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A REVISION OF THE GENUS DECLIEUXIA (RUBIACEAE).

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A REVISION OF THE GENUS  
DECLIEUXIA (RUBIACEAE)

by

JOSEPH H. KIRKBRIDE, JR.

A dissertation submitted to the Graduate  
Faculty in Biology in partial fulfillment  
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of New York.

1975

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ABSTRACT

A REVISION OF THE GENUS

DECLIEUXIA (RUBIACEAE)

by

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Declieuxia, a genus of Rubiaceae tribe Psychotrieae, is distinguished from all close relatives by its drupaceous, laterally compressed schizocarps. It is found on neotropical savannas, especially those of the Planalto Central do Brasil. Its morphology, both vegetative and reproductive, is discussed in detail. Most useful taxonomic characters are found in the vegetative structures. The distribution and ecology are considered, and the center of distribution is shown to be in the Serra do Espinhaço from the vicinity of Diamantina to that of Ouro Preto, Brazil. The degree of advancement of some characters is evaluated. A diagram illustrates the author's interpretation of similarities and differences between the species. Phytogeography is discussed, and the hypothesis developed that the high density of species in the Serra do Espinhaço may have resulted from the Pleistocene climatic fluctuations. The genus is described, a key to the 26 species given, and each is treated. Six new taxa, Declieuxia deltoidea var perfoliata, D. lancifolia, D. diamantinae, D. irwinii, D. gracilis, and D. cacuminis var decurrens, and two new combinations, D. cordigera var divergentiflora and D. humilis, are proposed.

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The new names preposed in this dissertation are not intended to meet the requirements for formal publication under the International Code of Botanical Nomenclature, but rather to indicate the intent for future publication.

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## INTRODUCTION

Declieuxia, a genus of Rubiaceae tribe Psychotrieae is distinguished from all close relatives by drupaceous laterally compressed schizocarps. It is found on neotropical savannas, especially those of the Planalto Central do Brasil. The collections made in the last three decades, particularly those from the program of exploration of the Planalto Central do Brasil initiated a decade ago by Howard S. Irwin, have posed many problems. Some specimens could not be identified; others seemed to have several suitable names; others were intermediate between recognized species. The last major treatment of the genus (Müller Argoviensis, 1881) was inadequate for dealing with this wealth of new material. Also, it was evident that little or no field data were available for that study. Five times more material than was available to Müller Argoviensis is now accessible, and I have seen 19 of 26 species in the wild state. If so defined as to include Congdonia, the genus is one of the most sharply delimited in the Rubiaceae.

The herbarium and field studies detailed below have solved many problems in Declieuxia, but have also uncovered others which remain to be investigated. Cytological studies were attempted, but they were hampered by a paucity of material and the cytological difficulties usually encountered in the Rubiaceae (Lewis, 1962). Due to a lack of time, anatomical studies were not undertaken. Field and laboratory studies (unpublished data and Kirkbride, 1974) have definitely established that hybridization has occurred in one population involving D. fruticosa and D. passerina (see under the latter for details).

Morphological studies have also suggested the possibility that hybridization is also occurring between D. passerina and D. deltoidea and between D. fruticosa and D. dasyphylla. Additional population studies in conjunction with an extended project in artificial hybridization are now needed to elucidate these situations. This approach would also be useful in understanding the relationships between species of Declieuxia.

The genus Declieuxia was first described in 1819 by Humboldt, Bonpland, and Kunth from a specimen collected at Caripe, Venezuela. Unfortunately, their specific epithet, chiococcoides, has been superseded by an earlier one, fruticosa, by Roemer and Schultes (1818) which was based on a herbarium name of Willdenow on a duplicate of the specimen described by Humboldt, Bonpland, and Kunth. The genus was named in honor of Gabriel de Clieu, a French mariner, celebrated for his introduction of coffee into cultivation in the Antilles (Freres, 1964).

The taxonomic history of Declieuxia corresponds with the pioneering plant explorations of some of the more important early collectors in southeastern Brazil. For example, the many names proposed by Martius and Zuccarini based upon Martius' collections from Brazil, were adopted by Schultes and Schultes (1827); the arrival of Sellow's material from southeastern Brazil in Europe led to the treatment by Chamisso and Schlectendal (1829); Pohl's specimens from central Brazil were the most important new ones cited by de Candolle (1830). The culmination of the efforts of the early collectors in Brazil was Martius' magnificent Flora Brasiliensis, for which Müller Argoviensis contributed the portion of the Rubiaceae containing Declieuxia. Prior to the appearance of the complete work (1881), Müller Argoviensis

published a preliminary treatment of the genus (1876). He segregated the genus Congdonia in both of these. In the 20th century, the interest shown in Declieuxia has been limited mainly to publication of new species, principally by P.C. Standley, and citation in floristic works (Standley, 1928, 1930, 1931, 1936, 1938; Pittier et al., 1947; Lemee, 1963; Smith & Downs, 1956; Steyermark, 1972).

Members of the genus have had limited practical value. Martius (1843) reported the use of D. cordigera var angustifolia to treat ammenorrhœa and slow discharge of afterbirth, and Corrêa (1952) recorded the use of D. cordigera var cordigera against intermittent fevers.

#### MORPHOLOGY

Habit. The genus Declieuxia contains shrubs, subshrubs, and perennial herbs (fig. 1 a, b). True shrubs are rare, but they have been encountered in the field as tall as 1.5 m. Subshrubs are most common as individual plants, but if considered in relation to number of taxa, the perennial-herbaceous life form is most frequent in Declieuxia. The number of stems ranges from one in some of the shrubs to several in the subshrubs to many in the perennial herbs. The stems are terete and erect to spreading, becoming fastigate in the multiple stemmed perennial herbs. Pubescence is usually uniform on all parts of the individual plant, but can vary from 0.1 to over 2 mm in length on different individuals of a given species. Glabrous and densely long-pubescent individuals of the same species have been found growing in close proximity with intermediate individuals in the area. Raphides have been observed in all organs of Declieuxia.

Fig. 1. A, habit of Declieuxia fruticosa; b, habit of D. cordigera var cordigera; c, stipular structure of D. coerulea (all from Müller Argoviensis, 1881).



They are easily observable by reflected light and are highly variable in length; the size and shape of the cells containing them are also variable.

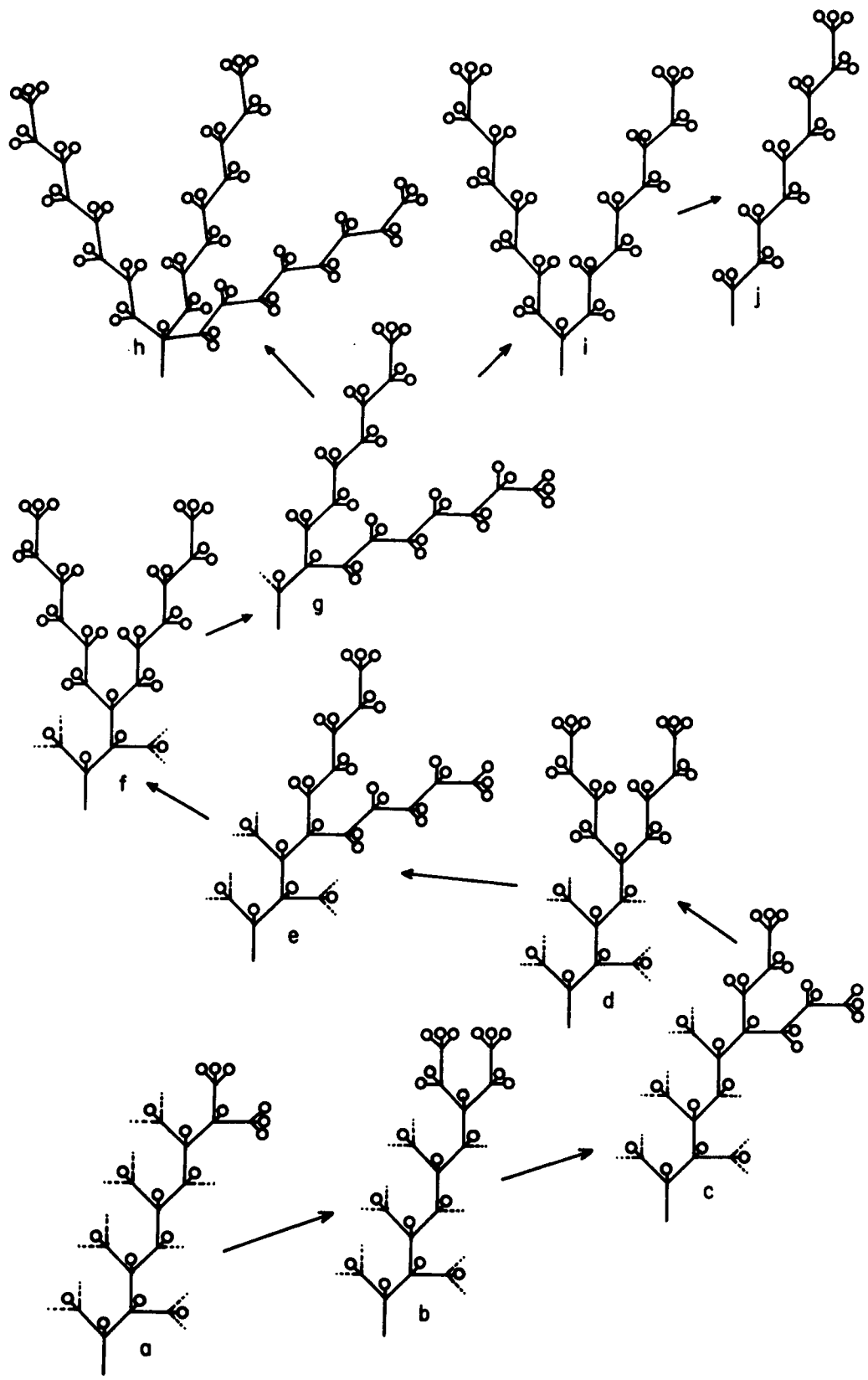
**Stipules.** The basic structure of the stipule in Declieuxia is a ridge of tissue extending from one leaf base to another with an erect, median appendage appressed to the stem (Fig. 1 c). The apex of the appendage is narrowly acute and glandular. In some taxa a second ridge of tissue at right angles to the first runs down the length of the stem as an extension of the appendage and reaches the node below. This condition is referred to as a decurrent stipule. In several taxa, there is a pair of appendages on either side of the primary one identical to it except only about half as long. Also, sometimes 1-3 pairs of glands similar to the apex of the primary appendage are found on the ridge, distributed equally to each side of the primary appendage. The appendages can be completely absent; or a solitary gland, again similar to the apex of an appendage, can occupy the median position on the ridge. In one species, D. passerina, even the ridge is sometimes absent so that there is no visible external trace of a stipule, although vascular remnants may well persist internally.

**Leaves.** The leaves of Declieuxia are opposite, ternate, or quaternate or, in D. verticillate, 5-7-verticillate. Three arrangements, opposite, ternate, and quaternate, are all encountered in several species, although the last is usually rare. Some specimens of D. cordigera consist of a single rootstock supporting several fastigiate stems that are partly opposite- and partly ternate-leaved. The leaves can be either sessile or petiolate. The petioles form

two groups: 1) short to long, not necessarily occurring with cordate leaf bases, and 2) very short, always occurring with cordate leaf bases. The former seems to be an independently evolved condition, the latter a secondarily derived condition in conjunction with the cordate leaf bases. The texture of the leaf blade ranges from chartaceous to strongly coriaceous and rigid. The more coriaceous leaves show a tendency to be lighter in color with a yellowish tinge both when alive and when dry. The range of size and form of the leaf blade in Declieuxia is great, and the amount of variability shown by the leaf blade of some species is tremendous.

Inflorescences. The pedunculate or rarely sessile inflorescences are either terminal, or axillary, or both. The inflorescences are compound dichasia, modified cymes or cymules, or solitary flowers (inflorescence types after Lawrence, 1955). The branches of the modified cymes or cymules are themselves modified scorpioid cymules of a lower order. Their axis is straight, with pairs of flowers subtended by two dichasial bracts spiralling around the branch. In D. fruticosa, both compound dichasia (Fig. 2 a) and modified cymes (Fig. 2 h, i, j) with a complete spectrum of intermediates is found (Fig. 2b-g). At the junction points in the compound dichasium, a central flower is flanked by two short branches and the whole subtended by two bracts. In a few intermediate inflorescences the central flower is flanked at the uppermost junction point by one short branch and one flower in the same relative position. Thus the branch tips of the 'compound dichasia' are modified scorpioid cymules. The intermediate inflorescences range from those with almost the complete branching system of a compound dichasium and short modified scorpioid

Fig. 2. Range of inflorescence types found in D. fruticosa and a suggested pathway of evolution indicated by arrows. The open circles represent flowers, the solid lines the axes of the inflorescence, and the dashed lines corresponding mirror image branches.

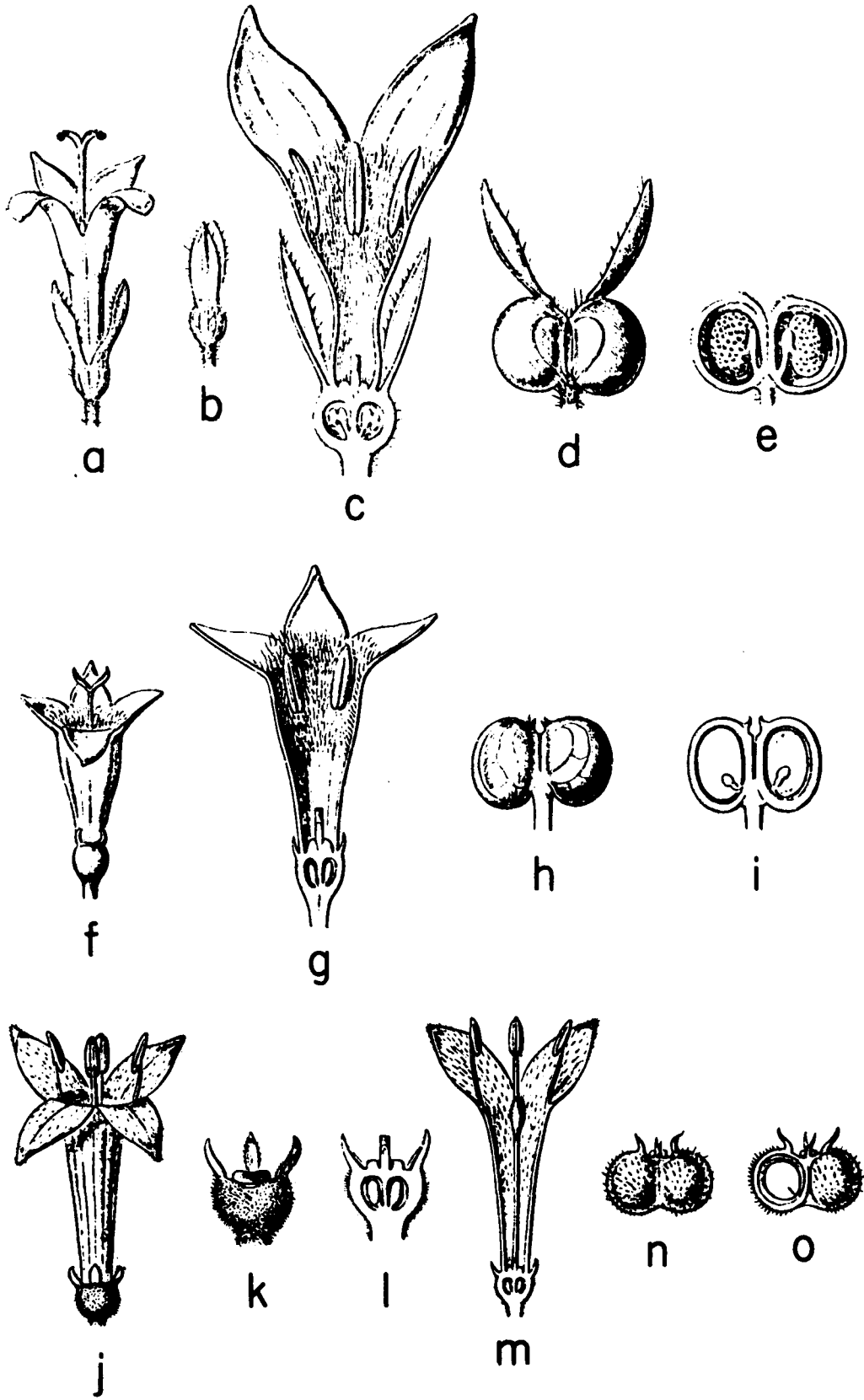


cymulose branch tips to those with little of the branching structure of a compound dichasium present while the length of the modified scorpioid cymulose branch tips are very long. A similar pattern occurs in D. deltoidea except that the spectrum of intermediate forms is not as complete. In 20 other species with modified cymes or cymules, the branches of the inflorescence are almost completely scorpioid-cymulose. In 13 species the branches are sometimes few and short, whereas in 5 others only a single short branch remains. The final form expressed in the series is the solitary flower which is found in 4 species.

Flowers. The form of the flowers (Fig. 3f, g, j, k, l, m) is uniform, and is of little value in discriminating among taxa except in the cases of D. tenuiflora and D. coerulea discussed below. There is variation in size, but intraspecific variation is greater than interspecific variation. The only exception to this is seen in D. tenuiflora which exhibits the smallest flowers in the genus; they are not heterostylous, but possibly protandrous. There is frequently a correlation between the floral pubescence and that of the vegetative organs. The floral pubescence is always less dense and shorter than the vegetative pubescence, but when the latter is very meager, the floral parts are usually glabrous. In some instances, however, the floral organs are glabrous even though the vegetative organs are densely pubescent.

The flowers are subpedicellate or rarely sessile. The pedicel is shorter than the hypanthium except for very rare instances when it is slightly longer. The term hypanthium is here used for the organ below the vascular plexus which gives rise to calyx, corolla, and androecium. It is formed by adnation of ovary wall, androecium, corolla, and calyx and is indivisible into these organs. The

Fig. 3. A-e, Declieuxia coerulea: a, pin flower; b, hypanthium and calyx lobes; c, cross section of pin flower; d, fruit; e, cross section of fruit. F-i, D. spergulifolia: f, pin flower; g, cross section of pin flower; h, fruit; i, cross section of fruit. J-o, D. cordigera var angustifolia: j, thrum flower; k, hypanthium; l, cross section of hypanthium; m, cross section of thrum flower; n, fruit; o, cross section of fruit (all from Müller Argoviensis, 1881).



hypanthium is wider than long and slightly compressed laterally to the septum. Because of the lateral compression, the hypanthium is measured and described from its broadest aspect as if it were two-dimensional. It varies in pubescence from glabrous to densely puberulous or densely papillate.

The calyx is represented by four free lobes in all species except D. coerulea which has two (Fig. 3a, b, c). The lobes are equal or sometimes weakly unequal, and vary from much shorter than the hypanthium to slightly longer.

The corolla, white to blue with numerous intermediate shades, is tubular and salverform or rarely funnel-salverform. The four corolla lobes are valvate and shorter than the tube. The exterior of the tube and of the lobes range from glabrous to sparsely puberulous or sparsely hispidulous. In bud, the much shorter, unopened corolla has pubescence of the same length as has the open corolla, but the hairs are disposed much more densely. The interior surface of the corolla lobes is minutely papillate; that of the corolla tube is glabrous below and sericeous above with moniliform hairs. The pubescence of the sericeous portion is fairly uniform in density throughout the genus, but the width of the sericeous area is highly variable within any one species, ranging from  $5/16$  to  $3/4$  of the length of the tube. In several species, a narrow glabrous band sometimes occurs at the orifice of the tube. The androecium is epicorollar with the filaments fused to the inner face of the corolla tube. The point at which the filaments become free and their length are discussed below. The stamens number four and are inserted alternate to the lobes of the corolla. The

anthers are narrowly oblong, glabrous, and may be included or excluded. They are 4-thecate and dehisce longitudinally by full-length slits. The pollen is tricolporate and suboblate to prolate spheroidal, and the exine is reticulate. In D. tenuiflora, there are small papillae on the exine.

The stigma is bifid, exserted or included, and the inner faces of its lobes are papillate. The style varies in length, as described below. The space between the base of the style and the base of the corolla tube is occupied by a glabrous floral disc which consists of two hemicylindrical glandular lobes. Each lobe is situated above one locule of the bilocular hypanthium. When the mericarps separate, each carries with it two calyx lobes and one lobe of the floral disc. I have opened corollas of several species of Declieuxia in the morning and found a drop of a sweetish liquid there. The floral disc is thus probably involved in the pollination biology of Declieuxia.

Each of the two locules of the hypanthium contains a single, basally attached anatropous ovule which is borne erect on a slender upright funiculus. In D. coerulea, a basally attached club-shaped or cylindrical structure, here referred to as a placenta, has the amphitropous ovules are found attached near the apex of the placenta.

The species of Declieuxia, with three exceptions, exhibit morphologically complete heterostyly, involving three readily observable characters: 1) style length, 2) filament length, and 3) point of filament separation from the inner face of the corolla tube. In pin flowers (Fig. 3a, c, f, g), the stigma is borne on an elongate style and exserted from the corolla tube, and the very short filaments separate from the inner face sufficiently below the apex of the corolla

tube to permit the anthers to remain included in the corolla tube. In thrum flowers (Fig. 3j, m), the abbreviated style bears the stigma completely within the corolla tube, and the filaments, 2-4-times longer those of the pin flowers, separate from the inner face at or near the orifice of the corolla tube. In the northern reaches (Belize and Cuba) of the distribution of D. fruticosa, incomplete morphological heterostyly is found. In pin flowers, the anthers are half included and half exerted, and in thrum flowers, the stigma is similarly positioned. In herbarium collections of D. tenuiflora, the flowers exhibit three anther-stigma positions: 1) both included, 2) anthers alone exerted, and 3) both exerted. If it is assumed that the degree of exertion of these organs corresponds to their maturity and receptivity, respectively, then this species is probably protandrous. Three types of flower also occur on the herbarium specimens of D. dusenii viz.: 1) anthers and stigma both exerted, 2) anthers alone exerted, and 3) stigma alone exerted. Morphologically, this corresponds to long homostyly which sometimes arises in heterostyled species by mutation or crossing over in the super gene that controls heterostyly (Dowrick, 1956; Bir Bahadur, 1968). The long form of homostyly in distyled species has been more frequently reported in the literature than has the short form in which both the anthers and stigma are included (Dowrick, 1956; Bir Bahadur, 1968).

**Fruits.** The fruits of Declieuxia are didymous schizocarps compressed laterally to the septum so that the mericarps are lenticular when dry (Fig. 3d, e, h, i, n, o). Müller Argoviensis (1881) referred to the mericarps as 'hemicarpsia.' The mericarps are described

and measured first from their broad aspect, as if two-dimensional, and then their 'thickness' has been determined. Of their two-dimensional measurements, that of the longer axis was taken first, then the width at right angles to this axis. Very rarely one locule will develop and the other will remain unaltered yet persistent on the developing locule. In these cases, the single mericarps will be slightly larger than normal, and so only the fruits with both mericarps normally developed were measured. The calyx lobes and floral disc persist on the fruit, each mericarp carrying one lobe of the disc and two calyx lobes. The apex of the fruit is emarginate, and this emargination was measured to determine its greatest depth. In most species, the intraspecific variation in the depth of the emargination is greater than the interspecific variation, although its depth is useful as a character in several species.

On the herbarium specimens and in the field, the fruit set on species of Declieuxia is high with few undeveloped hypanthia. On several plants of D. fruticosa grown to fructification under artificial conditions, fruit set was low. This indicates that D. fruticosa is self-incompatible as would be expected in a heterostylous species (Bir Bahadur, 1968; Vuilleumier, 1971) and that the percentage of successful outcrossing in nature is high. One plant of D. tenuiflora that reached fructification in the greenhouse had a high fruit set, suggesting that it is self-compatible and further supporting the hypothesis that it is not heterostylous but rather protandrous.

As the fruit of D. fruticosa matures, it changes color from green to blue or purple and the mericarps become fleshy and spherical. In

the field I observed dry, brown fruits with lenticular mericarps lower on the same inflorescence as fleshy colored ones. Apparently, the succulent condition lasts only a short period. The fruit of D. fruticosa is the most succulent in the genus, others being much less so and some, such as D. tenuiflora, seemingly quite dry throughout. The color change still occurs even in the less fleshy fruit.

The range of D. fruticosa is the largest found in the genus Declieuxia (see Maps 1 and 2). This, considered in conjunction with it also having the fleshiest fruit in the genus, suggests that it was dispersed by birds which consumed the fruit. But, D. tenuiflora, which has nonsucculent fruit, has the second largest range in Declieuxia after D. fruticosa (see Map 20). The wide dispersal of this species may be the result of greater ease of establishing viable populations as it is self-compatible. In other species of Declieuxia which are heterostylous and nonsucculent or much less so than D. fruticosa, a lessened rate of dispersal combined with greater difficulty in establishing populations due to self-incompatibility may be factors contributing to their smaller ranges.

The pyrenes and seeds are lenticular with the raphe visible on the seed coat. The seed coat, typical in tribe Psychotrieae, is composed of parenchymatous cells 23-115  $\mu$  long with a slight thickening of the reticulate cell walls (Hayden, 1968; Hayden, 1972, personal communication). The cells of the seed coat contain a reddish brown pigment which is also characteristic of tribe Psychotrieae. The embryo is erect and embedded in endosperm.

Table 1. A comparison for all recognized taxa of Declieuxia of the most taxonomically useful characters. List of the abbreviations used: +, present; +-, present on some and absent on others;  $\pm$ , incompletely present; -, absent; ac, acute; at, attenuate; ax, axillary; bl, blue; by, broadly; co, cordate; NA, not applicable; ny, narrowly; ob, obtuse; op, opposite; ph, perennial herb; qu, quaternate; sh, shrub; st, straight; su, subshrub; ta, terminal and axillary; te, ternate; tm, terminal; tr, truncate; V, highly variable; wh, white; wl, whorls of 5-7 leaves.

	Habit	Height (cm)	Stem pubescent	Stem with stomata	Stipular appendage present	Number of stipular appendages	Length of stipular appendages (mm)	Stipule pubescent	Stipule decurrent	Stipular structure present	Leaves connate-perfoliate	Leaf arrangement	Leaf axilla with fascicles or a pair of smaller leaves	Petiole	Petiole pubescent	Shape of base of leaf blade	Length of leaf blade (mm)	Width of leaf blade (mm)	Ratio of leaf blade	Leaf blade pubescent	Secondary venation evident	Inflorescence position	Inflorescence pedunculate	
D. frutescens	sh su	7-150	+ -	+	+	1	(0.3)0.6-0.8(0.8)	+ -	+	+	-	op te	-	+	NA	V	(1.0)2.0-3.0	(1.3)-3.7(1.8)	1.2-1.8(1.8)	+ -	+	ta	+	
D. deltoidea	sh su	40-200	-	+	+			-	-	+	-	op	-	-	NA	ca	(1.2)2.0-4.0	(0.9)2.1-3.2	0.6-1	-	+	ta	+	
var deltoidea						1	0.3-0.6(0.4)				-													
var perfoliata						6-7	0.5-1				+													
D. pruinosa	sh su	40-100	±	+	+	1	0.3-0.6(0.4)	-	-	+	-	op te	-	-	NA	V	(1.0)2.0-3.0	1.6-3.0	1.1(1.3)-1.4(1.4)	-	+	ta	+	
D. lysimachioides	ph	7-20(0.8)	+	-	+	1	1.8-5.1(3)	+	+	+	-	op te	-	-	NA	V	(1.0)2.0-3.0	(1.0)2.0-3.0	1.0-1.5(1.3)	+	+	ta	+	
D. dasycalyx	ph	1.5-2.5	-	-	+	1	(0.4)0.7-2.0	+ -	+	+	-	op	-	-	NA	ob	(1.0)2.0-3.0	1.0-1.5	1.0-1.5	-	+	ta	+	
D. lanifolia	ph	15-40	+	+	+ -	1	0.1-0.4	+ -	+	+	-	op	-	-	NA	ob	7-20	(1.0)2.0-3.0	1.0-1.5	3-5	-	+	ta	+
D. condigera	ph	(0.2)0.3-2.0(0.3)	+	-	+ -	1	(0.3)0.7-2.0	+ -	-	+	-	op te	-	-	NA	ob				(0.3)0.3-2.0	+	+	ta	+
var condigera																								
var angustifolia																								
var divergentiflora																								
D. passerina	su ph	2-40(0.8)	+	-	-	0	NA	NA	-	+	-	op te	-	-	NA	ob	4-10	0.5-1.0	1.3-1.8	+	+	ax	-	
D. spergulfolia	sh	40-100	+ -	+	+	1	0.5-3.2	-	+	+	-	op	+	+	-	at	(7)10-20(10)	(0.4)1-2.0	0.8-1.8	+	+	ta	+	
D. ornithoides	ph	(1.0)2.0-7.0	+ -	+	+ -	1	0.1-0.6(0.4)	-	-	+	-	te su	-	-	NA	st	(1.0)2.0-7.0	0.4-1	0.8-1.8	+	+	ta	+	
D. diamantinae	su ph	2.0-5.0	-	+	+	3	0.1-1.5	+ -	+	+	-	te su	+	-	NA	at	2.5-5.0	0.4-1	0.8-1.8	-	-	ta	+	
D. asparthaloides	su ph	1.5-1.00	+	-	+	3	0.2-3.8	+	+ -	+	-	te su	+	-	NA	st	(0.2)0.2-3.8	0.4-1	0.8-1.8	-	-	ta	+	
D. lewinii	ph	5.5-1.0	+	-	-	0	NA	+	-	+	-	op	-	+	ac	(0.2)0.2-3.8	1.0-1.8	1.0-1.8	+	+	ta	+		
D. muscosa	ph	2.0-3	-	-	-	0	NA	-	±	+	-	op	-	+	at	2.5-5.0	0.4-1	0.8-1.8	-	-	ta	+		
D. juniperina	su ph	1.2-2.4	+ -	?	-	0	NA	+ -	+	+	-	te su	+	-	NA	at	(1)3-10	0.4-1	0.8-1.8	-	-	ta	+	
D. latophylla	ph	0.5-0.8	-	-	+	1	1.4-2.5	-	+	+	-	op	-	-	NA	cu	1.4-2.5	2.0-5.0	4.2-9	-	+	ta	+	
D. sacrowaldae	sh su	1.3-40(1.4)	+	-	+ -	1	0.1-1.5(0.4)	+	+ -	+	-	op te	+	+	cu	at	(0.2)2.0-20(1.0)	0.6-2.0(1.0)	0.8-1.8(1.0)	+	+	ta	+	
D. hamilis	ph	4-1.0	+	?	+	1	(0.3)0.3-2.0(0.4)	+	-	+	-	te su	+	-	NA	te	10-15	1-1.8	0.8-1.3	+	-	ta	+	
D. gracilis	ph	12.0-22	+	-	+	1	0.5-1.5	+	-	+	-	op te	-	-	NA	ny/du	9-1.6	1-2	0.3-1.6	+	-	ta	+	
D. maritima	su	22-39	+	-	+ -	1	0.2-0.6	+	+	+	-	te su	+	+	ob	22-4	1.4-1.9	1.4-2.5	+	-	ax	+		
D. dactyloides	sh su	30-60	+	?	+	1	1-3	+	+	+	-	op	+	+	at	(1.2)3.0-6.0(2.0)	2.0-3.0	2-2.5	+	+	ta	+		
D. densiflora	sh su	1.5-4.0	+ -	-	+	1	1.3-2.8	+ -	+ -	+	-	op	-	+	at	0.8-1.6	0.8-2	1.4	+	+	ta	+		
D. ovalifolia	sh su	1.5-4.0	+	-	+		0.1-1	+	-	+	-	op	+	+	at	3.2-2.5	1.2-1.8	1.3-1	+	+	ta	+		
var ovalifolia						3																		
var decurrens						1																		
D. complanata	sh	1.5-3.5	+ -	-	+	3	0.2-0.8	+ -	+	+	-	op	-	+	ob	at	6.5-20	2.5-1.6	1.4-3.4	+	+	ta	+	
D. verticillata	ph	10-2.5	+	-	+ -	1	1.0-1.6	+	-	+	-	op	-	-	NA	cu	1.0-1.6	1.4-1.8	1.3-1.5	+	+	ax	+	

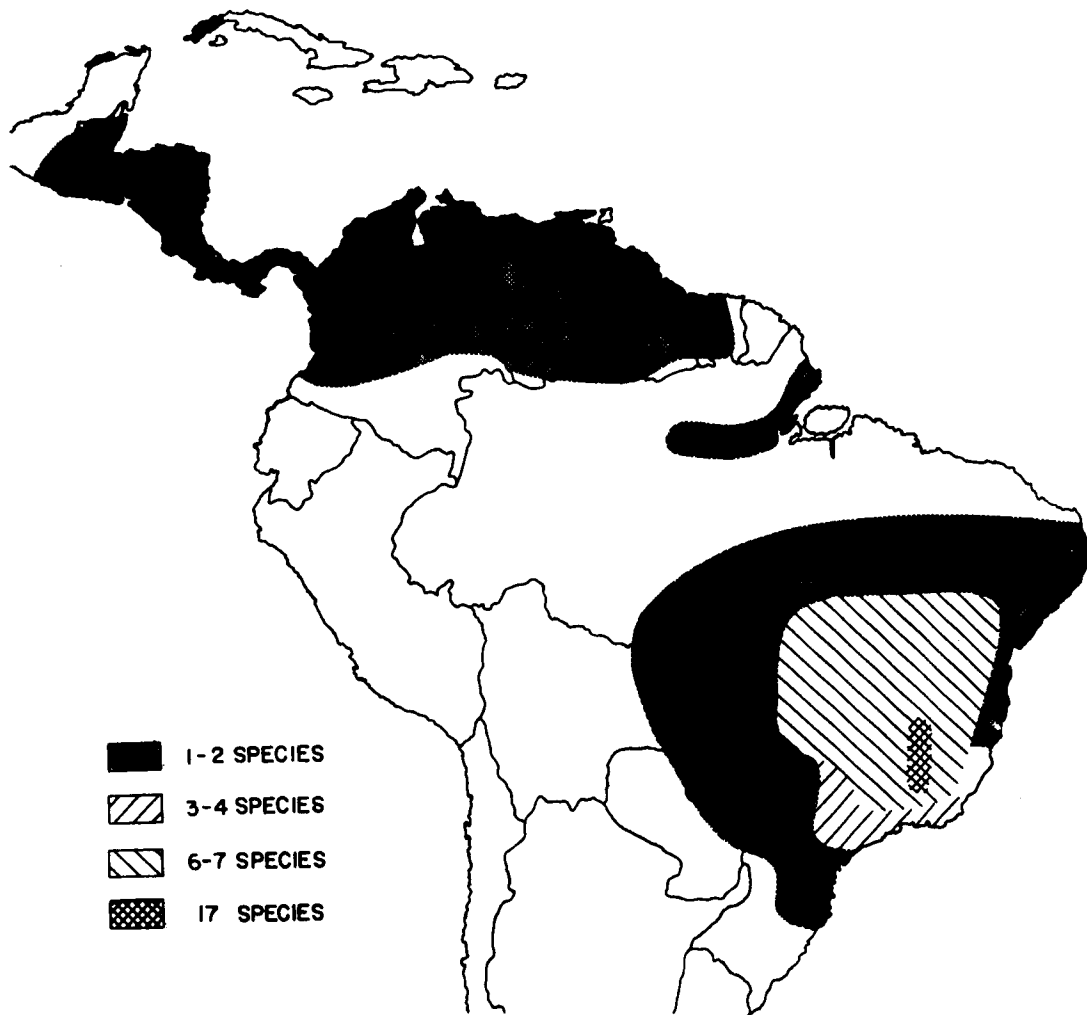


## DISTRIBUTION

The genus Declieuxia is found in neotropical savanna vegetation from Santa Catarina, Brazil, to Chiapas, Mexico, and Pinar del Rio, Cuba (see Map 1). Declieuxia fruticosa, in the northernmost part of its range, occurs in pine forests. Of the 26 species here recognized, only two, D. fruticosa and D. tenuiflora, are found outside of southeastern Brazil. The range of D. fruticosa extends the genus to its limits in the west and north. Declieuxia tenuiflora, outside of southeastern Brazil, is found in northernmost Brazil and southern and eastern Venezuela. The southernmost limits of Declieuxia are set by D. dusenii in Santa Catarina.

The central portion of the Planalto Central has the highest concentration of species (see Maps 1 and 3) with the greatest diversity occurring in the segment of the Serra do Espinhaço extending from approximately Diamantina south to Ouro Preto, the small cross-hatched area on Map 1. The Planalto Central, outside of this core region, divides up into four provinces each with 6 or 7 species (Map 2), of which at least 1 or 2 are endemic or have the majority of their range in this area: 1) Bahia, 2) southern Goiás, 3) northern Minas Gerais, and 4) southern Minas Gerais. Northeastern São Paulo has four species, but three of these are at the southern edges of their ranges and one is at the northern edge of its range.

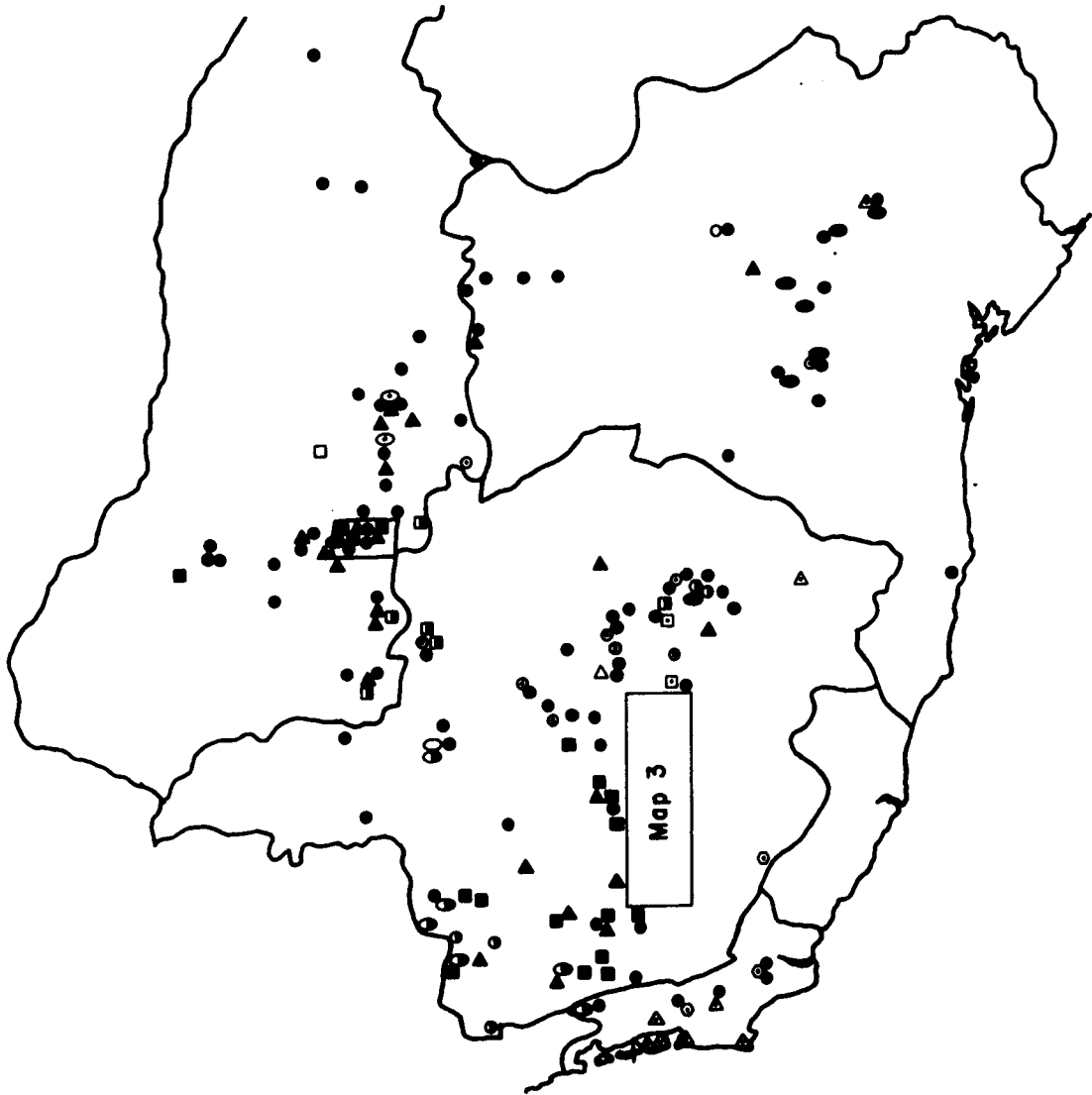
Seventeen species occur in the core area (Map 2), eleven of which are endemic. The area divides into two centers of concentration of species, the Chapada da Diamantina, the elevated area above 1200 m west



Map 1. Distribution of the genus Declieuxia and species density throughout its range.

Map 2. Known distribution of the genus Declieuxia where species density is 6-7 as shown in Map 1. Symbols used to represent the taxa:

- D. aspalathoides
- D. cacuminis
- ① var decurrens
- D. cordigera
- ① var angustifolia
- var cordigera
- var divergentiflora
- ⊙ D. coerulea
- ⊙ D. dasyphylla
- D. deltoidea
- △ var deltoidea
- var perfoliata
- D. fruticosa
- D. lancifolia
- D. lysimachioides
- ▲ D. oenanthoides
- ▣ D. passerina
- ⊙ D. pruinosa
- D. saturejoides
- △ D. tenuiflora



Map 3. Known distribution of the genus Declieuxia where species density is 17 as shown in Map 1. Symbols used to represent taxa:

- D. cordigera
  - var angustifolia
  - var cordigera
- D. cacuminis
  - var cacuminis
- D. deltoidea
  - △ var deltoidea
- D. diamantinae
- D. diantheroides
- D. fruticosa
- D. gracilis
- △ D. humilis
- D. irwinii
- D. junperina
- ⊙ D. leiophylla
- D. lysimachioides
- ⊙ D. muscosa
- ▲ D. oenanthoides
- D. passerina
- ⊙ D. saturejoides
- D. spergulifolia





of Diamantina, and the Serra do Cipó to the south. This area is about 270 km long, oriented north-south, and 25 to 50 km wide with an average width of 40 km.

Species of Declieuxia grow in full sun or only partial shade in areas that are well drained and receive strongly seasonal monsoon rainfall. Outside of the core area of Serra do Espinhaço, in southeastern Brazil, they grow on deep latosol and regosol soil types as defined by Eiten (1972). In the core area, the endemic species are found on lithosols which are thin, light gray in color, and composed principally of quartz sand, commonly around and on outcrops where the soils are especially thin. Perhaps these species have evolved in response to reduced competitive pressures. Their distribution corresponds well with the area referred to as 'campos rupestres' by Eiten (1972).

The genus is usually not encountered in ruderal situations. In my field experience of Declieuxia, I have seen only three instances of plants occupying ruderal habitats. In Panama, I observed D. fruticosa along a roadside; at Cerro Altamira, Venezuela, D. tenuiflora as a primary invader of areas recently bulldozed clean of all vegetation; in the core area in Serra do Espinhaço, Brazil, D. oenanthoides in an area heavily grazed with tightly packed soil.

#### PHYLOGENY

Hypotheses concerning character states are based primarily upon consideration of the genus Declieuxia itself and upon comparison of the genus to other neotropical genera of tribe Psychotrieae, but they

should be freely applied to Declieuxia alone. The central guiding principle has been that the evolution of characters has in most cases involved progressive reduction (Bessey, 1915; Cronquist, 1968; Takhtajan, 1969; Barneby, 1964; Wendelbo, 1961). Character states that do not form a clear reduction series have been correlated with those which do, the assumption being made that less advanced characters will tend to correlate with other less advanced ones and that more advanced characters will tend to correlate with other more advanced ones.

The vast majority of the Rubiaceae are either arborescent or fruticose, and the predominant life form in the Psychotrieae is fruticose. It has been proposed (Verdcourt, 1958) that the arborescent or fruticose life forms are more primitive than the herbaceous one and gave rise to it in the Rubiaceae. Declieuxia supports this contention with the shrubby condition appearing to be more primitive than the subshrubby, while the perennial-herbaceous one is the most advanced. Concomitant with this loss of woodiness are a reduction in branching and the appearance of several to many stems rather than one. Those species tolerating slight shade are less advanced than those growing in full sun. Those growing on 'deep' soils are more primitive than those growing in 'shallow' soils.

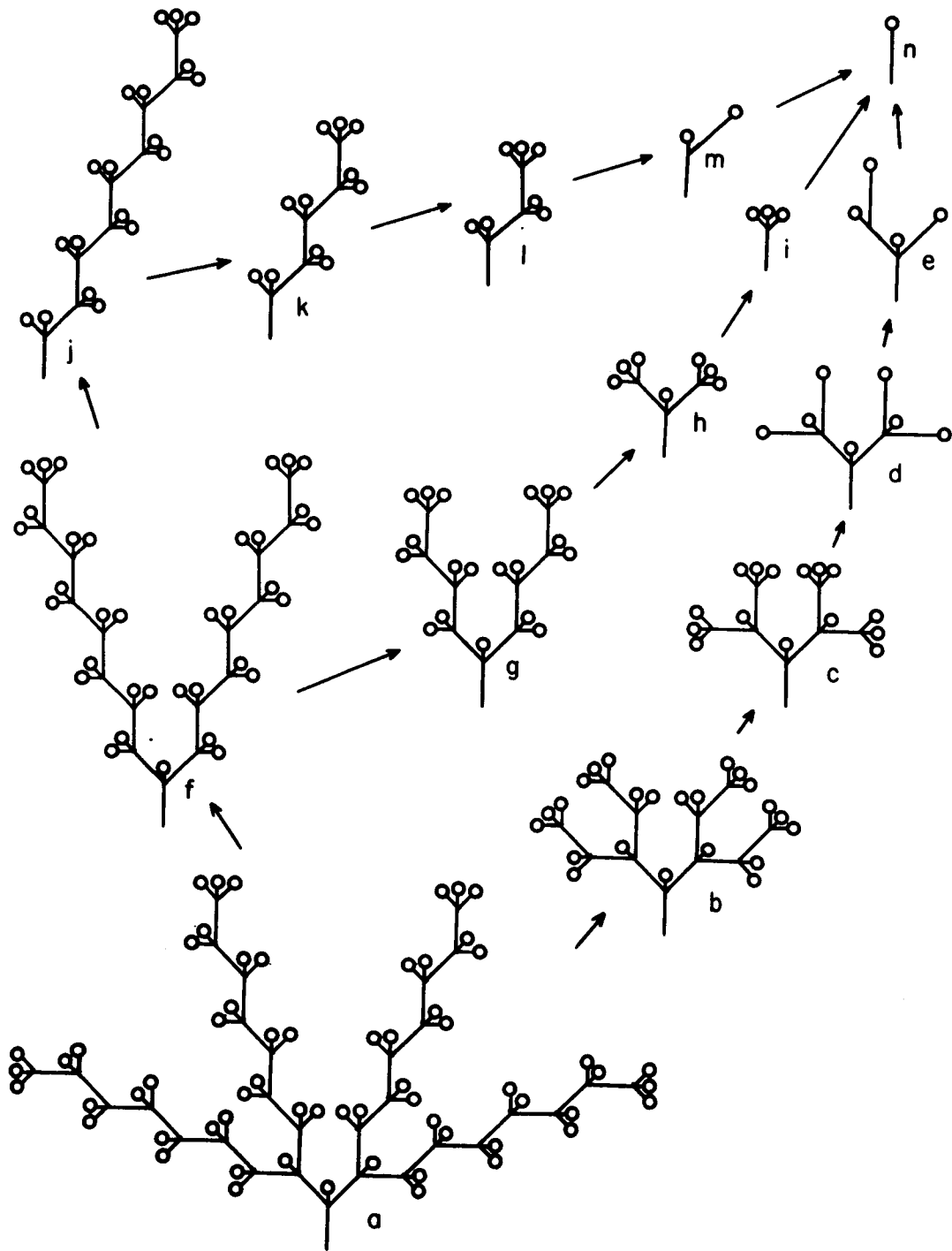
The stipules have undergone reduction and loss. The most primitive species have a complete stipular structure, that is a ridge of tissue with a decurrent appendage. The nondecurrent stipule is more advanced. There is a graduated advancement series in reduction of the appendage which culminates in complete loss. In the most

advanced state the ridge of tissue between the leaf bases is lost, leaving no visible trace of stipular structure.

There are two advanced character states in the leaves that mark particular taxa rather than general trends: 1) in D. verticillata, the leaves are 5-7 verticillate, which must be more advanced than opposite, ternate, or quaternate, and 2) in D. deltoidea var perfoliata, a possibly 'easy' step in advancement has been taken by the connation below the stipules of strongly cordate bases of opposite leaves. A number of general trends are also evident in leaf structure. The chartaceous condition is less advanced than the coriaceous. Concurrent with the modification of texture of the leaf blade is its orientation, the spreading being primitive in relation to the erect, strictly appressed. There has also been a clear reduction in the size of the leaf blade. Finally, there seems to have been an evolutionary reversal, the petiolate leaf being more advanced than the sessile.

The inflorescence structure has been greatly modified in a most complex, multifaceted reduction series. The basic type as found in D. fruticosa and D. deltoidea is the compound dichasium. More advanced than the compound dichasium is the modified cyme with modified scorpioid cymulose branches found in D. fruticosa, D. deltoidea, and other species. In D. fruticosa, the entire range of intermediates between the compound dichasium and modified cyme can be seen (Fig. 2). Next in advancement is the cymule in which the length and number of branches have lessened; and finally the inflorescence is reduced to a solitary flower which is, in fact, a highly modified cymule (Fig. 4). A reversal is then evident in D. juniperina in which the solitary

Fig. 4. The hypothetical reduction series of inflorescences in Declieuxia from the modified cyme with modified scorpioid cymulose branches to the solitary flower. The open circles represent flowers, and the solid lines the axes of the inflorescence.



flowers are tightly clustered together and give the effect of a multiflorate inflorescence. Several other trends are also evident. As a consequence of these changes in structure, the size of the inflorescence and its number of flowers are gradually reduced. Concomitant with these changes is a gradual shift in placement of the inflorescence from terminal and sometimes axillary to terminal and frequently axillary to obligately axillary, the axillary condition always the more advanced.

The flowers and fruits are the most stable structures of Declieuxia. The flower displays only isolated changes and no general trends. In D. coerulea, the bifid calyx lobes and the presence of a placenta are obvious advancements over the 4-fid calyx and the absence of a placenta in the remainder of the genus. The shift away from heterostyly in D. tenuiflora and D. duseii is also an obvious advancement over the heterostylous condition. In fruit structure, there is a single general trend in specialization evident, the change from fleshy to a nonfleshy pericarp.

These characters correlate very well with each other in species such as D. passerina, D. aspalathoides, D. juniperina, D. muscosa, D. gracilis, D. marioides, and D. coerulea, which have syndromes of the most advanced characters, whereas D. fruticosa exhibits all of the most primitive character states. The progenitors of Declieuxia must have strongly resembled D. fruticosa. They were probably diffusely branched shrubs 1-2 m tall. Their habitat was probably deep soils in semishade with strongly seasonal rainfall. The stipules were most likely unidentate with the appendage entire and decurrent, and the

leaves were large, compared with contemporary Declieuxia, sessile, and chartaceous. The inflorescences were probably large, terminal, many-flowered, compound dichasia with flowers similar in size and structure to those of their modern descendents. Of the neotropical members of tribe Psychotrieae, the progenitors of Declieuxia probably resembled most closely less advanced members of the genus Psychotria.

If the genus Declieuxia, as it is now known, is arranged in a two-dimensional pattern based upon similarities, differences, and the above assumptions of primitive versus advanced, Figure 5 results when the most primitive species, D. fruticosa, is placed in the center with the rest radiating outward from it. The size of the circle and ovals is not significant, but the distance separating them indicates my evaluation of their similarity to and difference from one another. The orientation of the long axes of the ovals is in the direction of greatest similarity and probable relationships, in my opinion.

'Relatedness' has, in this study, been based upon the possession of the same characters (Simpson, 1961). The degree of 'relatedness' has been determined by the number of characters in common. The possession of different character states has also been considered, but given less emphasis. Emphasis has been given to the presence of a character suite common to the taxa in determining 'relatedness.'

#### PHYTOGEOGRAPHY

Declieuxia fruticosa, the most widely distributed species in the genus (Map 4), presents a distinct pattern of morphological variation.

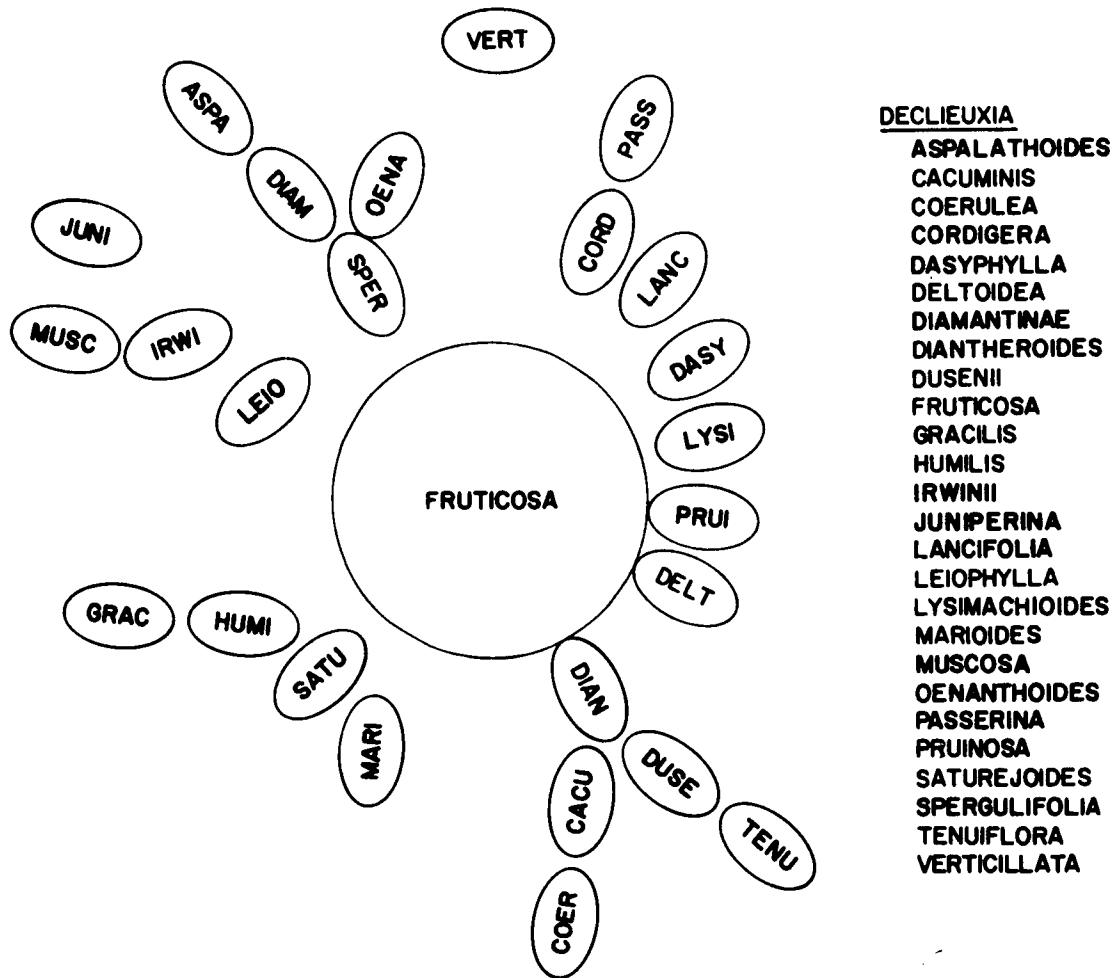


Fig. 5. The genus *Declieuxia*, as it is now known, shown in two dimensions. Similarity and difference is indicated by degree of separation, and orientation of the long axes of the ovals is in the direction of greatest similarity and probable relationships.

The degree of variation is greatest in the Serra do Espinhaço from the vicinity of Diamantina to that of Ouro Preto and decreases with distance from that focus. In northern South America, the degree of variation is greatly reduced and is least in Central America and Cuba. For details based upon the examination and comparison of over 2,200 herbarium specimens of D. fruticosa, refer to the discussion of D. fruticosa in the Systematic Treatment. This pattern of variation suggests that the populations in northern South America are derived from propagules which carried with them only part of the specific gene pool. The relative homogeneity of D. fruticosa in Central America and Cuba further suggests that very few propagules become established in these areas from northern South America, resulting in a greatly depleted genetic potential. It appears that distance has acted as a filter to reduce variability. Because no new variation has arisen north of the Amazon valley, it is probable that D. fruticosa evolved somewhere in southeastern Brazil and only in recent geological time migrated northward. A pathway to migration opened up during those phases of the Pleistocene when the Amazonian forests contracted and gave way to savannas over large areas of the Amazon valley (Haffer, 1969; Vuilleumier, 1971).

It has now become well accepted, on the basis of much evidence (Vuilleumier, 1971; Haffer, 1969; Prance, 1973; van der Hammen et al., 1960, 1961, 1963; Ericson et al., 1964; Groot & Groot, 1966; Mabesoone, 1966) that the climatic fluctuations that marked the Pleistocene in the temperate zone of the northern hemisphere were world-wide in scope and affected all parts of the globe. Van der Hammen's palynological

analyses from Colombia and Guyana (1960, 1961, 1963) give the clearest ideas of the climate in northern South America in the later phases of the Pleistocene. In the area of the Sabana de Bogotá, Colombia, he found that the temperatures during the Würm glacial period were 8°C. lower than at present, during the Riss I glacial period 11°C. lower, and during the interglacial periods 2-3°C. higher. These temperature changes combined with increased atmospheric precipitation during the glacials and decreased atmospheric precipitation during the interglacials resulted in a downward shift of the treeline 950 m below the present treeline during the Würm glacial and  $\pm$  1700 m during the Riss I glacial. Van der Hammen's work in Guyana (1963) has shown that the sea level dropped over 70 m during the Pleistocene glacials.

Our understanding of the Pleistocene climate in southern Brazil is based principally on geomorphological evidence (de Martonne, 1944; Rich, 1953; King, 1956; Bigarella et al., 1965; Bigarella & Mousinho, 1966). This area probably had a semiarid climate during the glacials and a humid climate during the interglacials. Estimates of the minimum temperature regime in this area during the Pleistocene have been based upon reports of glaciation at Agulhas Negras on Serra da Itatiaia (de Martonne, 1944; Rich, 1953; King, 1956; Birot, 1957; Brochu, 1957; Cailleux, 1957; Dresch, 1957; Hamelin, 1957; Lefevre, 1957; Raynal, 1957; Cailleux & Tricart, 1959; Ebert, 1960). Ebert (1960) reported that tongues of glaciers on Serra da Itatiaia reached as low as 1,100 m for short periods during the Pleistocene, and suggested that the vegetational zones were depressed as much as 1,500 m. Brochu (1957) inferred from the glaciation of Itatiaia that the

Serra do Espinhaço at higher elevations from the vicinity of Ouro Preto to that of Diamantina was periglacial during the colder periods of the Pleistocene. Bigarella et al. (1965) have contested the reports of glaciation on Itatiaia and attempted to explain the facts by erosional processes.

Eighteen taxa of Declieuxia, of which eleven are endemic, are found at higher elevations on the Serra do Espinhaço from the vicinity of Diamantina south to Ouro Preto (Maps 1 and 3). It has become an accepted tenet that one of the basic modes of speciation is the separation and isolation of a portion of a population system constituting a species with subsequent differentiation into two species. But if this tenet is correct and assumed to be the major pathway of speciation in Declieuxia, how could eighteen taxa of which eleven are endemic become sympatric in this small area? If the contemporary situation is viewed as part of a continuing process related to the climatic history of southeastern Brazil during the Pleistocene, a hypothesis can be suggested.

The species found in this area fall into two principal groups: 1) those with very limited ranges, such as D. irwini, D. muscosa, D. gracilis, and D. humilis, and 2) those which extend through the entire area or almost all of it, such as D. passerina, D. saturejoides, and D. fruticosa. Species of the first group naturally have narrow ranges of morphological variation, whereas those of the second group have wide ones. The present ranges of variation and relatively wide distribution in the second group of species suggest that former larger ranges have been disrupted in some places and fused in others. It is possible that the Pleistocene climatic fluctuations have shifted both

upwards and downwards the vegetational zones in the Serra do Espinhaço and with the zones, the species delimiting them. It is impossible to determine how great these shifts were, but they must have sufficed to cause isolation and differentiation in some cases and permit fusion in others. If this hypothesis is correct, the species of the second group are older and have undergone more than one cycle of change, whereas the first group is younger and may have arisen during the latest cycle. This type of speciation in response to climatic fluctuations, on a much larger scale, has been suggested by Valentine (1967) for mollusc species and by Stebbins (1974) for the climax forests of the tropics; Stebbins has referred to it as the 'species pump' hypothesis.

This area also harbors a large number of endemic species in other genera such as Vernonia, Byrsonima, Mimosa, Salvia, Hyptis, Cassia, Baccharis, Polygala, and others. Further work needs to be done in order to clarify all possible factors which could affect speciation in this region.

#### SYSTEMATIC TREATMENT

##### The Tribe Psychotrieae

Frequently shrubs, rarely herbs or trees; raphides present; complete heterostyly common; aestivation valvate; pollen porate; ovules solitary in 2-8 locules, erect, anatropous; fruit usually fleshy, containing 2-8 pyrenes, more rarely dry and separating into cocci, the seeds albuminous.

Declieuxia is a member of tribe Psychotrieae (Schumann, 1891;

Verdcourt, 1958; Bremekamp, 1966). It is one of the best defined genera in the Rubiaceae. The didymous schizocarp compressed laterally to the septum and the lenticular mericarps are found in no other genus of the Psychotrieae. Declieuxia is further set off by its preponderance of perennial-herbaceous species.

In the synonymies given herein, only the relevant portion of the name is italicized. Only material critically examined has been cited with the herbarium of deposit indicated according to Holmgren and Keuken (1974).

Declieuxia Humboldt, Bonpland, & Kunth, Nov. Gen. et Sp. 3: t. 281, 1819, 3: 352 cum descriptione, 1820.

Psyllocarpus Pohl ex de Candolle, in synonymy, Prodr. 4:

479, 1830, non Psyllocarpus Martius ex Martius & Zuccarini, Flora 7(1), Beil. (4): 130, betw 25 IV and 7 VII, 1824, and Nov. Gen. et Sp. PL. I: 44, 1 X 1824.

Congdonia Müller Argoviensis, Flora 59(28): 437, 1876.

Declieuxia Humboldt, Bonpland, & Kunth ser Platyphylla K. Schumann, Natürl. Pflanzenfam. IV(4): 118, 1891.

Declieuxia Humboldt, Bonpland, & Kunth ser Stenophylla K. Schumann, Natürl. Pflanzenfam. IV(4): 118, 1891.

Perennial herbs, subshrubs, or shrubs, erect or spreading, stems terete, simple or diffuse-branched, many tissues with raphides. Stipules a ridge bearing 1, 3, or 6-7 appendages with a glandular apex, or reduced to a ridge, or rarely completely absent, the ridge sometimes with 1-6 glandules. Leaves opposite or in whorls of 3-7, some with 1-5 pairs of smaller leaves in the axils, sessile to petiolate, entire, highly diverse in size and form. Inflorescences compound dichasia, modified cymes or cymules, or a solitary flower,

terminal and/or axillary, pedunculate or sessile, with 1 to many flowers, with 1 to many or no axes, the axes dichasial or modified scorpioid cymous, the peduncle with 2 or 3 bracts at apex. Flowers heterostylous or partially so, protandrous (D. tenuiflora), or undertermined (D. dusenii), subpedicellate or sessile, each dichasium subtended by 2 bracts or rarely ebracteate, the dichasial bracts of various sizes and forms; hypanthium compressed laterally, with 4 (or 2 in D. coerulea) lobes varying in size and form, persistent on fruit; corolla white or blue, salverform to funnel-salverform, with the interior of the tube sericeous moniliform above and glabrous below, the lobes 4, valvate, with the interior minutely papillate; stamens 4, alternate to corolla lobes, included or excluded, the filaments adnate to the inner face of the corolla tube and departing from it in the upper half of the tube when anthers included or near the apex when anthers exerted, glabrous or granulate, the anthers 4-thecate, narrowly oblong, glabrous introrse, opening by full-length slits, dorsifixed below the middle; disc filling the space between the base of the corolla and the base of the style, consisting of 2 glandular hemicylindrical nectaries, 1 positioned over each locule, persistent on the fruit; style glabrous or granulate, the stigma bifid, minutely papillate, included or excluded; ovary inferior, bilocular, each locule containing 1 basally attached ascending anatropous ovule with the funiculus thin and straight or a basally attached cylindrical or club-shaped placenta (D. coerulea) with 1 or occasionally 2 amphitropous ovules. Fruit a schizocarp, drupaceous for a short interval, didymous, emarginate, indehiscent, the mericarps globose to compressed-lenticular when fleshy and compressed-lenticular when dry with the compression at right angles to

the septum, the pyrenes compressed-lenticular, the seeds compressed-lenticular, the embryo erect, straight, with the radicle inferior, embedded in endosperm.

Type: Declieuxia fruticosa (Willdenow ex Roemer & Schultes) O. Kuntze, Revisio Generum Plantarum 1: 279, 1891.

Key to the Species of Declieuxia

1. Leaves sessile or connate-perfoliate.
  2. Leaves verticillate in whorls of 5-7; Mato Grosso, Brazil.
    26. D. verticillata.
  2. Leaves opposite, ternate, quaternate, or connate-perfoliate.
    3. Leaf axils with fascicles of leaflets; secondary venation obscure.
      4. Stipules reduced to a ridge; inflorescences reduced to 1 flower (inflorescences with 7-10 flowers simulated by solitary flowers at terminal and secondary and sometimes tertiary nodes), sessile; calyx lobate; corolla lobes 2.3-2.7 x 1.3-1.8 mm; above 1200 m W of Diamantina, Minas Gerais, Brazil.
        15. D. juniperina.
      4. Stipules unidentate or tridentate; inflorescences with (1-)2-65 flowers (when flower 1, pedunculate); calyx lobate or gamosepalous; corolla lobes 1.6-2.3 x 0.8-1.6 mm.
        5. Stems glabrous, with stomata; leaf blade 20-31 times longer than wide; calyx lobate; above 1200 m W of Diamantina, Minas Gerais, Brazil.
          11. D. diamantinae.

5. Stems puberulous to glabrate, without stomata; leaf blade (4.2-)8.5-16 times longer than wide; calyx lobate or wholly gamosepalous.
6. Subshrub or shrub 15-150 cm tall; leaf blade revolute, linear-subulate, 2.5-8.5(-13) x 0.4-1 mm; inflorescences with 2-8 flowers; calyx lobate or wholly gamosepalous; Sergipe, Bahia, NE Minas Gerais, and Distrito Federal, Brazil.

12. D. aspalathoides.

6. Perennial herb 4-10 cm tall; leaf blade plane, narrowly to very narrowly elliptic, 10-15 x 1-1.8 mm; inflorescences with 25-65 flowers; calyx lobate; Serra do Cipó, Minas Gerais, Brazil.

18. D. humilis.

3. Leaf axils without fascicles of leaflets; secondary venation evident or sometimes obscure.
7. Inflorescences with 1-2 flowers, axillary; S half of Serra do Espinhaço, Minas Gerais, Brazil.

8. D. passerina.

7. Inflorescences with (2-)4-400(-800) flowers, terminal or both terminal and axillary.
8. Stipules not decurrent or very rarely (in D. cordigera), very weakly decurrent and not reaching to the next node.
9. Leaf blades 0.4-2.3 mm wide, 5.6-30(-38) times longer than wide (when less than 6, the bracts at apex of peduncle scabrous), lateral veins not evident or only rarely evident (evident on 2 collections of D. oenanthoides

from Chapada dos Veadeiros).

10. Height (17-)24-100 cm, the stems with stomata; stipules reduced to a ridge or unidentate, glabrous; fruit glabrous or very rarely papillate; Planalto Central do Brasil.

10. D. oenanthoides.

10. Height 4-21 cm, the stems without stomata; stipules unidentate, puberulous; fruit puberulous to sparsely so (fruit of D. humilis unknown).
11. Height 12.5-21 cm; leaf blades puberulous; dichasial bracts 2.2-3.2 x 0.5-0.6 mm, sparsely puberulous; calyx lobes 0.4-0.9 mm long; Serra do Cipó, Minas Gerais, Brazil.

19. D. gracilis.

11. Height 4-10 cm; leaf blades scabrous; dichasial bracts 1.9-2.3 x 0.2-0.3 mm, glabrous; calyx lobes 0.2-0.4 mm long; Serra do Cipó, Minas Gerais, Brazil.

18. D. humilis.

9. Leaf blades (1-)4-25 mm wide, 0.68-6(-9) times longer than wide lateral veins evident; bracts at apex of peduncle glabrous or sometimes glabrate to puberulous.
12. Perennial herb (8-)13-25(-37) cm tall; Planalto Central do Brasil south to E São Paulo and E Paraná, Brazil.

7. D. cordigera.

12. Shrub or subshrub 40-200 cm tall.
13. Leaf blades connate-perfoliate or strongly cordate at base and 0.68-0.97 times longer than wide; S

Serra do Espinhaço and Morro das Pedras, Minas Gerais, Brazil.

2. D. deltoidea.

13. Leaf blades not connate-perfoliate, acute to obtuse or very rarely attenuate at base, and (1.7-)3.1- 4.4 (-7.1) times longer than wide; N Minas Gerais, Goiás (Sítio da Abadia), and Bahia (Serra do Sincorá), Brazil.

3. D. pruinosa.

8. Stipules decurrent reaching the next node.
14. Inflorescences appearing as a mass of over lapping bracts, the dichasial bracts 0.9-1.3 mm wide; Chapada dos Veadeiros and vicinity, Goiás, Brazil.

5. D. dasyphylla.

14. Inflorescences not appearing as a mass of over lapping bracts, the dichasial bracts 0.12-0.8(-1) mm wide.
15. Shrub or subshrub; savannas and pine forests in Pinar del Río, Cuba, Chiapas, Mexico, Central America, and Colombia, and tropical savannas E of the Andes.

1. D. fruticosa

15. Perennial herb.
16. Stipule reduced to a ridge or rarely unidentate at lower nodes, lobe when present 0.1-0.4 mm long; near Niquelândia, Goiás, Brazil.

6. D. lancifolia.

16. Stipules unidentate, lobe 1.4-5(-6) mm long.
17. Internodes 0.3-1.4 cm long; leaf blades 1.4-2.5 x 0.2-0.5 cm, 4.2-7 times longer than wide; mericarps 2.1-2.5 x 1.5-1.6 mm; Serra do Cipó, Minas Gerais,

Brazil.

16. D. leiophylla.

17. Internodes 2-5(-9) cm long; leaf blades (1.5-)3.5-6.5(-7) x (0.6-)1.4-2.8 cm, (1.4-)1.8-3.5 times longer than wide; mericarps 1.4-1.9(-2.2) x 1.2-1.6(-1.8) mm; S Minas Gerais, W Rio de Janeiro, E São Paulo, Brazil.

4. D. lysimachioides.

1. Leaves petiolate, not connate-perfoliate.

18. Inflorescences reduced to a solitary flower.

19. Subshrub 22-39 cm tall with the stems puberulous; leaves ternate and quaternate, sparsely puberulous; inflorescences pedunculate; exact locality unknown, probably in S Serra do Espinhaço, Minas Gerais, Brazil.

20. D. marioides.

19. Perennial herb 2.5-7 cm tall with the stems glabrous; leaves opposite, glabrous; inflorescences epedunculate; above 1200 m W of Diamantina, Minas Gerais, Brazil.

14. D. muscosa.

18. Inflorescences with 2-300(-450) flowers.

20. Inflorescences terminal.

21. Calyx lobes 4, 0.3-0.6 mm long; without a placenta, with 1 ovule per locule; summit of Pico do Itambé and near Grão Mogol, Minas Gerais, Brazil.

24. D. cacuminis.

21. Calyx lobes 2, 1-3.5 mm long; with a placenta, with 1 or occasionally 2 ovules per locule; summits of Serra dos Orgãos and Alto de Desengano, Rio de Janeiro, and Serra do

Caparaó, Minas Gerais - Espírito Santo.

25. D. coerulea.

20. Inflorescences both terminal and axillary.

22. Perennial herb 5-10 cm tall.

23. Internodes 0.3-0.7 cm long; stipules unidentate; inflorescences with 2-9 flowers; dichasial bracts 2-6.7(-8) mm long; mericarps  $\pm$  2.3 x 1.9 mm; Serra do Cipó, Minas Gerais, Brazil.

13. D. irwinii.

23. Internodes (0.4-)1-8(-9.5) cm long; stipules reduced to a ridge bearing 1-3 glands; inflorescences with 10-225 (-250) flowers; dichasial bracts 0.7-1.6 mm long; mericarps 1-1.6 x 0.7-1.3 mm; NE Santa Catarina, E Paraná, and Campos do Jordão, São Paulo, Brazil.

22. D. dusenni.

22. Shrub or subshrub 10-150 cm tall.

24. Leaf axils without fascicles of leaflets.

25. Peduncle 1-29(-50) mm long; mericarps 1.6-3.5 x 1.4-3 mm; savannas and pine forests in Pinar del Río, Cuba, Chiapas, Mexico, Central America, and Colombia, and tropical savannas E of the Andes.

1. D. fruticosa.

25. Peduncle 25-45(-55) mm long; mericarps 1-1.6 x 0.7-1.3 mm; NE Santa Catarina, E Paraná, and Campos do Jordão, São Paulo, Brazil.

22. D. dusenni.

24. Leaf axils with fascicles of leaflets.

26. Hypanthium minutely and densely papillate; fruit moderately papillate; E and S Venezuela, N and SE Brazil.

23. D. tenuiflora.

26. Hypanthium glabrous to puberulous or hispidulous or rarely with a few curly hairs; fruit glabrous to puberulous or hispidulous or rarely with a few long curly hairs.
27. Leaf blades 3-20 mm wide, 1.4-4(-4.7) times longer than wide, plane; fruit emargination 0.1-0.3 mm.
28. Petiole glabrous or glabrate to scabrous; leaf surfaces scabrous to glabrous; floral bracts 0.7-1.6 mm long, glabrous; corolla blue, exterior glabrous; mericarps 1-1.6 x 0.7-1.3 mm; NE Santa Catarina, E Paraná, and Campos do Jordão, São Paulo, Brazil.

22. D. dusenii.

28. Petiole puberulous; leaf surfaces puberulous; floral bracts 1.8-3.5 mm long, puberulous to sparsely so; corolla white, exterior sparsely puberulous; mericarps 1.6-2 x 1.2-1.4 mm; near Conselheiro Mata and Serra do Cipó, Minas Gerais, Brazil.

21. D. diantheroides.

27. Leaf blades 0.6-2.5(-3) mm wide (rarely a few leaf blades on plants of D. saturejoides from

Serra da Caraça to 5 mm wide), (2.7-)3.4-15(-60)  
times longer than wide, revolute; fruit  
emargination 0.2-1.1 mm.

29. Younger branches glabrous to rarely sparsely  
puberulous, with many stomata; leaves glabrous;  
Serra do Espinhaço near Diamantina and Congo  
Soco, Minas Gerais, Brazil.

9. D. spergulifolia.

29. Younger branches hispidulous or puberulous, with-  
out stomata; leaves scabrous to puberulous to  
glabrate or hispidulous to sparsely so; higher  
elevations of S Serra do Espinhaço, Minas  
Gerais, and Serra Assuruá, Bahia, Brazil.

17. D. saturejoides.

1. Declieuxia fruticosa (Willdenow ex Roemer & Schultes) O. Kuntze,  
Revisio Generum Plantarum 1: 279, 1891.

Houstonia fruticosa Willdenow ex Roemer & Schultes, Syst. Veg. 3:  
527, 1818.

*Declieuxia* chiococcoides Humboldt, Bonpland, & Kunth, Nov. Gen.  
et Sp. 3: t. 281, 1819, 3: 354 cum descriptione, 1820.

*Declieuxia* *chiococcoides* Humboldt, Bonpland, & Kunth var genuina  
Müller Argoviensis, Flora 59(28): 435, 1876.

*Declieuxia* alba Zuccarini ex Schultes & Schultes, Mantissa ...  
Syst. Veg. 3: 113, 1827.

*Declieuxia* *chiococcoides* Humboldt, Bonpland, & Kunth var papillosa  
Müller Argoviensis, Flora 59(28): 435, 1876.

Type: Brazil, Minas Gerais, Serra dos 3 Barras, prope Tejunco,  
Martius 1265 (holotype M, fragment G; isotype M).

*Declieuxia* mollis Zuccarini ex schultes & Schultes, Mantissa ...  
Syst. Veg. 3: 112, 1827. Type: Brazil, ad Villa do Rio das Contas,  
Martius 1986 (holotype M, fragment G; isotype M).

*Declieuxia* origanoides Zuccarini ex Schultes & Schultes, Mantissa  
... Syst. Veg. 3: 112, 1827. Type: Brazil, Minas Gerais, without  
locality, Martius sn (holotype M, fragment G).

*Declieuxia* rubioides Zuccarini ex Schultes & Schultes, Mantissa  
... Syst. Veg. 3: 112, 1827. Type: Brazil, Minas Gerais, Martius  
sn (holotype M, fragment G; isotypes M).

*Declieuxia* vincoides Martius & Zuccarini ex Schultes & Schultes,  
Mantissa ... Syst. Veg. 3: 113, 1827.

*Declieuxia* *chiococcoides* Humboldt, Bonpland, & Kunth var vincoides  
(Martius & Zuccarini ex Schultes & Schultes) Müller Argoviensis,  
Flora 59(28): 435, 1876.

Type: Brazil, Minas Gerais, without locality, Martius sn (holotype

M, fragment G).

*Declieuxia glauca* Martius ex Chamisso & Schlechtendal, *Linnaea* 4(1): 8, 1829. Type: Brazil, without locality, Sello 1721/1126 (lectotype COI; isotype F).

*Declieuxia mucronulata* Martius ex Chamisso & Schlechtendal, *Linnaea* 4(1): 10, 1829.

*Declieuxia chiococcoides* Humboldt, Bonpland, & Kunth var lucida Müller Argoviensis, *Flora* 59(28): 435, 1876.

Type: Brazil, without locality, Sello 1719/1124 (lectotype COI, isotype S).

*Declieuxia pulverulenta* Martius ex Chamisso & Schlechtendal, *Linnaea* 4(1): 9, 1829.

*Declieuxia chiococcoides* Humboldt, Bonpland, & Kunth var hirta Müller Argoviensis, *Flora* 59(28): 435, 1876.

Type: Brazil, Minas Gerais, inter Alegres et Rio Sao Francisco, IX 1834, Riedel 2868 (neotype BR; isotypes BR, LE, US).

*Declieuxia foliosa* Pohl ex de Candolle, *Prodr.* 4: 480, 1830.

*Psyllocarpus foliosus* Pohl ex de Candolle, in synonymy, *Prodr.* 4: 480, 1830.

Type: Brazil, Goiás, Ad S. Anna in sumitate montium de S. Felis, Pohl 1971 (holotype G-DC; isotypes F, NY, W).

*Declieuxia glabra* Pohl ex de Candolle, *Prodr.* 4: 481, 1830.

*Psyllocarpus glaber* Pohl ex de Candolle, in synonymy, *Prodr.* 4: 481, 1830.

Type: Brazil, without locality, Pohl sn (holotype G-DC).

*Declieuxia mexicana* de Candolle, Prodr. 4: 479, 1830.

*Declieuxia chiococcoides* Humboldt, Bonpland, & Kunth var mexicana (de Candolle) Müller Argoviensis, Flora 59(28): 435, 1876.

*Declieuxia fruticosa* (Willdenow ex Roemer & Schultes) O. Kuntze var mexicana (de Candolle) Standley, Field Mus. Nat. Hist., Bot. Ser. 12: 378, 1936.

Type: Mexico, without locality, Haenke sn (lectotype PR; isotype W).

*Psyllocarpus trichotomus* Pohl ex de Candolle, in synonymy, Prodr. 4: 481, 1830. Based upon Pohl 879, Brazil, Minas Gerais, Paracatu (G-DC, W).

*Declieuxia brevicollis* Müller Argoviensis, Flora 59(28): 437, 1876. Type: Brazil, Goiás, Porto Real to Igarapé (Smith & Smith, 1967), Burchell 8426 (lectotype BR, fragment G).

*Declieuxia clinopodioides* Müller Argoviensis, Flora 28(59): 437, 1876. Type: Brazil, Bahia, ad Villa do Rio das Contas, Martius sn (holotype G; isotype M).

*Declieuxia revoluta* Müller Argoviensis, Flora 28(59): 438, 1876. Type: Brazil, Goiás, Serra d'Ourada, Pohl 1568 (holotype W, fragment G).

*Declieuxia chiococcoides* Humboldt, Bonpland, & Kunth var guyanensis Müller Argoviensis, Mart. Fl. Bras. 4(5): 442, 1881.

*Declieuxia fruticosa* (Willdenow ex Roemer & Schultes) O. Kuntze var guyanensis (Müller Argoviensis) Standley, Publ. Field Columbian Mus., Bot. Ser. 8(5): 369, 1931.

Type: Guyana, Rupununi District, prope Pirara, 1840, Spruce 723  
(lectotype G; isotypes F, FI, NY, US, W).

*Declieuxia chiococcoides* Humboldt, Bonpland, & Kunth var linearis  
Müller Argoviensis, Mart. Fl. Bras. 4(5): 445, 1881. Type:  
Venezuela, Amazonas, prope Maypures, ad flumen Orenoco, VI 1854,  
Spruce 3657 (lectotype K, fragment G; isotypes BR, W).

*Declieuxia chiococcoides* Humboldt, Bonpland, & Kunth var opaca  
Müller Argoviensis, Mart. Fl. Bras. 4(5): 442, 1881.  
Type: Brazil, Goiás, Chapada da Mangabeira, IX 1839, Gardner 3231  
(lectotype G; isotypes F, GH, NY, W).

*Declieuxia chiococcoides* Humboldt, Bonpland, & Kunth var pallida  
Müller Argoviensis, Mart. Fl. Bras. 4(5): 444, 1881. Type: Brazil  
Minas Gerais, without locality, Martius sn (holotype M, fragment G).

*Declieuxia chiococcoides* Humboldt, Bonpland, & Kunth var puberula  
Müller Argoviensis, Mart. Fl. Bras. 4(5): 442, 1881. Type: Brazil,  
Bahia, Serra Jacobina, Blanchet 3751 (lectotype G; isotypes BR, C, F,  
G, LE, MO, NY, U, W).

*Declieuxia chiococcoides* Humboldt, Bonpland, & Kunth var puberulina  
Müller Argoviensis, Mart. Fl. Bras. 4(5): 444, 1881. Type:  
Brazil, São Paulo, prope Mugy, XI 1833, Riedel 2867 (holotype BR,  
fragment G; isotypes BR, LE).

*Declieuxia alfredi* Ernst, Revista Ci. Mensual Univ. Centr.  
Venezuela 1(7): 222, 1887. Type: Venezuela, Amazonas, Puerto  
Ayacucho, 18 V 1940, L. Williams 12999 (neotype US; isotype F).

*Declieuxia* anceps Schumann ex Glaziou, nom nud, Bull. Soc. Bot. France, Mem. 3: 358, 1909. Based upon Glaziou 21500, Brazil, Minas Gerais, entre Lagoa do Piquiero et Buraco da Onça, 30 IX 1895 (BR, C, F, G, LE, R).

*Declieuxia* calophylla Standley, Publ. Field Mus. Nat. Hist., Bot. Ser. 22(3): 184, 1940. Type: Brazil, Minas Gerais, Serra do Cipó, Km 131, 14 IV 1935. Barreto 1130 & Brade 14738 (holotype F; isotype R, UB).

Type: Venezuela, Monagas, Caripe, Vendémiaire an 8 (22/23 IX-21/22 X 1790), Humboldt, Bonpland 223 (D. fruticosa (holotype B-Wilddenow hb; isotype P) and D. chiococcoides (holotype P; isotype B-Wilddenow hb)).

Shrub or subshrub 7-150 cm tall, glabrous or glabrate to hispidulous except flowers and fruit, the branches terete, with stomata, the internodes (0.5-)1-7.5(-12) cm long. Stipules unidentate, linear to narrowly oblong or linear-subulate to narrowly triangular or rarely triangular, narrowly acute and glandular at apex, (0.3-)0.5-6.5(-8.5) x 0.1-0.5(-1) mm, decurrent reaching to the next node. Leaves opposite or ternate or rarely quaternate, sessile or rarely petiolate, the petiole winged, 0.5-1.2(-4) mm long; blade coriaceous to chartaceous, elliptic to narrowly so or sometimes ovate to broadly so or rarely obovate to narrowly so, acuminate to narrowly so or acute to narrowly so or rarely obtuse with a point at apex, attenuate to narrowly so or cuneate to narrowly so or acute to narrowly so or obtuse to rarely cordate at base, (1-)1.3-8 x (0.1-)0.3-3.7(-5.2) cm, 1.2-12(-17.5) times longer than wide, venation pinnate with (4-)5-9(-10) arcuate, anastomosing lateral veins on each side, the midrib prominent to prominulous or rarely prominulous in a sulcus and the lateral veins prominulous to sulcate above, the midrib prominent to subprominulous and the lateral veins prominent to weakly sulcate beneath, the tertiary venation obscure or closed reticulate. Inflorescences compound dichasia or modified cymes, terminal and axillary at the apical node and sometimes axillary at secondary nodes or rarely at tertiary nodes, pedunculate, 1-6(-7.5) x 0.8-6 cm, with (10-)25-300(-450) flowers, with (1-)2-64 axes, the axes terete, 2-35(-70) mm long; peduncle

terete, 1-29(-50) mm long, with 2-3 dichasial or larger bracts at the apex, the bracts narrowly elliptic or narrowly oblong to linear or narrowly triangular, narrowly acute at apex, (1-)1.3-16(-19) x 0.15-4(-6) mm. Flowers heterostylous or morphologically, incompletely so in Belize and Cuba, subpedicellate with the pedicels terete, 0.1-0.8 mm long, dichasial bracts narrowly elliptic or narrowly oblong to linear or narrowly triangular, narrowly acute at apex, (0.5-) 0.7-6(-7.5) x 0.2-0.8(-1) mm, sometimes ciliate or minutely and irregularly ciliate; hypanthium obovate to depressed obovate or broadly elliptic to transversely so or oblong to transversely so in outline, 0.3-1.1(-1.8) x 0.5-1.3(-1.5) mm, glabrous or puberulous or glabrous with minutely and densely papillate patches; calyx lobes narrowly triangular to deltoid or narrowly oblong to broadly so, acute to narrowly so or rarely obtuse at apex, 0.1-1.1 x 0.1-0.7 mm, glabrous to sparsely puberulous and rarely ciliate or sparsely and irregularly ciliate; corolla white or blue, salverform, the tube 1.2-7.3 mm long, orifice 0.7-1.7(-2) mm in diam, (0.4-)0.5-1.3 mm at base, exterior glabrous or glabrate to puberulous or sparsely hispidulous, the lobes triangular to broadly so or narrowly ovate to broadly so or oblong to narrowly so or elliptic or obovate, acute to narrowly so at apex, 1.2-3 x 0.5-1.9 mm, glabrous or glabrate to puberulous or sparsely hispidulous outside; stamens with the filaments 0.1-1.4 mm long, glabrous, the anthers 0.7-1.8 mm long, glabrous; style 1.1-7.6 mm long, glabrous. Fruit with the emargination 0.1-1.3 mm, pedicellate to slightly so with the pedicel 0.1-1.4 mm long, the mericarps elliptic to broadly so or rarely circular in outline, 1.6-3.5 x 1.4-3 mm, 0.3-0.8(-1) mm thick, glabrous or glabrate to

puberulous or papillate-puberulous to papillate and rugose to weakly so.

Distribution. Known from savannas and pine forests in Pinar del Río, Cuba, Chiapas, Mexico, Central America, and Colombia, and from tropical savannas east of the Andes. Map 4.

Representative Specimens. CUBA. Pinar del Río: Mantua, 3 VI 1920, Ekman 11081 (G, NY, S): nr San Diego de los Baños, 21 VIII 1914, León 4457 (GH, NY, US): without locality, Wright 2732 (G, GH, LE, MO, NY, S, US). BELIZE. Cayo: Pine Ridge nr Blancaneaux Lodge, 7 VIII 1972, Dwyer, Pippin 10133 (MO, NY). Toledo: Cow Pen, nr Monkey River, 15 VI 1942, Gentle 4059 (F, GH, MO, NY, US). MEXICO. Chiapas: Los Lagos, 3 mi NW of Rancho San Jose, which is 34 mi SE of Comitán, 1525 m, Carlson 1741 (F). GUATEMALA. Zacapa: along Rillito del Volcán de Monos, Volcán de Manos, 1150-2100 m, 10 I 1942, Steyermark 42312 (F, US). Huehuetenango: betw Democracia & canyon of Chamushú, 1000-1300 m, 24 VII 1942, Steyermark 51088 (F, MO, NY, US). NICARAGUA. El Cabo: Río Leicus 28 km SE de Waspan, 66 m, 25 VII 1965, Molina 15199 (F, NY). HONDURAS. Yoro: Aguan River valley, vic Coyoles, above the village of Los Flores, 336 m, 30 VI 1938, Yuncker, Koepper, Wagner 8142 (F, G, GH, MO, NY, S, US). El Paraíso: Sierra de la Villa Santa above Río California, 1000 m, 31 x 1951, Standley 29195 (F, US). Francisco Morazán: tabla Grande, 1050 m, 19 VI 1947, Molina 356 (F, GH, MO, US). Comayagua: Barranca El Socorro, 7 mi on road from Siguatepeque to Comayagua, 1400 m, 28 XI 1958, Hawkes, Hjerting, Lester 2120 (C, F, S). COSTA RICA. Guanacaste: Paturagos de la Cruz de Guanacaste, 250 m, 4 VI 1890, Tonduz 2806 (BR). San Jose:



Map 4. Known distribution of *D. fruticosa* (closed circles).

vic El General, 700 m, VI 1939, Skutch 4356 (A, F, MO, NY, S, US).

Puntarenas: Buenos Aires, 250m, Pittier 3911 (BR, US). PANAMA.

Panama: Isla Taboga, 0-350 m, 16 XII 1938, Allen 1271 (F, GH, MO, US);

Chepo Highway W of Río Pacora, 20 x 1962, Duke 5898 (MO); Cerro

Compana area, above Su Lin Motel, 900 m, Dwyer, Kirkbride 7824 (MO).

Canal Zone: Cerro de Ancon, 4 VII 1913, Gervais 140 (US). Cocle:

Santa Clara Beach, 13 VII 1970, Croat 9588 (MO); Penonome & vic. 15-

305 m, 23 II-22 III 1908, Williams 68 (NY). Chiriquí: Boquete, Llanos

Francia, 4 mi from Boquete toward Dolego, ca 1350 m, 6 VIII 1967,

Dwyer, Hayden 7593 (MO); Cerro Vaca, 900-1136 m, 25-28 VII 1911,

Pittier 5354 (US); David, VII 1858, Wagner sn (G, W). Without locality:

XI 1735 - III 1736, de Jussieu sn (P-JU). SURINAM. Maratakka

River, Sapparra Creek (W-bank), 9 V 1965, Maas, Tawjoeran 3230, (NY, U);

ad rivulum Palaime, flum Sipaliwini, 24 II 1963, Wessels Boer 759

(U). GUYANA. Orealla Savanna, Orealla Indian Reservation, Courantyne

River, 7 I 1955, Irwin 309 (US); Macubere savanna, Macubere Mountains,

X 1948, Wilson-Browne WB 403 (NY, U). VENEZUELA. Monagas: ca 7 km

W of Caripe nr El Guacharo, ca 1000 m, 11 VII 1972, Kirkbride 2697

(NY, VEN). Sucre: 20 km W of Cumana, Vista de Bahia, hill betw Buena

Vista and Barbacoa, ca 450 m, Kirkbride, Keshiva Bhat 2693 (NY, VEN).

Distrito Federal: Galipan, 1526 m, III 1875, O. Kuntze 1545 (F, NY, US);

Caracas, 26 V 1830, Vargas 256 (FI, G-DC). Miranda: Los Toques, 21

VI 1946, Burkhart 16987 (SI); Caracas, Urbanization de Alto Hatillo,

ca 1220 m, 17 XII 1972, Kirkbride 2700 (NY, VEN). Aragua: Colonia

Tovar, V 1854, Fendler 611 (BR, F, G, GH, MO, NY); El Castano, 480 m,

L. Williams 10462 (F). Carababo: Hacienda de Cura, nr San Joaquín,

480-1200 m, 15 VIII 1918, Pittier 8001 (US). Yaracuy: N of Nirgua, leading to Cerro La Chapa, 600-800 m, 11 III 1967, Steyermark, Bunting 97610 (NY, U). Lara: sabanas de Cujucito, 300-450 m, 3 VIII 1930, Saer 542 (F). Trujillo: Via Escuque, 13 VIII 1948, Curran 329m (NY). Merida: trail betw La Trampa and Lagunillas, 1188-2430 m, 29 IV 1944, Steyermark 56200 (F). Zulia: Sierra de Perija, loma arriba de la quebrada del Río Omira-Kuná (Tumuriasa), 1500-1800 m, Steyermark, Dunsterville, Dunsterville 105704 (NY). Bolivar: Ciudad Piar across road from El Club Tomoca, ca 320 m, 13 XII 1972, Kirkbride 2699 (NY, VEN); alto Caroní, alrededores de Santa Elena de Uairen, 25 IV 1946, Lasser 1629 (NY). Amazonas: sabana de bajo Sanariapo, 120 m, 4 VII 1942, L. Williams 16035 (F, G, S, US). COLOMBIA. Cesar: Sierra Nevada de Santa Marta, SE slopes, Hoya del Río Candela, downward to Atanques, 1200-1700 m, 15 X 1959, Cuatrecasas, Romero-Castañeda 24870 (US). Norte de Santander: Ocaña, 1068 m, X 1830, Schlim 161 (BR, G). Cordoba: Palotal, 9 VII 1948, Romero-Castañeda 1180 (F). Santander: Mesa de los Santos, 1500 m, 11-15 XII 1926, Killip, Smith 15232 (A, F, GH, NY, S, US). Vichada: along Río Vichada at Bopimí, ca 14 km NW of San José de Ocuné, 100 m, 23 I 1944, Hermann 11076 (F, GH, NY, US). Cundinamarca: Anapoime, 700 m, I 1853, Triana 3147(30) (F). Meta: nr "El Mico" hacienda, N end of Cordillera Macarena, ca 60 km S of San Martin, ca 500 m, 19 VII 1950, Smith, Idrobo 1451 (F, GH, MO, NY, US). Valle: Cali, loma Los Cristales, 1300-1400 m, 25 XII 1959, Cuatrecasas, de Garganta, Rovira 25717 (US). Cauca: Lavaièu uber Quilcacé, 1200 m, I 1884, Lehmann 3455 (US). Huila: W of Palacio in Valley of Río Fortalecillas, 20 km E of Néiva, 1200 m, 20 I 1943, Fosberg 19811 (S). BRASIL. Amapá: Rio Araguari, 2 km from river, along road from Porto

Platón to Macapá, 19 IX 1961, Pires, Rodrigues, Irvine 51061 (NY).  
 Roraima: Foz do Rio Branco, VII 1969, Dobereiner, Tokarnia SaP64B (RB).  
 Paraíba: Taboleiro entre João Pessoa e Goiana, 26 VIII 1952, A. Lima  
52-1175 (R). Pernambuco: Goiana, 5 IX 1962, Tavares 1019 (US).  
 Ceará: Serra do Araripe, VIII 1838, Gardner 1701 (FI, OXF, W), 1702  
 (FI, G, GH, NY, OXF, W). Maranhão: ca 40 km S of Lorêto, nr place  
 called "Picada," ca 300 m S of the creek "Riacho da Picada," ca 250 m,  
 25 III 1962, Eiten, Eiten 3802 (US). Pará: Serra do Cachimbo, 425 m,  
 16 XII 1956, Pires, Black, Wurdack, Silva 6317A (UB); prope Santarem,  
Spruce 666 (M). Bahia: Espigão Mestre, ca 100 km WSW of Barreiras, 760  
 m, 6 III 1972, Anderson, Stieber, Kirkbride 36674 (NY, UB); Serra  
 Jacobina, Blanchet 2571 (BR, F, G, LE, TUB, W); ca 26 km N of Seabra,  
 road to Agua de Rega, nr Rio Riacho, ca 1000 m, 23 II 1971, Irwin,  
Harley, Smith 30818 (UB). Goiás: 10 km S of Guará, ca 550 m, 18  
 III 1968, Irwin, Maxwell, Wasshausen 21408 (NY, UB); Ipameri, 16 I 1940,  
Rambo 3393 (LIL); Serra Dourada, I 1893, Ule 429 (R). Distrito  
 Federal: pres de la Barra do Rio Torto, 20 II 1895, Glaziou 21496  
 (BR, C, G, LE, S); 1 km S of Planaltina, ca 900 m, 26 I 1972, Kirkbride  
1700 (NY, UB); Parque Nacional do Gama, 25 V 1965, Sucre 294 (NY, UB).  
 Mato Grosso: Morro Podre, cabeceiras do Rio Aricá, Chapada, III 1911,  
Hoehne 2765 (SP); ca 86 km N of Xavantina, 550 m, 3 VI 1966, Irwin,  
Grear, Souza, Reis dos Santos 16556 (NY, UB); Cuiabá, VIII 1828, Manso  
307 (BR). Minas Gerais: ca 35 km SW of Gouveia, Km 243 on M.G. 259,  
 1080 m, 2 II 1972, Anderson, Stieber, Kirkbride 35102 (NY, UB); Serra  
 da Caraça, Claussen 126 (F, FI, G, M, NY, W); Serra do Cipó, Km 137,  
 14 II 1963, Duarte 7647 (NY, RB); ca 3 km W of Cantoni, 1000 m, 9  
 III 1970, Irwin, da Fonsêca, Souza, Reis dos Santos, Ramos 27224 (NY,  
 UB); Cidade de Uberaba, 13 XII 1848, Regnell III 104 (F, S, US). Rio

de Janeiro: Santa Madalena, Pedra das Flores, 1200 m, 4 III 1934, Lima, Brade 13352 (NY, RB); Itatiaia, X 1913, A. Lutz 576 (R). São Paulo: Serra Bocaina, Serra Fazenda do Bonito, 15 I 1913, A. Lutz 371 (NY, R); Município Itepetininga, Fazenda Bom Retiro, 25 XI 1959, Machado de Campos 127 (SP); prope Mugy das Cruces, Martius sn (M); Itapéva, I 1958, Vidal sn (R). Paraná: Campo Mourão, 8 XII 1965, Hatschbach, Lindmane, Haas 13257 (NY, U, US). BOLIVIA. Santa Cruz: El Portion, II 1950, Cárdenas 4529 (LIL, US); Santiago, Serrania S. Miserato, 11 II 1958, Krapovickas 9349 (LIL). PARAGUAY. Concepcion: Ypé Jhú, XI 1898, Hassler 5267 (F, G, GH, MPU, NY, W); Punta Porá, XII 1907, Hassler (or Rojas in Hassler) 9797 (G, LIL, MO, MPU, NY).

Declieuxia fruticosa is the most complex and variable species of the genus. It also has the largest number of primitive characteristics (see the sections on morphology and phology) and is probably closest to the ancestor of Declieuxia. The center of variation of D. fruticosa is in the Serra do Espinhaço between Ouro Preto and Diamantina; all variants have been found here. From this area, it radiates outwards across the savannas of tropical America, and in northern Central America it is also found in pine forests at higher elevations (see Clewell, 1973). The degree of variation decreases in proportion to the distance from this area. Its pubescence ranges from none at all to very dense with hairs as long as 2 mm. The densest form of pubescence with the longest hairs occurs only in the Espinhaço area. As the distance from this area increases, the most extreme form of pubescence for a particular area becomes less dense with shorter hairs until in Colombia only a few glabrate collections are encountered; all collections from Central America and Cuba are glabrous. The breadth of the leaf blade

and the shape of its base also varies in a similar manner. The width of the leaf blade has its greatest ranges in the Espinhaço area with the shape of the base varying from attenuate to obtuse to rarely cordate. As the distance from the Espinhaço area increases, the maximum width of the leaf blade decreases, and the range in shape of its base is reduced. Cordate bases are very rarely encountered outside of the Espinhaço area, and the frequency of occurrence of obtuse leaf bases decreases northward across South America.

The processes of racial differentiation have clearly been at work in D. fruticosa. The median condition of a number of minor variants can be recognized, but the morphological characters involved are not sufficient for taxonomic recognition of them when considered in relation to the broad spectra of intermediate forms. The seven most striking minor variants are listed below:

M. v. 1. A robust, glabrous shrub with a semiherbaceous stem and large leaves. - Moderate to lower elevations in the upper drainage of the Rio São Francisco and rarely eastern Bahia.

M. v. 2. A small, glabrous shrub with reduced branching and narrower leaves. - Range of the species, and sole variant encountered in Central America, Mexico, and Cuba. (= D. mexicana, D. fruticosa var mexicana).

M. v. 3. A taller shrub with broad leaves and the pubescence consisting of the longest hairs encountered. - Serra do Espinhaço from the Diamantina area to Ouro Preto. (= D. organoides).

M. v. 4. A densely puberulous to hispidulous shrub with moderate sized leaves and extremely long, linear dichasial bracts. - Southern Bahia. (= D. mollis).

M. v. 5. A glabrous subshrub or shrub with several spreading

stems, reduced branching, and coriaceous leaves. - Serra do Cipó and Serra do Cabral. (= D. calophylla).

M. v. 6. Like M. v. 2 but leaves revolute and slightly more coriaceous. - Serra Dourada. (= D. revoluta).

M. v. 7. A glabrous shrub with moderate sized, subcoriaceous leaves with subcordate to cordate leaf bases. - Serra do Espinhaço from the Diamantina area to Ouro Preto. (= D. rubioides).

Declieuxia fruticosa is most closely related to D. deltoidea and D. pruinosa. It is separated from both by its decurrent stipules.

2. Declieuxia deltoidea Müller Argoviensis, Flora 59(28): 437, 1876.

Shrub or subshrub cane-like, often glaucous, 40-200 cm tall, the branches terete, glabrous, the internodes (1-)2-5 cm long. Stipules unidentate or 6-7-dentate, the lobes narrowly to broadly triangular, narrowly acute and glandular at apex, 0.2-1 x 0.2-0.5 mm, glabrous, not decurrent. Leaves opposite or connate-perfoliate below the stipules, sessile, glabrous; blade coriaceous, very broadly ovate to depressed ovate, abruptly acuminate at apex, strongly cordate at base, (1.3-) 2-4.9 x (1.4-)2.2-6.2 cm, 0.6-0.97 times longer than wide, venation pinnate with several basal laterals and others joining the midrib, with (5-)8-10 arcuate anastomosing lateral veins on each side, the midrib prominulous to plane above and prominent beneath, the lateral veins subprominulous to weakly sulcate above and prominent to prominulous beneath, the tertiary venation closed reticulate. Inflorescences terminal or axillary modified cymes or compound dichasia or rarely terminal cylindrical thyrses formed by foliar reduction, pedunculate,

1.4-5(-13.5) x 0.5-3(-5) cm, with 7-200(-800) flowers, with 2-12 (-84) axes, the axes terete, 2-40 mm long, glabrous or very rarely glabrate to sparsely puberulous; peduncle terete, 2-34 mm long, glabrous or very rarely glabrate to sparsely puberulous, with 2 bracts at apex, bracts narrowly elliptic or narrowly ovate, narrowly acute at apex, 2-10 x 0.8-2.5 mm, glabrous. Flowers heterostylous, dichasial bracts narrowly triangular or narrowly oblong, narrowly acute at apex, 1.5-3 x 0.4-0.6 mm, glabrous, subpedicellate with the pedicels terete, 0.1-0.5 mm long, glabrous; hypanthium depressed obovate in outline, 0.5-0.8 x 0.9-1.1 mm, glabrous or very rarely densely papillate; calyx lobes deltoid to triangular or oblong to narrowly so, acute to narrowly so at apex, 0.1-0.7 x 0.1-0.4 mm, glabrous; corolla blue, salverform, the tube 4.8-7 mm long, orifice 1.2-1.5 mm in diam, 0.7-0.9 mm at base, exterior glabrous, the lobes triangular or ovate, acute to narrowly so at apex, 1.5-2.4 x 0.9-1.5 mm, glabrous outside; stamens with the filaments 0.2-0.4 or 1.1-1.8 mm long, glabrous, the anthers 1.1-1.4 mm long, glabrous; style 4.1-4.4 or 5.3-7 mm long, glabrous. Fruit with the emargination 0.4-1.8 mm, subpedicellate, the pedicel 0.2-0.5 mm long, glabrous, the mericarps elliptic to circular in outline, 1.6-3 x 1.1-2 mm, 0.5-0.6 mm thick, glabrous or very rarely sparsely papillate.

Key to the varieties of D. deltoidea.

- a. Stipules unidentate, 0.2-0.5(-0.8) x 0.2-0.3 mm; leaves opposite.  
D. deltoidea var deltoidea.
- aa. Stipules 6-7-dentate, 0.8-1 x ca 0.5 mm; leaves connate—perfoliate.  
D. deltoidea var perfoliata.

2a. *Declieuxia deltoidea* var *deltoidea*.  
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*Declieuxia deltoidea* Müller Argoviensis, Flora 59(28): 437, 1876.

*Declieuxia amplexicaulis* Schumann ex Glaziou, nom nud, Bull. Soc. Bot. France, Mem. 3: 358, 1909. Based upon Glaziou 19449. Brazil, Minas Geras, entre Barreira Grande et Valla Funda, 18 III 1892 (C, F, LE, NY, R).

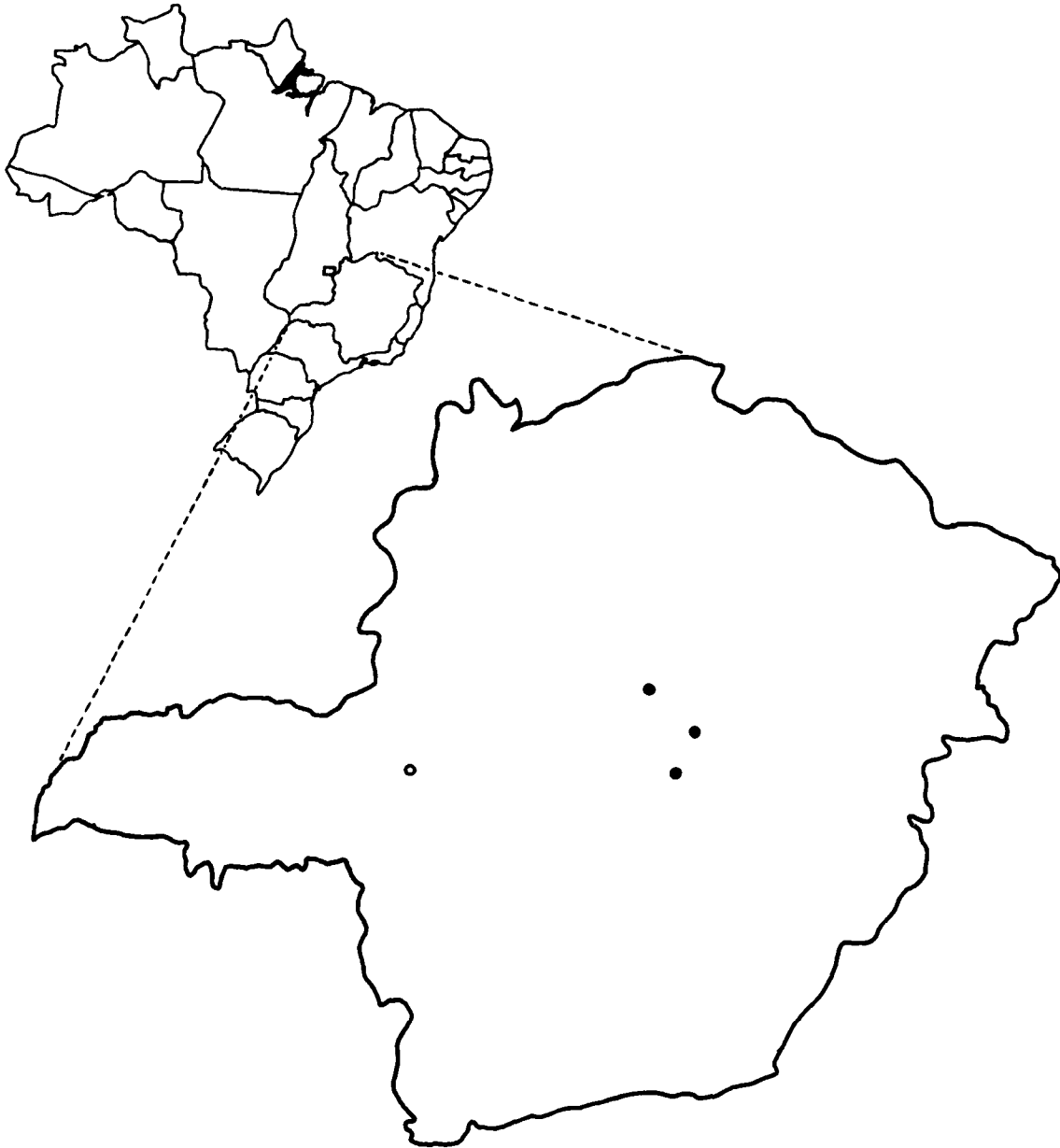
*Declieuxia cordigera* Martius & Zuccarini ex Schultes & Schultes var *floribunda* Schumann ex Glaziou, nom nud, Bull. Soc. Bot. France, Mem. 3: 358, 1909. Based upon Glaziou 19451, Brazil, Minas Gerais, Biribery, certo de Diamantina, 28 III 1892 (C, F, LE, R).

Type: Brazil, Minas Gerais, Serra da Lapa, XI 1824, Riedel 981 (holotype BR, fragment G; isotypes F, LE, US, W).

Distribution. Known from higher areas of the Serra do Espinhaço from Serra do Cabral to Serra do Cipó. Map 5.

Specimens Examined.

BRASIL. Minas Gerais: ca 17 km SW of Gouveia, Mun. da Gouveia, km 258 on M. G. 259, 1000-1050 m, 7 II 1972, Anderson, Stieber, Kirkbride 35594 (NY, RB); Conselheiro Matta, VI 1934, Brade 13853 (F, NY, RB); Serra do Cipó, 21 VI 1908, Damazio 1961 (G, NY, RB), 12 II 1971, Krieger 10177 (RB); Serra do Cipó, Km 137, 14 II 1963, Duarte 7830 (NY, UB); base de Serra de Diamantina, 20 XI 1964, Duarte, Pereira 8489 (HB, NY, RB); Serra de Cipó - Riacho de Serra Cerrados, 3 VIII 1965, Heringer 5272 (UB); immediately E of Joaquim Felício, 850 m, 6 III 1970, Irwin, da Fonseca, Souza, Reis dos Santos, Ramos 27049 (NY, UB); 27 mi before Curvelo on



Map 5. Known distribution of *D. deltoidea* var *deltoidea* (closed circles) and *D. deltoidea* var *perfoliata* (open circle) in Minas Gerais, Brazil.

road from Diamantina, 1000 m, 23 XII 1959, Maguire, Maguire, Pires 44781 (F, NY); Serra do Cabral, VI 1910, Silveira sn (R); Tejuco (Diamantina), 1833, Vauthier 71 (G); without locality, Damazio sn (RB); 1 IV 1947, Pereira 2755, Pabst 3591 (NY, RB); Schwacke 8093 (F).

2b. Declieuxia deltoidea var perfoliata Kirkbride, var nov.  
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Types: Brazil, Minas Gerais, ca 37 km NE of Patrocínio, Morro das Pedras, 1000 m, 29 I 1970, Irwin, Onishi, da Fonsêca, Souza, Reis dos Santos, Ramos 25590 (holotype UB; isotype NY); ca 25 km NE of Patrocínio, Morro das Pedras, 1050m, 28 I 1970, Irwin, Onishi, da Fonsêca, Souza, Reis dos Santos, Ramos 25518a (paratypes NY, UB). Map 5.

A D. deltoidea var deltoidea stipulis 6-7-dentatis, 0.8-1 x ca 0.5 mm, foliis conato-perfoliatis differt.

Declieuxia deltoidea is most closely related to D. fruticosa. The greatest degree of resemblance is between D. deltoidea var deltoidea and minor variant 6 of D. fruticosa. This strong resemblance might be the result of hybridization. Declieuxia deltoidea is separated from D. fruticosa by its nondecurrent stipules and leaf blades 0.68-0.97 times longer than wide.

3. Declieuxia pruinosa Pohl ex de Candolle, Prodr. 4: 481, 1830.  
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Psyllocarpus pruinosis Pohl ex de Candolle, in synonymy, Prodr. 4: 481, 1830.  
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Declieuxia glauca Martius ex Chamisso & Schlechtendal var subdecurrentis Müller Argoviensis, Mart. Fl. Bras. 6(5): 439, 1881.  
 Type: Brazil, Goiás, Chapada de Nossa Senhora d'abadia, V 1840,

Gardner 4170 (lectotype G; isotypes BR, F, G, GH, NY, W).

Type: Brazil, Minas Gerais, inter Rio Jequitinhonha et Columbus,  
Pohl 3147 (holotype G-DC; isotypes NY, W).

Subshrub of shrub glaucous to weakly so, 40-105 cm tall, the branches terete, weakly and irregularly striate, glabrate, with many stomata, the internodes (2-)3-11 cm long, usually much longer than the leaves. Stipules unidentate, narrowly triangular or oblong to narrowly so or very rarely linear, narrowly acute and glandular or obtuse at apex, 0.3-0.8(-5.6) x 0.1-0.5 mm, glabrous, not decurrent or very rarely, weakly decurrent not reaching the next node. Leaves opposite or rarely ternate, sessile, glabrous; blade coriaceous to subcoriaceous, narrowly elliptic to narrowly ovate or rarely elliptic to ovate, acute or sometimes obtuse and mucronate at apex, acute to obtuse or very rarely attenuate at base, (17-)20-60(-85) x 6.5-16(-24) mm, (1.7)3.1-4.4(-7.1) times longer than wide, venation pinnate with (6-)7-9(-11) arcuate sometimes anastomosing lateral veins on each side, the midrib prominulous in a sulcus above and prominulous beneath, the lateral veins weakly sulcate or faintly prominulous in a shallow sulcus above and prominulous beneath, the tertiary venation closed reticulate.

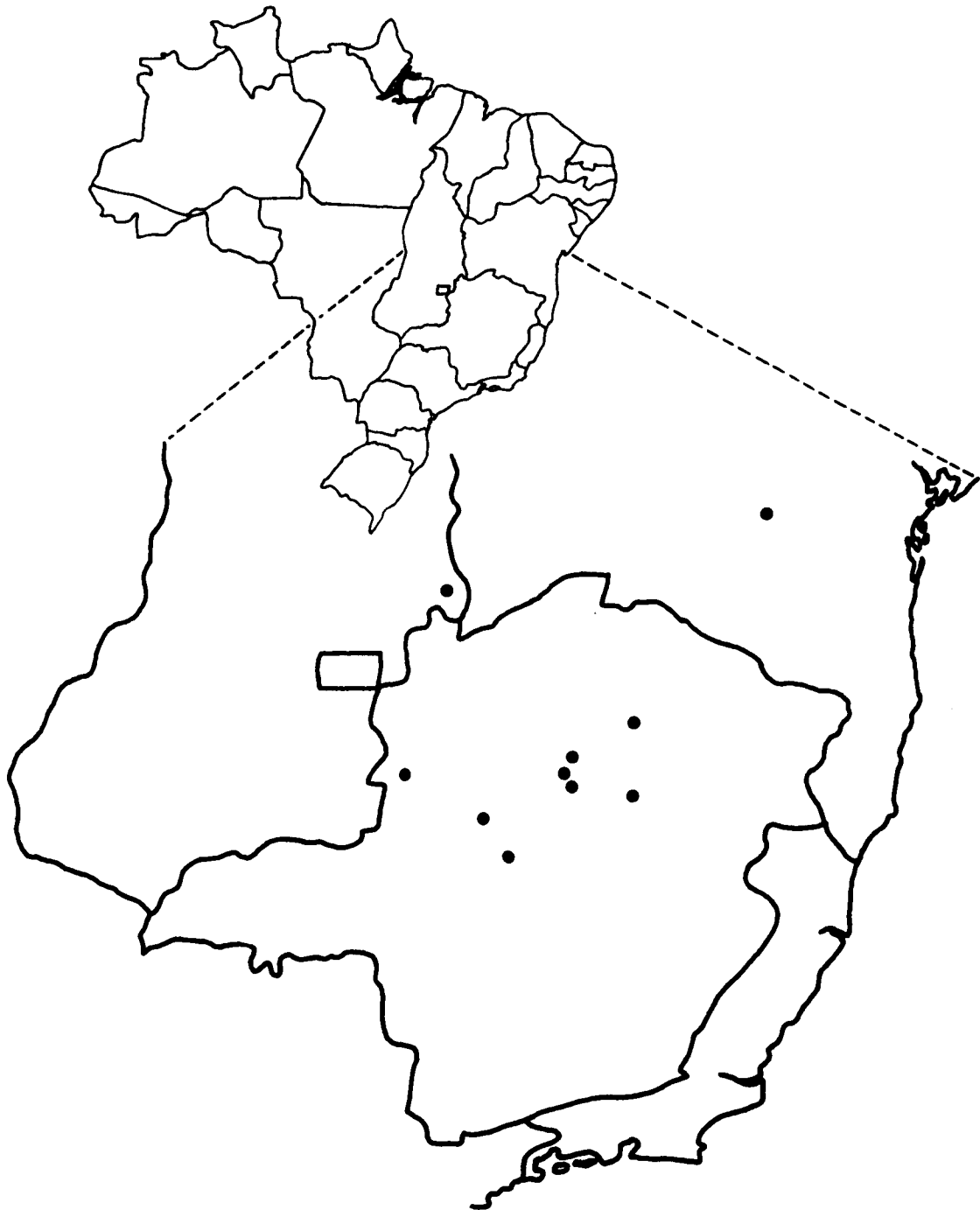
Inflorescences modified terminal and axillary cymes at the upper nodes, pedunculate, (2.5-)4-6(-14) x 3-5(-7) cm, with 20-150(-600) flowers, with 1-12(-40) axes, the axes terete, 10-35(-85) mm long, glabrous or glabrate; peduncle terete, 15-22(-70) mm long, glabrous or glabrate, with 2-3 dichasial or larger bracts at the apex, the larger bracts narrowly oblong or narrowly elliptic, acute at apex, 3.2-6 x ca 0.8 mm,

glabrous. Flowers heterostylous, subpedicellate with the pedicels terete, 0.1-0.55 mm long, glabrous or glabrate, dichasial bracts narrowly triangular or narrowly oblong, acute to narrowly so at apex, 0.8-2.3 x 0.2-0.6 mm, glabrous and rarely minutely ciliate; hypanthium broadly transverse to transversely elliptic or depressed obovate in outline, 0.5-0.9 x 0.7-1.2 mm, glabrous; calyx lobes triangular to broadly so or oblong to narrowly so, acute at apex, 0.2-0.7 x 0.1-0.3 mm, glabrous; corolla blue, salverform, the tube 3.9-5.8 mm long, orifice 1.2-2 mm in diam, 0.7-0.9 mm at base, exterior glabrous, the lobes triangular, broadly ovate, or narrowly oblong, acute at apex, 1.6-3.3 x 1-1.7 mm, glabrous outside; stamens with the filaments ca 0.2 or ca 1.5 mm long, glabrous, the anthers 1.1-1.4 mm long, glabrous; style 3.7-4.3 or 5.5-6.5 mm long, glabrous. Fruit with the emargination 0.4-0.7 mm, subpedicellate with the pedicel 0.3-0.8 mm long, glabrous or glabrate, the mericarps broadly elliptic in outline, (1.6-)1.8-2.2 (-2.4) x (1.4-)1.5-1.8 mm, ca 0.6 mm thick, glabrous or minutely papillate, subrugose.

Distribution. Known from moderate elevations in northern Minas Gerais, the vicinity of Sítio da Abadia in Goiás, and Serra do Sincorá in Bahia. Map 6.

Specimens Examined.

BRASIL. Bahia: ad Monte Sincorá, Martius sn (M). Minas Gerias: Serra do Cabral, norte, 1 V 1963, Duarte 7831 (NY, RB); entre Virgem da Lapa e Campo Alegre, 18 I 1965, Duarte 8758 (NY, RB); Paracatú, Rodovia Brasília - Belo Horizonte, Heringer 7570 (U, UB); ca 30 km NE of Francisco Sá, road to Salinas, 1100 m, 10 II 1969, Irwin, Reis dos



Map 6. Known distribution of *D. pruinosa* (closed circles) in Bahia, Minas Gerais, and Goiás, Brazil.

Santos, Souza, da Fonsêca 22971 (NY, UB); ca 65 km W of Montes Claros, 2 km E of Agua Boa, 950 m, 25 II 1969, Irwin, Reis dos Santos, Souza, da Fonsêca 23911 (NY, UB); Rio de São Francisco, X 1834, Lund sn (C, F); a 500 km de Brasília para Belo Horizonte, 19 VI 1964, Pires 58005 (NY, UB, US); inter Rio Jequetahy et Fazenda da Manoel da Souza, Pohl 3183 (W); prope Rio do Padre inter Rio São Francisco et Alegres, IX 1834, Riedel 2869 (BR, F, FI, LE, US, W); without locality, Claussen 527 (F), 620 (F, FI), 645 (C, F, GH, MO, NY, S), 927 (FI), sn (BR, F, G).

Since the time of de Candolle (1830), this species has been recognized as Declieuxia glauca Martius ex Chamisso & Schlechtendal. Martius' collection of D. 'glauca', cited above from Monte Sincorá, falls well within the limits of this species. Chamisso and Schlechtendal applied Martius' name, D. glauca, to a collection made by Sellow which fits within minor variant 7 of D. fruticosa and which was obviously the basis of the description written by Chamisso and Schlechtendal.

Declieuxia pruinosa is most closely related to D. fruticosa from which it is separated by its glaucous condition, internodes usually much longer than the leaves, and stipules nondecurent or weakly so not reaching the next node.

4. Declieuxia lysimachioides Zuccarini ex Schultes & Schultes, Mantiss  
 ... Syst. Veg. 3: 112, 1827.

Declieuxia scabra Bentham, Linnaea 23: 465, 1850. Type: Brazil, Minas Gerais, ad Caldas, Regnell I 179 (holotype K (without date); isotypes BR (without date), C (30 XI 1861), LE (9 XI 1854), M

(27 I 1846), R (without date), S (27 I 1846, 30 XI 1961, 24 XI 1864, and without date)).

Type: Brazil, Minas Gerais, Serro Frio, Martius 634 (holotype M, fragment of holotype G).

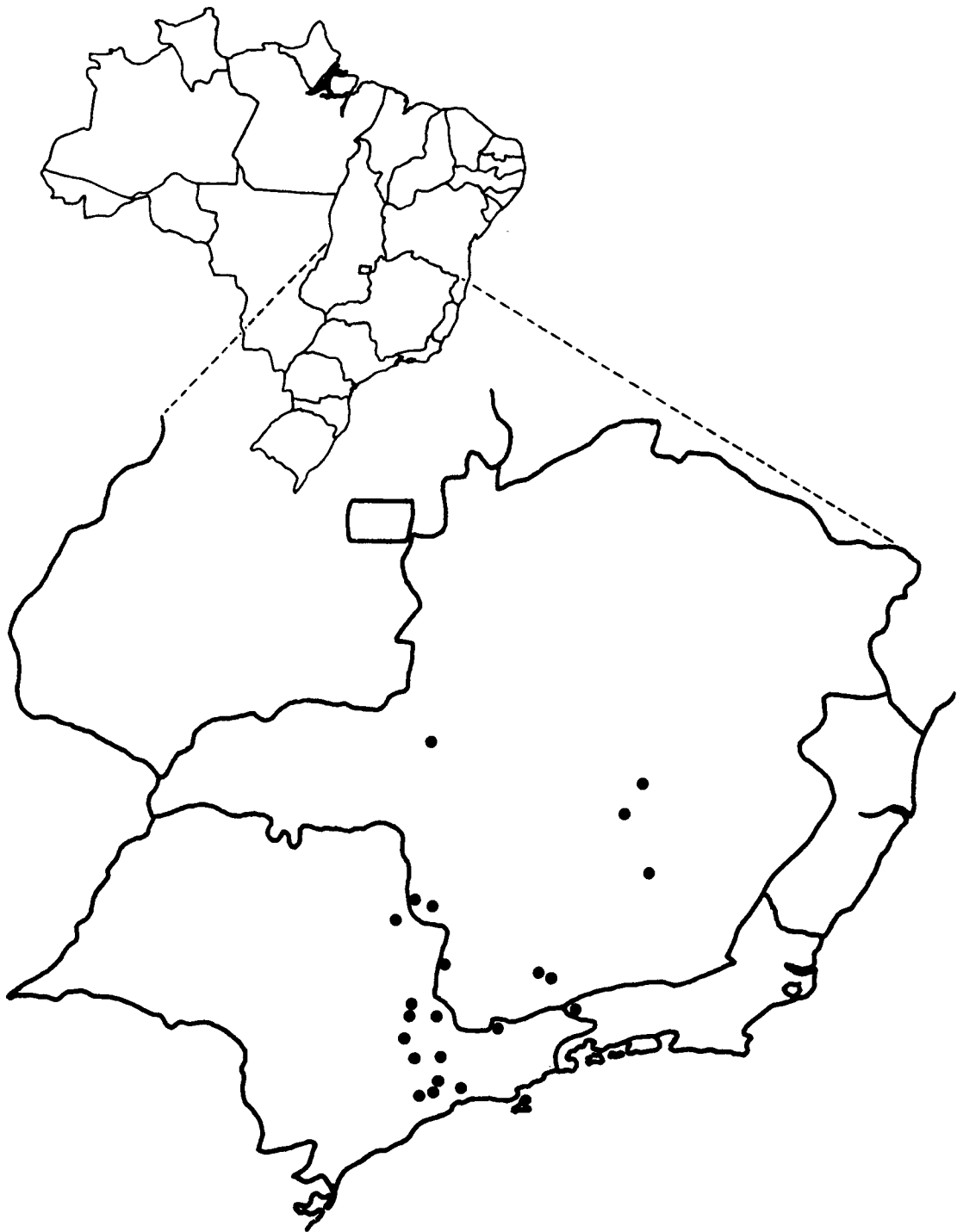
Perennial herb 7-28(-39) cm tall with 1 or sometimes 2-3 erect fastigiate unbranched stems, the stems terete, puberulous, basal internodes 0.2-1.5(-3) cm long, apical internodes 2-5(-9) cm long, basal leaves longer than apical leaves. Stipules unidentate, subulate-linear or linear, narrowly acute and glandular at apex, 1.5-5(-6) mm long, minutely puberulous, very rarely basal stipule foliar, up to 16 x 4.5 mm, decurrent reaching to the next node. Leaves opposite or ternate or rarely quaternate, sessile, not decurrent; blade subchartaceous, elliptic to narrowly so or narrowly obovate, obtuse to narrowly so and mucronate to weakly so at apex, cuneate to attenuate to narrowly so at base, (1.5-)3.5-6.5(-7) x (0.6-)1.4-2.8 cm, (1.4-)1.8-3.5 times longer than wide, with 5-7(-8) arcuate lateral veins sometimes anastomosing on each side, the prominent to subprominent midrib and prominent lateral veins puberulous and the intercostal areas puberulous to sparsely so above, the prominent midrib and subprominent lateral veins puberulous and the intercostal areas puberulous to sparsely so beneath, the tertiary venation closed reticulate or obscure. Inflorescences modified terminal and axillary compound or simple cymes at the upper nodes, pedunculate, 1-4.5 x 0.9-4 cm, with 11-400 flowers, with (1-)2-10(-20) axes, the axes terete, 5-13 mm long, puberulous; peduncle terete, 4-15 mm long, puberulous, with 2 or 3 dichasial bracts at apex. Flowers heterostylous, subpedicellate with the pedicels terete,

0.2-0.4 mm long, glabrous or glabrate, dichasial bracts narrowly oblong, acute to narrowly so at apex, 1.2-3 x 0.3-0.5 mm, glabrous and sometimes irregularly ciliate; hypanthium transversely elliptic in outline, 0.5-0.8 x 0.9-1.2 mm, papillate in patches; calyx lobes oblong to obovate or narrowly oblong or oblong-triangular, acute to narrowly so or obtuse at apex, 0.3-0.9 x 0.1-0.4 mm, glabrous; corolla blue, salverform, the tube 3.5-5.5 mm long, orifice 0.9-1.5 mm in diam, 0.4-0.7 mm at base, exterior glabrous, the lobes oblong or ovate, acute at apex, 1.5-2.5 x 0.7-1.5 mm, glabrous outside; stamens with the filaments 0.1-0.2 or ca 1.2 mm long, the anthers 0.8-1.1 mm long; style ca 3.7 or 5-6 mm long, glabrous and sometimes granulate. Fruit with the emargination 0.4-0.5 mm, subpedicellate with the pedicel 0.2-0.4(-0.9) mm long, glabrous or glabrate, the mericarps broadly elliptic in outline, 1.4-1.9(-2.2) x 1.2-1.6(-1.8) mm, 0.6-0.7 mm thick, papillate to sparsely so or very rarely, sparsely papillate-puberulous, rugose to slightly so.

Distribution. Known from Minas Gerais in the south, one station in the west, and three central stations, from one station in extreme western Rio de Janeiro, and from eastern São Paulo. Map 7.

Representative Specimens.

BRASIL. Minas Gerais: São Sebastião do Paraíso, Corrego de Atalho, 24 IV 1945, Emygdio 267 (R); Itacolomy près Ouro Preto, 1882, Glaziou 14199 (C); ca 35 km NE of Patrocínio, 1000 m, 29 I 1970, Irwin, Onishi, da Fonsêca, Souza, Reis dos Santos, Ramos 25648 (NY, UB); Aguas de Contendas, XII 1892, O. Kuntze sn (NY); ad Caldas, XII 1854, Lindberg 97a (BR, S), 1845, Widgren 1034 (BR); prope Baependy, XI 1897, Silveira



Map 7. Known distribution of *D. lysimachioides* (closed circles) in Minas Gerais, Rio de Janeiro, and São Paulo, Brazil.

2646 (R); Mun. Teresópolis, Chapada do Jacuhy, IV 1945, Vidal I 882 (NY, R); ad Lagôa Santa, 19 XII 1863, Warming sn (C). Rio de Janeiro: Itatiaya, Serra Negro, 14 I 1936, Porto 2857 (F, RB); São Paulo: Vila Emma, XI 1914, Brade 5273 (R); Iguatemy, 23 XII 1918, Hoehne 2655 (SP); Ipiranga, 5 V 1917, Hoehne 25153 (F, SP); Campinas, Fazenda Campo Grande, 4 XII 1938, Mourão, Zagatto, Guilherme 3149 (IAC, LIL, SP); ad Mugl, XI 1833, Riedel 2867 (BR); prope Alegado, Riedel sn (BR); Campos do Jordão, 12 VI 1938, Rombouts 22 (IAC, SP); Santo Amaro, 13 I 1942, Roth 64 (SP); Lages, Saint-Hilaire Cl 1022 (F); Moóca, 15 VIII 1905, Usteri 11698 (SP).

Declieuxia lysimachioides is closely related to D. fruticosa from which it differs by perennial-herbaceous habit and gradual decrease in leaf size from basal to apical leaves. The perennial-herbaceous habit of D. lysimachioides marks it as more advanced than D. fruticosa.

5. Declieuxia dasyphylla Schumann ex Steyermark, Los Angeles County Mus. Contr. Sci. 21: 24, 1958.

Declieuxia dasyphylla Schumann ex Glaziou, nom. nud., Bull. Soc. Bot. France, Mem. 3: 359, 1909.

Declieuxia dasyphylla Schumann ex Steyermark f ciliolata Steyermark, Los Angeles County Mus. Contr. Sci. 21: 26, 1958.  
Type: Brazil, Goiás, region of the Chapada dos Veadeiros at W 47°30', S 14°30', 20 km N of São João da Aliança, 13 IV 1956, Dawson 14163a (holotype R, not seen; isotype F).

Type: Brazil, Goiás, entre Rio Tocantins et Os Porcos, 3 I 1895,  
Glaziou 21502 (holotype F, smashed fragment from B; isotypes BR, C,  
 F, LE, R).

Perennial herb 16-39 cm tall with 1 to several erect fastigate to slightly spreading stems sometimes with short branches at the upper nodes, the stems terete, glabrous, the internodes 0.7-2.3 cm long. Stipules unidentate, the lobe narrowly triangular, acute and glandular at apex, (0.6-)1.2-2.8 mm long, glabrous or sometime puberulous or minutely ciliate, decurrent. Leaves opposite, sessile; blade subcoriaceous, elliptic to very rarely narrowly elliptic, broadly acute at apex, acute or sometimes obtuse at base, (10-)14-29 x (3.5-)6-16 mm, (1.4-)1.8-2.5(-2.9) times longer than wide, with 4-5 arcuate anastomosing lateral veins on each side, the prominulous midrib in a sulcus, faintly prominulous lateral veins, and intercostal areas glabrous above, the prominent midrib, prominulous lateral veins, and intercostal areas glabrous beneath, the tertiary venation obscure. Inflorescences modified terminal and axillary cymes at the upper nodes, pedunculate, 1.6-2.6(-3) x 1.5-2 cm, with 20-60 flowers, with 4-6 axes, the axes terete, 6-20 mm long, glabrous; peduncle terete, (2.5-)5-10(-15) mm long, glabrous, with 2 dichasial bracts at the apex. Flowers heterostylous, subpedicellate with the pedicel terete, 0.1-0.2 mm long, glabrous, dichasial bracts narrowly oblong, acute at apex, 3.2-5 x 0.9-1.3 mm, glabrous and sometimes sparsely and minutely ciliate; hypanthium broadly obovate or broadly transverse elliptic in outline, 0.7-0.9 x 0.9-1.1 mm, glabrous; calyx lobes oblong or triangular, acute at apex, 0.2-0.4 x 0.1-0.2 mm, glabrous; corolla blue or white,

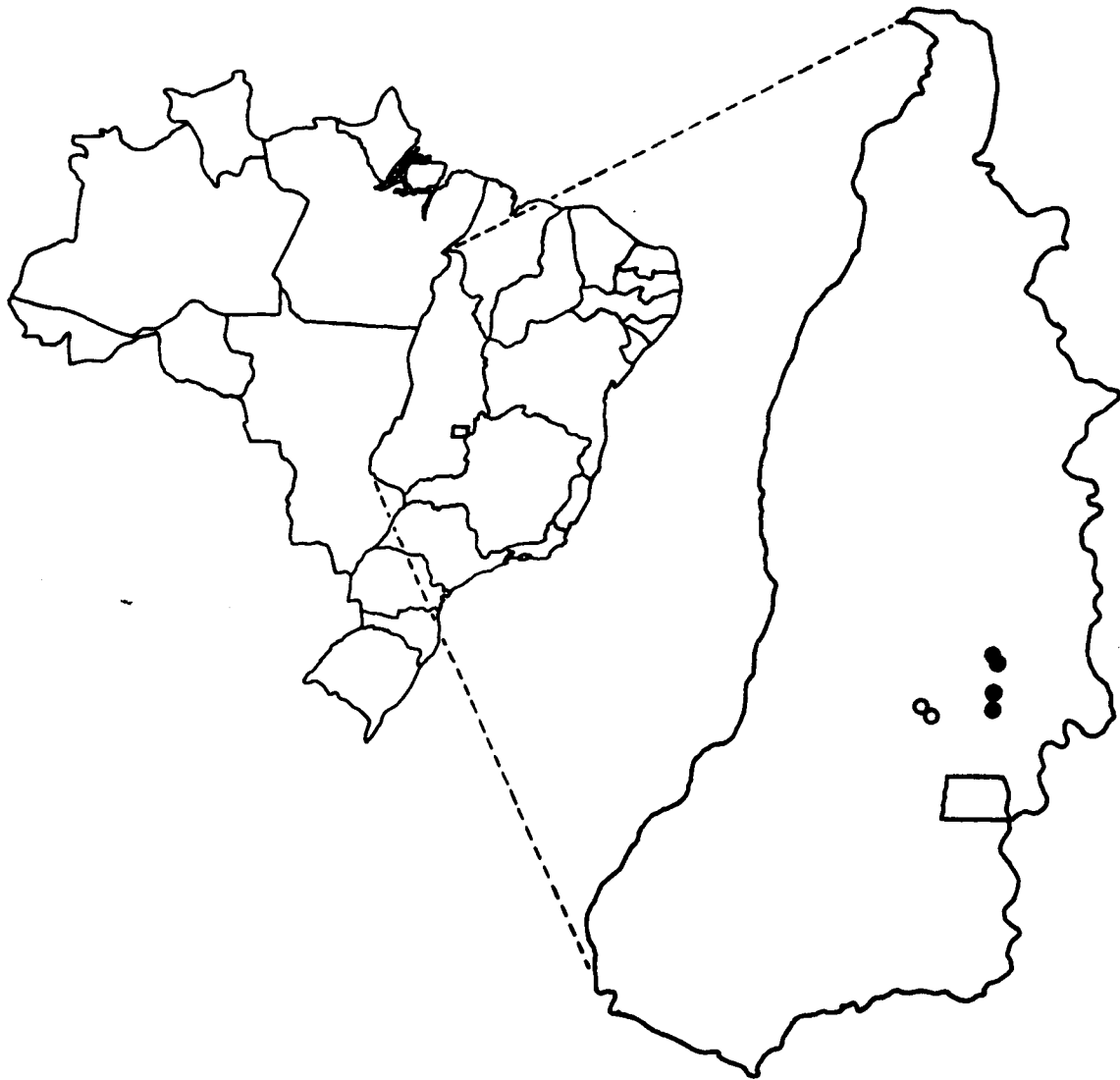
salverform, the tube 3.5-4.5 mm long, orifice 1.3-1.6 mm in diam, 0.5-0.7 mm at base, exterior glabrous, the lobes ovate to broadly ovate, acute at apex, 1.3-1.8 x 0.9-1.3 mm, glabrous outside; stamens with the filaments 0.1 or 0.8 mm long, glabrous, the anthers 0.7-0.8 mm long, glabrous; style ca 3.3 or 5 mm long, glabrous, the stigma included or excluded, minutely papillate. Fruit with the emargination 0.2-0.5 mm, subpedicellate with the pedicel 0.2-0.3 mm long, glabrous, the mericarps elliptic or circular in outline, 1.7-2 x 1.3-1.7 mm, 0.7-0.8 mm thick, glabrous.

Distribution. Known from the Chapada dos Veadeiros and vicinity.

Map 8.

Specimens Examined. BRASIL. Goiás: region of the Chapada dos Veadeiros at W 47°30', S 14°30', 20 km N of São João da Aliança, 13 IV 1956, Dawson 14163 (F); ca 35 km N of Veadeiros, 1000 m, 13 III 1969, Irwin, Reis dos Santos, Souza, Fonsêca 24279 (NY, UB); ca 20 km S of Alto do Paraíso (formerly Veadeiros), 1000 m, 20 III 1969, Irwin, Reis dos Santos, Souza, Fonsêca 24684 (NY, UB).

Declieuxia dasyphylla has affinities with D. fruticosa, lysimachoides, and lancifolia from which it is separated by having inflorescences which appear as a mass of overlapping dichasial bracts which are wider. Two collections were encountered which had the vegetative form and overall inflorescence structure of D. fruticosa and dichasial bracts like those of D. dasyphylla: Anderson, Arroyo, Hill, Reis dos Santos, Souza 6220, Goiás, Chapada dos Veadeiros, ca 20 km by road N of Alto do Paraíso, ca 1600 m, 3 III 1973 (NY, UB) and Irwin, Souza, Reis dos Santos 7991, Distrito Federal, Chapada da



Map 8. Known distribution of *D. dasyphylla* (closed circles) and *D. lancifolia* (open circles) in Goiás, Brazil.

Contagem, ca 20 km NE of Brasília, 1000 m, 5 IX 1965 (NY, UB). These collections might have resulted from hybridization between these two species.

6. Declieuxia lancifolia Kirkbride, sp nov.  
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Types: BRASIL. Goiás: ca 15 km S of Niquelândia, 1000 m, 21 I 1972, Irwin, Anderson, Stieber, Lee 34660 (holotype UB; isotypes NY); ca 5 km W of Niquelândia, 750 m, 25 I 1972, Irwin, Anderson, Stieber, Lee 35014 (paratypes NY, UB). Map 8.

A D. cordigera stomatibus caulinis, stipulis decurrentibus, lobis corollinis 1.4-1.5 mm longis, a D. dasyphylla stomatibus caulinis, decurrenti stipulae parte minute puberula, folii lamina 3-5-plo longiore quam lata, dichasii bracteis 1.2-3 mm longis, et a D. oenanthoidei stipulis decurrentibus, foliis oppositis, folii lamina 3-5-plo longa quam latiore absimilis.

Perennial herb 19-40 cm tall with 1 to several erect fastigate stems sometimes with short branches at the upper nodes, the stems terete, puberulous, with many stomata, the internodes (0.3-)0.7-1.2(-1.5) cm long. Stipules reduced to minutely puberulous ridges sometimes with conical glands or rarely unidentate at lower nodes, the lobe narrowly triangular, acute and sometimes glandular at apex, 0.1-0.4 mm long, glabrous or sparsely puberulous, decurrent with the minutely puberulous ridge reaching the next node. Leaves opposite, sessile; blade subcoriaceous, narrowly elliptic to narrowly oblong or narrowly ovate, narrowly acuminate at apex, narrowly acute to narrowly subobtuse, 7-20 x (1.5-)2-6(-7) mm, 3-5 times longer than wide, with 3-5 arcuate

anastomosing lateral veins on each side, the prominulous midrib, faintly prominulous lateral veins, and intercostal areas glabrous above, the prominent midrib, prominulous lateral veins, and intercostal areas glabrous beneath, the tertiary venation obscure or faintly discernable as closed reticulate. Inflorescences modified terminal and axillary cymes at upper nodes, pedunculate, 1.7-4.5 x 1-4.5 cm, with 30-150(-200) flowers, with 2-5(-9) axes, the axes terete with a minutely puberulous ridge, 9-17 mm long, glabrous; peduncle terete with a minutely puberulous ridge, (3-)5-12.5 mm long, glabrous with 2 dichasial bracts at apex. Flowers heterostylous, subpedicellate with the pedicels terete, 0.12 mm long, glabrous, dichasial bracts narrowly triangular to narrowly ovate, acute to narrowly acute at apex, 1.2-3 x 0.3-0.5 mm, glabrous; hypanthium broadly transverse to transversely elliptic in outline, 0.7-0.9 x 0.9-1.3 mm, glabrous; calyx lobes triangular or oblong, acute at apex, 0.3-0.5 x 0.1-0.2 mm, glabrous; corolla blue, salverform, the tube 3.6-3.9 mm long, orifice 1-1.4 mm in diam, 0.4-0.6 mm at base, exterior glabrous, the lobes ovate, acute at apex, 1.4-1.5 x 0.8-0.9 mm, glabrous outside; stamens with the filaments ca 0.2 or 0.8 mm long, glabrous, the anthers 0.7-1 mm long, glabrous; style ca 3.3 or 4 mm long, glabrous. Fruit with the emargination 0.2-0.3 mm, subpedicellate with the pedicel 0.2 mm long, glabrous, the mericarps broadly elliptic in outline, 1.4-2 x 1.1-1.7 mm, 0.3-0.6 mm thick, glabrous, slightly rugose.

The affinities of Declieuxia lancifolia lie with D. dasyphylla and D. fruticosa. It differs from D. dasyphylla by having the ridge of the decurrent stipule minutely puberulous, the leaf blade 3-5 times longer than wide, and smaller dichasial bracts. It is distinguished from D. fruticosa by perennial-herbaceous habit, internodes always much

shorter than leaves, and reduced stipular development.

Some plants of the type collection of D. lancifolia have short branches, 2.5-7.5 cm long, at their upper nodes. In all cases, the apical portion of the primary stem had been destroyed.

7. Declieuxia cordigera Martius & Zuccarini ex Schultes & Schultes,  
 Mantissa ... Syst. Veg. 3: 112, 1827.

Perennial herb (8-)13-25(-37) cm tall with 1 to many erect fastigiate rarely branched stems, the stems terete, puberulous to rarely glabrate, the internodes (0.2-)0.5-3.5(-4.5) cm long. Stipules reduced to a ridge with 1-5 conical glands or sometimes unidentate, narrowly triangular to narrowly oblong to rarely linear, acute and glandular at apex, 0.3-1.3(-7) mm long, glabrous or puberulous to sparsely so, not decurrent or very rarely, very weakly decurrent not reaching the next node. Leaves opposite or ternate or rarely quaternate, sessile, decurrent; blade coriaceous to subcoriaceous, ovate to broadly ovate or rarely narrowly ovate or rarely depressed ovate or elliptic to narrowly so or to broadly so, acuminate to sometimes acute or obtuse and rarely weakly mucronate at apex, cordate to truncate to acute or obtuse to cuneate to narrowly so or to broadly so at base, 6-28(-47) x (1-)4-25 mm, (0.7-) 0.9-6(-9) times longer than wide, with 2-7(-8) arcuate anastomosing lateral veins on each side, the subprominent or prominulous midrib and lateral veins and intercostal areas scabrous to glabrous or puberulous to sparsely so above, the prominent midrib, prominulous-prominent lateral veins, and intercostal areas scabrous to glabrous or puberulous to sparsely so beneath, the tertiary venation closed reticulate or obscure. Inflorescences modified terminal and axillary cymes at the upper nodes,

pedunculate, 0.6-4(-6.5) x 0.3-2.2(-5) cm, with 10-80(-300) flowers, with (1-)2-12(-16) axes, the axes terete, 2-16(-30) mm long, puberulous to sparsely so; peduncle terete, (1.2-)2.5-17(-21.5) mm long, puberulous to rarely glabrous, with 2-3 dichasial or larger bracts at apex, the larger bracts narrowly elliptic or sometimes narrowly ovate or linear, acute at apex, 2.3-6(-8) x 0.3-1(-3) mm, glabrous or sometimes glabrate to puberulous. Flowers heterostylous, subpedicellate with the pedicels terete, 0.1-0.4 mm long, glabrous, dichasial bracts narrowly oblong or narrowly elliptic or sometimes narrowly triangular or linear to linear-subulate, acute to narrowly so at apex, 0.9-2.5 x 0.1-0.6 mm, glabrous and sometimes irregularly and minutely ciliate; hypanthium broadly transverse to transverse elliptic or broadly to depressed obovate in outline, 0.4-0.9 x 0.6-1.3 mm, glabrous; calyx lobes triangular to oblong or narrowly so, acute or sometimes obtuse at apex, 0.2-0.9 x 0.1-0.4 mm, glabrous; corolla blue, salverform or rarely salver-funnelform, the tube 2.8-5.7 mm long, orifice 0.9-1.8 mm in diam, 0.4-0.8 mm at base, exterior glabrous, the lobes oblong to narrowly so or ovate to subovate or triangular to narrowly so or elliptic or ovate, acute or sometimes narrowly or broadly so at apex, 1.2-2.8 x 0.7-2 mm, glabrous outside; stamens with the filaments 0.1-1.7 mm long, glabrous, the anthers 0.6-1.2(-2.1) mm long, glabrous; style 2-7 mm long, glabrous; uniovulate or rarely biovulate per locule. Fruit with the emargination 0.2-0.8 mm, subpedicellate with the pedicel 0.1-0.6 mm long, glabrous to glabrate, the mericarps broadly elliptic to sometimes elliptic in outline, 1.3-1.9 x (1-)1.2-1.6(-1.7) mm, 0.5-0.8 mm thick, glabrous to glabrate or papillate or sparsely puberulous, rugose to slightly so.

Key to the varieties of D. cordigera.

- a. Leaf blade ovate to broadly ovate or rarely narrowly ovate or rarely depressed ovate, cordate to sometimes truncate at the base,  
     7a. D. cordigera var cordigera.
- aa. Leaf blade elliptic to narrowly so or to broadly so or very rarely ovate, obtuse to cuneate to narrowly so or to broadly so at the base.  
     b. Leaf blade acute to subacuminate or rarely broadly acute at apex, (9-)11-28(-40) x (1-)4-11(-16) mm, when dry brown or dark green; filaments 0.1-0.2 or 1-1.4 mm long.  
     7b. D. cordigera var angustifolia.
- bb. Leaf blade obtuse to acute and weakly mucronate at apex, (14-)21-47 x (6-)10-24 mm, when dry yellowish-green with the veins yellower; filaments ca 0.1 or 0.5-0.87 mm long.  
     7c. D. cordigera var divergentiflora.

7a. Declieuxia cordigera var cordigera.

Declieuxia cordigera Martius & Zuccarini ex Schultes & Schultes, Mantissa ... Syst. Veg. 3: 112, 1827.

Declieuxia cordigera Martius & Zuccarini ex Schultes & Schultes var genuina Müller Argoviensis, Mart. Fl. Bras. 6(5): 434, 1881.

Psyllocarpus cordifolius Pohl ex de Candolle, in synonymy, Prodrromus 4: 480, 1830. Based upon Pohl sn, Brazil, 1828 (G-DC).

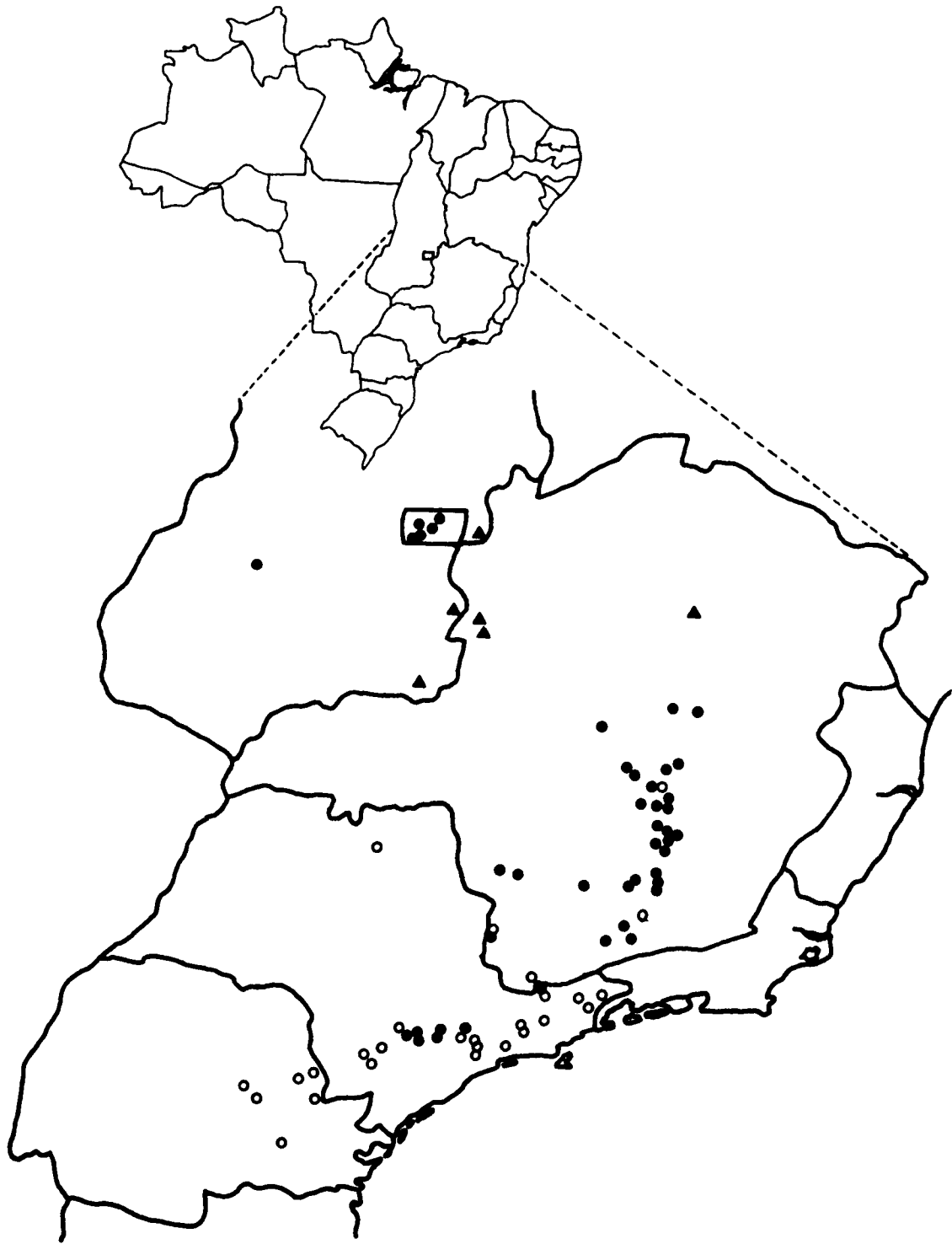
Type: Brazil, Minas Gerais, Cachoeira do Campo, IV 1839, Martius 1059 (lectotype BR; isotype LE).

Distribution. Known from eastern São Paulo, southern Minas Gerais, the Distrito Federal, and one station from western Goiás, and reported

from Bahia. Map 9.

Representative Specimens. BRASIL. Bahia: IX 1913, Millspaugh 48 (F).  
 Goiás; Serra Dourada, 1969, Rizzo 4522 (RB). Distrito Federal:  
 cabeceiras do Rio Bananal, 12 III 1895, Glaziou 21503a (G, R); Fundação  
 Zoobotânica, Brasília, 26 III 1962, Heringer 8907/1101 (HB, NY, U, UB);  
 near Rio São Bartolomeu, 18 km E of Brasília, 16 X 1965, Heringer 10689  
 (UB); immediately E of Lagôa Paranoá, 975 m, 11 XII 1965, Irwin, Souza,  
Reis dos Santos 11190 (NY, UB); ca 4 km S of Planaltina, ca 15°39'S,  
 47°41'W, ca 950 m, 26 I 1972, Kirkbride 1704 (NY, R, RB, UB); Parque do  
 Gama, Brasília, 6 V 1963, Pires, Silva, Souza 9616 (UB). Minas Gerais:  
 ca 8 km N of Gouveia on road to Diamantina, Município de Gouveia, 1220  
 m, 2 II 1972, Anderson, Stieber, Kirkbride 35186 (NY, UB); Serra do  
 Taquaril, Município do Belo Horizonte, 20 XI 1932, Barreto 3482 (F);  
 Cruz das Almas, Município da Andrelândia, 23 VIII 1936, Barreto 5217  
 (F); Ouro Preto, 1842 Claussen 39 (W); a Curvelo, Claussen sn (W);  
 Serra do Cipó, V 1933, Costa 83 (R); Carandá, 14 XI 1946, Duarte 466  
 (F, NY, RB); Poços das Caldas, Morro do Ferro, 29 II 1964, Emmerich 1781  
 (NY, R); Carmo do Rio Claro, Fazenda Alegria, 16 XI 1947, Emygdio 619  
 (NY, R); Pico da Aiuruoca, 17 IV 1876, Glaziou 9473 (G, R, US); Hórtio  
 Florestal de Paraopeba, 3 II 1954, Heringer 3657 (UB); Caeté, XI 1915,  
Hoehne 6445 (R); Serra do Itabirito, ca 45 km SE of Belo Horizonte, ca  
 1500 m, 9 II 1968, Irwin, Maxwell, Wasshausen 19657 (NY, UB); ad  
 Caldas, X 1854, Lindberg 97 (BR, S), 7 XI 1864, Regnell I 279 (BR, R, S,  
 US); São João del Rei, caminho a Casa da Pedra, 5 IV 1921, B. Lutz 24  
 (R); Montis Itambé, Martius sn (C); Sete Lagoas, 14 XII 1948, Palácios,  
Balegno, Cuezco 3669 (LIL, NY, R); Serra da Piedade, 1600-1800 m,  
 28 XII 1948, Palácios, Balegno, Cuezco 3965 (LIL); Serra Ouro Branco,

Map 9. Known distribution of D. cordigera var cordigera (closed circles), D. cordigera var angustifolia (open circles), and D. cordigera var divergentiflora (closed triangles) in Minas Gerais, Goiás, Distrito Federal, São Paulo, and Paraná, Brazil.



18 IV 1957, Pereira 2997, Pabst 3833 (RB); Registo Velho et Barbacena, Pohl 165 (W); prope Barbacena, V 1824, Riedel 135 (BR, LE); ad Sítio, III 1887, Schenck 3101 (C); ad Congonhas do Campo, 1843, Stephan sn (BR); ad Benta, 3 VII 1863, Warming sn (C); Capão dos Porços, 27 VI 1863, Warming sn (C); ad Lagôa Santa, VIII 1863, Warming sn (C); without locality, 1831, Ackerman sn (BR), 1840, Claussen 203 (BR, G, TUB), XI 1839, 23/12 (G), Martius sn (G), XI 1943, Weddell 1070 (G, NY). São Paulo: Cascata, 21 XI 1938, Kiehl 4013 (IAC, SP); prope Itu, II 1834, Lund sn (C), I 1818, Martius sn (M), II-VII 1834, Riedel 2066 (BR, C, F, FI, GH, LE, M, S, US, W); enter Itu et Sorocaba, II 1834, Lund sn (C); Km 120 estrada São Paulo - Itapetininga, Município da Sorocaba, 20 IX 1959, Machado de Campos 79 (SP, US); prope Jundiá, I 1818, Martius 572 (M).

7b. Declieuxia cordigera Martius & Zuccarini ex Schultes & Schultes var angustifolia Müller Argoviensis, Mart. Fl. Bras. 6(5): 434, 1881.

Declieuxia polygaloides Zuccarini ex Schultes & Schultes, Mantissa ... Syst. Veg. 3: 113, 1827.

Declieuxia polygaloides Zuccarini ex Schultes & Schultes, var genuina Müller Argoviensis, Mart. Fl. Bras. 6(5): 447, 1881.

Type: Brazil, Minas Gerais, Martius sn (holotype M, fragment of holotype G).

Asperula cruciata Vellozo, Flora Fluminensis 44, 1829.

Asperula cyanea Vellozo, Flora Fluminensis, 44, 1829.

Type: Brazil, São Paulo, Serra da Bocaina, ca 1700 m, 27 IV 1972, Kirkbride 1736 (neotype NY; isotypes R, RB, UB).

*Declieuxia brachyloba* Müller Argoviensis, Flora 59(28): 438, 1876.  
 Type: Brazil, São Paulo, city of São Paulo (fide Urban, 1906),  
 28 XI 1835, Raben 229 (holotype BR; isotypes C, F).

*Declieuxia intermedia* Müller Argoviensis, Flora 59(28): 438, 1876.  
 Type: Brazil, São Paulo, locality uncertain, Riedel 1519 pro  
 parte (lectotype BR; isotypes BR, F, FI, LE, S, US, W).

*Declieuxia cordigera* Martius & Zuccarini ex Schultes & Schultes  
 var longifolia Müller Argoviensis, Mart. Fl. Bras. 6(5): 434, 1881.  
 Type: Brazil, Minas Gerais, ad Lagôa Santa, Warming sn (holotype  
 C, fragment of holotype G).

*Declieuxia polygaloides* Zuccarini ex Schultes & Schultes var  
angustifolia Müller Argoviensis, Mart. Fl. Bras. 6(5): 447, 1881.  
 Type: Brazil, São Paulo, ad fluvium Tieté, Martius sn (holotype M,  
 fragment of holotype G).

*Declieuxia polygaloides* Zuccarini ex Schultes & Schultes var  
aristolochia Martius ex Müller Argoviensis, Mart. Fl. Bras. 6(5):  
 447, 1881.

*Declieuxia aristolochia* Martius, nom. nud., Syst. Mat. Med. Veg.  
 Bras. 70, 1843.

Type: Brazil, Minas Gerais, ad flumen Sapucahy, Martius 680  
 (lectotype G; isotype M).

*Declieuxia polygaloides* Zuccarini ex Schultes & Schultes var  
latifolia Müller Argoviensis, Mart. Fl. Bras. 6(5): 446, 1881.

Type: Brazil, São Paulo, São Bernando to São Paulo (fide Smith &

Smith, 1967), 20 I 1827, Burchell 4013 (lectotype BR, fragment of lectotype G).

*Declieuxia sclerophylla* Müller Argoviensis, Mart. Fl. Bras. 6(5): 467, 1881. Type: Brazil, São Paulo, Campos da Bocaina, 7 I 1876, Glaziou 8162 (lectotype G; isotypes BR, C, F, LE, NY, R, US).

Type: Brazil, Minas Gerais, ad Lagôa Santa, 25 X 1863, Warming sn (holotype G; isotype C).

Distribution. Known from the head waters of the Rio Paraíba do Sul, the vicinity of the present city of São Paulo, the southern edge of the planalto between the Rio Pardo and the Rio Tietê in São Paulo, and the northern edge of the highlands of Paraná and from five stations in Minas Gerais. Map 9.

Representative specimens. BRASIL. Minas Gerais: Serra de Grão Mogol, Martius sn (C); Caldas, XII 1873, Mosén 1350 (F, S); Ibitipoca, V 1897, Chages 2426 (R). São Paulo: Saúde, II 1911, Brade 5273 pro parte (F, S, SP); Barueri, X 1914, Brade 7060 (F, SP); Serra da Bocaina, Alto da Boa Vista, 1800 m, 26 IV 1951, Brade 20735 (NY, RB); about the village of São Bernando (fide Smith & Smith, 1967), 18 I 1827, Burchell 3952 (BR); São Paulo, ca 1 km NW by N from the Tanque de Zunica as far as the Caveira Santa (fide Smith & Smith, 1967), 13 II 1827, Burchell 4114 (C, BR); Morumbe, near the house (fide Smith & Smith, 1967), 13 III 1827, Burchell 4528-2 (BR); Barretos, 1917, Frazão sn (RB); Bocaina, Núcleo Colonial Senador Verqueiro, caminho para a Paredão, 2 V 1959, Fromm 26 (R); Jabaquara, 20 IV 1932, Hauff 1 (SP); Butantan, 16 X 1917, Hoehne 722 (F, SP); Umuarama, Campos do Jordão, II 1935, Kuhlman 32418 (F, SP);

Itapetininga, 28 XI 1943, J. S. de Lima sn (RB); São José dos Campos, 18 XI 1907, Loefgren 82 (RB, S); prope Mugy, XI 1833, Lund 919 (C); prope Taubaté, Martius sn (M); prope Lorena, Martius sn (M); Campos do Jordão, II 1944, N. Santos 1241 (R); Mogi das Cruzes, IV 1889, Schwacke sn (F, R); Mooca - Capital, XI 1912, Tamandaré 187 (RB); without locality, Sello 500 (F). Paraná: Capão Grande, Fortaleza, 22 XII 1903, Dusén 2906 (F, R, S); Jaguariahyva, 25 X 1910, Dusén 10655 (S); Tibagy, 11 VIII 1934, Reiss 7a (F, GH, NY, S); Mun. Ponta Grossa, Vila Velha, ca 25°13'S, 50°02'W, 800-920 m, 20 I 1965, L. B. Smith, Klein 14900 (GH, MO, US).

7c. Declieuxia cordigera var divergentiflora (Pohl ex de Candolle)  
Kirkbride, stat nov.

Declieuxia divergentiflora Pohl ex de Candolle, Prodr. 4: 480, 1830.

Psyllocarpus divergentiflorus Pohl ex de Candolle, in synonymy,  
Prodr. 4: 480, 1830.

Type: Brazil, Minas Gerais, Paracatú, Pohl 856 (holotype G-DC; isotypes F, G, W).

Distribution. Known from the valley of the Rio São Marcos, the vicinity of Paracatú and of Cabeceiras, and Serra do Catuni. Map 9.

Specimens Examined. BRASIL. Goiás: Vale do Rio São Marcos para Cristalina, 12 I 1967, Duarte 10149 (HB, NY, RB); ca 25 km NE of Catalão, 875 m, 21 I 1970, Irwin, Onishi, da Fonsêca, Souza, Reis dos Santos, Ramos 25046 (NY, UB); ca 22 km NE of Catalão, 875 m, 22 I 1970, Irwin, Onishi, da Fonsêca, Souza, Reis dos Santos, Ramos 25146 (NY, UB); ca 10 km E of Cabeceiras, 1000 m, 16 XI 1965, Irwin, Souza, Reis dos Santos

10326 (NY, UB). Minas Gerais: ca 2 km N of Paracatú, 700 m, 3 II 1970, Irwin, Onishi, da Fonsêca, Souza, Reis dos Santos, Ramos 25928 (NY, UB); ca 10 km SE of Paracatú, 675 m, 7 II 1970, Irwin, Onishi, da Fonsêca, Souza, Reis dos Santos, Ramos 26231 (NY, UB); Serra do Catuni, 1000 m, Markgraf 3275, Brade, Barreto 12016 (F, R, RB). Without Locality: Riedel 1519 pro parte (BR).

Declieuxia cordigera is a perennial herb which appears to put up new unbranched stems each year. A few plants of D. cordigera var cordigera did have branches at the upper nodes. In some instances, the apex of the primary stem had been destroyed. In other cases, the apex of the primary stem was occupied by an inflorescence or infructescence. Several plants of D. cordigera var divergentiflora showed limited primary branching at the upper nodes, and several specimens of D. cordigera var angustifolia from the vicinity of the city of São Paulo showed numerous primary branching. These types of branching would suggest that the stems are capable of being biennial.

Some aspects of the leaf morphology of D. cordigera are highly variable, most particularly size, relative width, and pubescence. Declieuxia cordigera var angustifolia shows the greatest variation in these characters. The separation of D. cordigera var cordigera from D. cordigera var angustifolia and var divergentiflora based upon leaf blade shape and the shape of the base of the leaf blade is not absolute. There are several collections, such as Irwin, Maxwell, Wasshausen 20326 from Serra do Cipó and Loefgren 102 from Tatuí, which consist of plants with cordate leaf bases and others with obtuse leaf bases.

One locule of one flower of D. cordigera var cordigera was found to contain two ovules which appeared to be normal. The 'funiculous' was

similar to that of the other uniovulate locule of the flower. There was no apparent development of a placenta-like structure as in D. coerulea.

The range of distribution of D. cordigera var cordigera, though restricted, coincides with that of D. oenanthoides. This reflects the fact that D. cordigera var cordigera is found in habitats, principally open forms of 'cerrado' vegetation (Goodland, 1971; Eiten, 1972), similar to those of D. oenanthoides. The distribution of D. cordigera var angustifolia corresponds to the southeastern limits of cerrado (sensu lato) vegetation with the exception of two or three stations in Minas Gerais, most particularly the one at Lagôa Santa based upon Warming's collections. Declieuxia cordigera var divergentiflora appears to be found in the river valleys of southwestern Goiás and east central Minas Gerais.

Declieuxia cordigera appears most closely related to D. passerina, for further discussion, refer to D. passerina.

8. Declieuxia passerina Martius & Zuccarini ex Schultes & Schultes,  
 Mantissa ... Syst. Veg. 3: 112, 1827.

Declieuxia daphnoides Zuccarini ex Schultes & Schultes var minor  
 Müller Argoviensis, Mart. Fl. Bras. 6(5): 433, 1881. Type: Brazil,  
 without locality, Martius pro parte 2346 (holotype M, fragment G).

Declieuxia orthophylla Müller Argoviensis, Mart. Fl. Bras. 6(5):  
 451, 1881. Type: Brazil, Minas Gerais, Serra da Lapa, XI 1824,  
Riedel 1000 (holotype LE, fragment G; isotype F).

Declieuxia schwackei Schumann ex Glaziou, nom nud, Bull. Soc. Bot.

France, Mem. 3: 360, 1909. Based upon Glaziou 19717, Brazil, Minas Gerais, Biribiry près Diamantina, III 1892 (C, F, LE, R).

Type: Brazil, Minas Gerais, inter Lavras da Pindaiba et S. Domingos Prata in Serra Frio, VI 1818, Martius 1382 (holotype M, fragment G).

Subshrub or rarely perennial herb 10-40(-55) cm tall with 1 to several erect fastigiately branched stems, the young stems terete and puberulous, the older stems glabrate to puberulous, the internodes 1-6.5(-9) mm long. Stipules reduced to a ridge or rarely absent. Leaves opposite, ternate, or quaternate, sessile, decurrent; blade coriaceous, subrevolute to revolute, narrowly ovate to ovate or rarely to narrowly elliptic, or narrowly elliptic to elliptic or rarely to narrowly subovate, or linear to linear-subulate, apex acuminate to acute, base acute to cordate or straight, 4-13(-14.5) x 0.5-4.5(-6.5) mm, 1.7-6.7 or 8-17.5 times longer than wide, with 1-6 arcuate lateral veins on lower half of blade on each side or none evident, the midrib prominent as 2 ridges or rarely plane, prominulous or plane lateral veins, and intercostal areas glabrous to puberulous above, the raised midrib, raised lateral veins, and intercostal areas glabrous to puberulous below, the tertiary venation obscure or faintly discernable as closed reticulate. Inflorescences axillary, the flowers solitary or in reduced cymules, 6-7 x 3-4 mm, sessile or subpedunculate, with 1 or 2 flowers, with 1 or 2 reduced axes, the axes terete, 0.2-0.5 mm long, glabrous to glabrate; peduncle terete, (0.1-)0.2-1.8 mm long, glabrous to puberulous, rarely with 2 bracts at apex, the bracts narrowly elliptic, acute at apex, cuneate at base, 4.0-5.5 x 0.5-0.9 mm, glabrous or sparsely puberulous. Flowers heterostylous, sessile or subpedicellate

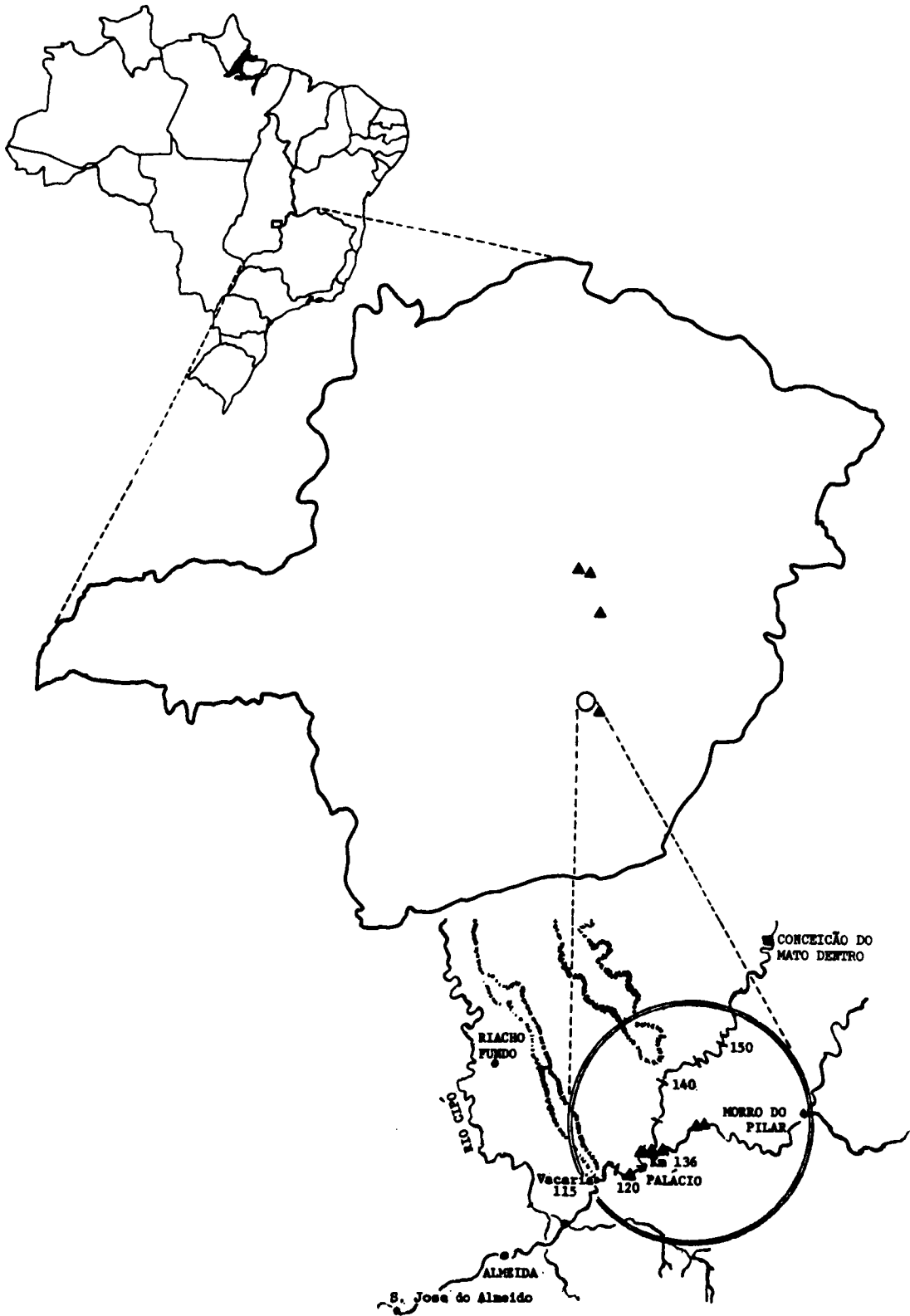
with the pedicels terete, 0.1-0.5 mm long, glabrate to glabrous, dichasial bracts narrowly elliptic, linear-subulate, or rarely linear, acute at apex, (1.1-)1.6-3.8(-5) x 0.1-0.4(-0.5) mm, glabrous to sparsely puberulous, occasionally ciliate; hypanthium broadly ovate to broadly elliptic to broadly obovate or transversely elliptic in outline, (0.2-)0.4-0.6 x 0.5-1 mm, glabrate to puberulous; calyx lobes oblong to triangular or narrowly triangular, acute to broadly acute at apex, 0.2-0.5 x 0.1-0.2 mm, glabrous to glabrate, sometimes ciliate; corolla blue, salverform, the tube 3-5 mm long, orifice (0.5-)0.7-1.5 mm in diam, 0.3-0.8 mm at base, exterior glabrous to sparsely puberulous, the lobes oblong to elliptic or rarely triangular, apex acute to broadly acute, (0.8-)1.2-2.3 x (0.5-)0.7-1.3 mm, glabrous or rarely sparsely puberulous outside; stamens with the filaments 0.1-0.3 or 0.6-1 mm long, glabrous, the anthers 0.7-1.3 mm long, glabrous with the apex sometimes minutely papillate; style 2.1-3.2 or (4.2-)4.5-5(-9.5) mm long, glabrous.

Fruit with the emargination (0.3-)0.5-0.8 mm, subpedicellate, the pedicel 0.1-0.25 mm long, glabrous to glabrate, the mericarps elliptic to circular or suboblong in outline, 1.4-2.2 x 1.6-2.8 mm, 0.6-1 mm thick, glabrous to puberulous, slightly rugose.

Distribution. Known from the southern half of the Serra do Espinhaço.  
Map 10.

Specimens Examined. BRASIL. Minas Gerais: Serra do Cipo, ca 1220 m, 20 II 1972, Anderson, Stieber, Kirkbride 36404 (NY, UB); Serra do Cipo Km 139 - estrada do Pilar, 11 I 1934, Barreto 7445 (F); Serra do Cipo Km 140 - estrada do Pilar, 15 IV 1935, Barreto, Brade 1132 (R); Serra do Cipo, Km 129 a 132, 1100-1300 m, 9 XII 1949, Duarte 2409 (RB); Serra

Map 10. Known distribution of D. passerina (closed triangles) in Minas Gerais, Brazil.



do Cipó, Km 139-140 do Ramal do Morro do Pilar, 1300 m, 14 IX 1950, Duarte 2479 (RB); Serra do Cipó, Km 131, 1400 m, 24 IV 1950, Duarte 2690 (NY, RB); Serra do Cipó, Km 140\*, 23 II 1967, Duarte 10388 (RB); Serra do Cipó, ca Km 120 (ca 145 km N of Belo Horizonte), 1200 m, 14 & 15 II 1968, Irwin, Maxwell, Wasshausen 20070a (NY, UB), 20124 (NY, UB); ca 15 km NE of Diamantina, road to Mendanha, 1275 m, 30 I 1969, Irwin, Reis dos Santos, Souza, Fonsêca 22893 (NY, UB); ca 3 km N of São João da Chapada, 1200 m, 24 III 1970, Irwin, Fonsêca, Souza, Reis dos Santos, Ramos 28224 (NY, UB); Serra do Catuný, Brejo das Almas, 1000 m, 10 XI 1938, Markgraf 3297, Brade, Barreto 12073 (F); Serra do Cipó, Km 137 estrada Pilar, 3 II 1934, Sampaio 6821 (R); Sêro, Schwacke 8092 (F); without locality, Saint-Hilaire Bl-1351 (F), sn (F), Schwacke 8088 (F). Without locality: Glaziou 19938 (C, F), Schwacke ?4917 (RB).

Declieuxia passerina is a variable species hybridizing with one or possibly two other species of the genus and occurring in two principal morphological forms. The most common form has narrowly ovate to ovate leaves with 3 to 5 (rarely 2 or 6) pairs of lateral veins, whose surfaces together with the intercostal areas range in pubescence from glabrous to puberulous. The next most frequently encountered form has linear to linear-subulate glabrous leaves without lateral veins. A third form, rarely encountered, has narrowly elliptic to rarely quite elliptic glabrous leaves with 1 or 2 lateral veins. The type collection of D. passerina is of the third type. The type collection of D. orthophylla consists of plants of all three forms. The three forms reach their greatest morphological similarity in this latter gathering. Müller Argoviensis apparently based his description upon that portion of the

latter collection bearing narrowly ovate puberulous leaves.

A hybrid swarm demonstrating possible introgression was found involving the narrowly ovate pubescent leafed form of D. passerina and typical D. fruticosa minor variant 5 (unpublished data; Kirkbride, 1974). The hybrids are intermediate in morphology and flavonoid composition between D. passerina and D. fruticosa minor variant 5 and show increased pollen unstainability. These hybrids seem best represented by the following collections: Anderson, Stieber, Kirkbride 36403 (from the analyzed hybrid swarm), 36405a, Serra do Cipó, 1220 m, 20 II 1972 (NY, UB); Atala 140 (R), 143 (NY, R), Serra do Cipó, 4 VI 1958; Claussen 241A (BR); Duarte 4599, Serra do Cipó, Chapeú de Sol, XII 1958; (NY, HB); Irwin, Maxwell, Wasshausen 20125, 20154, 20154a, Serra do Cipó, ca Km 120 (ca 145 km N of Belo Horizonte), 1300 m, 15 II 1968 (NY, UB); Irwin, Maxwell, Wasshausen 20384, Serra do Cipó, ca Km 105 (ca 130 km N of Belo Horizonte), 1150 m, 17 II 1968 (NY, UB); Kuhlman, Pereira 20, Serra do Cipó, 16 I 1951 (RB).

A second probable axis of hybridization is represented by 8 collections. The morphological trends within this axis, similar to those analyzed between D. passerina and fruticosa minor variants 5, may be characterized as having: 1) increasing leaf size and internode length, 2) increasing inflorescence size as represented by the number of flowers per inflorescence, and 3) increasing number of lateral veins in the leaves. Declieuxia daphnoides Zuccarini ex Schultes & Schultes, Mantissa ... Syst. Veg. 3: 112, 1827, includes those collections most similar to D. passerina. Declieuxia daphnoides var minor is so similar to the rare third form of D. passerina that it is here placed in synonymy under D. passerina. Declieuxia daphnoides var genuina

Müller Argoviensis, Mart. Fl. Bras. 6(5): 432, 1881 (type: Brazil, Minas Gerais, Serro Frio, May, Martius sn (holotype M; fragment G), also represented by the following, Lhotsky sn without locality (W)) and D. daphnoides var glabra Müller Argoviensis, Flora 28(59): 433, 1876 (type: Brazil, without locality, Pohl 865 (lectotype G; fragment of isotype F), also represented by Pohl sn, Goiás (probably incorrect), without locality (BR) and Pohl 3158, Minas Gerais, inter Rio Jequitinhonha et Columbi (W)) are intermediate in some characteristics. Declieuxia imbricata de Candolle, Prodr. 4: 480, 1830, and Psyllocarpus imbricatus Pohl ex de Candolle, in synonymy, Prodr. 4: 480, 1830, (type: Brazil, Pohl sn (holotype G-DC, fragment G)) are synonymous with D. daphnoides var glabra. The extreme form, least like D. passerina, is represented by D. rhexioides Martius & Zuccarini ex Schultes & Schultes, Mantissa ... Syst. Veg. 3: 112, 1827 (type: Brazil, Minas Gerais, Serra de S. Antonio, Martius 1572 (holotype M, fragment G; presumed isotype W)). If the D. daphnoides-rhexioides complex exhibits the same type of variation pattern as shown by the D. fruticosa-passerina hybrids, then the most likely putative parental species, among those sympatric with D. passerina, is D. deltoidea. More field work combined with cytological and artificial hybridization studies are needed to definitely prove the assumptions made here.

Declieuxia passerina is most closely related to D. cordigera from which it is separated by axillary inflorescences with 1 or 2 flowers and much shorter axes and the mericarps wider. Declieuxia passerina is more advanced than D. cordigera as evidenced by the complete absence of a stipular lobe and its greatly reduced inflorescences.

9. *Declieuxia spergulifolia* Martius & Zuccarini ex Schultes & Schultes,  
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 Mantissa ... Syst. Veg. 3: 111, 1827.

*Declieuxia spergulifolia* Martius & Zuccarini ex Schultes & Schultes  
 var *genuina* Müller Argoviensis, Mart. Fl. Bras. 6(5): 453, 1881.

*Declieuxia spergulifolia* Martius & Zuccarini ex Schultes &  
 Schultes var *longifolia* Müller Argoviensis, Mart. Fl. Bras.

6(5): 453, 1881. Type: Brazil, Sello sn (holotype G; isotype F;  
 presumed isotypes, with collection numbers 1119 & 1715, COI, S).

Type: Brazil, Minas Gerais, Martius sn (holotype M, fragment of holotype  
 G; isotypes M).

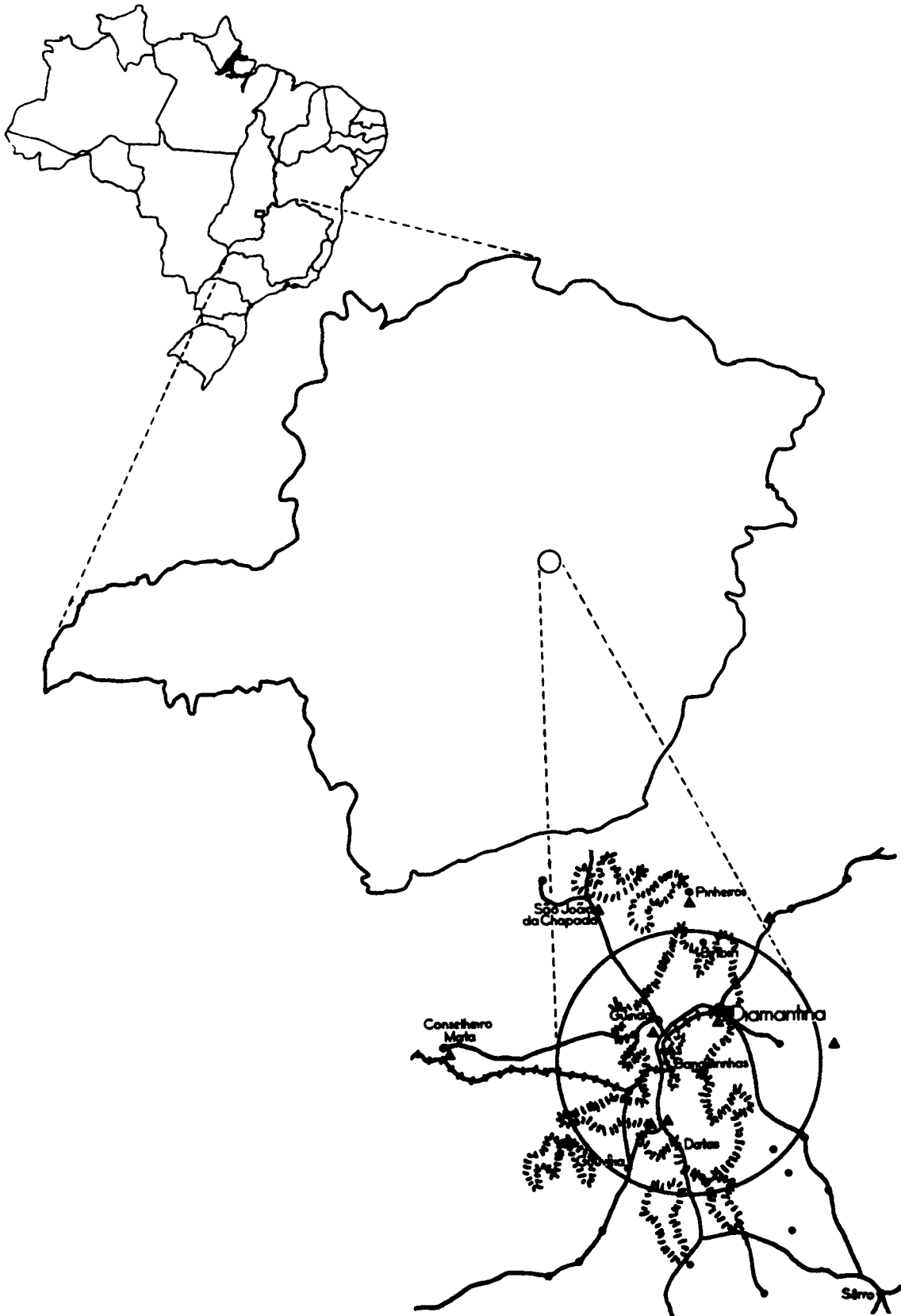
Shrub 40-100 cm tall, obconical, the stem much branched upwards,  
 the younger branches terete, glabrous to rarely sparsely puberulous,  
 with many stomata, the older branches and stem glabrous to rarely  
 glabrate, the internodes 0.3-2.3(-4.4) cm long, slightly shorter than to  
 sometimes half as long as the leaves. Stipules unidentate, the lobe  
 narrowly oblong to linear, narrowly acute and glandular at apex, 0.5-  
 3.2 x 0.1-0.3 mm, glabrous, with 1-2 conical glands at each side of the  
 base, strongly decurrent. Leaves opposite, some with 1-2 pairs of  
 smaller leaves in axils, petiolate, the petiole winged, 0.5-2 mm long,  
 glabrous; blade subchartaceous, revolute, narrowly acute at apex, long  
 attenuate at base, (7-)10-23(-30) x (0.4-)1-2.5(-3) mm, (5.5-)6-15(-60)  
 times longer than wide, venation pinnate with 2-4 arcuate lateral veins  
 on each side or the secondary venation often obscure, the prominulous  
 midrib, the plane lateral veins, and intercostal areas glabrous above,  
 the prominent midrib, the prominulous lateral veins when discernable,  
 and intercostal areas glabrous beneath, the tertiary venation obscure.

Inflorescences modified cymes, terminal and sometimes axillary at the apical node and rarely at the second node, pedunculate, 7-55 x 5-13 mm, with 9-31 flowers, with 1-4 axes, the axes terete, 4-39 mm long, glabrous; peduncle terete, 2-14 mm long, glabrous, with 2 bracts at apex, the bracts linear to narrowly oblong, narrowly acute at apex, 2-5.3 x 0.2-0.4 mm, glabrous. Flowers heterostylous, subpedicellate with the pedicels terete, 0.2-0.5 mm long, glabrous, dichasial bracts narrowly oblong to narrowly elliptic, narrowly acute at apex, 1.4-6 x 0.3-0.8 mm, glabrous; hypanthium very broadly to depressed obovate in outline, 0.4-0.6 x 0.7-0.9 mm, glabrous; calyx lobes triangular to oblong, acute to obtuse at apex, 0.2-0.4 x 0.1-0.2 mm, glabrous; corolla blue, salverform, the tube 3-3.6 mm long, orifice 1-1.2 mm in diam, 0.5-0.6 mm at base, exterior glabrous, the lobes ovate to broadly so to broadly elliptic, acute at apex, 1.4-1.9 x 0.9-1.5 mm, glabrous outside; stamens with the filaments 0.1-0.2 or 1-1.1 mm long, glabrous, the anthers 0.7-1.2 mm long; style 2.1 or 4.3-4.7 mm long, glabrous. Fruit with the emargination 0.2-0.6 mm, subpedicellate with the pedicel 0.5-1 mm long, glabrous, the mericarps elliptic to broadly so in outline, 1.6-2 x 1.2-1.7 mm, ca 0.5 mm thick, glabrous and somewhat rugose.

Distribution. Known from the Serra do Espinhaço in the area of Diamantina and collected once at Gongo Soco. Map 11.

Representative Specimens. BRASIL. Minas Gerais: ca 8 km N of Gouveia on road to Diamantina, 1220 m, 4 II 1972, Anderson, Steiber, Kirkbride 35381 (NY, UB); ca 15km S of Diamantina, Município de Datas, 1250m, 5 II 1972, Anderson, Stieber, Kirkbride 35534 (NY, UB); ca 11km N of Gouveia, Município de Datas, Km 286 on M. G. 259, 1300 m, 6 II 1972, Anderson,

Map 11. Known distribution of D. spergulifolia (closed triangles)  
in Minas Gerais, Brazil.



Steiber, Kirkbride 35580 (NY, UB); Diamantina, 1400 m, VI 1934, Brade 13835 (F, RB); Conselheiro Mata, Serra Preto, VI 1934, Brade 13837 (F, RB); Gongo Soco, VI 1909, Damasio sn (RB); Diamantina, Rio das Cristais, 21 XI 1964, Duarte 8531 (NY, RB); Pinheiro près Biribiry, 26 III 1892, Glaziou 19455 (BR, C, LE, NY, R); ca 18km E of Diamantina, 1100 m, 19 III 1970, Irwin, Fonsêca, Souza, Reis dos Santos, Ramos 27914 (NY, UB); ca 2km S of São João da Chapada, 1200 m, 26 III 1970, Irwin, Fonsêca, Souza, Reis dos Santos, Ramos 28370 (NY, UB).

Declieuxia spergulifolia is closely related to D. oenanthoides and to D. diamantinae and less closely to D. fruticosa (refer to the discussions of D. oenanthoides and of D. diamantinae). It can be distinguished from D. fruticosa by 1-2 pairs of smaller leaves found in some leaf axils and the narrower leaf blades.

10. Declieuxia oenanthoides Martius & Zuccarini ex Schultes & Schultes, Mantissa ... Syst. Veg. 3: 112, 1827.

Declieuxia oenanthoides var genuina Müller Argoviensis, Flora brasiliensis 4(5): 452, 1881.

Declieuxia oenanthoides var longifolia Müller Argoviensis, Flora brasiliensis 4(5): 452, 1881. Type: Brazil, Minas Gerais, in campis australioribus, II 1818, Martius sn (lectotype M, fragment G).

Declieuxia oenanthoides var stenophylla Müller Argoviensis, Flora brasiliensis 4(5): 452, 1881. Type: Brazil, São Paulo, Villa Franca, VI-VII 1834, Riedel 2344 (lectotype BR; isotypes BR, LE, US, W).

*Declieuxia galioides* Pohl ex de Candolle, Prodr. 4: 479, 1830.

*Psyllocarpus galioides* Pohl ex de Candolle, in synonymy, Prodr. 4: 479, 1830.

Type: Brazil, Pohl sn (holotype G-DC).

Type: Brazil, São Paulo, prope Jundiahy, I 1818, Martius 984 (lectotype M, fragment G; isotype M).

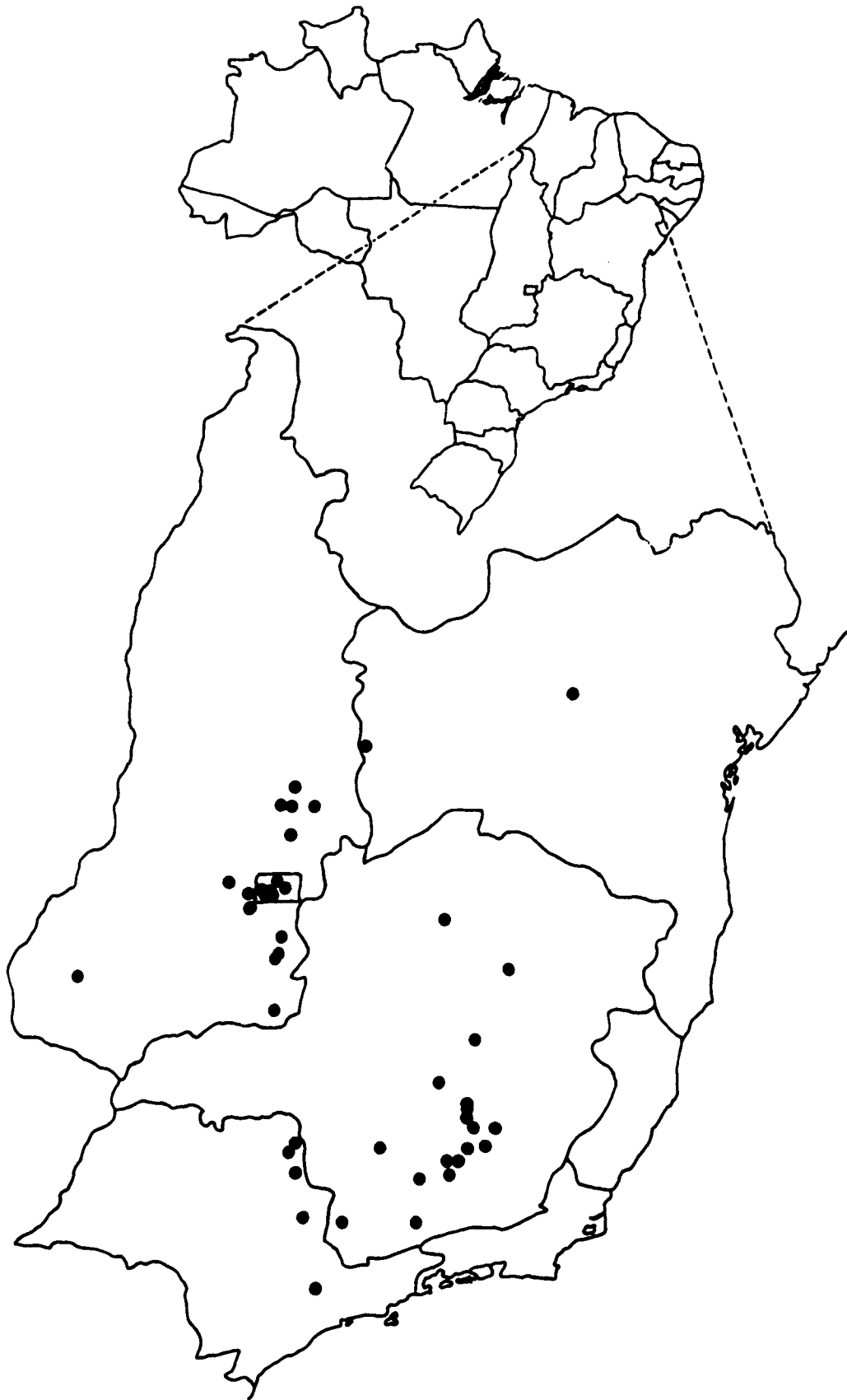
Perennial herb (17-)24-100 cm tall with erect stems sometimes subfastigiately branched, the stems terete, striate, glabrous or glabrate to sparsely puberulous, with many stomata, the internodes (0.8-)1.5-10.5 cm long, 2-4-times longer than leaves. Stipules reduced to a ridge or unidentate, linear to oblong or narrowly triangular or linear-subulate, acute and glandular at apex, 0.1-0.6(1.3) x 0.1-0.2(-0.4) mm, glabrous, not decurrent. Leaves ternate or quaternate, sessile; blade subcoriaceous, linear to narrowly elliptic or narrowly oblong, acute or sometimes narrowly acute at apex, narrowly cuneate to straight at base, (4.5-)5.5-40 x 0.4-2.3 mm, 6.5-30(-38) times longer than wide, only the midrib evident or very rarely 3-5 pinnate lateral veins also evident on each side, the intercostal areas above and below glabrous or minutely scabrous or rarely glabrate to puberulous, the midrib prominulous or plane above and prominent below, glabrous or rarely minutely scabrous, the arcuate lateral veins when present plane above and prominulous below, glabrous, tertiary venation not evident. Inflorescences modified terminal and axillary cymes at the upper nodes, pedunculate or sometimes sessile, 1.3-10(-15) x 0.5-6 cm, with 13-100(-150) flowers, with 1-4(-6) axes radiating from the apex of the peduncle, the axes terete, (2-)3-35(-65) mm long, glabrous or rarely glabrate to puberulous;

peduncle terete, 1-78 mm long, glabrous or rarely glabrate to puberulous, with 2-4 dichasial bracts at apex. Flowers heterostylous, subpedicellate with the pedicels terete, 0.1-0.5 mm long, glabrous, dichasial bracts narrowly oblong to narrowly triangular or narrowly elliptic or linear to linear-subulate, acute at apex, 0.6-2.2 x 0.2-0.6 mm, glabrous; hypanthium broadly transverse to transversely elliptic in outline, 0.6-0.8 x 0.8-1.1 mm, glabrous or very rarely papillate; calyx lobes oblong or triangular, obtuse or acute at apex, 0.2-0.5 x 0.2-0.3 mm, glabrous; corolla blue, salverform, the tube 3.5-5.5 mm long, orifice 1.2-2.2 mm in diam, 0.7-0.9 mm at base, exterior glabrous, the lobes ovate to elliptic, acute or broadly acute at apex, 1.4-2.3 x 1-1.6 mm, glabrous outside; stamens with the filaments 0.1-0.4 or 0.7-1.3 mm long, glabrous or minutely granulate, the anthers 0.8-1.1 mm long; style 2.2-3.3 or 4.7-6.3 mm long, glabrous or minutely granulate. Fruit with the emargination 0.2-0.6 mm, subpedicellate with the pedicel 0.2-0.4 mm long, glabrous or rarely glabrate, the mericarps elliptic to broadly elliptic or rarely circular in outline, 1.2-2 x (0.9-)1-1.6 mm, 0.4-0.5 mm thick, glabrous or very rarely papillate, rugose.

Distribution: Known from the Planalto Central do Brasil. Map 12.

Representative Specimens. BRASIL. Bahia: Minas do Espírito Santo, 4 VII 1933, Barreto 3479 (R); Campinas, ca 10km S of Rio Piau, ca 150km SW of Barreiras, 850 m, 13 IV 1966, Irwin, Grear, Souza, Reis dos Santos 14725 (NY, UB). Goiás: flats below butte 5km W of Veadeiros, 29 IV 1956, Dawson 14725 (F); Capelinha de Santo Antônio, 23 IX 1894, Glaziou 21501 (BR, C, G, LE); Chapada dos Veadeiros, ca 20km W of Veadeiros, 1000 m, 9 II 1966, Irwin, Grear, Souza, Reis dos Santos 12457a (NY, UB);

Map 12. Known distribution of D. oenanthoides (closed circles) in Bahia, Goiás, Distrito Federal, Minas Gerais, and São Paulo, Brazil.



ca 10km W of Cristalina, 1200 m, 4 III 1966, Irwin, Grear, Souza, Reis dos Santos 13457 (NY, UB); ca 26km NE of Catalão, 875 m, 23 I 1970, Irwin, Onishi, Fonsêca, Souza, Reis dos Santos, Ramos 25216 (NY, UB); ca 7km S of Cavalcante, 1000 m, 8 III 1969, Irwin, Reis dos Santos, Souza, Fonsêca 24028 (NY, UB); ca 35km N of Veadeiros, 1000 m, 14 III 1969, Irwin, Reis dos Santos, Souza, Fonsêca 24317 (NY, UB); ca 50km S of Caiapônia, on road to Jataí, 25 IX 1964, Irwin, Soderstrom 7343a (NY, UB). Distrito Federal: N slopes of Chapada da Contagem, W and S of Sobradinho, Km 6 on D.F.7, 1050 m, 30 I 1972, Anderson, Stieber, Kirkbride 35072 (NY, UB); Brasília, Área do Zoobotânico, 25 XI 1966, Duarte 9951 (NY, RB); Parque Municipal do Gama D.F., 12 X 1965, Heringer 10646 (NY, UB); ca 15km S of Planaltina, campo slopes of Rajadinha, 1000 m, 22 II 1970, Irwin, Fonsêca, Souza, Reis dos Santos, Ramos 26528 (NY, UB); ca 15km SW of Brasília, road to Goiânia, 1250 m, 24 IX 1965, Irwin, Souza, Reis dos Santos 8628 (NY, UB); ca 5 km W of Taguatinga, ca 1160 m, 28 I 1972, Kirkbride 1709 (NY, UB), 1712 (NY, UB); Brasília, Catetinho, 20 III 1964, Pereira 9009 (HB, NY, RB). Minas Gerais: ca 17km SW of Gouveia, Mun. de Gouveia, Km 258 on M.G. 259, 1000-1050 m, 7 II 1972, Anderson, Stieber, Kirkbride 35593 (NY, UB); Eda. Brasília, 4 IX 1960 Andrade, Emmerich 382 (R); S. João d'el Rey, Armond sn (R); Hargreaves, 9 I 1942, Barreto 11271 (UB); Serra da Caraça, 1843, Claussen 1 (BR, G); estrada para Ouro Preto, Km 48, 13 IX 1964, Hatschbach, Pabst, Pereira 11563 (US); Embiruçu, Paraopeba, 8 V 1956, Heringer 5184 (UB); Sabará, I 1916, Hoehne 6792 (R); Belo Horizonte, Serra da Motuca, 16 XI 1938, Markgraf, Barreto, Brade 3549 (F); caminho da Baleia, XII 1940, Occhioni sn (RB); Serra de Ouro Branco, 18 IV 1957, Pereira 2970, Pabst 3806 (RB); ad Formiga, Pohl 480

(W), 860 (GH); Usina, 1916, Porto 518 (RB); prope S. José, VI 1824, Riedel 190 (BR, LE); Belo Horizonte, Serra do Curral, 24 VII 1949, Vidal sn (R); ad Lagôa Santa, Warming sn (C, G, US); ad Caldas, 1845, Widgren 1033 (BR); Pico de Belo Horizonte, 1300 m, 6 VI 1953, Williams, Assis 7153 (F, GH); unknown, 1840, Claussen 202 (BR). São Paulo: Franca, 9 I 1893, Loefgren, Edwall 2081 (C, SP); inter Canna Verde et Casa Branca, in serra de Laguna, 18 II 1849, Cajurú, Retiro de Laguna, 18 III 1857, ad Villa de Batataes, Regnell III 105 (BR, S). Unknown: Pohl sn (BR, W); Schenck 4384 (NY); Sello 1716/1120 (COI), 1372 (S), sn (W).

In Müller's treatment of Declieuxia in Flora Brasiliensis (1881), four varieties of D. oenanthoides are described. In this treatment, D. oenanthoides var humilis Müller Argoviensis is raised to specific rank. Müller described three other varieties, stenophylla, genuina, and longifolia, based on leaf width, 1 mm wide versus 1.2-1.5 mm wide, and leaf length, ca 1.5 cm long versus 2-2.5 cm long. In order to maintain these varieties, Müller recognized different plants of the same collection, which presumably represent a small portion of one population, as different varieties. In portions of natural populations I have observed in Goiás and Minas Gerais, two of these varieties were sometimes represented. Therefore, the other three varieties are here placed in synonymy under D. oenanthoides.

The inflorescence of D. oenanthoides, like that of other species of Declieuxia, has a primary phase when it bears only buds. Once the flowers begin to open, a longer phase occurs in which the inflorescence bears fruit, buds, and open flowers simultaneously. Finally, for a short period, fruit only is present which is soon lost. The inflorescence is determinate, but undergoes continuous 'elongation.'

Inflorescences in the primary phase are much smaller than those near the end of the middle phase. No further elongation occurs in the final phase. This pattern results in the presentation of all the open flowers of the inflorescence in roughly one plane at the top level of the inflorescence.

The distribution of D. oenanthoides correspondes well to Rizzini's (1963) planalto sector of his phytosociological central plateau sub-province. Its distribution also correlates well with the cerrado vegetation province defined by Eiten (1972) except for the higher reaches of the Serra do Espinhaço. This correspondence results from the occurrence of Declieuxia oenanthoides as a natural member of the more open forms of 'cerrado' vegetation as it is defined by Goodland (1971).

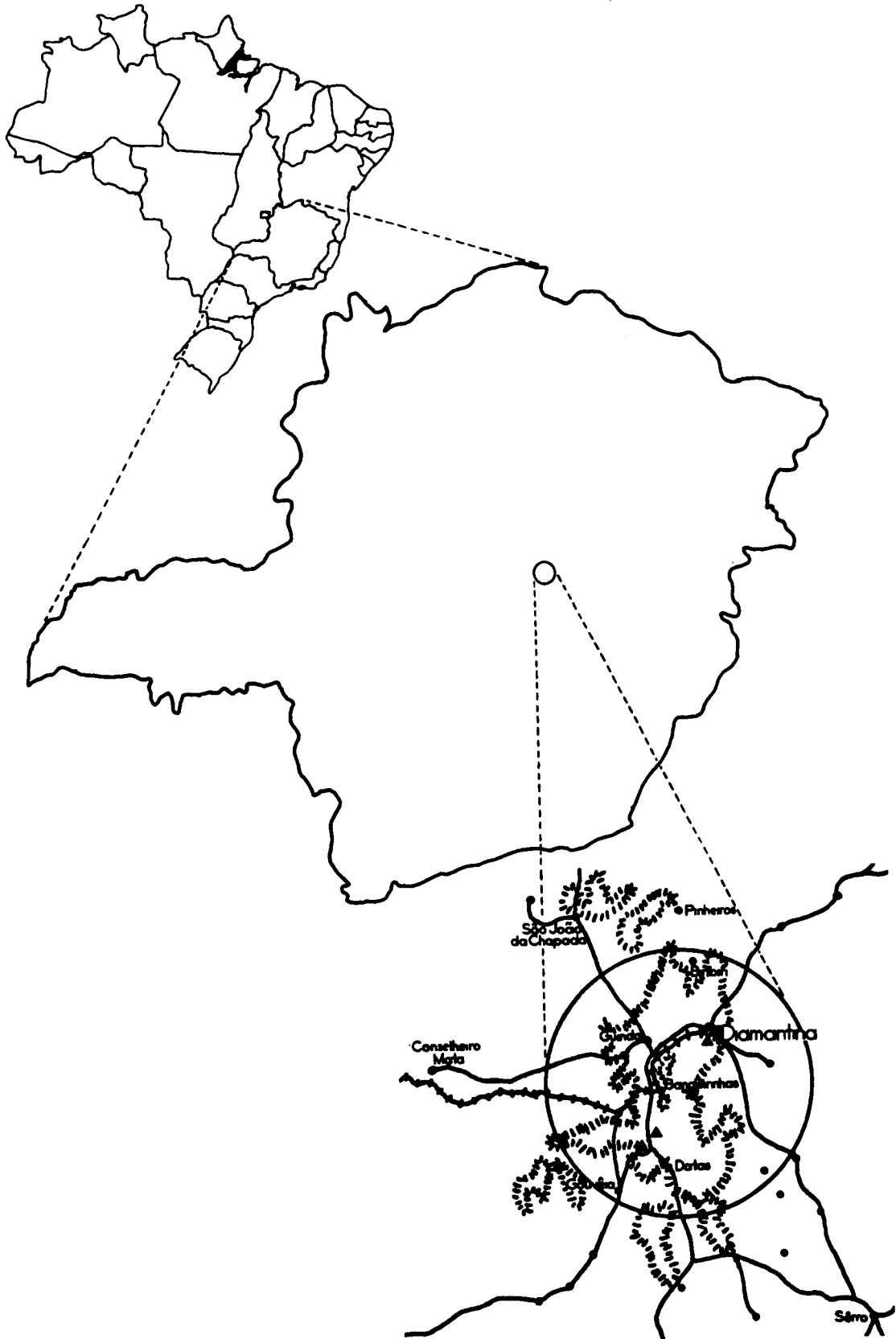
Declieuxia oenanthoides is most closely related to D. spergulifolia from which it is separated by its herbaceous habit with inconspicuous ternate and quaternate leaves 2-4-times shorter than the internodes.

11. Declieuxia diamantinae Kirkbride, sp. nov.

Types: BRASIL. Minas Gerais: ca 8 km N of Gouveia on road to Diamantina, 1220 m, 4 II 1972, Anderson, Steiber, Kirkbride 35402 (holotype UB; isotype NY), 35403 (paratypes NY, UB); ca 26km SW of Diamantina on road to Gouveia, 1300 m, 16 I 1969, Irwin, Reis dos Santos, Souza, Fonsêca 22067 (paratypes NY, UB); Tejuco (Diamantina), 1832, Vauthier 232 (paratypes F, G). Map 13.

A D. aspalathoides stomatibus caulinis, folii lamina 20-31-plo longiore quam lata, inflorescentiae axibus 4-9 mm longis, calyce lobato, mericarpis 1.8-2.3 x 1.5-1.6 mm, a D. juniperina stipulis

Map 13. Known distribution of D. diamantinae (closed triangles) in Minas Gerais, Brazil.



1-3-dentatis, folii lamina (10-)12.3-26 mm longa et 20-31-plo longiore quam lata, inflorescentiis 1-22-floris, si 1-floris tunc pedunculatis, a D. oenanthoidei foliorum axillis nonnullis ramulos breves aliis plurimis foliorum minorum 1-4 verticellos gignentibus, internodiis foliis 2-4-plo brevioribus, et a D. spergulifolia foliis ternatis vel quaternariis sessilibus, folii lamina lineari et 20-31-plo longiore quam lata absimilis.

Perennial herb to subshrub 20-50 cm tall, several fastigate sub-herbaceous stems or a single woody stem, showing increased branching upwards with advancing age and woodiness, the stems and branches terete, glabrous, with many stomata, the internodes (3-)4-18 mm long, with short branchlets in some leaf axils. Stipules unidentate or unequally tridentate, the lobes triangular to narrowly so or narrowly oblong, narrowly acute and glandular at apex, glabrous or minutely glabrate, the central lobe 0.3-1.5 mm long, the laterals when present 1/2-2/3 as long as the central lobe, decurrent. Leaves ternate or quaternate, most axils with 1-4 whorls of smaller leaves, sessile; blade sub-coriaceous, plane, linear, narrowly acute at apex, long attenuate at base, (10-)12.3-26 x (0.4-)0.5-1 mm, 20-31 times longer than wide, the midrib plane above and prominulous to prominent beneath with glabrous intercostal areas above and beneath, the secondary and tertiary venation obscure. Inflorescences modified cymes terminal and axillary at upper nodes, sessile or pedunculate, 7-13 x 3-10 mm, with (1-)4-22 flowers, with 1-4 axes, the axes terete, 4-9 mm long, glabrous; peduncle terete, 1.5-4.5 mm long, glabrous, with 2-3 dichasial bracts at the apex. Flowers heterostylous, subpedicellate with the pedicel 0.1-0.2 mm long,

glabrous, dichasial bracts linear to narrowly oblong to very narrowly elliptic, narrowly acute at apex, 1.2-3.4 x 0.1-0.4 mm, glabrous; hypanthium broadly transverse to transversely elliptic in outline, 0.5-0.8 x 0.8-0.9 mm, glabrous; calyx lobes triangular to suboblong, acute at apex, 0.2-0.5 x 0.1-0.2 mm, glabrous; corolla pale blue, salverform, the tube 3.1-3.2 mm long, orifice 1.3 mm in diam. 0.5-0.6 mm at base, exterior glabrous, the lobes elliptic to narrowly so, acute to narrowly so at apex, 2-2.3 x 0.8-1.3 mm, glabrous outside; stamens with the filaments 0.1 or 0.9 mm long, glabrous, the anthers 0.9-1 mm long; style 2.5 or 4 mm long, glabrous. Fruit with the emargination 0.3-1.2 mm, subpedicellate with the pedicel 0.2-1 mm long, glabrous, the mericarps elliptic to broadly so in outline, 1.8-2.3 x 1.5-1.6 mm, ca 0.6 mm thick, glabrous and weakly rugose.

Declieuxia diamantinae is related to both D. spergulifolia and D. aspalathoides, see the discussion of D. aspalathoides. It differs from D. spergulifolia by being a shorter perennial herb to subshrub with leaf blades 20-31 times longer than wide with the secondary venation obscure. Declieuxia diamantinae is probably more advanced than D. spergulifolia based upon its partial change to the perennial herb habit, alteration of the leaf blade, and decrease in size of the inflorescence.

12. Declieuxia aspalathoides Müller Argoviensis, Flora 59(28): 438, 1876.

Type: Brazil, Bahia, editis montanis ad Villa de Rio das Contas, Martius 1972 (holotype M, fragment G; isotype M).

Subshrub or shrub 15-150 cm tall with several erect fastigate frequently branched stems, the young stems terete and puberulous, the older stems glabrate to puberulous, the internodes (2-)3-7(-13.5) mm long, with abbreviated or rarely elongated branchlets in leaf axils, the elongated branchlets without smaller branchlets in leaf axils. Stipules unidentate or unequally tridentate, the lobes subulate, acute at apex, puberulous, the central lobe 0.4-3.3 mm long, ca twice as long as the lateral lobes, sometimes decurrent. Leaves ternate or quaternate, with fascicles of smaller leaves in axils, sessile; blade coriaceous-chartaceous, strongly revolute, linear-subulate, acute at apex, straight at base, 2.5-8.5(-13) x 0.4-1 mm, (4.2-)8.5-16 times longer than wide, the flat midrib and intercostal areas above glabrous to sparsely hispidulous or densely puberulous, the prominent midrib and intercostal areas beneath glabrous to sparsely puberulous, the secondary and tertiary venation not evident. Inflorescences reduced axillary cymes, 5-7 x 4-6 mm, sessile or subpedunculate, bearing 2-8 flowers, with 1 or 2 axes, the axes terete, to 0.8 mm long, glabrous or rarely puberulous; peduncle terete, 0.2-1 mm long, glabrous to puberulous. Flowers heterostylous, subpedicellate with pedicels terete, 0.2-0.4 mm long, glabrous or glabrate, ebracteate or subtended by 1-2 bracts, the bracts revolute, linear, acute at apex, 2-6.5 x 0.1-0.5 mm; hypanthium transversely elliptic to broadly ovate in outline, 0.3-0.6 x 0.6-0.8 mm, glabrous or rarely papillate; calyx lobate or gamosepalous, the lobes when present linear to narrowly elliptic, apex acute to broadly acute, 0.2-1.3 x 0.1-0.3 mm, glabrous, the tubular calyx 0.1 mm long, glabrous; corolla blue or white, salverform, the tube 2.5-4.6 mm long, orifice 0.7-1.5 mm in diam, 0.5 mm at base, exterior glabrous to glabrate or rarely puberulous, the lobes sub-

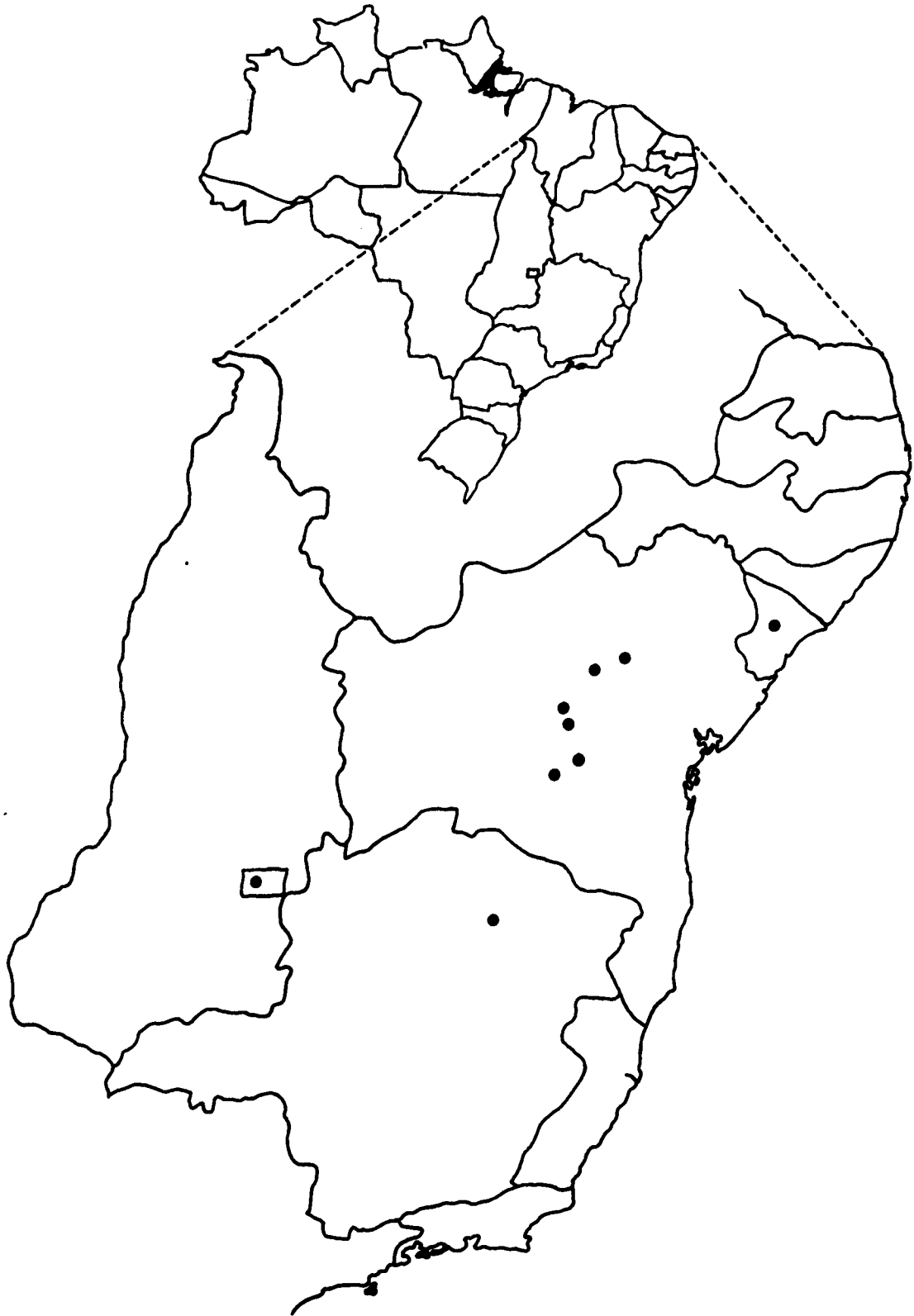
elliptic to suboblong to subovate, the apex broadly acute, 1.6-2 x 0.8-1.2 mm, glabrous or rarely puberulous outside; stamens with the filaments ca 0.3 or 1-1.2 mm long, glabrous, the anthers 0.7-1.1 mm long, glabrous with the apex smooth; style 1.9-2.5 or ca 5 mm long, glabrous. Fruit with the emargination ca 0.3 mm, sessile or subpedicellate, the pedicel 0.3-0.5 mm long, glabrous or rarely glabrate, the mericarps circular to oblong in outline, ca 1.5 x 1.2-1.5 mm, ca 0.3 mm thick, glabrous or rarely papillate, slightly rugose.

Distribution. Known from the Brazilian states of Sergipe, Bahia, and northeastern Minas Gerais and the Distrito Federal. Map 14.

Specimens Examined. BRASIL. Sergipe: Serra de Itabaiana, 11 VII 1962, A. Lima 62-4092 (RB), III 1932, Werdermann 3053 (F). Bahia. Serra Jacobina, 1857, Blanchet 3378 (BR, C, F, FI, G, NY, W); ca 24km N of Seabra, road to Agua de Rega, ca 1000 m, 24 II 1971, Irwin, Harley, Smith 30953 (NY, UB); ca 2km E of Morro do Chapéu, ca 1100 m, 18 II 1971, Irwin, Harley, Smith 32525 (UB); Serra Marsalina, VII 1913, von Lützelburg 24 (NY, M), VIII 1913, 134 (M); entre Palmeiras e Lençóis, 900 m, 14 IX 1956, Pereira 2196 (NY, RB); Serra do Sincorá, XI 1906, Ule 7351 (G); without locality, Blanchet 341 (G, W). Distrito Federal: cabeceiras do Rio Torto, 20 X 1894, Glaziou 21503 (BR, C, F, G, MPU, NY, R). Minas Gerais: Serra do Grão Mogol, 1000 m, 12 XI 1938, Markgraf, Barreto, Brade 3451 (F, RB).

Declieuxia aspalathoides is related to D. diamantinae from which it is separated by leaf blades (4.2-)8.5-16 times longer than wide, smaller inflorescences with fewer flowers, 2-8, and much shorter axes,

Map 14. Known distribution of D. aspalathoides (closed circles) in Sergipe, Bahia, Distrito Federal, and Minas Gerais, Brazil.



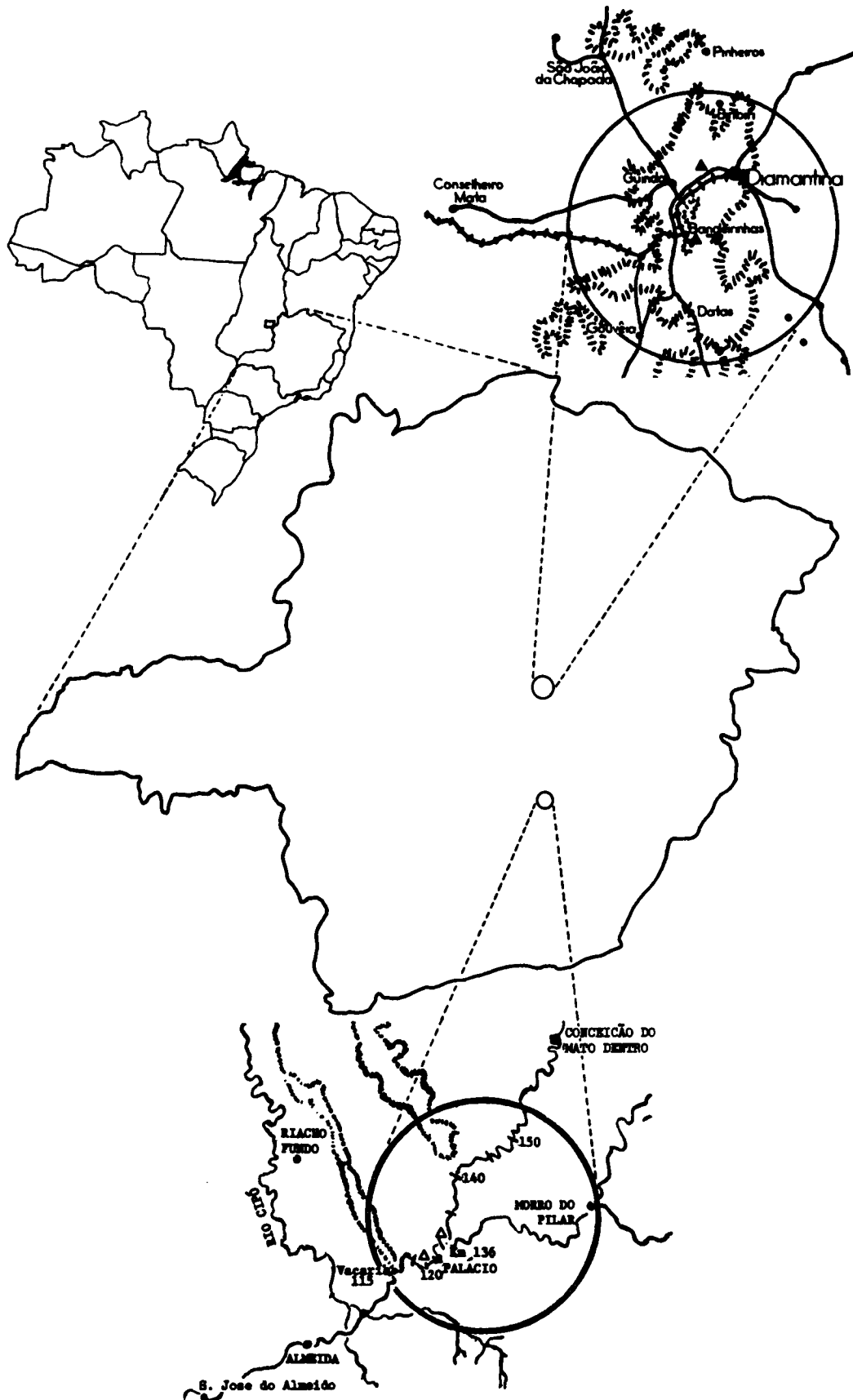
and smaller mericarps. Declieuxia aspalathoides seems to be more advanced based upon sometimes nondecurent stipules, smaller leaves, reduced axillary inflorescences with fewer flowers and shorter axes, and the calyx lobate or gamosepalous.

13. Declieuxia irwini Kirkbride, sp nov.

Types: Brazil, Minas Gerais, Serra do Cipó, ca 1125 m, 18 II 1972, Anderson, Stieber, Kirkbride 36255 (holotype UB; isotype NY); Serra do Cipó, Km 132, Santa Luzia, 2 IX 1933, Barreto 3491 (paratypes F, R, RB); Serra do Cipó, ca Km 120 (ca 145km N of Belo Horizonte), 1200 m, 14 II 1968, Irwin, Maxwell, Wasshausen 20070 (paratypes NY, UB); Saint-Hilaire Bl 2019 (paratype F). Map 15.

A D. muscosa caulibus puberulis vel sparsim puberulis, folii lamina (7.5-)10-17(-19) x (1.5-)2-4.5(-6) mm, inflorescentiis terminali et axillaribus e nodo apicali, floribus 2-9, hypanthio puberulo, mericarpiis ± 2.3 x 1.9 mm, sparsim puberulis, a D. juniperina statura 5.5-10 cm, folii lamina (7.5-)10-17(-19) x (1.5-)2-4.5(-6) mm, 2.5-5(-6.8)-plo longiore quam lata, inflorescentiae floribus 2-9, hypanthio puberulo, mericarpiis ± 2.3 x 1.9 mm, sparsim puberulis, a D. diamantina statura 5.5-10 cm, caulibus puberulis vel sparsim puberulis, stipulis in cristam 1-3-glanduliferam reductis, foliis petiolatis, folii lamina elliptica vel anguste elliptica vel anguste oblonga, (1.5-)2-4.5(-6) mm lata, 2.5-5(-6.8)-plo longiore quam lata, hypanthio puberulo, et a D. saturejoidei herbae perennis statura 5.5-10 cm, folii lamina glabra, dichasiae bracteis glabris absimilis.

Map 15. Known distribution of D. irwini (open triangles) and D. muscosa (closed triangles) in Minas Gerais, Brazil.



Perennial herb 5.5-10 cm tall, forming a sphere, the numerous erect stems from a subterranean caudex, the stems terete, puberulous to sparsely so, the internodes 3-7 mm long. Stipules reduced to a ridge bearing 1-3 glands. Leaves opposite or ternate, petiolate, the petiole winged, 1-1.5 mm long, glabrous to sparsely puberulous; blade subcoriaceous, subrevolute with the edge thickened, elliptic to narrowly so or to narrowly oblong, narrowly to broadly acute at apex, acute at base, (7.5-)10-17(-19) x (1.5-)2-4.5(-6) mm, 2.5-5(-6.8) times longer than wide, venation sometimes pinnate with 3-4 lateral veins on each side or the lateral veins obscure, the prominulous midrib, plane lateral veins, and intercostal areas glabrous above, the prominent midrib, slightly sulcate lateral veins, and intercostal areas glabrous beneath, the tertiary venation obscure. Inflorescences modified terminal and axillary cymes at the apical node, pedunculate, 1-1.5 x 0.7-1.5 cm, with 2-9 flowers, with 1-3 axes, the axes terete, 2-4 mm long, puberulous to sparsely so; peduncle terete, 1-2mm long, puberulous, with 2 bracts at apex, the bracts narrowly elliptic, acute at apex, cuneate at base, 6-10 x 1.5-2 mm, glabrous. Flowers heterostylous, subpedicellate with the pedicels terete, ca. 0.1-1.5 mm long puberulous to glabrous, dichasial bracts narrowly oblong to narrowly elliptic or narrowly obovate or linear, acute to narrowly so at apex, 2-6.7(-8) x 0.3-1.8(-2.2) mm, glabrous; hypanthium broadly transverse to transversely elliptic or broadly obovate in outline, 0.7-1 x 0.8-1.4 mm, puberulous; calyx lobes triangular or oblong, acute at apex, 0.2-1.5 x 0.1-0.4 mm, glabrous, rarely with the lobes petaloid, narrowly obovate, acute at apex, straight at base, 1.7-5 x 0.6-1.25 mm, glabrous outside, with a puberulous band ca  $\frac{1}{4}$  as long as the lobe ca  $\frac{1}{4}$  up from the base inside; corolla blue, salverform to subfunnelform,

the tube 3.5-5 mm long, orifice 1.7-3 mm in diam, 0.6-1 mm at base, exterior glabrous, the lobes ovate or elliptic or narrowly triangular or narrowly obovate, acute to broadly so at apex, 2-4.8 x 1-2.3 mm, glabrous outside; stamens with the filaments 0.1-0.3 or 1.1-1.9 mm long, glabrous, the anthers 1-1.2 mm long; style 3.4-6.3 mm long, glabrous. Fruit with the emargination ca 0.4 mm, subpedicellate, the mericarps broadly elliptic in outline,  $\pm$  2.3 x 1.9 mm, ca 0.6 mm thick, sparsely puberulous.

This species is named in honor of Howard S. Irwin whose botanical explorations of the Planalto Central do Brasil have contributed so much to this study.

Declieuxia irwini is very closely related to D. muscosa. It is easily distinguished from D. muscosa by its stems which are puberulous to sparsely so, larger leaf blades, larger inflorescences both terminal and axillary at the apical node with 2-9 flowers, puberulous hypanthium, and larger sparsely puberulous mericarps. The very close relationship of these two species would suggest that their divergence was relatively recent. Their character states would also suggest that D. irwini is the more primitive of the two.

14. Declieuxia muscosa Saint-Hilaire, Voyage dans le District des  
Diamans 1: 365, 1833.

Type: Brazil, Minas Gerais, Saint-Hilaire sn (holotype P; isotypes F, G, MPU, RB).

Perennial herb 2.5-7 cm tall, forming a small cushion, the numerous erect stems from a subterranean caudex, the stems terete, glabrous, the

internodes 0.5-4 mm long. Stipules reduced to a coriaceous membrane joining the petiole bases, glabrous, the margin with 1-4 glandules, weakly decurrent. Leaves opposite, petiolate, the petiole winged, 1-1.5(-2.5) mm long, glabrous; blade subcoriaceous, plane with the edge thickened, narrowly elliptic to rarely elliptic, acute at apex, attenuate to long attenuate at base, 2.7-4.2(-5.2) x 0.7-0.9(-1.3) mm, (2.1-) 3.7-5 times longer than wide, the midrib plane above and prominent beneath and the intercostal areas glabrous on both sides, the secondary and tertiary venation obscure. Inflorescences reduced to a solitary flower, terminal, epedunculate. Flowers heterostylous, subtended by 2 leaves or 2 bracts, the bracts narrowly elliptic, narrowly acute at apex, 2-3 x 0.3-0.5 mm, glabrous, subpedicellate with the pedicel terete, 0.1-0.2 mm long, glabrous; hypanthium transversely elliptic or very broadly to depressed obovate in outline, 0.5-0.6 x 0.8-0.9 mm, glabrous; calyx lobes triangular to narrowly so, acute at apex, 0.2-0.7 x 0.1-0.2 mm, glabrous, sometimes 1-2 lobes replaced by 2-5 small lobes, 0.1 x 0.07 mm; corolla blue, salverform, the tube 3.5-4 mm long, orifice 1.2-1.5 mm in diam, 0.5-0.8 mm at base, exterior glabrous, the lobes elliptic to ovate, acute at apex, 2-3.3 x 1.3-1.5 mm, glabrous outside; stamens with the filaments ca 0.2 or 1.4 mm long, glabrous, the anthers 0.7-1 mm long; style 2.2 or 4.4-5.3 mm, glabrous. Fruit with the emargination 0.3-0.4 mm, subpedicellate with the pedicel 0.1 mm long, glabrous, the mericarps elliptic in outline, 1.5-1.7 x 1-1.2 mm, 0.4-0.5 mm thick, glabrous and rugose.

Distribution. Known only from the area above 1200 m west and southwest of Diamantina. Map 15.

Specimens Examined. BRASIL. Minas Gerais: between Diamantina and Guinda, along highway, 25 IX 1936, Archer 4097 (F, US); Antônio Izabel - estrada para Datas, 17 XI 1937, Barreto 9839 (RB); entre Diamantina e as Datas, as Banderinhas, 18 IV 1892, Glaziou 19459 (C, F, LE, R).

Declieuxia muscosa is most closely related to D. irwini. It is separated from D. irwini by glabrous stems, smaller leaf blades, inflorescences reduced to a solitary terminal flower, glabrous hypanthium, and smaller glabrous mericarps. Refer to the discussion of D. irwini.

15. Declieuxia juniperina Saint-Hilaire, Voyage dans le District des Diamans 1: 366, 1833.

Declieuxia ericoides Glaziou, nom. nud., Bull Soc. Bot. France, Mem. 3: 360, 1909. Based upon Glaziou 19458, Brazil, Minas Gerais, Rio Biribiry, perto de Diamantina, 18 IV 1892 (data with the specimen at R) or bords du Riacho das Varas (data in the publication) (C, F, LE, R).

Type: Brazil, Minas Gerais, Saint-Hilaire 2277 B2 (lectotype P; presumed isotypes, without collection number, F, G, MPU).

Subshrub or perennial herb 12-24 cm tall, from a single stem with divided spreading branches to a cluster of fastigate sparsely branched stems, the stems and branches terete, glabrous or glabrate, the internodes 0.5-7(-9) mm long, sometimes with short branchlets in leaf axils. Stipules reduced to a ridge with 1-4 conical glands or glandules, decurrent, with the ridge glabrous or glabrate to sparsely

puberulous. Leaves ternate or quaternate, usually with 1-5 pairs of smaller leaves in axils, sessile, nondecurrent; blade subcoriaceous, subrevolute, linear to rarely very narrowly elliptic, narrowly acute at apex, long attenuate at base, (4-)7-10 x (0.4-)0.5-0.8(-1) mm, (5.4-)12-16 times longer than wide, the midrib plane above and prominent beneath and the intercostal areas glabrous above and beneath, the secondary and tertiary venation obscure. Inflorescences simulated by solitary terminal and axillary flowers at the apical and secondary nodes and sometimes tertiary nodes, the flowers epedunculate. Flowers heterostylous, dichasial bracts narrowly oblong to linear or very narrowly elliptic, narrowly acute at apex, 1.5-3.8 x 0.2-0.4 mm, glabrous, subpedicellate with the pedicel terete, 0.1-0.3 mm long, glabrous; hypanthium transversely elliptic or sometimes depressed obovate in outline, 0.5-0.6 x 0.8-1 mm, glabrous; calyx lobes triangular to narrowly so or rarely deltoid, acute at apex, (0.1-)0.2-0.5 x 0.1-0.3 mm, glabrous; corolla blue, salverform to funnelform, the tube 3.2-5 mm long, orifice 1.2-1.7 mm in diam, 0.4-0.5 mm at base, exterior glabrous, the lobes elliptic or ovate, broadly acute at apex, 2.3-2.7 x 1.3-1.8 mm, glabrous outside; stamens with the filaments 0.2 or 1.2-1.8 mm long, glabrous, the anthers 1.1-1.2 mm long; style 2.9-5.4 mm long, glabrous. Fruit with the emargination 0.3-0.8 mm, subpedicellate with the pedicel 0.2-0.5 mm long, glabrous, the mericarps broadly elliptic in outline, 1.4-2.4 x 1.3-1.8 mm, 0.5-0.6 mm thick, glabrous.

Distribution. Known only from the area above 1200 m west of Diamantina. Map 16.

Specimens Examined. BRASIL. Minas Gerais: ca 5km SW of Diamantina,

Map 16. Known distribution of D. juniperina (closed triangles) in Minas Gerais, Brazil.



Km 305 on M. G. 259, 1300 m, 5 II 1972, Anderson, Steiber, Kirkbride 35441 (NY, UB), 35442 (NY, UB), 35443 (NY, UB); ca 14km SW of Diamantina on road to Gouveia, 1300-1360 m, 5 II 1972, Anderson, Steiber, Kirkbride 35470 (NY, UB); Guinda, 5 XI 1937, Barreto 9476 (F, R), 10 XI 1937, 9714 (F).

The habit of Declieuxia juniperina, with increasing age and freedom from disturbance, shifts gradually from perennial herb to subshrub. This series is displayed in Anderson, Steiber, Kirkbride 35441, 35442, and 35443. Collection 35442 consists of plants in the youngest stages, each displaying many fastigiate stems with longer leaves and internodes and some branching at the upper nodes. One plant had been burned, leaving a charred stem 3.5 mm in diam that was surrounded by a number of simple stems 1 to 2 mm in diam. The next stages are seen in collection 35443. The number of stems per plant is less but with increased branching, shorter internode and leaf length, and larger stem diameters. The oldest form is represented by collection 35441 which is a single plant with an erect stem 5 mm in diam. The dense, highly branched, globose crown has the shortest leaves and internodes represented in these collections.

Declieuxia juniperina, when younger, resembles D. muscosa by similarity of habit and inflorescences reduced to a single epedunculate flower. I believe that this is a case of evolutionary parallelism rather than close relationship. Declieuxia muscosa is much more closely related to D. irwini, while D. juniperina is distinguished from D. muscosa by greater height, by the shift from perennial herb to subshrub with increased age, and by actually and proportionally longer, sessile, ternate or quaternate leaves that usually subtend 1-5 pairs of smaller



scences modified terminal cymes, sessile, 1-1.8 x 1-2 cm, with 30-60 flowers, with 3-6 axes, the axes terete, 4-8 mm long, glabrous. Flowers heterostylous, subpedicellate with the pedicels terete, ca 0.2 mm long, glabrous, dichasial bracts linear, acute at apex, 2-4 x 0.2-0.3 mm, glabrous; hypanthium broadly transverse to transversely elliptic in outline, 0.7-0.8 x 0.9-1 mm, glabrous; calyx lobes narrowly oblong, acute at apex, 0.6-1.1 x 0.1-0.3 mm, glabrous; corolla blue, salverform, the tube 5-6.4 mm long, orifice 1.7-1.9 mm in diam, 0.6-0.9 mm at base, exterior glabrous, the lobes ovate or narrowly oblong, acute at apex, 2.5-3.5 x 1-1.5 mm, glabrous outside; stamens with the filaments ca 0.2 or ca 1.5 mm long, glabrous, the anthers 1.1-1.3 mm long; style ca 5 or ca 6.3 mm long, glabrous. Fruit with the emargination 0.5-1 mm, subpedicellate, the pedicel terete, ca 0.2 mm long, glabrous, the mericarps elliptic to broadly so in outline, 2.1-2.5 x 1.5-1.6 mm, 0.7-1.3 mm thick, glabrous and rugose.

The placement of D. leiophylla within Declieuxia is uncertain. Its similarity in habitat and habit to D. spergulifolia and D. irwini nevertheless suggests close affinities to these species.

17. Declieuxia saturejoides Martius & Zuccarini ex Schultes & Schultes, Mantissa ... Syst. Veg. 3: 111, 1827.

Declieuxia saturejoides Martius & Zuccarini ex Schultes  
& Schultes var genuina Müller Argoviensis, Mart. Fl. Bras. 4(5):  
454, 1881.

Declieuxia thymbroides Martius & Zuccarini ex Schultes & Schultes,  
Mantissa ... Syst. Veg. 3: 111, 1827.

Declieuxia saturejoides Martius & Zuccarini ex Schultes & Schultes

var thymbroides (Martius & Zuccarini ex Schultes & Schultes) Müller Argoviensis, Flora 59(28): 437, 1876.

Type: Brazil, Minas Gerais, Serro Frio, Martius sn (holotype M, fragment of holotype G; isotype M).

Declieuxia selloana Müller Argoviensis, Flora 59(28): 438, 1876.

Type: Brazil, Sello sn (holotype G; presumed isotypes COI (number given on label, 1311), F).

Declieuxia frankenioides Schumann ex Glaziou, nom. nud., Bull. Soc. Bot. France, Mem. 3: 359, 1909. Based upon Glaziou 19457, Brazil, Minas Gerais, Serra dos Cristais près Diamantina, 3 IV 1892 (C, F, LE, R) and Glaziou 19116, Brazil, Minas Gerais (sterile specimen examined at P, and probably not Declieuxia).

Declieuxia minutifolia Standley, Publ. Field Mus. Nat. Hist., Bot. Ser. 22(3): 185, 1940. Type: Brazil, Minas Gerais, Diamantina, VI 1934, Brade 13840 (holotype F).

Type: Brazil Minas Gerais, Serro Frio, Martius 1201 (holotype M, fragment of holotype G; presumed isotype C).

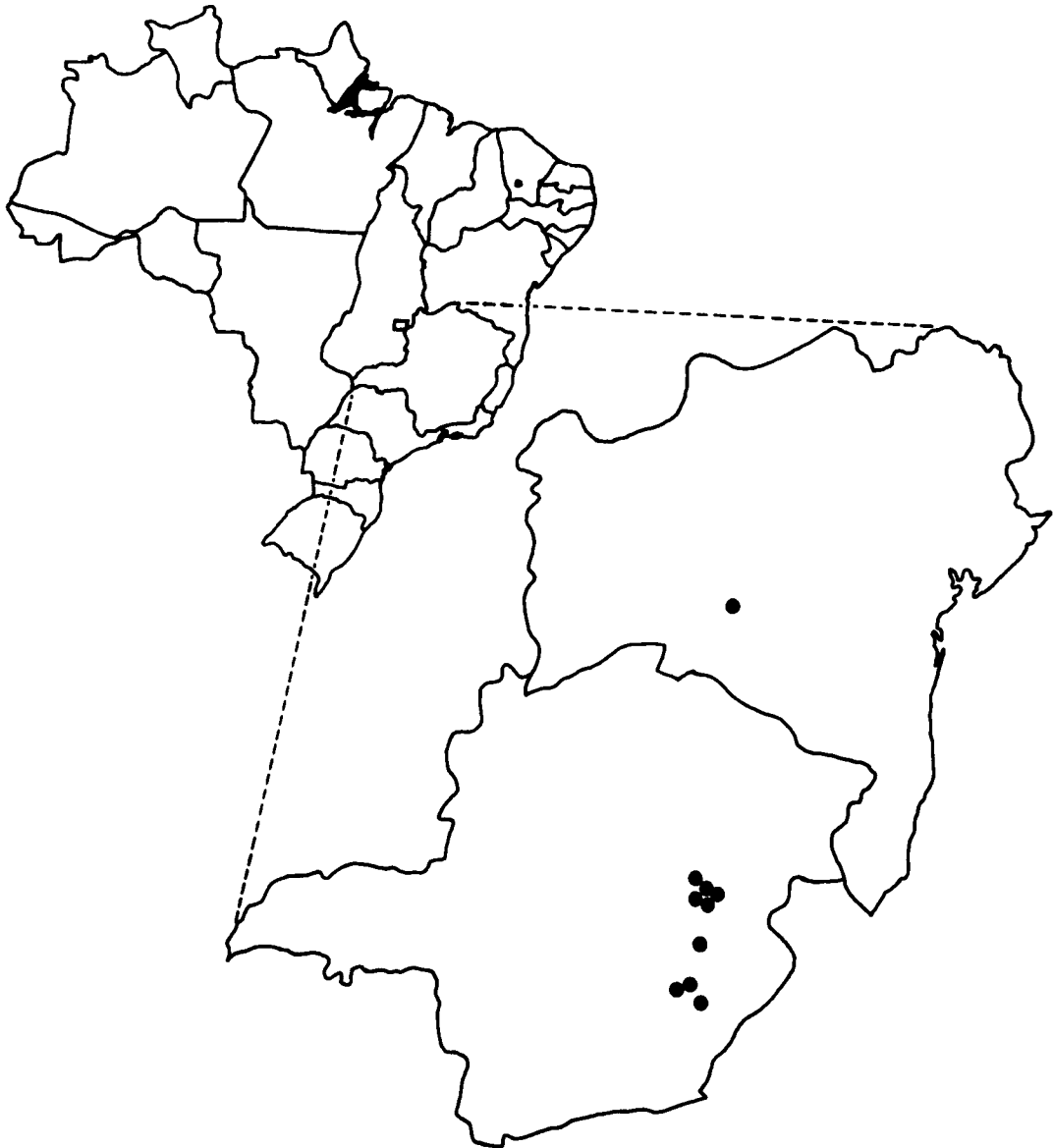
Shrub or subshrub 13-40(-100) cm tall, the single stem with many spreading frequently divided branches, the younger branches terete, hispidulous or puberulous, the older branches and stem terete, hispidulous or puberulous or basally glabrate, the internodes 1-8(-12) mm long, with short branchlets in many leaf axils. Stipules unidentate or unequally tridentate or sometimes reduced to a ridge with 1-5 conical glands, the lobes narrowly oblong to linear, acute and glandular at apex, hispidulous or puberulous to glabrate, the central lobe 0.2-1.3

(-3.8) mm long, the laterals when present  $\frac{1}{2}$ - $\frac{2}{3}$  as long as the central lobe, sometimes with 1-3 conical glands at each side of the base, decurrent or nondecurrent. Leaves opposite or very rarely ternate (Blanchet 2877), usually with 1-3(-5) pairs of smaller leaves in axils, petiolate, the petiole winged, 0.5-2 mm long, hispidulous or puberulous to minutely and sparsely puberulous; blade subcoriaceous, revolute, narrowly elliptic to rarely linear, acute at apex, attenuate to rarely cuneate at base, (1.8-)2.2-10(-20) x 0.6-2.5(-5) mm, (2.7-)3.4-7.7(-14) times longer than wide, venation rarely pinnate with 3-4 arcuate lateral veins on each side (only a few leaves on plants from Serra da Caraça), the midrib prominulous or rarely plane above and prominent beneath and the lateral veins faintly prominulous above and beneath and the intercostal areas scabrous to puberulous to glabrate or hispidulous to sparsely so above and beneath, the secondary venation usually obscure and the tertiary venation always so. Inflorescences modified cymes terminal and sometimes axillary at the apical nodes, sessile or sometimes pedunculate, 4-30 x 3-15 mm, with 5-40 flowers, with 1-6 axes, the axes terete, 2.5-30 mm long, hispidulous to sparsely so or sparsely puberulous to glabrate; peduncle terete, 1-4 mm long, sparsely puberulous to glabrate, with 2 dichasial or 2 larger bracts at the apex, the larger bracts resembling very small leaves. Flowers heterostylous, subpedicellate with the pedicel 0.1-0.8 mm long, glabrous or minutely puberulous, often 1 or rarely 2 in each dichasium, dichasial bracts narrowly elliptic or narrowly obovate or oblong to linear, acute at apex, 1.1-5.9 x 0.1-1.5 mm, hispidulous to sparsely so or glabrous to sparsely puberulous; hypanthium broadly to transversely elliptic or depressed to very broadly obovate in outline, 0.2-0.8 x 0.5-1 mm, densely hispidulous

or glabrous or minutely puberulous; calyx lobes oblong to narrowly so or triangular to broadly so, acute or sometimes obtuse at apex, 0.1-1.3 x 0.1-0.3 mm, glabrous and irregularly ciliate when hypanthium densely hispidulous; corolla blue or very rarely white (1 collection reported with white flowers), salverform, the tube 2.7-4.5 mm long, orifice 0.7-1.3 mm in diam, 0.4-0.6 mm at base, exterior glabrous or sparsely hispidulous when hypanthium densely hispidulous, the lobes ovate to broadly so or to elliptic or triangular to broadly so, acute to sometimes broadly so at apex, 0.9-2.5 x 0.2-1.4 mm, sparsely hispidulous when hypanthium densely hispidulous or glabrous or sparsely puberulous outside; stamens with the filaments 0.1-0.3 or 0.5-1.4 mm long, glabrous, the anthers 0.7-1 mm long; style 2.1-2.3 or 3.5-4.5 mm long, glabrous, the stigma included or excluded, minutely papillate. Fruit with the emargination 0.3-1.1 mm, subpedicellate with pedicel 0.2-0.8 mm long, glabrous, the mericarps elliptic to broadly so in outline, 1.2-2.9 x 1-2.2 mm, 0.5-0.6 mm thick, hispidulous to sparsely so or glabrous to puberulous.

Distribution. Known at higher elevations on the Serra do Espinhaço from north of Diamantina to Serra Caraça and on Serra Assurua, Bahia, from a single gathering. Map 17.

Representative Specimens. BRASIL. Bahia: Serra Assurua, Blanchet 2847 (F, FI, G, W). Minas Gerais: ca 10km SW of Diamantina, 1250 m, 3 II 1972, Anderson, Stieber, Kirkbride 35201 (NY, UB); ca 14km SW of Diamantina on road to Gouveia, 1300-1360 m, 5 II 1972, Anderson, Stieber, Kirkbride 35469 (NY, UB); ca 15km S of Diamantina, 1250 m, 5 II 1972, Anderson, Stieber, Kirkbride 35533 (NY, UB); Serra do Cipó, ca 1225 m,



Map 17. Known distribution of *D. saturejoides* (closed circles) in Bahia and Minas Gerais, Brazil.

18 II 1972 Anderson, Stieber, Kirkbride 36215 (NY, UB); Serra da Piedade, 6 V 1934, Barreto 3465 (F, RB), IX 1824 Riedel 545 (LE), XI 1834, Riedel 2865 (BR, F, FI, G, LE, US, W); Serra Caraça, 1843, Claussen 15 (BR, F, FI, G, LE, M, NY, W); Serra Caraça, au Morro do Carapuca, 11 VI 1884, Glaziou 14927 (F, G, LE, R); ca 25km E of Diamantina, near Rio Jequití, 800 m, 15 III 1970, Irwin, Fonsêca, Souza, Reis dos Santos, Ramos 27548 (NY, UB); ca 3km N of São João da Chapada, 1200 m, 24 III 1970, Irwin, Fonsêca, Souza, Reis dos Santos, Ramos 28233 (NY, UB); near summit of Serra da Piedade, ca 35km E of Belo Horizonte, near BR-31, 1800-2000 m, 13 I 1971, Irwin, Harley, Onishi 30230 (NY, UB); Serra do Espinhaço at Lapinha, ca 18km N of Sêrro on road (MG 2) to Diamantina, 1200 m, 23 II 1968, Irwin, Maxwell, Wasshausen 20660 (MO, NY, UB, US); Serra do Curral, Belo Horizonte, 18 VII 1957, Roth 1713 (RB); Milho Verde, Saint-Hilaire 469 D (F); Tejuco (Diamantina), 1832, Vauthier 418 (G); Serra do Frio, 1833, Vauthier 557 (F, G); quartzite hills near Diamantina, 1250 m, 25 IV 1944, L. O. Williams 8152 (F, GH).

Declieuxia saturejoides is a variable species with two principal morphological forms based upon pubescence, one hispidulous and the other puberulous or scabrous-puberulous. The species appears to have three centers of distribution along the southern end of the axis of the Serra do Espinhaço. In the southernmost center of its distribution, Serra da Caraça, Serra da Piedade, and Serra do Curral, the populations are all puberulous or scabrous-puberulous with a tendency towards larger leaves. On Serra da Caraça, this tendency reaches its maximum expression, some of the lower leaf blades reaching 20 mm in length and displaying displaying discernable lateral veins. On Serra do Cipó, the midmost center of distribution, the plants resemble those from Serra da Piedade and

Serra do Curral except that all of them are hispidulous. At the northernmost center of distribution, around Diamantina, the greatest amount of variation is exhibited, with individual plants ranging in pubescence from hispidulous to puberulous. The varying degree and pattern of branching is reflected in the physiognomy which ranges from globose to obconical or irregular. Similarly, the inflorescences vary greatly in length. In contrast, uniformity is shown in foliar size and shape without any foliage similar to the most extreme type from Serra da Caraça.

This pattern of distribution and variation suggests two possible modes of origin, each of which presupposes that at some period in the past, the species had a continuous range of distribution. By the first hypothesis the patterns of variation in that continuous range would most closely have resembled those found in the present northernmost center of distribution. Subsequently this prior range was disrupted, and the resulting midmost and southernmost centers of distribution were subjected to greater or more continuous forces of selection. By the second hypothesis the continuous range of which the present northernmost center of distribution was undoubtedly at least a segment, would have given rise to the midmost and southernmost centers through dissemination of a limited number of propagules as founders. These populations would have inherited a reduced genetic potential accounting for their narrower morphological variation (Mayer, 1963).

The single gathering from Serra Assurua, Bahia, falls within the variation of D. saturejoides, except that some of the plants have opposite leaves, and others are ternate.

Declieuxia saturejoides is related to D. fruticosa and to D. humilis, refer to the discussion of D. humilis. It differs from

D. fruticosa by shorter internodes, smaller leaves often with 1-3(-5) pairs of reduced leaves in the axils, loss of the stipular lobe, sometimes, and also sometimes nondecurent, and smaller inflorescences. It is also probably more advanced than D. fruticosa.

18. Declieuxia humilis (Müller Argoviensis) Kirkbride, stat nov.

Declieuxia oenanthoides Martius & Zuccarini ex Schultes & Schultes  
var humilis Müller Argoviensis, Mart. Fl. Bras. 6(5): 468, 1881.

Type: Brazil, Minas Gerais, Glaziou 9474 (holotype G; isotype C).

Perennial herb 4-10 cm tall, several erect fastigiate branched stems from a woody rootstock, the stems terete, puberulous, the internodes 3-9 mm long. Stipules unidentate, subulate-linear, narrowly acute and glandular at apex, (0.2-)0.3-0.5(-0.7) x ca 0.1 mm, minutely puberulous, not decurrent. Leaves ternate or quaternate, sometimes with 1-4 pairs of smaller leaves in leaf axils, sessile; blade subcoriaceous, narrowly to very narrowly elliptic, narrowly acute at apex, narrowly acute at base, 10-15 x 1-1.8 mm, 5.6-13.5 times longer than wide, lateral veins not evident, the prominent midrib and intercostal areas scabrous above, the prominent midrib scabrous and the intercostal areas sparsely scabrous beneath, the tertiary venation obscure. Inflorescences modified terminal and axillary cymes at the apical node, pedunculate, 1.2-1.6 x 0.8-1 cm, with 25-65 flowers, with 3-7 axes, the axes terete, 3-8 mm long, puberulous; peduncle terete, 5-6 mm long, puberulous, with 2 or 3 bracts at apex, the bracts narrowly oblong to linear, acute at apex, 3.5-7 x 0.4-0.6 mm, minutely scabrous. Flowers heterostylous, subpedicellate with the pedicels terete, 0.1-0.3 mm long, glabrous,

dichasial bracts narrowly oblong, acute at apex, 1.9-2.3 x 0.2-0.3 mm, glabrous; hypanthium transversely elliptic in outline, 0.5-0.6 x 0.8-0.9 mm, glabrous; calyx lobes oblong to narrowly so, acute at apex, 0.2-0.4 x 0.1-0.2 mm, glabrous; corolla blue, salverform, the tube 2.1-3 mm long, orifice ca 1 mm in diam, ca 0.5 mm at base, exterior glabrous, the lobes triangular to broadly ovate, acute at apex, 1.4-2 x 0.6-1.6 mm, glabrous outside; stamens with the filaments 0.7-1 mm long, glabrous, the anthers ca 0.7 mm long, glabrous; style ca 1.7 or ca 4.4 mm long, glabrous. Fruit unknown.

Distribution. Presumably known from the higher reaches of the present day Serra do Cipó.

Specimen Examined. BRASIL. Minas Gerais: Ayuroca, au Serro Frio, Glaziou 16115 (C, F, G, LE).

Declieuxia humilis is related to D. saturejoides and to D. gracilis (see the discussion of D. gracilis). It differs from D. saturejoides by its habit as a much shorter perennial herb with several erect stems and with longer leaves, and is probably more advanced than D. saturejoides considering the reduced habit of a perennial herb and completely nondecurrent stipules.

19. Declieuxia gracilis Kirkbride, sp nov.  
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Types: Brazil, Minas Gerais, Serra do Cipó, Km 118 (ca 153km N of Belo Horizonte), 1300 m, 20 II 1968, Irwin, Maxwell, Wasshausen 20589 (holotype UB; isotypes NY, US); Serra do Cipó, ca 1125 m, 18 II 1972, Anderson, Stieber, Kirkbride 36253 (paratypes NY, UB); Serra do Cipó,

1200-1300 m, 16 III 1964, Pereira 8941 (paratypes HB, NY).

A D. passerina internodiis 7-28 mm longis, stipulis 1-dentatis, 0.5-1.3 mm longis, inflorescentiae terminalis floribus 20-70, a D. oenanthoidei statura 12.5-21 cm, caule sine stomatibus, stipulis puberulis, dichasiae bracteis 2.2-3.2 mm longis, hypanthio dense puberulo, fructibus puberulis vel sparsim puberulis, a D. lysimachioidei stipulis 0.5-1.3 mm longis, non decurrentibus, folii lamina revoluta, 9-16 x 1-2 mm, 6.3-16-plo longiore quam lata, hypanthio dense puberulo, fructibus puberulis, a D. cordigera folii lamina revoluta, 1-2 mm lata, 6.3-16-plo longiore quam lata, hypanthio dense puberulo, et a D. humili statura 12.5-21 cm, internodiis 7-28 cm longis, folii lamina puberula, dichasiae bracteis 2.2-3.2 x 0.5-0.6 mm, sparsim puberulis, calycis lobis 0.4-0.9 x 0.1-0.3 mm absimilis.

Perennial herb 12.5-21 cm tall with solitary erect stems, the stems terete, densely puberulous, without stomata, sometimes with 1-2 short branches from an upper node, the internodes 0.7-2.8 cm long. Stipules unidentate, subulate-linear, narrowly acute and glandular at apex, 0.5-1.3 x 0.1-0.3 mm, puberulous, not decurrent. Leaves opposite or ternate, sessile; blade coriaceous, revolute, narrowly oblong to linear, narrowly acute at apex, narrowly cuneate at base, 9-16 x 1-2 mm, 6.3-16 times longer than wide, no lateral veins evident, prominent to prominulous midrib and intercostal areas puberulous above, prominent midrib puberulous and intercostal areas glabrous to glabrate beneath, the tertiary venation obscure. Inflorescences modified terminal cymes, sessile, 1-3.5 x 1-4 cm, with 20-70 flowers, with 1-4 axes, the axes terete, 7-28 mm long, puberulous. Flowers heterostylous, subpedicellate with the pedicels terete, ca 0.1 mm long, glabrous to puberulous, dichasial bracts

narrowly oblong, broadly acute at apex, 2.2-3.2 x 0.5-0.6 mm, sparsely puberulous; hypanthium broadly transverse to transversely elliptic in outline, 0.6-0.8 x 0.8-1 mm, densely puberulous; calyx lobes oblong to narrowly so or triangular, acute at apex, 0.4-0.9 x 0.1-0.3 mm, glabrous and sparsely ciliate; corolla blue, salverform, the tube 2.7-4 mm long, orifice 1.5-1.8 mm in diam, 0.5-0.8 mm at base, exterior glabrous, the lobes elliptic to ovate, acute to broadly so at apex, 1.6-2.4 x 1.1-1.6 mm, glabrous outside; stamens with the filaments ca 0.1 or ca 1.5 mm long, glabrous, the anthers 0.8-1 mm long; style ca 2.4 or ca 3.4 mm long, glabrous. Fruit with the emargination ca 0.7 mm, subpedicellate with the pedicels ca 0.4 mm long, puberulous, the mericarps broadly elliptic in outline, 1.8-2 x 1.4-1.6 mm, ca 0.6 mm thick, puberulous to sparsely so, nonrugose to slightly so.

Declieuxia gracilis appears to be related to D. humilis from which it differs by greater stature, solitary stems, longer internodes, puberulous leaf blades, larger dichasial bracts, and larger calyx lobes. It seems to be more advanced than D. humilis because of its solitary stems and reduction in amount of foliage.

20. Declieuxia marioides Martius & Zuccarini ex Schultes & Schultes,  
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 Mantissa ... Syst. Veg. 3: 111, 1827.

Type: Brazil, Minas Gerais, Martius sn (lectotype M; isotypes G, M).

Subshrub 22-39 cm tall with erect branched stems, the young stems terete and puberulous, the older stems terete and puberulous to glabrous, the internodes 3-11 mm long. Stipules reduced to a ridge or unidentate,

the lobe oblong to narrowly so, narrowly acute and glandular at apex, 0.2-0.6 x 0.1-0.2 mm, puberulous, decurrent. Leaves ternate or quaternate, sometimes with 1-2 pairs of smaller leaves in axils, petiolate, the petiole faintly winged, 0.2 mm long, sparsely puberulous, decurrent; blade coriaceous, revolute, ovate, acute at apex, obtuse to truncate at base, 2.2-4 x 1.4-1.9 mm, 1.4-2.5 times longer than wide, the midrib faintly prominulous above and prominent beneath with intercostal areas sparsely puberulous above and beneath, the secondary and tertiary venation obscure. Inflorescences reduced to a solitary flower, axillary, pedunculate; peduncle terete, 0.9-4 mm long, glabrous to sparsely puberulous. Flowers heterostylous, sessile, dichasial bracts coriaceous, elliptic to narrowly so or obovate, broadly acute at apex, attenuate to long-attenuate at base, 1.9-2.2 x 0.7-0.9 mm, very minutely and very sparsely scabrous; hypanthium broadly transverse-elliptic or depressed obovate in outline. 0.5-0.6 x ca 0.8 mm, glabrous; calyx lobes oblong or square, obtuse at apex, 0.1-0.6 x 0.1-0.3 mm, glabrous, with 2-3 glandules in the sinuses between the lobes; corolla salverform, the tube 3-3.5 mm long, orifice 1 mm in diam, 0.5 mm at base, exterior glabrous, the lobes ovate or narrowly oblong, acute at apex, 1.7-2.5 x 0.9-1.1 mm, glabrous outside; stamens with the filaments 0.2 or 1.4 mm long, glabrous, the anthers 0.7-1 mm long; style ca 2 or 5.7 mm long, glabrous, glabrous. Fruit unknown.

Distribution: Known only from the type collection.

Declieuxia marioides possibly has affinities with D. saturejoides but is easily separated from it by leaves much shorter than the internodes and completely axillary, uniflorate inflorescences and is obviously

more advanced than it.

21. Declieuxia diantheroides Standley, Publ. Field Mus. Nat. Hist.,  
 Bot. Ser. 22(3): 185, 1940.

Declieuxia bouvardioides Standley, Publ. Field Mus. Nat. Hist.,  
 Bot. Ser. 22(3): 183, 1940. Type: Brazil, Minas Gerais,  
 Conselheiro Mata, VI 1934, Brade 13849 (holotype F).

Type: Brazil, Minas Gerais, Conselheiro Mata, VI 1934, Brade 13848  
 (holotype F, isotype RB).

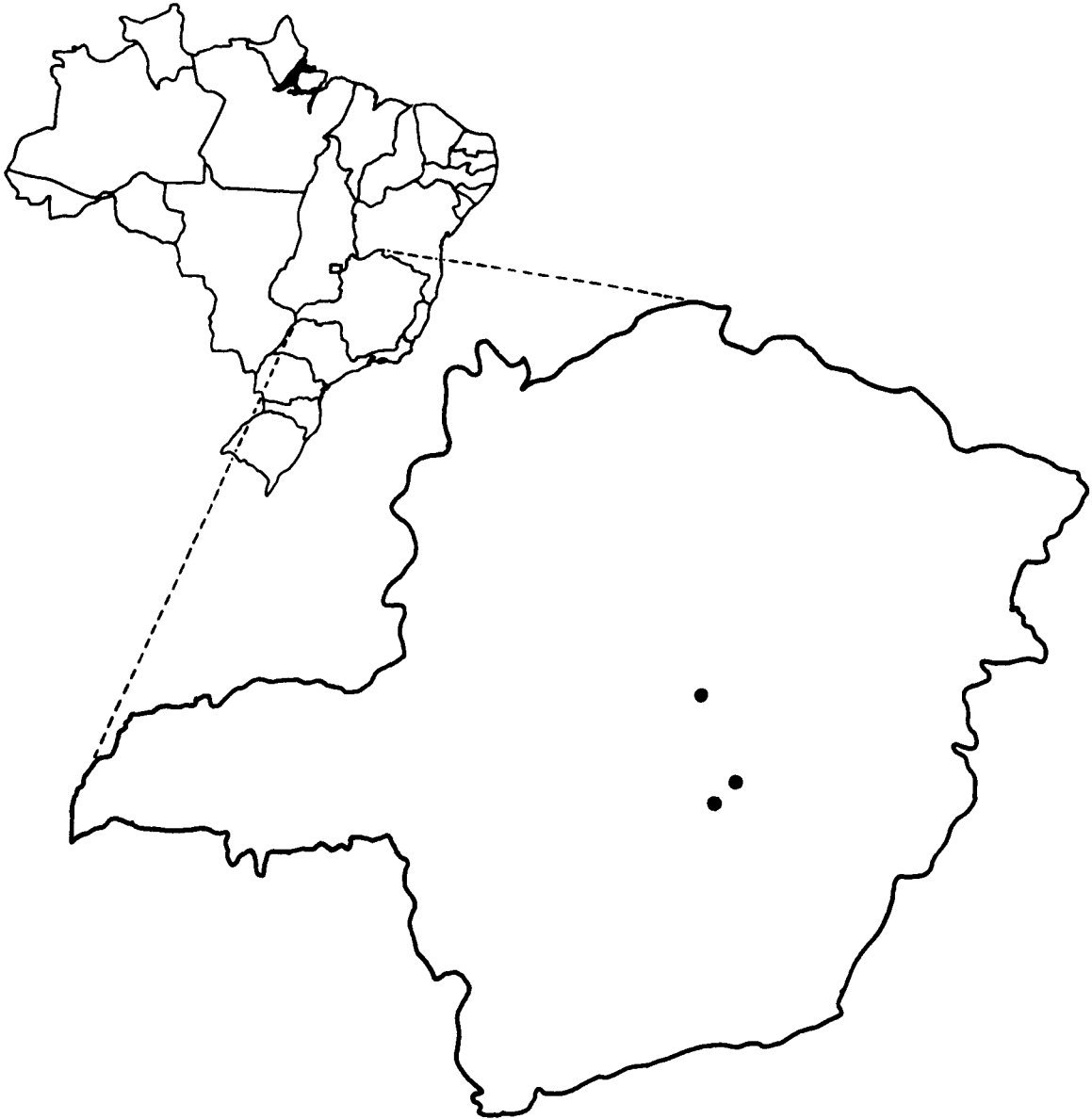
Shrub or subshrub 30-60 cm tall with suberect frequently divided branches, the branches terete, puberulous, the internodes (1-)1.5-3.5 (-5) cm long. Stipules unidentate, narrowly oblong to linear, acute and glandular at apex, 1-3 mm long, puberulous, sometimes with 1-3 glands on each side of the stipule at base, decurrent to the next node. Leaves opposite, some with 1-3 pairs of reduced leaves in axils, petiolate, the petiole winged, (2-)4-6(-18) mm long, puberulous; blade subchartaceous, elliptic, acuminate to acute at apex, attenuate at base, (12-)16-28(-71) x (5.5-)7-12(-30) mm, 2-2.5 times longer than wide, venation pinnate with 5-8 arcuate lateral veins on each side, the prominulous midrib, faintly prominulous lateral veins, and intercostal areas puberulous above, the prominent midrib, prominent lateral veins, and intercostal areas puberulous below, the tertiary venation obscure. Inflorescences terminal and axillary modified cymes, pedunculate, 1.9-3 x 0.5-2.5 cm, with 11-120 flowers, with 2-8 axes, the axes the axes terete, 0.7-1.3 cm long, puberulous; peduncle terete, (0.3-) 1-1.8 cm long, puberulous, with 2 dichasial bracts at the apex. Flowers

heterostylous, subpedicellate with the pedicel terete, 0.1-0.3 mm long, glabrous, dichasial bracts narrowly oblong to narrowly elliptic, acute at apex, 1.8-3.5 x 0.3-0.6 mm, puberulous to sparsely so; hypanthium broadly to very broadly obovate in outline, 0.5-0.7 x 0.6-0.8 mm, puberulous; calyx lobes triangular or oblong to narrowly so, acute at apex, 0.3-0.5 x 0.1-0.3 mm, surfaces glabrous, irregularly ciliate; corolla white, salverform, the tube 2.6-3.1 mm long, orifice 0.9-1.2 mm in diam, ca 0.5 mm at base, exterior sparsely puberulous, the lobes elliptic, acute at apex, 1.5-2 x 0.7-1.3 mm, sparsely puberulous outside; stamens with the filaments ca 0.4 or 0.9-1 mm long, glabrous, the anthers 0.7-1 mm long; style 1.7-2.1 or ca 4 mm long, glabrous. Fruit with the emargination 0.1-0.3 mm, subpedicellate with the pedicels 0.1-0.2 mm long, glabrous, the mericarps elliptic to broadly so in outline, 1.6-2 x 1.2-1.4 mm, 0.6-0.8 mm thick, puberulous.

Distribution. Known from the areas of Conselheiro Mata and Serra do Cipó in the Serra do Espinhaço. Map 18.

Specimens Examined. BRASIL. Minas Gerais: Serra do Cipó, ca 1125 m, 18 II 1972, Anderson, Stieber, Kirkbride 36264 (NY, UB), 36266 (NY, UB); Serra do Cipó, Km 129, 1280 m, 18 IV 1950, Duarte 2486 (NY, RB); 30km N of Lagoa Santa, Km 72 on road from Belo Horizonte to Conceição, 900 m, 2 V 1952, L. B. Smith 6796 (NY, R, US).

The holotype of Declieuxia bouvardioides has been much smaller leaves with denser pubescence than the corresponding portions of other collections of D. diantheroides. If only the very young parts of the latter are considered, it is evident that the materials are conspecific



Map 18. Known distribution of *D. diantheroides* (closed circles) in Minas Gerais, Brazil.

and that the smaller size and denser pubescence of such a collection are due to a lack of enlargement in size.

Declieuxia diantheroides is related to D. fruticosa and to D. coerulea, D. cacuminis, D. dusenii and D. tenuiflora. Of the latter four, it is most closely related to D. cacuminis and D. dusenii. It is easily separated from D. coerulea by its 4-fid calyx, axillary and terminal inflorescences, and much denser pubescence, from D. cacuminis by its larger number of lateral veins on each side of the midrib, axillary and terminal inflorescences with usually longer peduncles, and much denser pubescence, from D. dusenii by its denser puberulous pubescence, larger, puberulous floral bracts, white corolla with sparsely puberulous exterior, and larger fruit, and from D. tenuiflora by the more uniform length of its internodes, slightly smaller ratio of leaf blade to width, larger, puberulous floral bracts, puberulous hypanthium, larger corolla with sparsely puberulous exterior, and puberulous fruit. It differs from D. fruticosa by its longer petioles and 1-3 pairs of reduced leaves in some leaf axils. It appears to be intermediate among D. fruticosa, D. cacuminis and dusenii.

22. Declieuxia dusenii Standley, Publ. Field Columbian Mus., Bot. Ser. 8(5): 369, 1931.

Type: Brazil, Paraná, Serrinha, 7 XII 1908, Dusén 7301 (holotype S; isotypes F, G, GH, LE, MO, NY).

Subshrub or perennial herb 10-75(-100) cm tall with several erect stems, the stems terete, glabrous or glabrate to puberulous, the internodes (0.4-)1-8(-9.5) cm long, with branchlets bearing 1 or 2 pairs

of small leaves in some leaf axils. Stipules unidentate, linear-subulate with the apex terminating in a conical gland or foliar, the foliar stipules narrowly elliptic to linear, acute at apex, cuneate at base, glabrous, the linear-subulate stipules glabrous or glabrate to sparsely scabrous or to puberulous, 1.3-27 x 0.1-3 mm, usually decurrent.

Leaves opposite, petiolate, the petiole winged, 1-15 mm long, glabrous or glabrate to scabrous; blade chartaceous, narrowly elliptic to occasionally elliptic or ovate, acute at apex, attenuate to shortly attenuate at base, 0.8-6 x 0.3-2 cm, 1.4-4(-4.7) times longer than wide, venation pinnate with 3-6 arcuate lateral veins on each side, the prominulous midrib and faintly prominulous lateral veins scabrous above, the upper intercostal areas scabrous or very rarely glabrous to glabrate, the prominent midrib and prominulous lateral veins glabrous to sparsely scabrous beneath, the lower intercostal areas glabrous, the tertiary venation closed reticulate or obscure. Inflorescences terminal and axillary modified cymes, pedunculate, 0.7-7.5(-9) x 0.4-3 cm, with 10-225 (-250) flowers, with 2-12(-22) axes, the axes terete, (0.1-)0.4-1.9 cm long, glabrous or glabrate to puberulous or rarely villous; peduncle terete, 0.2-4.5(-5.5) cm long, glabrous or glabrate to puberulous or rarely villous, with 2 dichasial or 2 larger bracts at the apex, the enlarged bracts narrowly oblong or narrowly elliptic, acute at apex, straight or cuneate at base, (0.4-)2-10 x 0.4-1.2 mm, glabrous or glabrate or rarely with the adaxial surface scabrous. Flowers subpedicellate with the pedicels terete, 0.1-0.3 mm long, glabrous to glabrate or very rarely with 2 or 3 long curly hairs, dichasial bracts narrowly oblong to linear or linear-subulate to triangular or narrowly elliptic, acute at apex, 0.7-1.6 x 0.12-0.5 mm, glabrous; hypanthium

transverse to rarely broadly transverse elliptic or very broadly ovate in outline, 0.4-0.6 x 0.6-0.9 mm, glabrous or glabrate or with puberulous patches or rarely a few long curly hairs; calyx lobes narrowly oblong to oblong or narrowly triangular to triangular, acute to broadly acute or rarely subobtuse at apex, 0.2-0.7 x 0.1-0.3 mm, glabrous or rarely with a few long curly hairs; corolla blue, salverform, the tube 1.7-4.8 mm long, orifice 0.8-1.8 mm in diam, 0.3-0.8 mm at base, exterior glabrous, interior with a sericeous, moniliform band ca 2/5 as long as the tube and ca 2/5 from the base in flowers with only anthers exerted or lower 3/8-7/16 glabrous and upper 9/16-5/8 sericeous, moniliform in flowers with only the stigma exerted or both anthers and stigma exerted, the lobes ovate or oblong or triangular, acute or broadly acute at apex, 0.8-2.1 x 0.5-1.2 mm, glabrous outside; stamens with the filaments 0.1-1.3 mm long, glabrous or sometimes minutely puberulent, the anthers 0.3-1.2 mm long, glabrous; style 1-6.5 mm long, glabrous or sometimes sparsely and minutely puberulent. Fruit with the emargination 0.2-0.3 mm, subpedicellate with the pedicels 0.2-0.3 mm long, glabrous, the mericarps broadly elliptic or rarely elliptic in outline, 1-1.6 x 0.7-1.3 mm, 0.5-0.6 mm thick, glabrous or puberulous or with a few scattered long curly hairs.

Distribution. Known from northerstern Santa Catarina, eastern Paraná, and Campos do Jordão in São Paulo. Map 19.

Representative Specimens. BRASIL. São Paulo: Campos do Jordão, 5-20 II 1937, Campos Porto 3265 (F, RB). Paraná: Rodovia do Cafe, Km 50 Curitiba-Ponta Grossa, 23 I 1965, Dombrowski 1396 (US); Ypiranga, 7 II 1904, Dusén 3639 (paratypes F, R, S); Casa Ypiranga, 16 I 1914, Dusén



Map 19. Known distribution of *D. dusenii* (closed circles) in São Paulo, Paraná, and Santa Catarina, Brasil.

14004 (paratype F); Jaguariabepa, 9 X 1911, Dusén sn (SI); Serra de S. Luiz a 50 km de Curitiba, 1000 m, 7 I 1958, Emygdio, Angely 1547 (R); Serra S. Luis de Puruná, 1150 m, 6 I 1948, Hatschbach 852 (US); Serra das Almas, 12 I 1966, Hatschbach 13495 (US); Villa Velha, 23 X 1914, G. Jönsson 1247a (paratypes A, F, G, S, US); près Carambehí, 1820, Saint-Hilaire C2-1549 (paratype F); Papagaio, 6 km W of Rodovia do Café turnoff, ca 25°33' S 50°08' W, 900-930 m, 21 I 1965, Smith, Klein 14937 (NY, US); Procedência Curitiba, campos do Country Club, 4 II 1945, Stellfeld 1122 (F); between Ponta Grossa and Curitiba close to Curitiba, 10 I 1863, Weir 442 (paratypes F, FI). Santa Catarina: Campos dos Curitibanos, III 1877, F. Müller 39 (F, R); Serra da Boa Vista, 1000 m, 24 I 1961, Reitz, Klein 10722 (NY); Campo do Areão, Santa Cecília, 1100 m, 2 I 1962, Reitz, Klein 11378 (NY, US); Pôrto União, 750 m, 25 II 1962, Reitz, Klein 12447 (BR, G); lower fazenda of Ernesto Scheide, Campo Alegre, 900 m, 1 II 1957, Smith, Klein 10524 (NY, US); 6 km N of Ponte Alta, 800-900 m, 16 III 1957, Smith, Klein 12205 (GH, US).

It is difficult to determine the possible breeding system of Declieuxia dusenii from the herbarium specimens. There are three observable flower types: 1) with both the anthers and stigma excluded, 2) with only the anthers excluded, and 3) with only the stigma excluded. The flowers with both anthers and stigma exerted seem to have shorter corolla tubes, while those with only the anthers excluded have a different interior pubescence of the corolla tube, with a centrally located sericeous, moniliform band rather than the upper half of the tube sericeous, moniliform as in flowers with only the stigma or both the anthers and the stigma exerted.

Some characters of D. dusenii are correlated with its north-south distribution. Those specimens from Paraná and São Paulo have fewer pairs of lateral veins, less pubescence, and more of the enlarged stipules than those from Santa Catarina. Two specimens from Santa Catarina, Reitz 5415 and 5499, have the immature portions of the inflorescence villous. As the inflorescences mature and enlarge, this condition results in the distribution of very scattered long curly hairs on the various parts of the inflorescence.

Declieuxia dusenii is related to both D. tenuiflora and D. diantheroides (refer to the discussion of D. diantheroides). It differs from D. tenuiflora by greater regularity of internode length, smaller inflorescences, and normally larger flowers with nonpapillate hypanthia, and apparently occupies an intermediate position between D. diantheroides and D. tenuiflora.

23. Declieuxia tenuiflora (Willdenow ex Roemer & Schultes) Steyermark  
 & Kirkbride, Mem. New York Bot. Gard. 23: 399, 1972.

Tournefortia tenuiflora Willdenow ex Roemer & Schultes, Syst.  
 4: 540, 1819.

Knoxia brasiliensis Sprengel, Syst. 1: 406, 1824.

Declieuxia herbacea Chamisso & Schlechtendal, Linnaea 4(1):  
 11, 1829.

Declieuxia brasiliensis (Sprengel) Müller Argoviensis, Flora  
 59(28): 434, 1876.

Type: Brasilia (fide Müller Argoviensis, 1881, prope Rio de  
 Janeiro), Sello 1267 (lectotype COI; isotype COI).

Type: Venezuela, Sucre, Cumaná, Humboldt sn (holotype B).

Shrub 12-75 cm tall with several erect to spreading branched stems, the stems terete and glabrous to sparsely puberulous, the internodes 0.4-9(-11) cm long, basally short, increasing in length apically to very long. Stipules unidentate or rarely unequally bidentate or tridentate, the lobes linear-subulate with a triangular base, terminating in a conical gland, glabrous to puberulous, with 1-3 glands on each side of the stipule, the longest lobe 1-5(-5.3) mm long, the laterals when present 2-4 times shorter than the longer lobe, very rarely the basal stipules foliar, 5-13 x 0.5 mm, narrowly elliptic, acute at apex, decurrent. Leaves opposite, often with smaller axial leaves, petiolate, the petiole winged, 1.5-11(-15) mm long and puberulous or rarely glabrous to glabrate; blade chartaceous, narrowly elliptic to rarely elliptic or rarely ovate to narrowly ovate, acute to narrowly acute or sometimes subacuminate at apex, attenuate at base, (0.8-)1.1-4.4(-7) x (0.1-)0.4-1.5(-2.6) cm, (2.5-) 2.9-3.5 or very rarely 11-23 times longer than wide, venation pinnate with 3-8(-10) arcuate anastomosing lateral veins on each side, the prominulous midrib, faintly prominulous lateral veins, and intercostal areas above glabrous to puberulous, the prominent midrib, prominulous lateral veins, and intercostal areas beneath glabrous to puberulous, the tertiary venation closed reticulate. Inflorescences numerous axillary and terminal modified cymes, pedunculate, 2.5-15 x (0.5-)2-20 cm, with 15-200 flowers, dichotomously or umbellately branched into 2-8 axes or rarely unbranched, the axes terete, 1-14 cm long, glabrous to sparsely puberulous; peduncle terete, 0.3-6.5 cm long, glabrous or glabrate to sparsely puberulous, with 2 bracts at apex

resembling dichasial bracts or larger, the enlarged bracts narrowly elliptic or linear, acute at apex, cuneate at base, (2.2-)3.5-8.5 x 0.3-1.5 mm, glabrous or sparsely puberulous and occasionally ciliate. Flowers possibly protandrous, sessile to subpedicellate with the pedicels terete, 0.1-0.5 mm long, glabrous or sparsely puberulous, dichasial bracts narrowly oblong to linear-subulate, acute to broadly acute at apex, 0.7-2 x 0.1-0.5 mm, glabrous; hypanthium broadly transverse to transversely elliptic in outline, 0.4-0.8 x 0.4-0.9 mm, minutely and densely papillate; calyx lobes oblong or triangular or elliptic, acute to broadly acute or obtuse at apex, 0.2-0.4 x 0.1-0.3 mm, glabrous; corolla blue or white, funnelform, the tube 1.5-2.5 mm long, orifice 0.9-1.4 mm in diam, 0.3-0.5 mm at base, exterior glabrous, interior with a moderately sericeous, moniliform band ca 2/5 as long as the tube ca 2/5 from the base, the lobes oblong to ovate or broadly elliptic, broadly acute at apex, 0.7-1.3 x 0.5-0.9 mm, glabrous outside; stamens with the filaments 0.1-0.8 mm long, glabrous, the anthers 0.4-0.9 mm long, glabrous; style 1-3 mm long, glabrous. Fruit with the emargination 0.2-0.6 mm, sessile to subpedicellate, the pedicels 0.1-0.5 mm long, glabrous or sparsely puberulous, the mericarps broadly elliptic to circular in outline, 0.9-2.3 x 1.4-2.1 mm, 0.2-1.1 mm thick, moderately papillate.

Distribution. Known from eastern and southern Venezuela and from northern and southeastern Brazil. Map 20.

Representative Specimens. VENEZUELA. Bolivar: Cerro Altamira at the summit, ca 7°31' N, 63°12' W, ca 600 m, 13 XII 1972, Kirkbride 2698 (NY, VEN). Amazonas: southern part of Isla del Raton, ca 5°2' N, 67°46' W, ca 90 m, 22 XI 1965, Breteler 4787 (US); near Danta (Tapir) Falls, 125 m, 19 XI 1948, Maguire, Politi 27337 (NY, US); Laja Catipan, Río Yatua,



Map 20. Known distribution of *D. tenuiflora* (closed circles) in eastern South America.

100-140 m, 26 IX 1957, Maguire, Wurdack, Maguire 41580 (NY, US);  
 prope Maypures, ad flumen Orenoco, VI 1854, Spruce 3587 (W); vic of  
 Sanariapo, near Río Sanariapo, 100 m, 8 IX 1944, Steyermark 58501 (F);  
 Cãno San Miguel between Limoncito and Cãno Ikebenie, ca 70 km from  
 mouth, 100-140 m, 29 VI 1959, Wurdack, Adderley 43239 (NY, S, U, US).

BRAZIL. Roraima: southeast escarpment of Serra Tepequém, 1000-1200 m,  
 29 XI 1954, Maguire, Maguire 40084 (NY, US); Serra Grande <sup>R</sup>io Branco,  
 VII 1913, Kuhlman 869/3388 (RB); Serra de Mairary, Rio Branco, Surumu,  
 IX 1909, Ule 8463 (F, G, U). Piauí: Vereda do Faria para Bom Jesus, VI  
 1912, Lützelberg 1243 (RB). Pará: beira das cachoeiras do Arirambe  
 subaf1. do Trombetas, Ducke sn (NY, RB). Bahia: Serra Jacobina, 1839,  
Blanchet 2548 (BR, F, G, W); Serra Marsalina, VII 1913, Lützelberg 307  
 (F, M). Minas Gerais: entre Itaobim e Medina BR4, 24 XI 1964, Duarte  
8586 (NY, BR); Serra de Mantiqueria, à João Gomez, IV 1883, Glaziou  
13968 (C, F, G, S). Rio de Janeiro: Novo Friburgo, 1959, Duarte 4190  
 (RB); Serra de Tocaia, 1838, Guillemin 233 (G), Mikan sn (W), Pohl 4357  
 (W), 4455 (W); Cabo Frio, 1835, Riedel sn (US); Distrito de Maricá, ca  
 2 m, 25 XI 1912, Vidal sn (NY, RB). Guanabara: Restinga de Sernambetiba,  
 14 VI 1938, Brade 16095 (F, NY, RB); Restinga de Jacaré paguá, Pedra  
 Itaúna, 12 II 1960, Castallanos 22738 (RB); near <sup>R</sup>io-Santos road, 500 m  
 W of Pedra de Hauna, Barra de Tijuca, 1 m, 1 IV 1972, Kirkbride,  
Emmerich 1713 (NY, R, RB, US); ad Rio de Janeiro, Lund sn (C); Recreio  
 dos Bandeirantes - Jacarepaguá, 9 I 1949, Palácios, Balegno, Cuezzo  
4047 (LIL, R); Praia de Sernambetiba (Recreio dos Bandeirantes), 23°  
 00'13" S, 43°20'49" W, near sea level, 4 IV 1952, L. B. Smith 6408 (F,  
 NY, US); Recreio dos Bandeirantes, Lagoa das Taxas, 24 IV 1965, Santos  
5832 (US). Without locality: Pohl sn (G), Schott sn (W), Sello 15 &  
1267 (F), 78 (COI), 78 & 1267 (S), sn (F, G).

Declieuxia tenuiflora is a cohesive species with the exception of one collection, Glaziou 13968. In this gathering, the leaves are very narrow so that the ration of length to width is very high. In all other aspects, it falls within the normal range of variation for the species.

In the herbarium collections, the flowers seem to fall into three categories: 1) both anthers and stigma included, 2) only the anthers exserted, and 3) both the anthers and stigma exserted. This would seem to point to the possibility of protandry in this species, assuming that the maturity of these organs is indicated by the degree to which they are exserted.

This species exhibits a long disjunction, ca 2000 km, in its distribution which is very unusual in Declieuxia. There seem to be no character correlations which coincide with the distributional pattern. The same type of variation, that is in leaf size, amount of pubescence, and other characters, occurs in both areas of distribution of this species.

In the vicinity of Rio de Janeiro, D. tenuiflora inhabits a distinctive vegetational zone, restinga, on the recent sandy alluvial plain behind the beach, and appears to be a normal constituent of this vegetation type. On Cerro Altamira, it is an adventitive occurring on the edges of recent mining operations which removed all vegetation cover. The extensive savannas at the base of the mountain apparently do not support D. tenuiflora. Field observations would indicate that it is a facultative ruderal under some circumstances.

Declieuxia tenuiflora is related to D. dusei from which it can be distinguished by gradually increasing length of the internodes, that is

from basally short to apically long, larger inflorescences, and smaller flowers with papillate hypanthia.

24. *Declieuxia cacuminis* Müller Argoviensis, Flora 59(28): 438, 1876.  
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Shrub or subshrub 15-150 cm tall, obconical or globose, with erect or spreading ramose branches, the branches terete, glabrate to puberulous or sparsely so, the internodes 0.1-2.7(-4.7) cm long, with short branchlets in many leaf axils. Stipules unidentate or unequally tridentate, the lobes linear-subulate or linear to narrowly oblong, terminating in a conical gland or acute and glandular at apex, puberulous to glabrate, the central lobe 0.3-4 mm long, the laterals when present  $\frac{1}{2}$  as long as the central lobe, either decurrent or not so. Leaves opposite, some with 1-2 pairs of reduced leaves in axils, petiolate, the petiole winged, 0.5-6 mm long, puberulous; blade chartaceous, broadly to narrowly elliptic or subovate to narrowly so, obtuse to very broadly acute to acute at apex, attenuate or shortly attenuate at base, 3.2-25 x (1.2-)1.8-11 mm, 1.3-4 times longer than wide, venation pinnate or with laterals attached only to basal half of midrib, with (1-)2-4 arcuate lateral veins on each side, the prominulous midrib and plane to faintly prominulous lateral veins scabrous or scabrous-puberulous with the intercostal areas also scabrous to sparsely scabrous-puberulous above, the prominent midrib puberulous, the prominulous lateral veins glabrate to puberulous, and the intercostal areas glabrous to sparsely puberulous beneath, the tertiary venation obscure. Inflorescences terminal modified cymes, sessile or pedunculate, 0.8-2 x 0.4-2.4 cm, with 6-48 flowers, with 1-4 axes, the axes terete, 1.6-12 mm long, puberulous

to sparsely so; peduncle terete, 2-7.5 mm long, sparsely puberulous, with 2 dichasial bracts at apex. Flowers heterostylous, some solitary or paired flowers subtended by 2 bracts, the dichasial bracts linear to narrowly oblong to very narrowly elliptic to narrowly obovate, acute to narrowly so or obtuse at apex, 1-5 x 0.1-0.6 mm, glabrous to glabrate to sparsely puberulous and sometimes ciliate, subpedicellate with the pedicel terete, 0.1-1.7 mm long, glabrous to glabrate; hypanthium broadly transverse to transverse elliptic or very broadly to depressed ovate or obovate in outline, 0.3-1.2 x 0.5-1.7 mm, densely puberulous; calyx lobes oblong to narrowly so or triangular to narrowly so or sub-triangular to suboblong or ovate, obtuse or acute at apex, 0.2-0.6 x 0.1-0.2 mm, glabrous and sometimes ciliate; corolla blue or white, salverform, the tube 3-4.3 mm long, orifice 0.9-2 mm in diam, 0.4-0.7 mm at base, exterior sparsely puberulous or glabrous, the lobes ovate or oblong, acute to narrowly so or broadly so at apex, 1.3-3 x 0.7-2 mm, sparsely puberulous or glabrous outside; stamens with the filaments 0.2-0.4 or 1-1.4 mm long, sparsely short puberulous or glabrate to glabrous, the anthers 0.8-1.3 mm long, glabrous; style 2-2.8 or 4-4.5 mm long, glabrous or sparsely granulate. Fruit with the emargination 0.5-1 mm, subpedicellate, the pedicels 0.2-0.5 mm long, glabrous to glabrate, the mericarps elliptic to broadly so in outline, 1.5-2.6 x 0.8-1.8 mm, 0.2-0.9 mm thick, sparsely puberulous.

Key to the varieties of D. cacuminis.

- a. Stipules unidentate or tridentate, not decurrent; calyx lobes 0.3-0.6 mm long; corolla blue, exterior sparsely puberulous; mericarps 2.2-2.6 x 1.6-1.8 mm, 0.7-0.9 mm thick.

24a. D. cacuminis var cacuminis.

aa. Stipules unidentate, decurrent; calyx lobes 0.2-0.4 mm long; corolla white, exterior glabrous; mericarps 1.5-2.1 x 0.8-1.1 mm, 0.2-0.4 mm thick.

24a. D. cacuminis var decurrens.

24a. Declieuxia cacuminis var cacuminis.

Declieuxia cacuminis Müller Argoviensis, Flora 59(28): 438, 1876.

Type: Brazil, Minas Gerais, sumo Brasiliae monte Itambé, 1818, Martius sn (holotype M, fragment G).

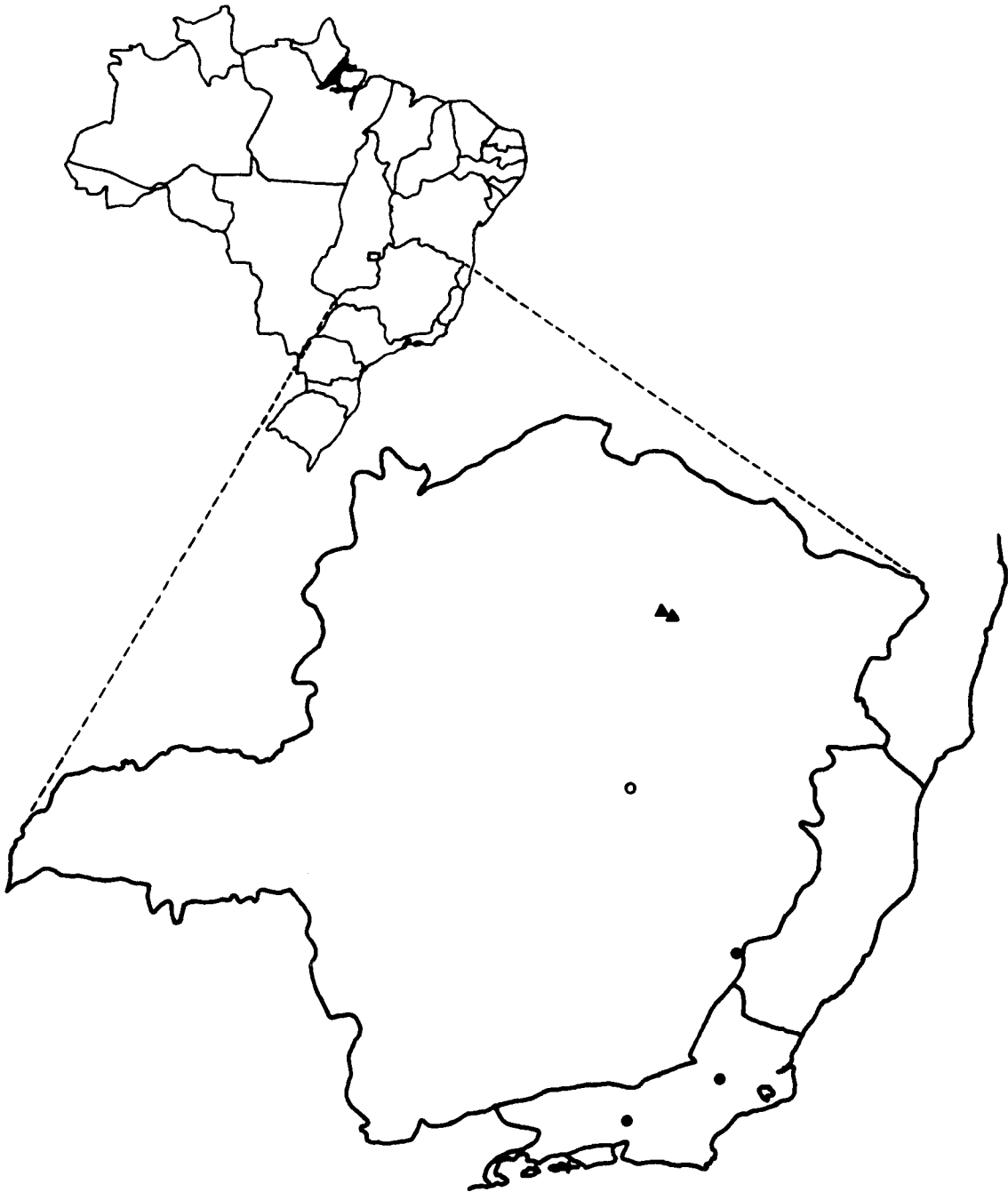
Distribution. Known only from or above the tree line of Pico do Itambé. Map 21.

Specimens Examined. BRASIL. Minas Gerais: E slopes of Pico do Itambé, first large sandstone outcrop below the summit, ca 1700 m, 11 II 1972, Anderson, Steiber, Kirkbride 35833 (NY, UB); E slopes of Pico do Itambé, ca 1310 m, 13 II 1972, Anderson, Steiber, Kirkbride 35899 (NY, UB).

24b. Declieuxia cacuminis var decurrens Kirkbride, var nov.

Types: Brazil, Minas Gerais, ca 8km W of Grão Mogol, 950 m, 16 II 1969, Irwin, Reis dos Santos, Souza, Fonsêca, 23348 (holotype UB; isotype NY); ca 15km W of Grão Mogol, 950m, 19 II 1969, Irwin, Reis dos Santos, Souza, Fonsêca 23539 (paratypes NY, UB); Serra de Grão Mogol, Pagão, 1000 m, 12 XI 1938, Markgraf 3479, Brade, Barreto 12079 (paratypes F, RB). Map 21.

A D. cacuminis var cacuminis stipulis 1-dentatis, decursivis, lobis calycinis 0.2-0.4 mm longis, corolla azurea, extus glabra, mericarpis 1.5-2.1 x 0.8-1.1 mm, 0.2-0.4 mm crassis differt.



Map 21. Known distribution of D. cacuminis var cacuminis (open circles), D. cacuminis var decurrens (closed triangles), and D. coerulea (closed circles) in Minas Gerais and Rio de Janeiro, Brazil.

Declieuxia cacuminis var decurrens is well set off from D. cacuminis var cacuminis by its decurrent stipules, white corolla with a glabrous exterior, and slightly smaller fruit. Its habit is more open, the longer internodes making the general appearance not ericoid. Also, the pubescence is much less dense, with the hairs on the mature fruit longer.

Declieuxia cacuminis and D. coerulea are more closely related to each other than either is to any other species of Declieuxia. D. coerulea is most similar to D. cacuminis var cacuminis in habit, vegetative morphology, and ecological adaptations. They are both found at higher elevations, 'above tree line,' in areas which are cool and often cloud-covered. A large part of the vegetation cover consists of Gramineae and shrubs of ericoid habit on a shallow zone of very black soil overlying sand.

On Pico do Itambé, I observed that there seemed to be 2 vegetative forms of D. cacuminis var cacuminis. Some of the plants tended to have longer internodes and stipules and larger leaves. One plant was encountered with branches displaying each type. The branches with enlarged structures more closely resemble D. cacuminis var decurrens. Some parts of the type collections of D. cacuminis var decurrens have larger leaves without a corresponding increase in size of the internodes or stipules. The herbarium specimens of D. coerulea also seem to generally fall into 2 groups similar to those found in D. cacuminis var cacuminis. The distinction does not seem quite as strong but none the less is evident.

The differences between D. cacuminis and D. coerulea lie in inflorescence and floral structures. The inflorescences of D. coerulea

are smaller and closer to the basic cymose pattern with more groups of 3 flowers subtended by 2 bracts. The inflorescences of D. cacuminis are larger with a greater number of single flowers and pairs of flowers subtended by 2 bracts while very rarely exhibiting 3 flowers subtended by a pair of bracts.

The most striking differences between the 2 species are found in their flowers. Declieuxia cacuminis has 4 smaller calyx lobes and a solitary basal ovule attached by its funicule in each locule, while D. coerulea has 2 larger calyx lobes and a basally attached placenta with 1 or occasionally 2 ovules in each locule. The presence of 2 calyx lobes and the placenta is encountered in no other species of Declieuxia except D. coerulea.

25. Declieuxia coerulea Gardner, London J. Bot. 4: 106, 1845.  
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 Congdonia coerulea (Gardner) Müller Argoviensis, Flora 59(28):  
 437, 1876.

Declieuxia bradei Standley, Publ. Field Mus. Nat. Hist., Bot. Ser. 22(3): 184, 1940. Type: Brazil, Rio de Janeiro, Sta. Magdalena, Alto do Desengano, 2000 m, 4 III 1934, Santos Lima, Brade 13353 (holotype F).

Type: Brazil, Rio de Janeiro, summit of the Organ Mountains, III 1841, Gardner 5736 (holotype BM; isotypes F, FI, G, GH, NY, OXF, US, W).

Shrub 15-75 cm tall with erect or spreading frequently divided branches, the branches terete, glabrous or sparsely pilose to pilose with septate hairs, the internodes 0.2-8.5(-13) cm long, with short branchlets in many leaf axils. Stipules unidentate or unequally

tridentate, the lobes linear-subulate or sometimes linear, acute and glandular at apex, glabrous or with a few long, septate hairs, sometimes with 2 or 3 glands on each side of the stipules, the central lobe 1-8 mm long, the laterals when present  $\frac{1}{4}$ - $\frac{1}{2}$  as long as the central lobe, the bases of lobes united by a narrow membrane to the bases of petioles, decurrent. Leaves opposite, petiolate, the petiole winged, 1-6 mm long, glabrous or sparsely pilose with septate hairs; blade chartaceous, elliptic to narrowly elliptic or ovate to narrowly ovate, obtuse or acute at apex, attenuate or shortly attenuate to obtuse at base, 6.5-28 x 2.5-16 mm, 1.6-3.4 times longer than wide, venation pinnate with 3-6 arcuate lateral veins on each side, the prominent midrib in a sulcus and plain or faintly sulcate lateral veins glabrous or glabrate with the intercostal areas glabrous or sparsely scabrous above, the prominent midrib, prominent lateral veins, and intercostal areas glabrous or sparsely pilose with septate hairs or sparsely puberulous beneath, the tertiary venation obscure. Inflorescences terminal cymes, sessile, ebracteate, 0.7-3 x 0.7-2.5 cm, with 4-50 flowers, with 1-15 axes, terete, glabrous or glabrate to puberulous, the primary axes 1-15 mm long, the secondary axes 0.5-2 mm long. Flowers heterostylous, subpedicellate with the pedicels terete, 0.1-0.2 mm long, densely puberulous, each dichasium and some single flowers subtended by 2 bracts, the dichasial bracts narrowly elliptic to subovate or oblong or rarely triangular, acute at apex, 1-5 x 0.4-1.4 mm, glabrous or rarely ciliate; hypanthium transversely elliptic in outline, 0.5-1.2 x 1-2.3 mm, glabrous or sparsely puberulous with the apex ciliate between the calyx lobes; calyx bilobate (all other species quadrilobate), the lobes elliptic to narrowly elliptic or oblong to narrowly oblong or triangular, acute to broadly acute at apex, 1-3.2 x 0.4-1 mm, glabrous, with a basal gland

on each side; corolla blue, funnelform or salverform, the tube 3.5-4.8 or rarely ca 10.5 mm long, orifice 1.5-3 mm in diam, 0.6-1.1 mm at base, exterior glabrous or sparsely puberulous with septate hairs, interior with the lower  $\frac{1}{4}$ - $\frac{1}{2}$  glabrous and the upper  $\frac{1}{2}$ - $\frac{3}{4}$  sericeous, moniliform or rarely with a sericeous, moniliform band  $\frac{3}{8}$  as long as the tube  $\frac{1}{2}$  way up from the base, the lobes narrowly oblong to ovate or narrowly elliptic to elliptic or triangular, acute or broadly acute at apex, 2.1-4.8 x 1-2.4 mm, glabrous outside; stamens with the filaments 2.2-3 or 0.2-0.4 mm long, glabrous, the anthers 0.9-1.8 mm long, glabrous; style 2-3.8 or 5.5-8.2 mm long, glabrous; placenta basally attached (all other species without a placenta), cylindrical or club-shaped, with 1 or occasionally 2 ovules per locule. Fruit with the emargination 0.3-0.5 mm, subpedicellate, the pedicels 0.2-0.5 mm long, densely puberulous, the mericarps broadly elliptic to circular in outline, 1.6-2.3 x 1.5-2 mm, 0.6-0.8 mm thick, glabrous or rarely sparsely puberulous.

Distribution: Known with certainty from the higher elevations of Serra dos Orgãos and Alto de Desengano near Sta. Maria Magdalena in Rio de Janeiro and Serra do Caparaó on the border between Minas Gerais and Espírito Santo. Map 21.

Representative Specimens. BRASIL. Minas Gerais: Serra do Caparaó, 2500 m, 9 IX 1941, Brade 16901 (F, NY, RB), 8 XII 1917, A Lutz 1251 (R); Serra do Piedade, Damazio sn (RB); Serra do Caparaó, Serra do Mantiqueira, 1949, Moreira 96 (NY, R). Rio de Janeiro: Parque Nacional da Serra dos Orgãos, Frade, 1700 m, 3-6 IX 1949, Brade 20055 (RB); point culminant des Orgues, 7 VIII 1865, Glaziou 3754 (BR, C, R); haut des Orgãos, 1 II 1888, Glaziou 17029 (BR, C, NY); Pedra do Sino, ca 2190 m, 16 IV 1972, Kirkbride, Emmerich, Wagner 1722 (NY, R, RB, US), I 1952, Vidal II

180 (NY, R); Serra dos Orgãos, Morro Assu, 2000 m, 1916, von Lützelburg 6605 (M); Campos das Antas, 2000 m, 24 XII 1952, Markgraf 10454 (RB), 26 II 1887, Schenck 2880 (C); no caminho para a "Pedra Nariz de Frade" ou "Verruga de Frade" no Parque Nacional da Serra dos Orgãos, 1952, Vidal II 4589 (R); Teresópolis, Serra da Baleia, Serra dos Orgãos, 2000 m, XII 1952, Vidal II 5699 (NY, RB).

There seems to be a cline in the pubescence of Declieuxia coerulea from north to south. A larger number of specimens with dense pubescence are encountered from Serra do Caparaó than Serra dos Orgãos. Unfortunately, there is only a single collection from Alto de Desengano, and it is similar to those from Serra do Caparaó. Also, several specimens were seen from Serra do Caparaó with extremely long corolla tubes, ca 10.5 mm.

Declieuxia coerulea is found in cool relatively moist elevations such as Serra dos Orgãos. There is one collection which is labeled as coming from Serra da Piedade and being made by Damazio. George Gardner (1846) characterized Serra da Piedade as "rich in plants interesting to the botanist, but not nearly so much so as the Organ Mountains, in the province of Rio do Janeiro, owing, no doubt, to its great want of moisture." Howard S. Irwin (personal communication) has described the summit of Piedade, in Damazio's time, as probably having been similar to current relatively undisturbed conditions atop Chapada da Contagem, near Brasília. Considering both the frequency of visitation to Serra da Piedade by botanists without additional collections of D. coerulea being obtained and the relative dryness compared to Serra dos Orgãos, it is most probable that this collection was not made on Serra da Piedade.

Müller Argoviensis (1876) segregated D. coerulea as the monotypic



to puberulous, with 1-5 bracts at apex, the bracts narrowly elliptic, acute at apex, 1.2-2 x 0.3-0.4 mm, glabrous. Flowers heterostylous, subpedicellate with the pedicels terete, ca 0.1 mm long, glabrous, ebracteate or subtended by 1-2 bracts, the dichasial bracts narrowly elliptic, acute at apex, 0.7-1 x ca 0.3 mm, glabrous; hypanthium transversely elliptic in outline, 0.5-0.6 x 0.9-1.1 mm, glabrous and strongly rugose; calyx lobes triangular or oblong, acute or obtuse at apex, 0.2-0.3 x ca 0.1 mm, glabrous; corolla blue, salverform, the tube 5.8-8.3 mm long, orifice 1.2-1.5 mm in diam, 0.4-0.6 mm at base, exterior glabrous, the lobes triangular, broadly acute at apex, 1.7-2.5 x 1-1.3 mm, glabrous outside; stamens with the filaments 0.1 or 1.2 mm long, glabrous, the anthers 0.7-0.9 mm long, glabrous; style ca 4.6 or 7.6-10 mm long, glabrous. Fruit with the emargination ca 0.5 mm, subpedicellate, the pedicels ca 0.1 mm long, glabrous, the mericarps elliptic to broadly so in outline, ca 1.5 x 1-1.2 mm, ca 0.8 mm thick, glabrous, strongly rugose.

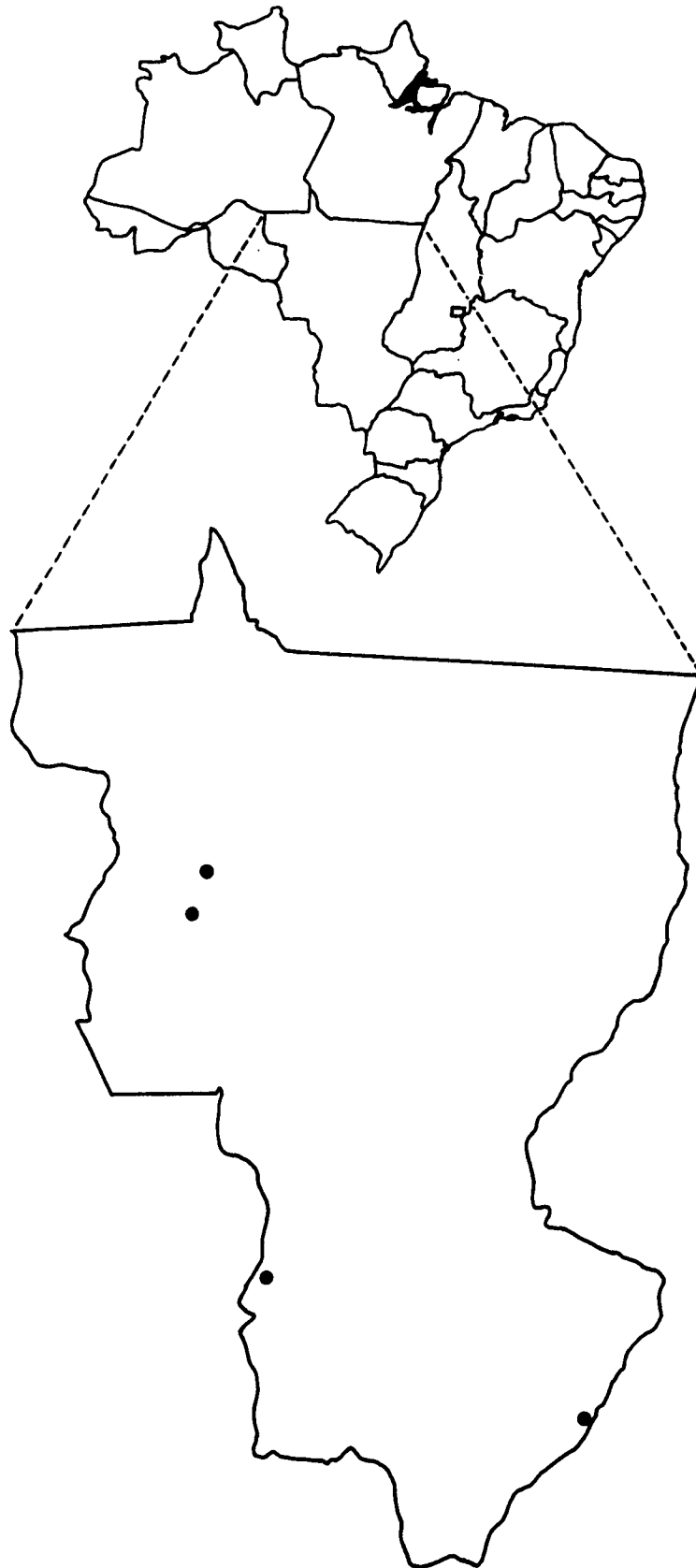
Distribution. Known from southern and northwestern Mato Grosso. Map 22.

Specimens Examined. BRASIL. Mato Grosso: campo Utiarity, 21 XI 1944, A. S. Lima 7868 (IAC); 370 km NW de Cuiabá, 26 IX 1963, Pires 9889 (UB).

Declieuxia verticillata is anomalous within the genus Declieuxia. Its whorls of 5-7 leaves and strongly rugose fruit set it off distinctly from all other species of Declieuxia. Its affinities may lie with D. cordigera or with D. oenanthoides.

Map 22. Known distribution of D. verticillata (closed circles) in Mato Grosso, Brazil.

!



## EXCLUDED SPECIES

- Declieuxia galeottii* Martens ex Martens & Galeotti, Bull. Acad. Roy. Sci. Bruxelles 9(4): 231, 1844, is a part of the Hedyotis-Houstonia-Oldenlandia complex, fide F. R. Fosberg, W. H. Lewis, and E. E. Terrell (1974, personal communications).
- Declieuxia latifolia* Hochstetter, in synonymy, Flora 26: 70, 1843 = Pentanisia prunelloides Walpers subsp latifolia (Hochstetter) Verdcourt, Bull. Jard. Bot. Etat. 22(3 & 4): 250, 1952, fide Verdcourt, 1952.
- Declieuxia peruviana* Wernham, J. Bot. 52: 225, 1914 = Arcytophyllum sp.
- Declieuxia prunelloides* Klotzsch ex Ecklon & Zeyher, Enum. p. 363, 1835 = Pentanisia prunelloides (Klotzsch ex Ecklon & Zeyher) Walpers, Walp. Repert. 2: 941, 1843, fide Verdcourt, 1952.
- Declieuxia* ? psychotrioides de Candolle, Prodrumus 4: 481, 1830 = Psychotria bahiensis de Candolle var bahiensis, fide Steyermark, 1972.
- Declieuxia roraimensis* Wernham, J. Bot. 52: 226, 1914 = Psychotria capitata Ruiz & Pavon subsp inundata (Benth) Steyermark var roraimensis (Wernham) Steyermark, Mem. New York Bot. Gard. 23: 619, 1972, fide Steyermark, 1972.
- Declieuxia stenocardia* Standley, Publ. Field Columbian Mus., Bot. Ser. 8(3): 235, 1930, Brazil, Minas Gerais, à Formação, Glaziou 19460 (lectotype C; isotype F (sterile)) is synonymous with Spigelia aceifolia Woodson, Ann. Missouri Bot. Gard. 37(3): 404, 1950, fide H.H. Hurley (1974, personal communication).

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