*  
▲ *Bachia talpa*



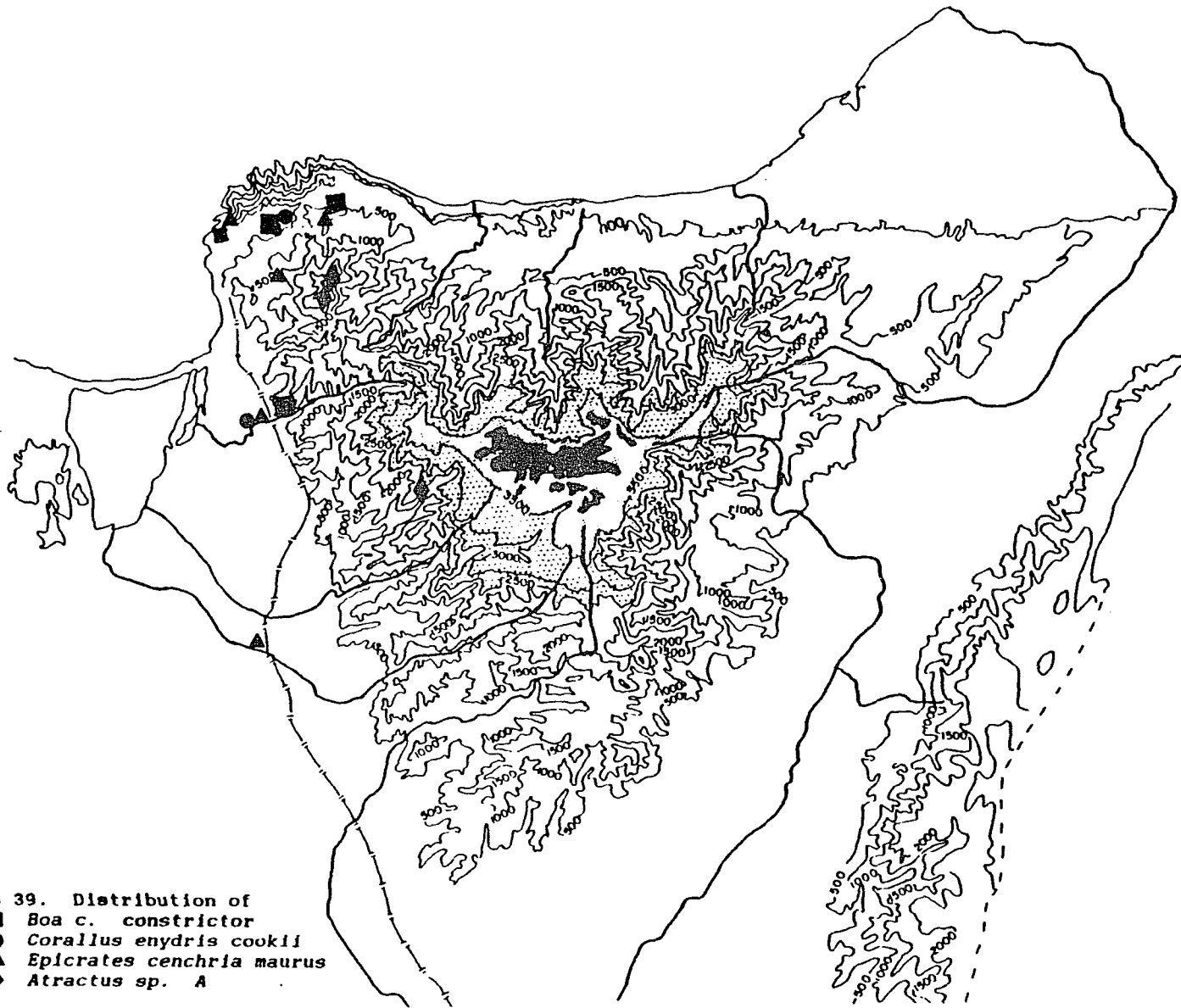


Map 36 Distribution of  
 ■ *Leposoma rugiceps*  
 ▲ *Tretioscincus b. bifasciatus*  
 ◆ *Tupinambis teguixin teguixin*

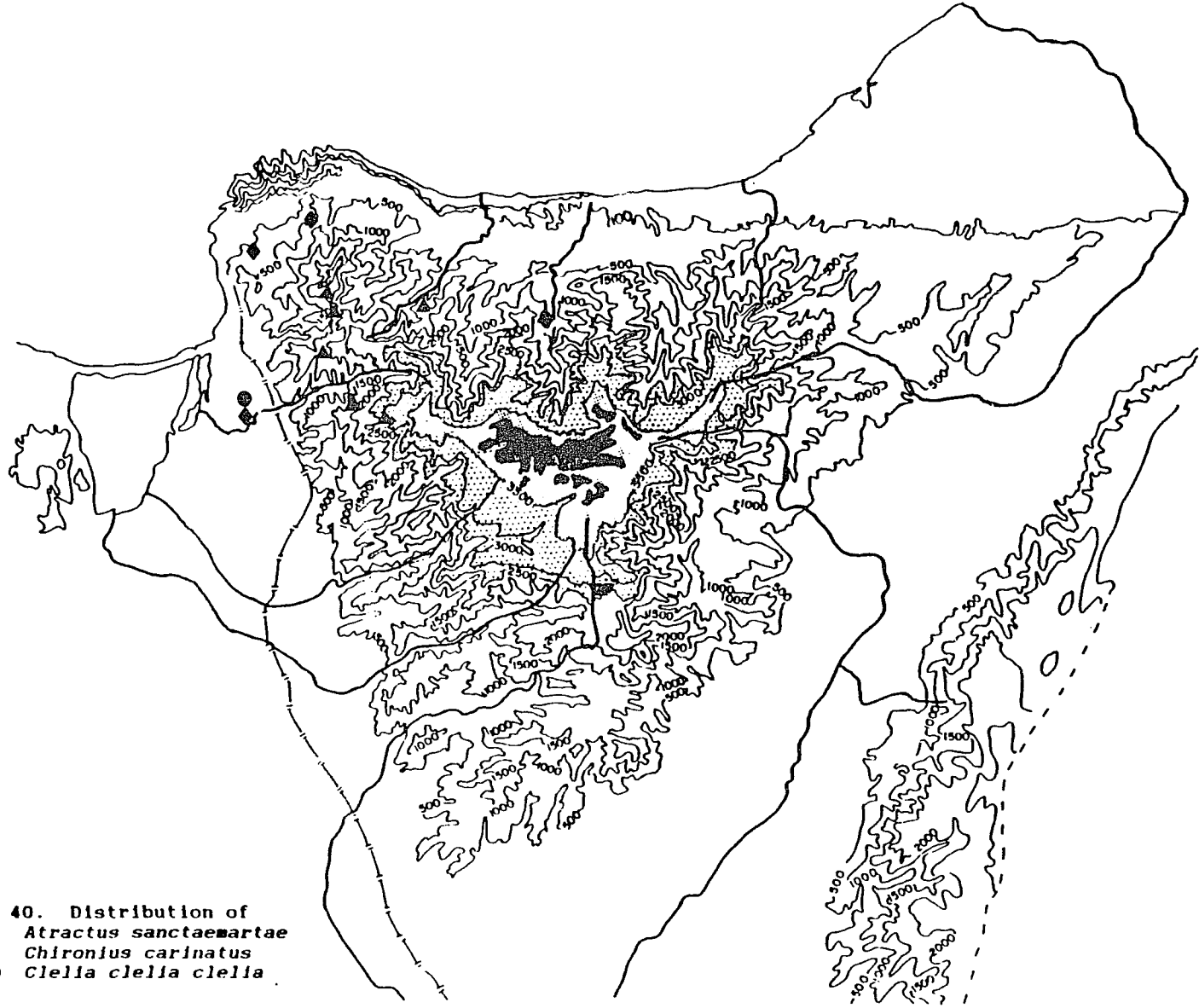




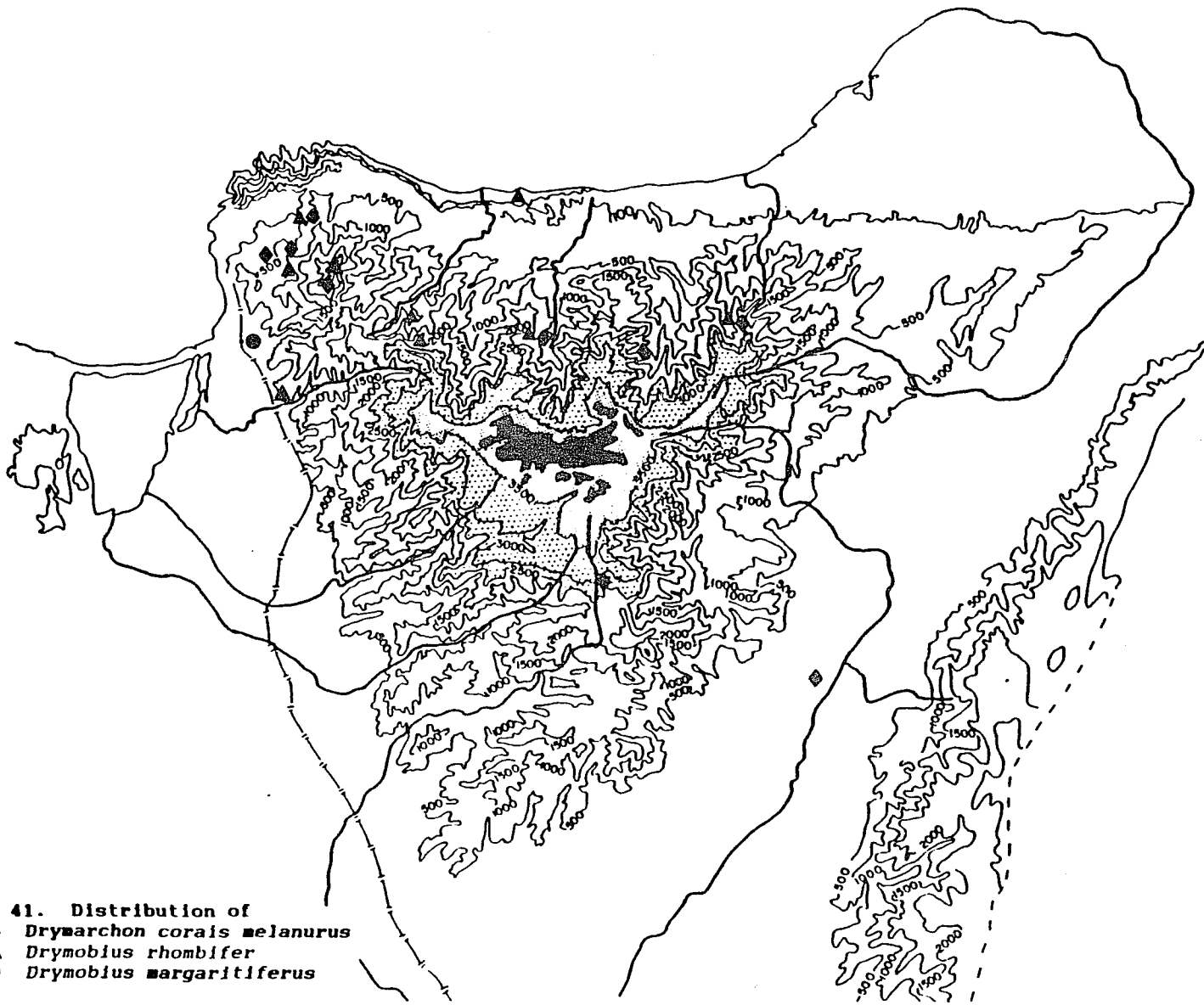
Map 38. Distribution of  
▲ *Liotyphlops albirostris*  
● *Leptotyphlops macrolepis*



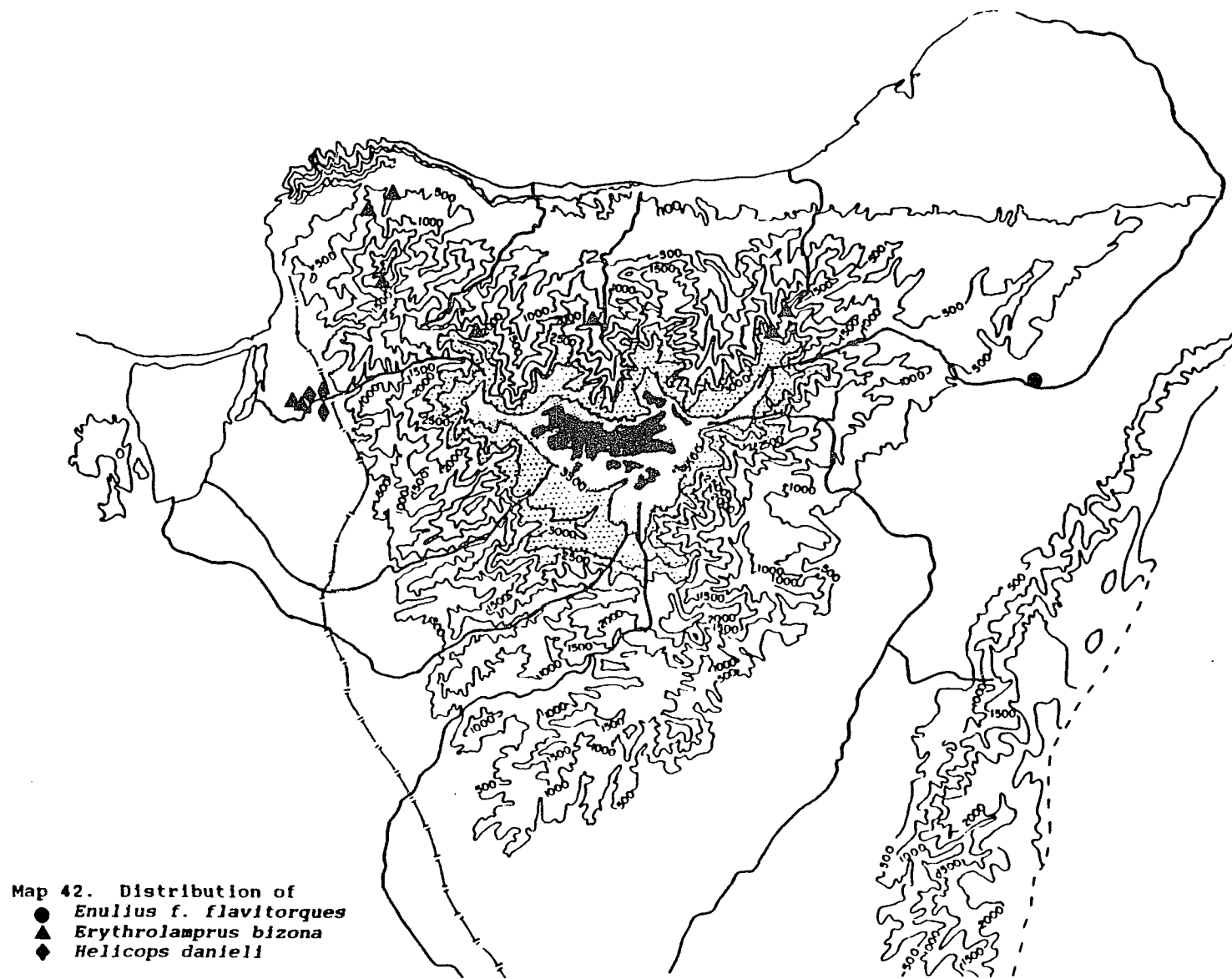
Map 39. Distribution of  
 ■ *Boa c. constrictor*  
 ● *Corallus enydris cookii*  
 ▲ *Epicrates cenchria maurus*  
 ◆ *Atractus sp. A*

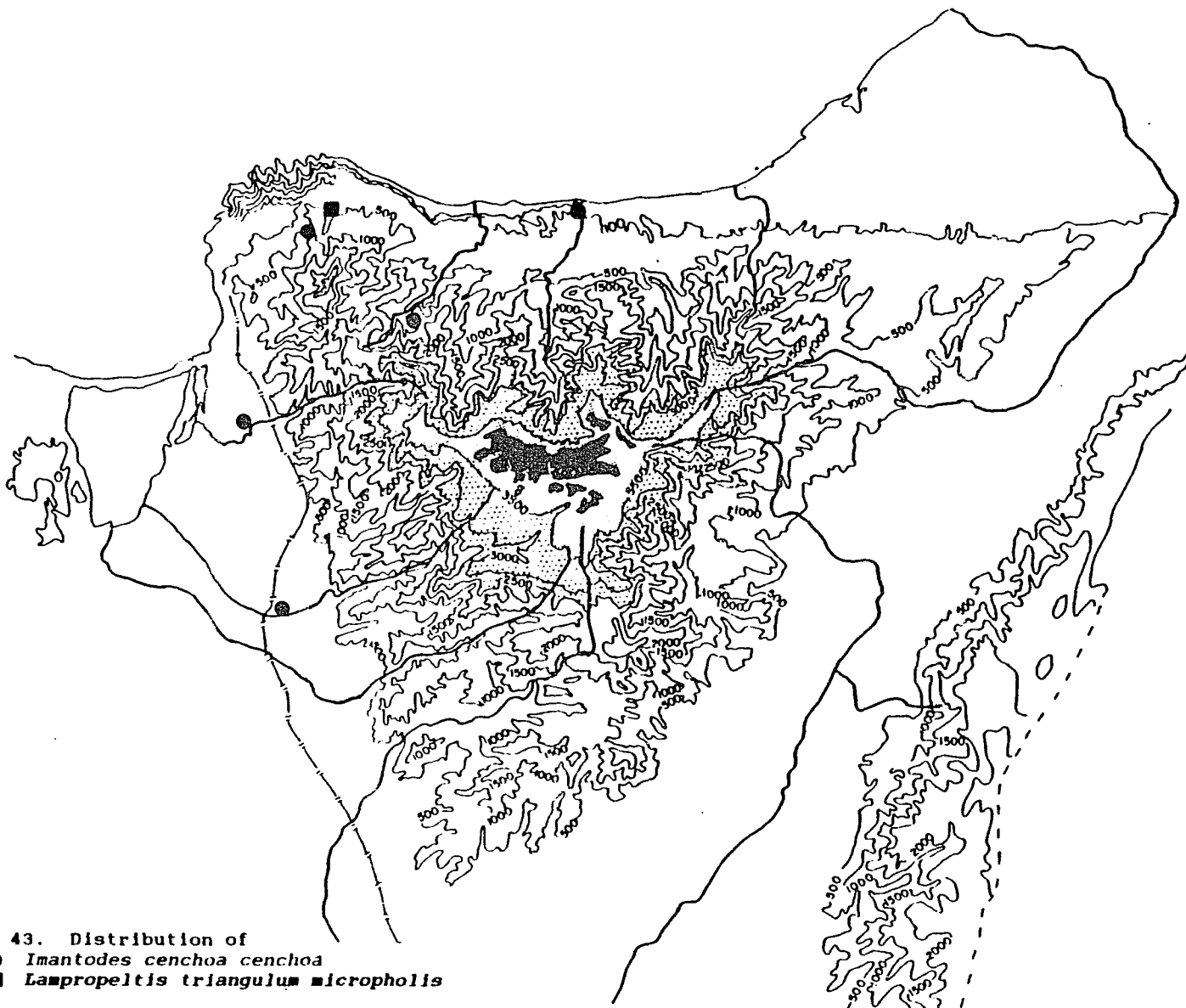


Map 40. Distribution of  
 ▲ *Atractus sanctaemartae*  
 ◆ *Chironius carinatus*  
 ● *Clelia clelia clelia*

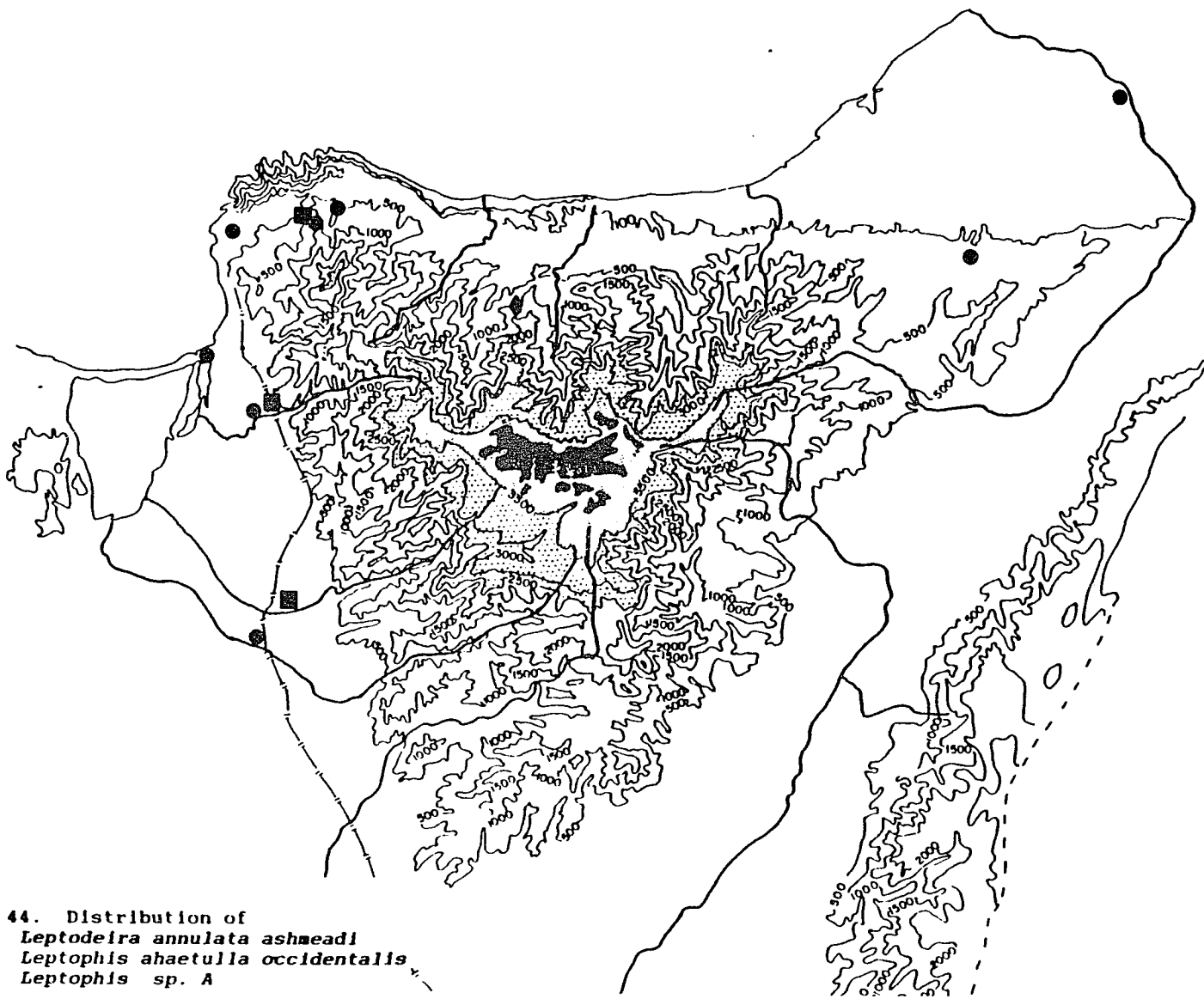


Map 41. Distribution of  
◆ *Drymarchon corais melanurus*  
▲ *Drymobius rhombifer*  
● *Drymobius margaritiferus*





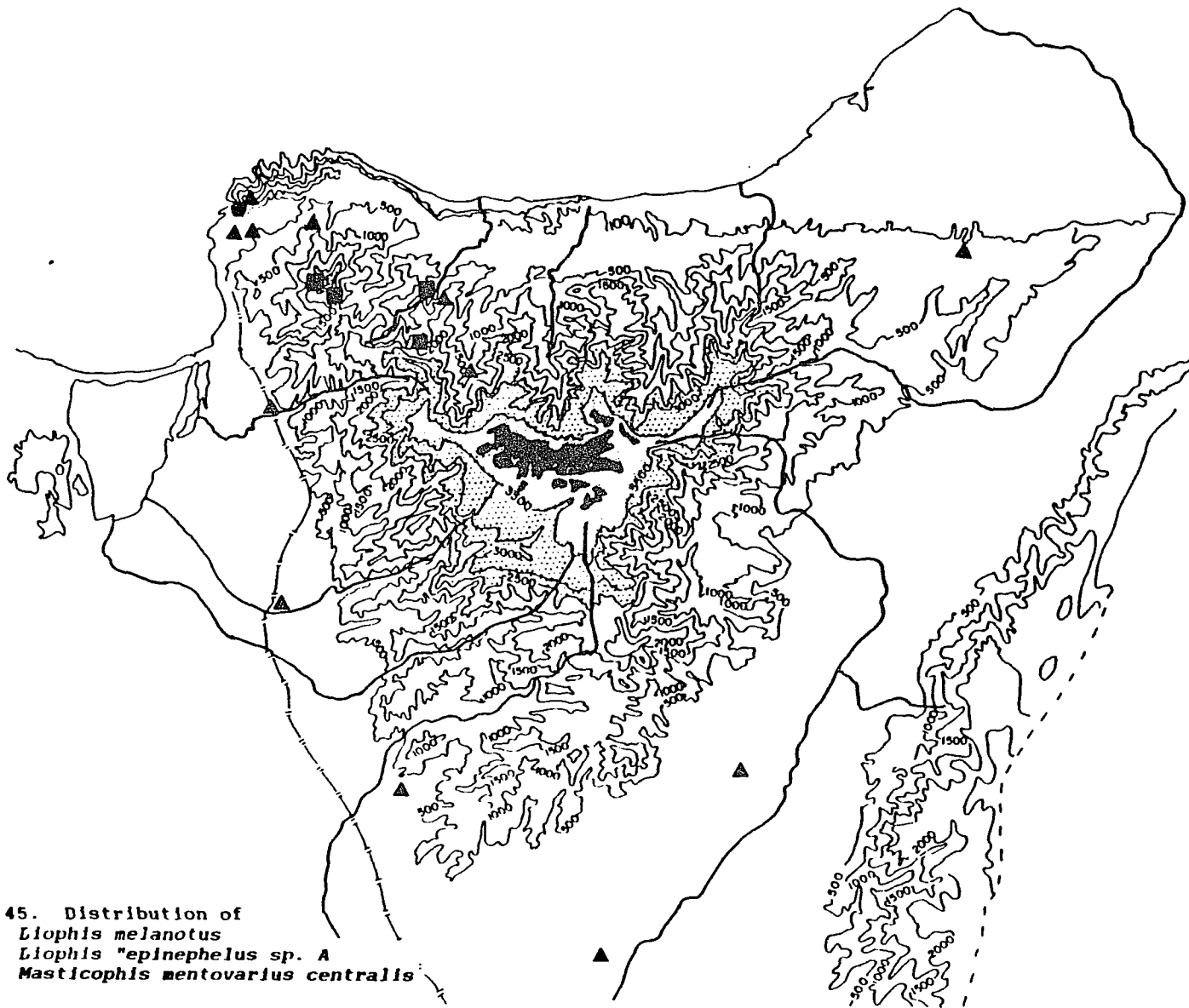
Map 43. Distribution of  
 ● *Imantodes cenchoa cenchoa*  
 ■ *Lampropeltis triangulum micropholis*

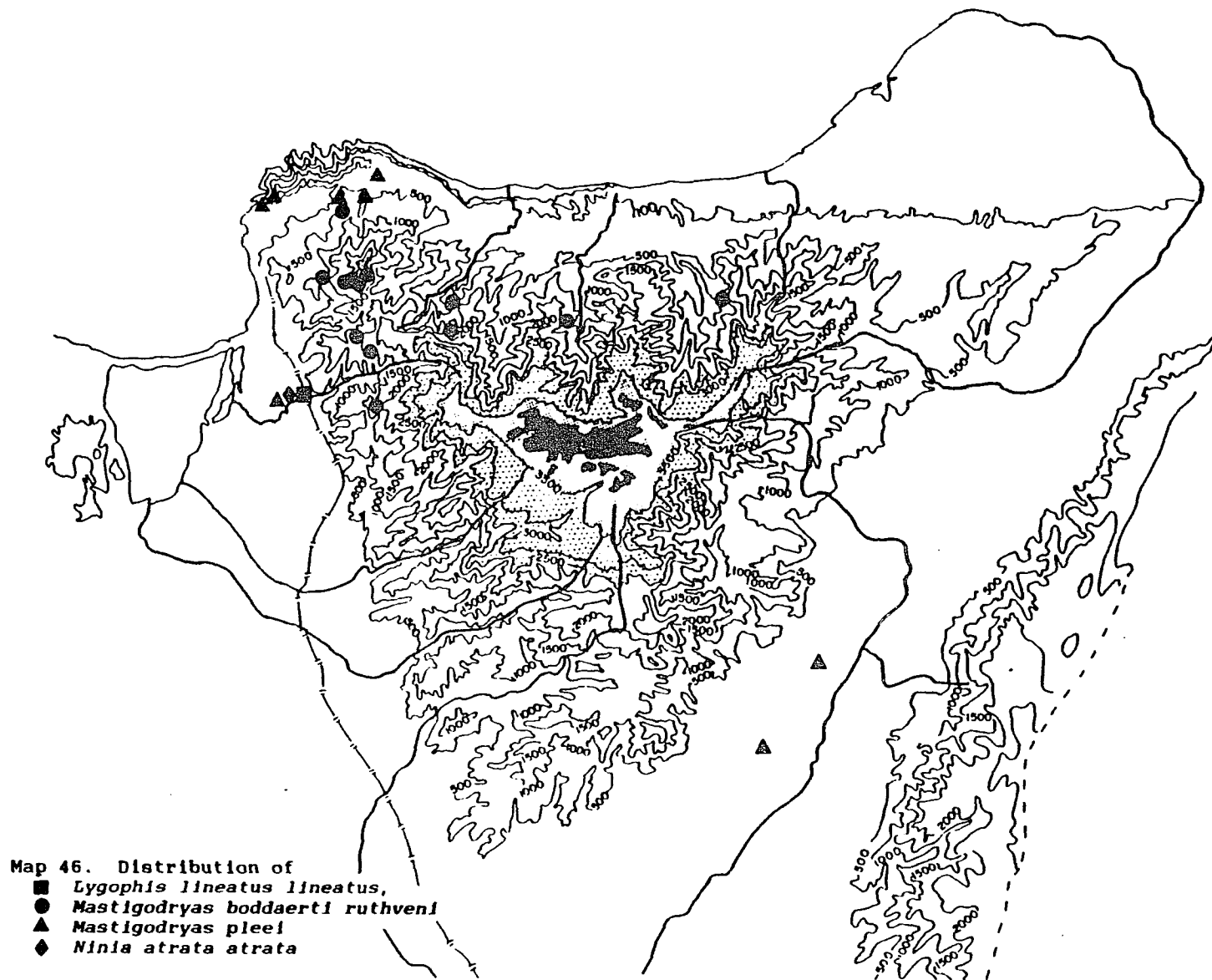


Map 44. Distribution of  
 ● *Leptodeira annulata ashmeadi*  
 ■ *Leptophis ahaetulla occidentalis*  
 ◆ *Leptophis sp. A*

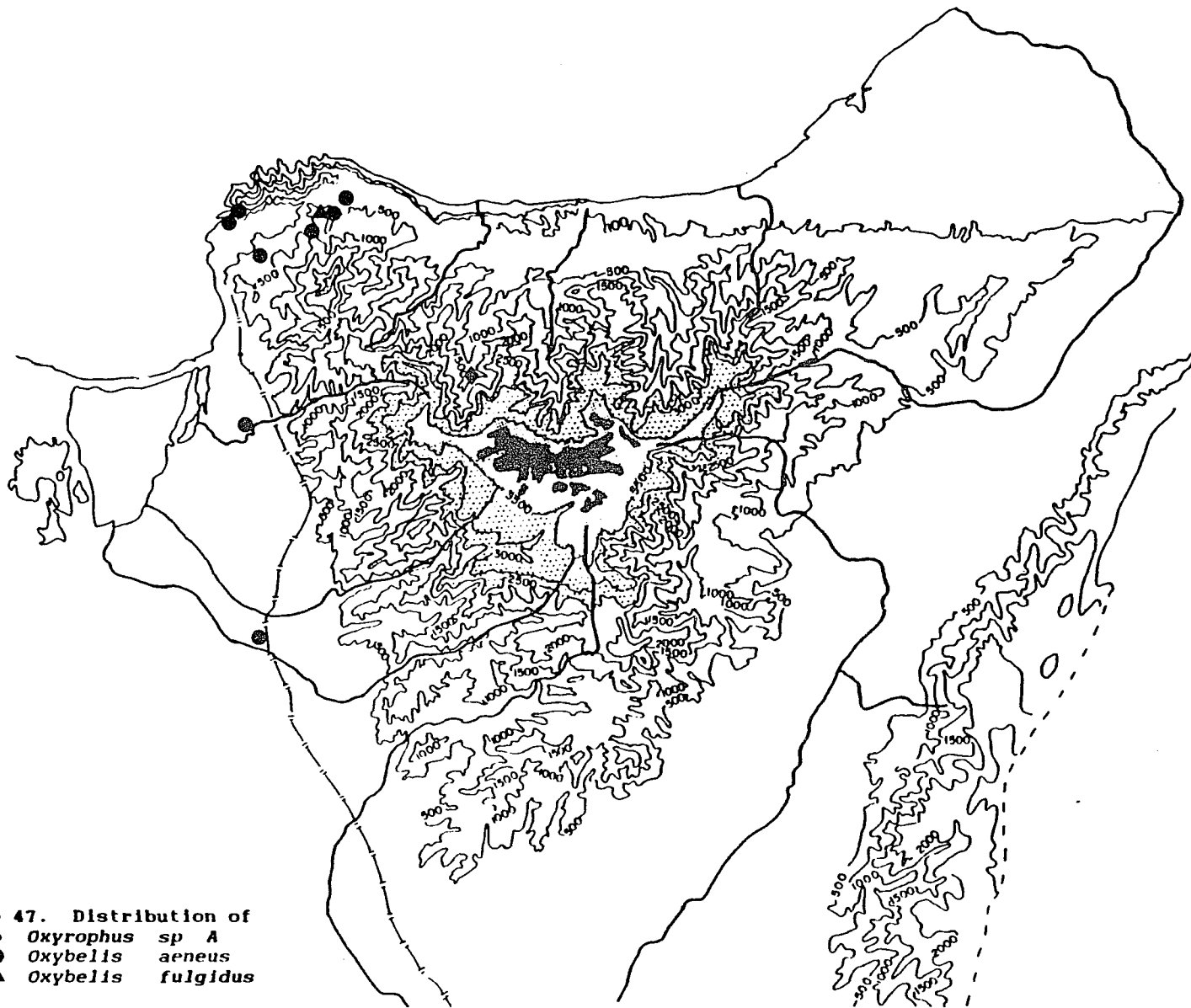
Map 45. Distribution of

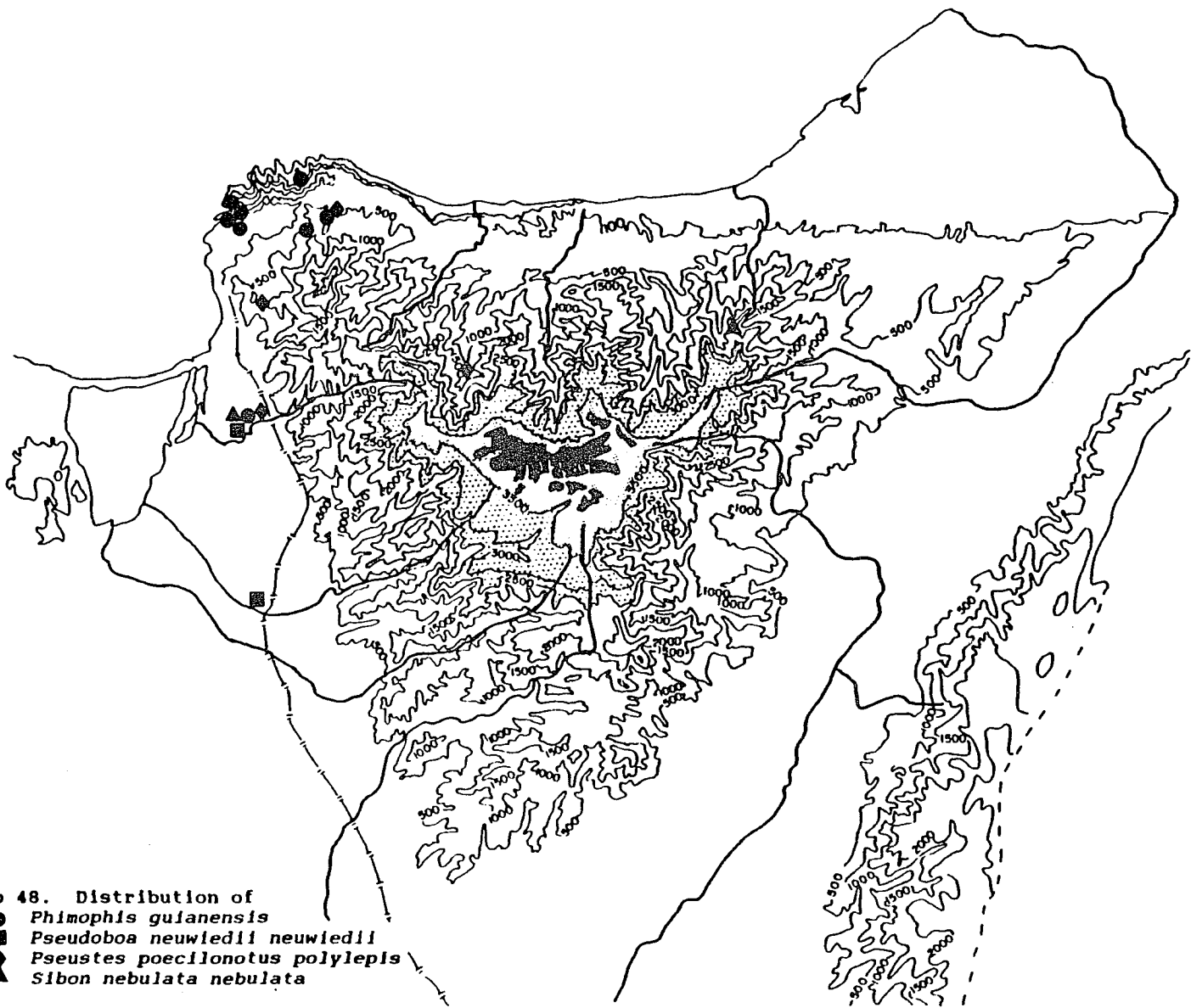
- ▲ *Llophis melanotus*
- *Llophis "epinephelus" sp. A*
- *Masticophis mentovarius centralis*

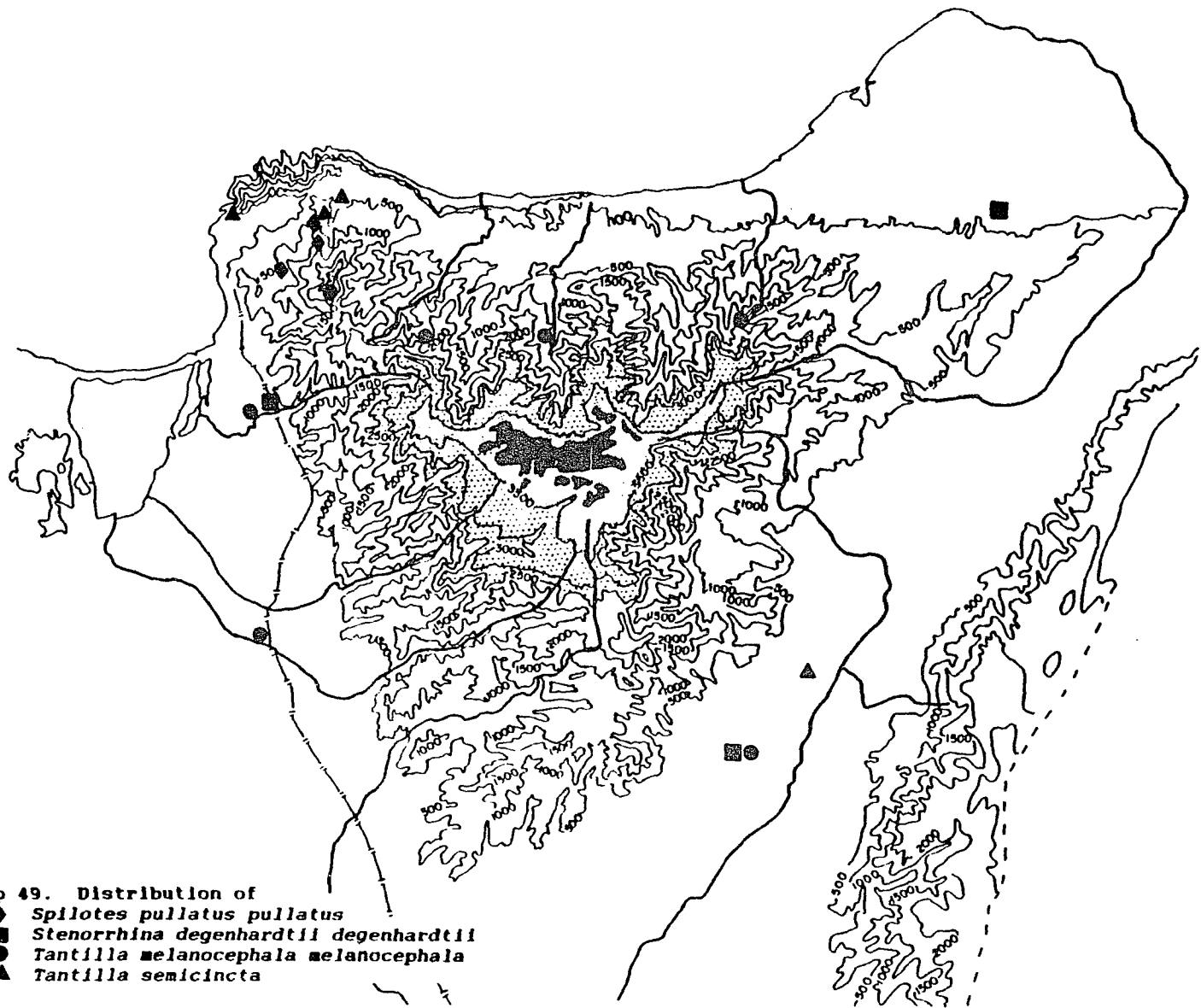




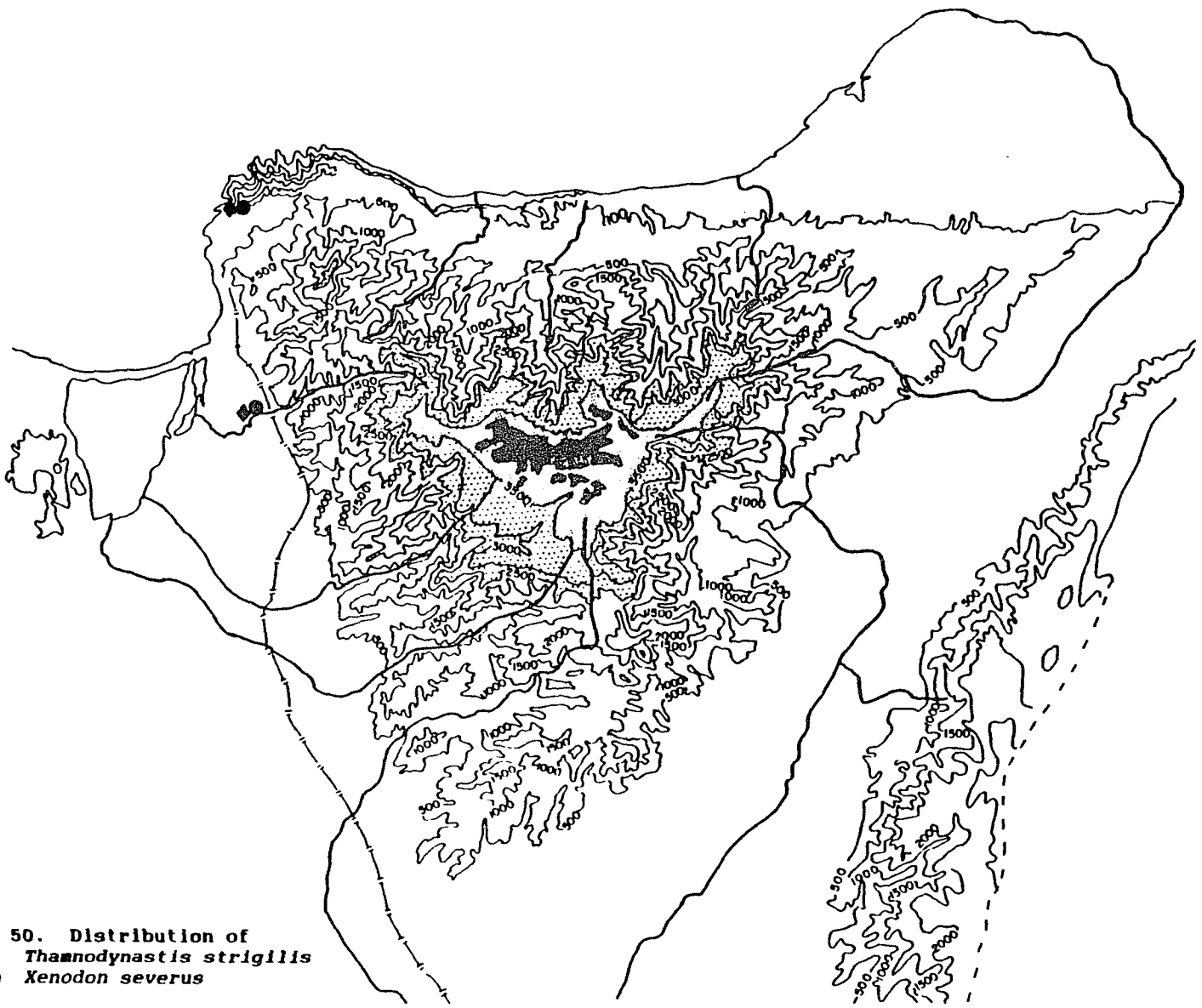
Map 47. Distribution of  
◆ *Oxyrophus* sp A  
● *Oxybellis* aeneus  
▲ *Oxybellis* fulgidus



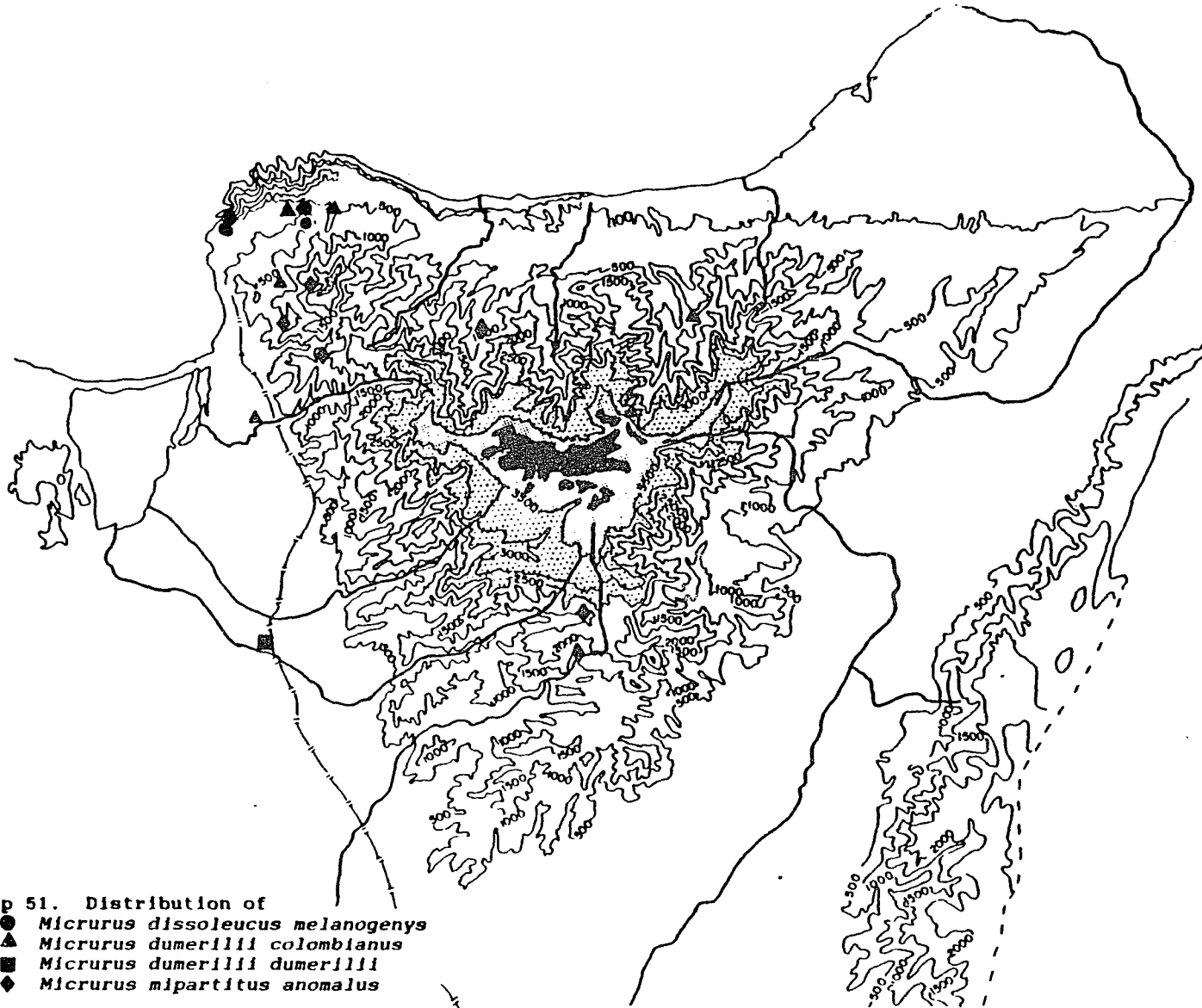


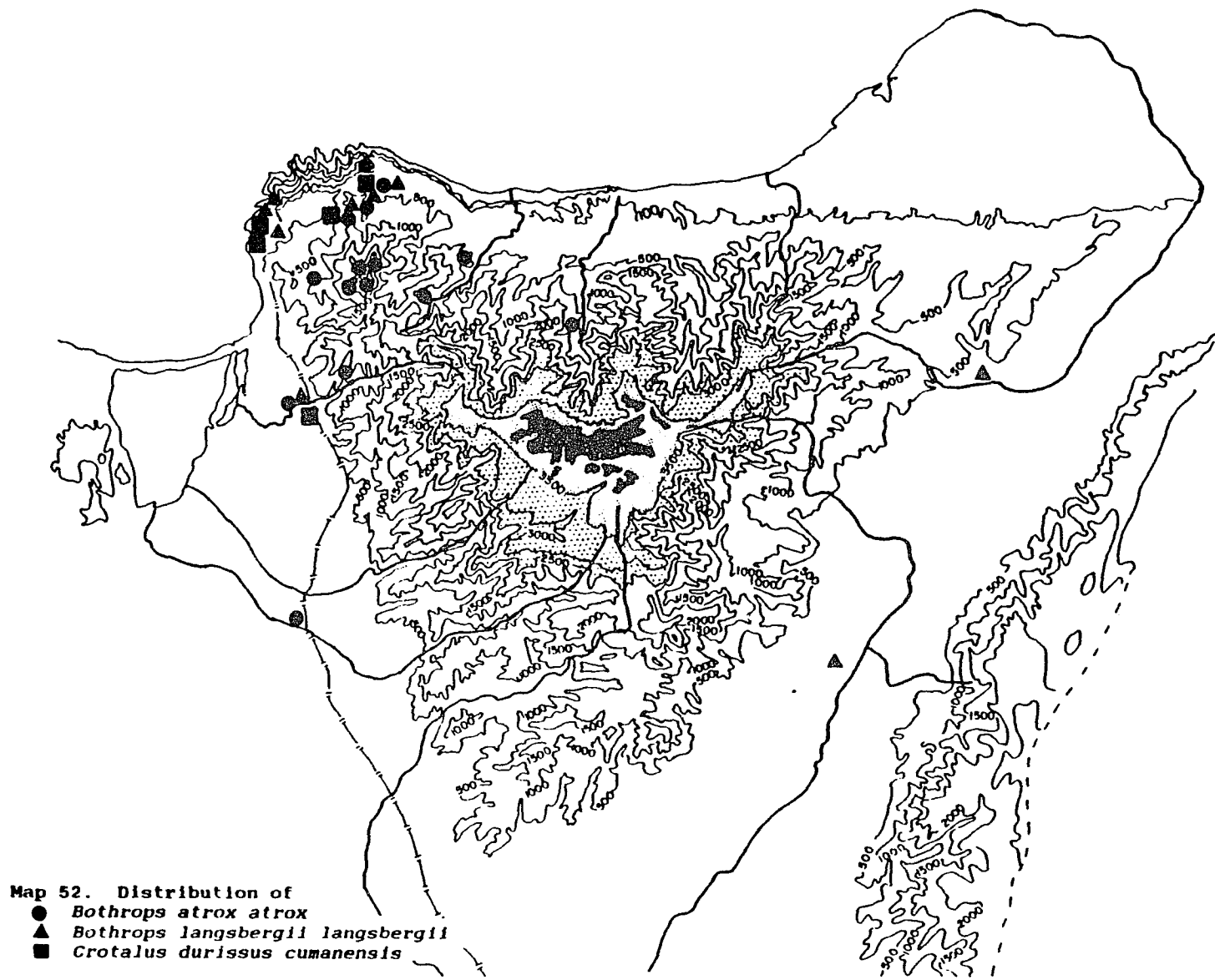


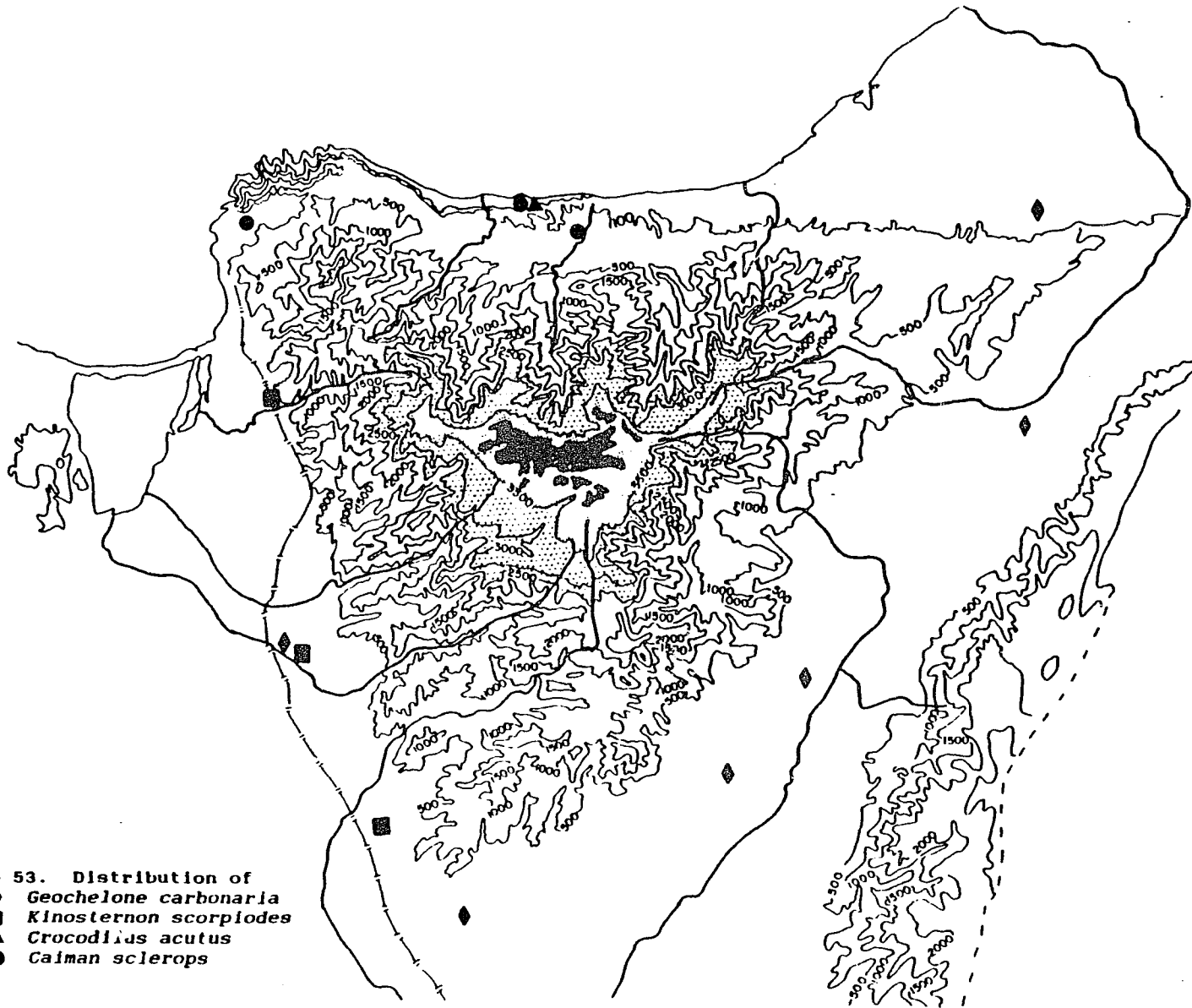
**Map 49. Distribution of**  
 ◆ *Spilotes pullatus pullatus*  
 ■ *Stenorrhina degenhardtii degenhardtii*  
 ● *Tantilla melanocephala melanocephala*  
 ▲ *Tantilla semicineta*



Map 50. Distribution of  
◆ *Thamnodynastis strigilis*  
● *Xenodon severus*







Map 53. Distribution of  
 ◆ *Geochelone carbonaria*  
 ■ *Kinosternon scorpiodes*  
 ▲ *Crocodilus acutus*  
 ● *Caiman sclerops*

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