



## Flora of the Venezuelan Guayana-I

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# FLORA OF THE VENEZUELAN GUAYANA—I

JULIAN A. STEYERMARK<sup>1</sup>

## XYRIDACEAE

**Aratitiopea** Steyer. & Berry, gen. nov. TYPE:  
*Aratitiopea lopezii* (L. B. Smith) Steyer.  
& Berry.

Inflorescentia terminalis capitata late hemisphaerica multiflora expedunculata. Flores sessiles trimeri purpurei. Sepala 3, duobus conduplicatis valde carinatis, tertio nec carinato. Corolla purpurea fere actinomorpha gamopetala trilobata, tubo anguste cylindrico, lobis aequalibus linearibus rectis. Stamina 3, filamentis in parte suprema tubi corollae insertis. Ovarium 3-loculare superum. Stylus simplex basi appendicibus conspicuis carnosus reflexis subtentus. Stigmata 3 patuli fimbriati. Semina exalata ovoideo-elliptica turgida longitudinaliter 12–14-porcata, inter porcas valde alveolati. Herbae perennes, caulibus valde elongatis subhorizontalibus vel serpentibus.

*Aratitiopea* from Cerro Aratitiope, Territorio Federal Amazonas, Venezuela.

**Aratitiopea lopezii** (L. B. Smith) Steyer. & Berry, comb. nov. *Navia lopezii* L. B. Smith, Bot. Mus. Leaflet 15: 40. 1915; 16: 195. pl. 28. 1954. Fl. Neotrop. Monogr. 14: 465. fig. 163: L–M. 1974. TYPE: Brazil. Amazonas: Cerro Dimití, upper Rio Negro basin, on rocks, 800 m, May 12–19, 1948, *Schultes & López 9956* (holotype, US-1985318; isotype, US-1985319). Figure 1.

Stem trailing, subhorizontal to ascending at the apex, elongated to 2 m, rooting near the base, densely foliose, to 2.5 cm thick. Leaves rich green both sides, densely crowded towards the apex, deciduous lower down, many ranked, spreading-ascending, those immediately subtending the inflorescence ligulate-lanceolate, 10–14 cm by 2.5–3 cm, those lower down more elongated, 21–23 cm by 3.5–4 cm, firmly membranous, abruptly acuminate, entire; leaf sheaths lustrous, brown basally, 4 cm wide. Inflorescence sessile, expedunculate, broadly hemispheric, capitate, terminal, multiflorous, 10–12 cm diam., 7–9 cm high. Bracts surrounding inflorescence erect, purple, chartaceous-scarious, wine-red or reddish purple, lanceolate, acute, 3.2–3.3 cm by 0.6–1.1

cm, the outermost ones ovate-lanceolate, subacute, 2.2 cm by 1.1–1.2 cm. Bracts subtending flower similar in size to those subtending inflorescence. Sepals pale lilac, chartaceous-scarious, free to the base, linear-lanceolate, attenuate to an acute apex, 4.5–5.5(–6) cm long, 5–12 mm wide at base, 5 mm wide upward, two of them strongly keeled, the third not keeled. Corolla purple, straight or nearly so, actinomorphic or nearly so, 7–8.3 cm long, tube narrowly cylindrical, 5–6.2 cm long, 4–4.5 mm wide; lobes 3, equal, straight, linear-ligulate, rounded or broadly obtuse at apex, 1.5–2.2 cm long, 3–4 mm wide. Stamens 3, epipetalous; filaments 8–12 mm long, attached 2–7 mm below base of sinus of corolla lobes in upper fourth of corolla; anthers golden, linear, 5–10 mm long, 1.5–2.5 mm wide, basifixed, slightly bilobate at base. Stigmas 3, purple, suborbicular-ovate, spreading, 3 mm long, 2 mm wide, fimbriate-penicillate. Style exerted, lavender, filiform, 8 cm long, 0.8–1 mm wide, 3-angled, provided at the base with 3 fleshy, ligulate-oblong glands 3–4.5 mm by 1.5–2 mm, the glands strongly reflexed, touching the apex of the ovary, obscurely crenulate at the truncate apex, and raised on 3 clavate stipes 3.5 mm by 1 mm closely appressed to the stylar base. Ovary pale green, 3-celled, placentas 6, axile; ovules numerous. Seeds dark brown-castaneous, ovoid-elliptic, rounded at each end, or slightly apiculate at one end, 1.1 mm long, 0.9–1 mm wide, longitudinally 12–14-ridged, alveolate with ca. 15 transverse ribs.

Distribution: Territorio Federal Amazonas of southwestern Venezuela, northwestern Brazil and southeastern Colombia (Vaupés).

*Specimens examined.* VENEZUELA. AMAZONAS: shaded moss- and sphagnum-covered crevasse in wet shade over rocks, Cerro Aratitiope, 90 km SW of Ocamo, ascent of forested NW ridge leading to summit, 1,550–1,600 m, 28 Feb. 1984, *Steyermark, Berry & Delascio 130289* (MO, NY, US, VEN); *Saxofridericia-Brocchinia* thickets at base of laja, Cerro Aratitiope, 90 km SW of Ocamo, 990 m, 24 Feb. 1984, *Steyermark, Berry & Delascio 130088* (MO, NY, US, VEN);

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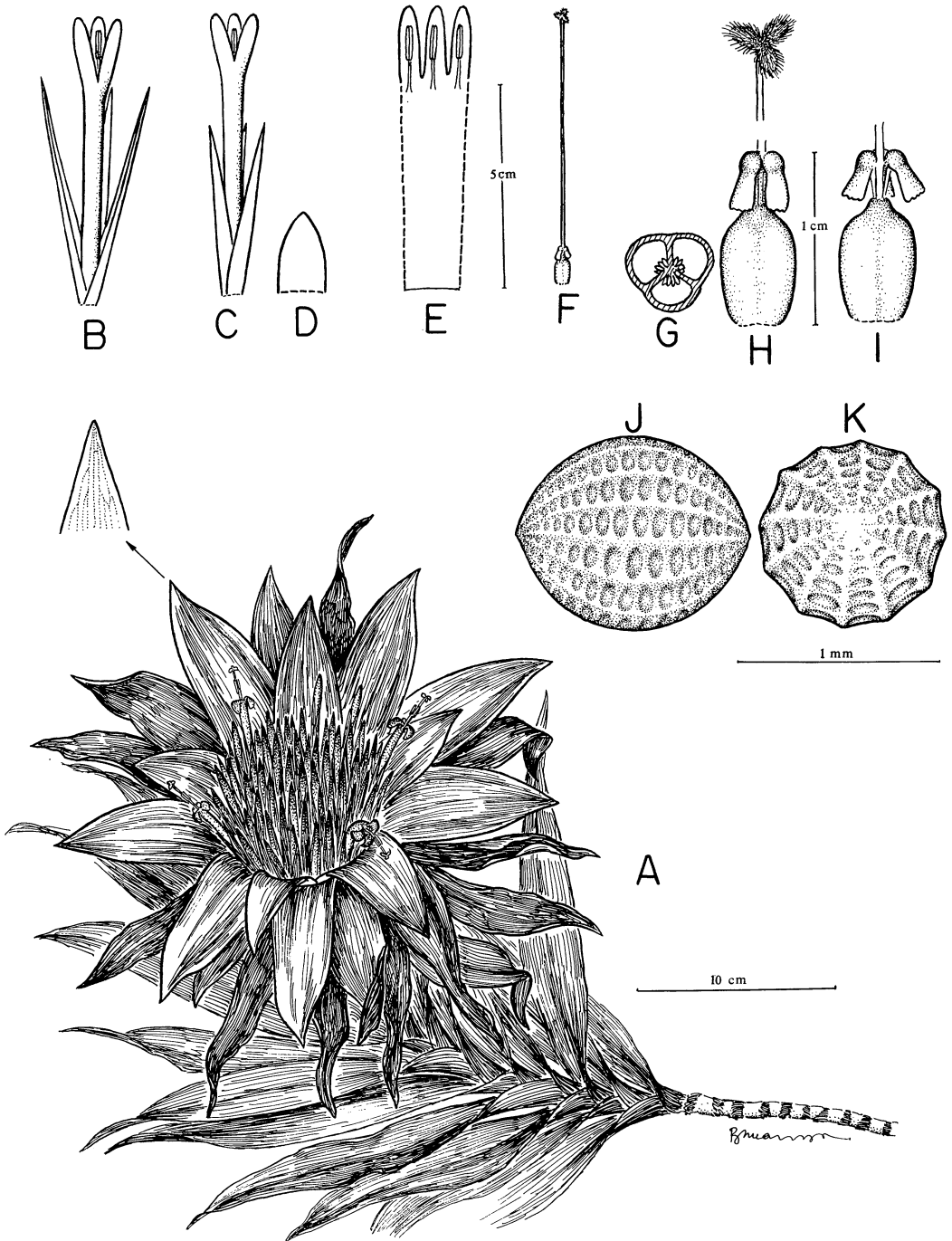


FIGURE 1. *Aratitiopea lopezii*.—A. Habit.—B, C. Corolla with sepals, showing length variation of sepals.—D. One of the outermost bracts of inflorescence.—E. Interior of corolla with attached stamens.—F. Pistil, showing style, stigmas, stilar appendages at base, and ovary.—G. Cross-section of ovary.—H. Natural reflexed position of stilar appendages at apex of ovary and detail of stigmas.—I. Stilar appendages elevated, showing relation to base of style and ovary.—J. Seed, lateral view.—K. Seed, end view.

locally frequent in scrub forest on granitic dome on right bank of river, Río Siapa, just below Raudal Gallineta (about 110 river km from mouth), 600–700 m, 21 July 1959, *Wurdack & Adderley 43564* (NY, US, VEN); lower N escarpment, hanging on wet cliffs, Cerro Sipapo, 1,300 m, 27 Nov. 1948, *Maguire & Politi 29497* (NY, US, VEN); Cerro Sipapo, 1,500 m, 17 Dec. 1948, *Maguire & Politi 27742* (NY, US); 10 Jan. 1949, *Maguire & Politi 28276* (NY, US); summit of Cerro Avispa, Río Siapa, 10°30'N, 65°51'W, 1,510 m, 5 Dec. 1972, *Dunsterville & Dunsterville s.n.* (US, VEN, photo US).

***Aratitiopea lopezii* var. *colombiana*** (L. B. Smith)

Steyerm. & Berry, comb. nov. *Navia lopezii* var. *colombiana* L. B. Smith, Bot. Mus. Leaflet 16: 195. 1954. Fl. Neotrop. Monogr. 14: 465. 1974.

Distribution: Vaupés of southeastern Colombia.

*Specimens examined.* COLOMBIA. VAUPÉS: Cerro Isibukuri, Río Kananari, 4 Aug. 1951, *Schultes & Cabrera 13342* (holotype, US; isotype, COL, GH); Cerro Isibukuri, Río Kananari, 4 Aug. 1951, *Schultes & Cabrera 13393* (US); 23–25 June 1952, *Schultes & Cabrera 15078* (COL, US).

When Dr. Lyman B. Smith (in Schultes, 1951: 40) originally published the description of this outstandingly beautiful plant, he wrote Dr. Schultes that “This species has flowers more than twice the size of any previously known *Navia*, and the rose-purplish color of the petals appears to be unique in the genus.”

Unfortunately, when the species was described, the stamen number was apparently overlooked, since only three, rather than six, stamens are present in the flowers of *Navia lopezii*. A careful comparison of herbarium specimens of *Navia lopezii* with the newly collected material of *Aratitiopea* leaves no doubt but that they are congeneric and conspecific. The sessile large heads with rose-purple bracts and purplish flowers of *Aratitiopea* are identical with those found in *Navia lopezii*. Moreover, a careful examination of both fresh and pickled material of flowers of *Aratitiopea*, and herbarium material of *Navia lopezii* identified by Dr. Lyman Smith reveals the presence of three prominent, reflexed, fleshy glands or appendages at the base of the style, together with three stamens, the same combination of characters duplicated in *Orectanthe*, a member of the Xyridaceae.

The relationship of the genus *Aratitiopea* is most closely shown with the genus *Orectanthe*,

in habit approaching the elongated caudex of *O. ptaritepuiana*. *Aratitiopea* radically departs from *Orectanthe* in the completely different seeds, which are exalate, alveolate, prominently ridged, and symmetrically ovoid-elliptic in *Aratitiopea* rather than broadly winged, non-alveolate, and non-ridged as in *Orectanthe*, in the equal, linear-ligulate lobes of the purple nearly actinomorphic corolla, and in the sessile, epedunculate inflorescence.

The stylar appendages in both *Aratitiopea* and *Orectanthe* are strictly basal, the reflexed apex of the glandular appendages touching the apex of the ovary, whereas in *Abolboda* they are elevated above the ovary. Moreover, the glandular portion of the appendage in *Aratitiopea* and *Orectanthe* is flattened, plate-like, oblong-ligulate, and much broader than the slender supporting stipe, whereas in *Abolboda* the glandular portion is very slender, scarcely or not at all broader than the filiform, supporting portion and does not touch the apex of the ovary. Additionally, the apex of the ovary in *Abolboda* is slightly split into three triangular or ovate-lanceolate, acute, usually indurate lobes, whereas in *Aratitiopea* the ovary is entire and of the same texture throughout. The seeds of *Aratitiopea* are symmetrical, whereas those of *Abolboda* are asymmetrical and suboblique, although the two are similar in having alveolate, striate surfaces. Although Maguire (in Maguire et al., 1958: 2–3, fig. 1: g, k, l) described and figured the style of *Orectanthe* as “crateriform, . . . undivided” and the stigma as “oblique terminati aliquantum fimbriato crateriformi,” an examination of herbarium material provides evidence that the stigma is trifold as in *Aratitiopea*, which in freshly preserved material definitely shows a trifold or deeply three-lobed fimbriate-penicillate stigma.

Dr. Joan Nowicke, palynologist of the Department of Botany, National Museum of Natural History, Smithsonian Institution, Washington, D.C., has studied the pollen of *Aratitiopea lopezii*, and has kindly supplied the following description based upon herbarium specimens preserved in 70 percent ethanol, with a double stain according to Alexander (1969). “Pollen spheroidal, 175–195  $\mu\text{m}$  diam. (exclusive of projections), inaperturate, intectate, the wall 9–10  $\mu\text{m}$  thick, the surface with a very thin layer of sparsely distributed granules (pila?) and with prominent knob-like projections 6–7  $\mu\text{m}$  long.

Pollen of *Aratitiopea* lacks the typically stratified angiosperm exine that consists of endexine,

footlayer, columellae, and tectum. Only two parts of the wall absorbed the stain, the knob-like projections and a very thin surface layer of sparsely distributed granules. This suggests that they have similar composition, and being the outermost components suggests that both are ektexine. The remainder and vast majority of the wall was translucent. The most likely interpretation of the pollen wall in *Aratitiopea* is that reduction of the exine has occurred. Judging from the staining pattern, the granules and knob-like projections are the only remaining components of exine; the thick, clear portion of the wall is probably intine. Since the exine is so thin, preformed openings (apertures) are not necessary.

The staining pattern of *Aratitiopea* is similar to that reported by Carlquist (1960) for three xyridaceae genera, *Abolboda*, *Orectanthe*, and *Achlyphila*: an outer portion, the spines and ornamentation, which absorbed safranin red, and an inner portion which absorbed fast green. The pollen of *Aratitiopea* is very similar to that of the above genera, all have large inaperturate grains with an outermost thin granular layer and spines or knob-like projections having widened bases. This distinctive pollen morphology reinforces the validity of the transfer of *Navia lopezii* from Bromeliaceae to Xyridaceae."

Among the characters Maguire used in differentiating *Orectanthe* (in Maguire et al., 1958: 2), the caulescent habit was given in his table of contrasts and comparisons between the known genera of Xyridaceae. However, when the two known species of *Orectanthe* are keyed out on the following page (in Maguire et al., 1958: 3), it is stated that *O. sceptrum* includes "plants essentially acaulescent," as contrasted with *O. ptaritepuiana* having "plants caulescent." This same inconsistency is repeated in Maguire's later key to the genera of Xyridaceae (in Maguire et al., 1960: 12).

Although Maguire at first believed that taxonomic evidence supported Erdtmann's suggestion that *Abolboda* and *Xyris* were not compatible familiarly (in Maguire et al., 1958: 1-2, 1960: 11) and that *Abolboda* should be referred to a separate family, Abolbodaceae (Nakai, Ordines, familiar, tribus (etc.) in praelectionibus anni 1937), Maguire later conceded (in Maguire et al., 1960: 15) that all four genera known at that time pertain to a single family, Xyridaceae, and "mutually exclude them from any other monocotyledonous family or families."

The following key is provided to account for

the additional genus, *Aratitiopea*, of the Xyridaceae.

KEY TO THE GENERA OF XYRIDACEAE

1. Corolla gamopetalous; stylar appendages usually present ..... 2
2. Sepals 3; stylar appendages basal, at apex of ovary, the reflexed portion ligular-oblong, broader than the supporting stipe, and touching the apex of the ovary; apex of the ovary entire, of soft uniform texture ..... 3
3. Corolla lobes unequal in size and shape; corolla yellow or brownish yellow; inflorescence long pedunculate; seeds broadly winged, not alveolate nor ridged ..... *Orectanthe*
3. Corolla lobes equal in size and shape; corolla purple; inflorescence sessile; seeds exalate, alveolate, ridged ..... *Aratitiopea*
2. Sepals usually 2; stylar appendages raised on the style above the apex of the ovary and not touching the apex, the reflexed portion filiform and about equalling width of the filiform-supporting stipe; apex of the ovary 3-toothed, undurate ..... *Abolboda*
1. Corolla polypetalous; stylar appendages absent ..... 4
4. Rhizomatous caulescent herb; inflorescence open, the flowers pedicellate; sepals not keeled; staminodia lacking ..... *Achlyphila*
4. Non-rhizomatous, usually acaulescent herb, inflorescence capitate, the flowers sessile; 2 lateral sepals keeled; staminodia present ..... *Xyris*

RAPATEACEAE

***Stegolepis maguireana* Steyererm., sp. nov.** TYPE: Venezuela. Bolivar: Chimantá Massif, Aco-pán-tepui, around sandstone outcrops in wet savanna area, NW portion, 1,950 m, 14 Feb. 1984, *Steyermark, Luteyn & Huber 129962* (holotype, VEN; isotype, NY).

Herbae perennes, 2-metralis altae; vaginis conductis 17 cm by 6 cm nervatis marginibus scarioso-membranaceis; laminis utrinque glaucis friabilibus valde 1-nervatis 1.5-2 m longis 2-3 cm latis; pedunculo axillari apice non dilatato foliis manifeste longiore 2-2.5 cm longo 5-6 mm diam.; inflorescentia hemisphaerica 3.2 cm longo 3.5-3.8 cm diam. multiflora; spiculis ovoideis occultis 8-9 mm × 4 mm; sepalis induratis non reflexis; petalis luteis parvis.

This species differs from the related *S. parvipetala* Steyererm. and subsp. *chimantensis* Maguire in the peduncles prominently longer than the leaves, the very brittle narrower leaves only 2-3 cm wide, the leaves glaucous on both sides, not silvery below with green stripes as in *S. parvipetala*, and in the yellow instead of orange petals.

***Stegolepis terramarensis* Steyer., sp. nov. TYPE:**

Venezuela. Amazonas: Cerro Marahuaca, cumbre, extremo noreste, 3°50'N, 65°28'W, 2,580–2,600 m, 30 Mar.–1 Apr. 1983, *Steyermark & Delascio 129197* (holotype, VEN).

PARATYPE: same locality and date, *Fernandez 66* (VEN).

Herbae perennes 0.5–1-metralis; vaginis valde duplicatis 14–15 cm longis apice 2.5–3 cm latis, auriculis prominentibus ligulatis suborbicularibus apice rotundatis 1.5–1.8 cm longis 2.5–3.5 cm latis marginibus scariosis; laminis coriaceis lineari-ligulatis apice falcate rotundatis vel obtusis 47–54 cm × 3–3.5 cm, costa media nervis secundariisque tantum leviter manifestis haud prominentibus; pedunculis 6–7, valde costatis 25–55 cm longis 2–3 cm crassis infra spiculum 4–6 mm crassis; spiculis plerumque (1–)3–7, bracteolis tantum inclusis 1–1.5 cm longis; bracteolis lanceolato-oblongis obtusis vel subobtusis, exterioribus 4–5 mm longis, interioribus (superioribus) 8–10 mm × 2.5–3.5 mm; sepalis lanceolatis acutis 15 mm longis induratis; petalis 1.5–2 cm longis; antheris linearibus transverse rugosis 9–10 mm longis.

This species is related to *S. hitchcockii* Maguire, *S. pulchella* Maguire, and *S. membranacea* Maguire, but differs in the rounded to falcately obtuse leaf blades with more strongly developed ligulate auricles and obtuse broader bracteoles. In its 3–7 (rarely 1–) flowered inflorescences, it is more closely allied to *S. hitchcockii* but the latter has shorter anthers and broader leaf blades. From *S. membranacea* it may additionally be distinguished by the indurated, enervate, coriaceous leaf blades which are inconspicuously nerved, and in the broader apex of the peduncle, while from *S. pulchella* it further differs in the usually greater number of spikelets and the less conspicuously, coriaceous leaf blades.

Although Maguire (1982: 139) states that the bracteoles in *S. pulchella* and *S. membranacea* are “algo obtusas” or “obtusiusculis,” an examination of these taxa, as well as *S. hitchcockii* and subsp. *morichensis*, indicates that they are all lanceolate or deltoid-lanceolate and narrowed to a subacute apex, whereas those of *S. terramarensis* are oblong-lanceolate and much broader towards an obtuse apex.

The species is named to commemorate the Fundacion Terramar, under whose auspices the expedition to Cerro Marahuaca was administered.

NOTE ON *SAXOFRIDERICIA SPONGIOSA*  
MAGUIRE AND *S. DUIDAE* MAGUIRE

In his description of the leaf width of *S. duidae* Maguire (1982: 94) states “2–3.5 cm de ancho”

and that of *S. spongiosa* (Maguire, 1982: 97) as “7–10 cm de ancho.” Measurements of material of *S. spongiosa* nevertheless indicate a more limited range of variation from 4–8 cm, with some specimens only 4–6 cm wide.

The peduncles of *S. spongiosa* are stated to be “abruptamente ensanchados y bulbosos debajo de la inflorescencia.” Some specimens, such as *Wurdack & Adderley 4366* are not. The spongelike texture of the sheath is characteristic.

On the other hand, *S. duidae* may exhibit a pronounced enlargement below the heads, as in *S. spongiosa*, although in his key Maguire (1982: 90) states that the peduncles are “ensanchados” only “gradualmente debajo de la inflorescencia.”

Although *S. duidae* is included under the portion of the key (Maguire, 1982: 89) which states that the heads are “4 cm mas o menos ancho,” nevertheless the text under *P. duidae* (Maguire, 1982: 94) gives greater dimensions of “inflorescencia 4.5–5.5 cm de diametro.” There is intergradation in head size between these two taxa. *Huber 6182*, identified as *S. duidae*, is *S. spongiosa*.

## IRIDACEAE

***Trimezia chimantensis* Steyer., sp. nov. TYPE:**

Venezuela. Bolívar: Piar, Macizo de Chimantá, sector centro-noreste del Chimantá tepui, cabeceras orientales del Caño Chimantá, 5°18'N, 62°09'W, 2,000 m, 26–29 Jan. 1983, *Steyermark, Huber & Carreño 128071* (holotype, VEN). PARATYPE: Macizo de Chimantá: sector SSE, altiplanicie sur-oriente del Acopán-tepui, cabeceras del Río Arauac, praderas húmedas y arbustales enanos sobre turberas, bosquecillos ribereños y vegetación sobre rocas abiertas, 5°11'N, 62°00'W, 1,920 m, 14–16 Feb. 1984, *Steyermark, Luteyn & Huber 129864* (VEN).

A *T. fosteriana* foliis angustioribus 3 mm latis utrinque viridibus haud glaucis, petalis minoribus 2 cm longis, spathae valvis 2.5–3.5 cm longis, antheris minoribus 3–3.5 mm longis recedit.

Cormous herb 0.8–1.2 m tall; leaves rich green both sides, narrowly linear, 0.7–0.8 m long, 3 mm wide; scape 0.7–1.2 m tall, equalling or exceeding the leaves, 3 mm wide, 2–3-bracteate; bracts linear, the lower ones 16–45 cm long, those in the upper third 4–8.5 cm long; spathes lanceolate, acuminate 2.5–3.5 cm long; perianth completely yellow, unspotted, the segments 2 cm

long; anthers 3–3.5 mm long; style 6 mm long, branches 4 mm long.

This species differs from the related *T. fosteriana* Steyerl. in the generally narrower, completely green, non-glaucous leaves, shorter spathes and perianth segments, and smaller anthers. Originally described from specimens collected in the Gran Sabana of Estado Bolívar, *T. fosteriana* is also now known to occur on the summit of Chimantá Massif (Steyerl, Huber & Carreño 128440 and 128798).

#### SARRACENIACEAE

##### REALIGNMENT OF THE GENUS *HELIAMPHORA*

*Introduction.* One of the outstanding endemic genera of the Guayana Highland of Venezuela is *Heliamphora*. Thus far, it is known to be restricted to the summits of some of the sandstone table mountains of the Roraima formation of Estado Bolívar and Territorio Federal Amazonas of the Venezuelan Guayana and adjacent Sierra de Neblina and Pirapicu of northwestern Brazil. The genus also descends to the Gran Sabana of southeastern Estado Bolívar in Venezuela.

The original species, *H. nutans*, was collected by Robert Schomburgk from Roraima and described by Bentham in 1841. As a result of Tate's collections from the summit of Cerro Duida, Gleason described three additional species, *H. macdonaldae*, *H. tatei*, and *H. tyleri* in 1931. A fifth species was added by Gleason (in Gleason & Killip, 1939: 164) as a result of collections made by Tate and Cardona from the summit of Auyan-tepui. Subsequent to his expedition to Ptari-tepui in 1944, Steyerl (in Steyerl et al., 1951: 239) described a sixth species, *H. heterodoxa*, and presented a key to the known species, at that time commenting on the variation as demonstrated by *H. heterodoxa* as well as by the *H. tatei-tyleri-macdonaldae* group.

A review of the comparative morphology, foliar trichomes, and glands present on the species of *Heliamphora* known up to 1942 was published by F. E. Lloyd (1942: 9–16). His account was based partly on previous literature, as well as herbarium material and living plants of *H. nutans*. A popular article on the mechanism of the trap in the species of *Heliamphora* on Cerro de la Neblina appeared in 1973 by Charles Brewer-Carías. In 1978, Dr. Bassett Maguire published a review of the genus Sarraceniaceae (in Maguire et al., 1978: 36–62). In that treatment two new species, *H. ionasii* and *H. neblinae*, and four new

varieties (two in *H. heterodoxa* and two in *H. neblinae*) were described, while *H. tyleri* was synonymized with *H. tatei*, and *H. macdonaldae* was reduced to a variety of *H. tatei*.

*Present work.* In an attempt to identify numerous specimens of *Heliamphora* collected by the writer on various expeditions to the Venezuelan Guayana during the past five years, Maguire's treatment of the genus was used. Unfortunately, due to the tremendous variation exhibited throughout the genus, it became evident that several characters employed in his key were inapplicable to distinguish various taxa. This has resulted in the present realignment in which a re-examination and evaluation has been made of various gross morphological characters available in differentiating the taxa.

Previous observations by Steyerl (in Steyerl et al., 1951: 240–242) stressed the morphological variations which occurred in *H. heterodoxa* and within the *H. tatei-tyleri-macdonaldae* group. Attention at that time was also called to the variation in pitcher size and shape induced by changes in wetter habitats. Observations on living plants as well as on extensive collections from expeditions made in 1953, 1955, and since 1960 to the present have further aided the writer in his realignment of the genus. An examination of the extensive collections of *Heliamphora* in the Herbario Nacional of Venezuela (VEN), supplemented by duplicate material from NY, has been a basis for the following observations and a new key to the taxa.

*Variation within the genus.* It should be emphasized that all the taxa in *Heliamphora* exhibit a great amount of plasticity, varying to such an extent that scarcely a single character remains foolproof for their differentiation. Size and shape of pitchers, their appendages, height of flowering plant, contraction or elongation of the cauline axis, glabry and length of pedicels, length and apex of the lowest floral bract, shape and size of tepals, number of flowers on the scape, relative length of the lowest floral bract as compared with length of the lowest pedicel, and presence or absence of a foliar bract on the scape below the inflorescence—each of these characters exhibits a certain degree of instability and intergradation, so that their role in distinguishing one taxon from another is indeed limited, if not completely unreliable. Although shape and size of pitchers, height of plant, and other characters may afford generally recognized differences between taxa, such characters may change under varied envi-

ronmental conditions. Certain characters, however, have been found to be more or less constant and applicable, even though exhibiting some variation. I refer here to the relative number and length of the anthers, the relative total length of the upper pubescent zone of the interior surface of the pitcher in proportion to the length of the pitcher itself, and the density and relative length of the hairs of this upper pubescent zone. Each of the characters examined will be discussed in the following section of this study (see Table 1 for summary of these characters).

*Androecium.* The number of anthers within a flower has been found to be generally reliable in separating the main taxa of the Territorio Federal Amazonas from those of the Estado Bolívar, the latter varying from usually (4)–8–14(–15 or rarely 16), the former from 15–20. The taxa of Estado Bolívar include *H. minor* with stamens varying from 10–14, *H. heterodoxa* var. *heterodoxa* from 8–14 (rarely to 16 in Steyermark & Wurdack 374 from Chimantá Massif (VEN), *H. heterodoxa* var. *exappendiculata* from 7–10 rarely 4 in Cardona 1523 from Chimantá Massif (VEN), 10–14 in *H. nutans*, and 15 (according to Maguire in Maguire et al., 1978: 54) in *H. ionasii*. The taxa of Territorio Federal Amazonas, *H. tatei* and *H. neblinae*, and their variations, possess 15–20 stamens.

The length of the anthers varies from 3–8.5 mm. Smaller anthers of 3–3.5 mm are found in *H. nutans* and *H. ionasii*, while larger anthers often 6–8 mm long are found in *H. heterodoxa* of Estado Bolívar and in the *H. tatei*–*H. neblinae* complex of Territorio Federal Amazonas. However, *H. heterodoxa* sometimes has anthers only 4.5–5 mm long, while anthers of only 5 mm long may be found in the *H. neblinae* group (Steyermark 103775 [VEN]) and may vary in *H. minor* from 3–5 mm.

*Length of the upper pubescent interior zone of the pitcher.* In *H. nutans* and *H. minor* the upper zone of pubescence on the interior surface of the pitcher is relatively shorter in proportion to the length of the pitcher than in the other known taxa, occupying from  $\frac{1}{4}$ – $\frac{3}{8}$  the entire length, whereas in *H. heterodoxa* and the taxa of the Territorio Federal Amazonas the pubescent upper zone varies from  $\frac{3}{8}$ – $\frac{1}{2}$  the entire length. In *H. heterodoxa*, *H. tatei*, and *H. neblinae* the pubescent zone varies in length from 7–18 cm, whereas in *H. nutans* and *H. minor* it is 2–8 cm long.

*Trichomes of the upper pubescent zone.* An

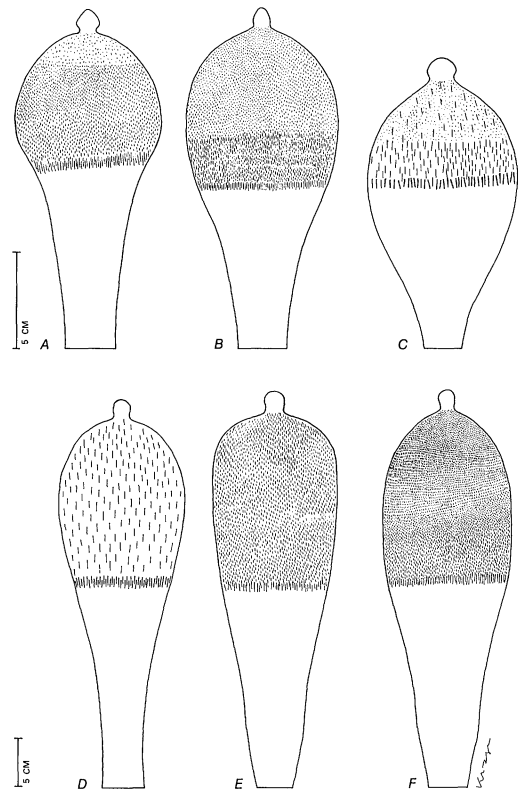


FIGURE 2. Interior leaf surface of species of *Heliamphora*, semi-diagrammatic.—A. *Heliamphora nutans*.—B. *H. heterodoxa*.—C. *H. minor*.—D. *H. ionasii*.—E. *H. tatei* var. *tatei*.—F. *H. tatei* var. *neblinae*.

examination of the trichomes of the upper pubescent zone of the pitcher reveals some differences which are mainly constant within a given taxon (Fig. 2). In *H. nutans*, *H. heterodoxa*, and in the taxa from Territorio Federal Amazonas, the upper pubescent zone consists of a velvety mat of minute, densely crowded, retrorse trichomes mainly 0.2–2 mm long. These minute hairs are shortest in the upper half of the zone, becoming longer toward the basal part, eventually merging with a basal zone of more elongated retrorse trichomes. A longer type of trichome 2–5 mm long, with the hairs more widely separated from one another, prevails in *H. ionasii* and *H. minor*, the former having the elongated hairs scattered over most of the surface, whereas in the latter, the longer hairs are dispersed more prominently in the lower portion of the zone, with a mixture of longer scattered hairs over a dense covering of minute trichomes 0.5 mm or shorter in the upper interior sector. Glabrous



TABLE 1. Summary of characters in the realignment of the genus *Heliamphora*.

	<i>minor</i>	<i>nutans</i>	<i>heterodoxa</i>	<i>tatei</i>	<i>tatei</i> var. <i>neblinae</i>	<i>ionasii</i>
Pitcher length (cm)	5-22(-30)	15-29	12-32(-42)	25-50	(12-) <sup>1</sup> 15-30	40-50
Pitcher length hairiness (cm)	2-8	6-8.5	7-18	9-14	10-15	14.5-19
Pitcher hairiness ratio	$\frac{1}{3}$ - $\frac{2}{3}$	$\frac{1}{3}$ - $\frac{2}{3}$	$\frac{1}{2}$ or less to $\frac{3}{8}$	$\frac{3}{8}$ to nearly $\frac{1}{2}$	$\frac{3}{8}$ to nearly $\frac{1}{2}$	$\frac{3}{8}$ or more
Pedicel pubescent	densely pubescent			sparsely densely	more or less	
Pedicel glabrous	—	rarely pubescent	rarely pubescent			
Tepals in anthesis (mm)	21-50 by 7-19	35-45 by 11-16	30-60 by (10-) <sup>1</sup> 12-25	3 by 7-30	35-60 by 13-35	30-35
Tepals in fructification (mm)	40-53 by 12-20	45-47 by 20	45-80 by 18-37	45-72 by 20-40	70 by 30	55-60 by 15
Anther length (mm)	3-5	3-3.5	4.5-6(-8.5)	6-7.5	5-8	3.5
Lowest bract exceeding lowest pedicel	variable			rarely only equaling	sometimes only slightly exceeds	
Lowest bract shorter than lowest pedicel	—	—	—	—	—	—
Pedicel length (cm)	1.5-10	2-7	2-11(-16)	2-10	1-7.5	8-12
Height of plant (m)	0.1-0.85	0.3-0.5	0.3-0.9	0.3-2	0.4-1.2	0.85
Number of flowers to scape	(1-) <sup>2</sup> 2-5	4	2-7	2-3	2-3(-4)	8-10
Floral bract rounded	—					
Floral bract cuspidate	rarely		mainly	—	—	—
Length of lowest floral bract (cm)	2-6	3-3.5	2-10	6-17	(4.5-) <sup>9</sup> 21	4-5
Pitcher appendage (mm)	3-15(-20) by 2-15(-20) as broad as long or broader than long	2-7 by 5-12 broader than long	6-35 by 5-30 often longer than broad to as broad as long (var. <i>exappendiculata</i> 0.2 by 2-10)	10-40 by 5-20 longer than broad	25-40 by 20-42 (also 11 by 11 as broad as long, also longer than broad)	16-20 by 10-30 about as broad as long
Lowest floral bract bearing appendage	—	—	—	—	—	—
Lowest floral bract lacking appendage	—	—	—	sometimes	sometimes	—
Number of anthers	10-14	10-14	(7-) <sup>8</sup> 14(-16)	15-20	15-20	15

forms are known in *H. heterodoxa*, *H. minor*, and *H. tatei* f. *macdonaldae*.

*Pitcher shape and length.* The ventricose shape of the pitcher has been employed by Maguire (in Maguire et al., 1978: 50–51) to distinguish the species occurring in the Estado Bolívar from those having an “essentially tubular” shape found among the taxa of the Territorio Federal Amazonas. Unfortunately, the character of the shape, while more or less uniform among the taxa from the Territorio Federal Amazonas, varies considerably in *H. heterodoxa*, *H. minor*, and *H. nutans*, changing from a ventricose to a tubular type. Steyermark (in Steyermark et al., 1951: 240) noted previously that under conditions of more abundant moisture and shade, *H. heterodoxa* had larger and more elongated pitchers (Steyermark 59934), and in subsequent collections (Steyermark et al. 115698, 115742, Steyermark & Wurdack 374, 375, Steyermark 121104) this was noted on collection labels.

In *H. minor* the pitchers, although usually ventricose, are more elongated and subtubular in Steyermark, Huber & Carreño 128666. *Heliampora nutans* has ventricose as well as more elongated tubular pitchers, as shown by Delascio & Brewer 4733 from Ilu-tepui and Delascio & Brewer 4967 from Kukenan-tepui. In the Territorio Federal Amazonas the taxa usually have the pitchers elongated to as much as 50 cm in length, but may be smaller and reduced to 12 cm long when they are growing in more desiccated or more exposed situations, as exemplified by Steyermark 103775 and 103844 from Neblina, by Fariñas, Velasquez & Medina 279 and 549 from Duida, and by the type collection (Maguire, Wurdack & Bunting 37171) of *H. neblinae* var. *parva* Maguire. In his key, Maguire (in Maguire et al., 1978: 51) partly differentiated *H. ionasii* from *H. heterodoxa* on the basis of pitcher length, indicating 40–50 cm long for *H. ionasii*, based upon the type collection only, and “30 cm or less long” for *H. heterodoxa*. However, the abundant material of *H. heterodoxa* represented in VEN shows a variation of pitcher length from 12 to 42 cm.

*Elongation of the cauline axis.* Some emphasis has been placed by Maguire (in Maguire et al., 1978: 50–53) upon the differentiation of the taxa from Estado Bolívar having rosette-forming pitchers on shortened axes from those with pitchers cauline on more elongated axes 2–5 dm long. In this manner, *H. nutans* and *H. minor* are separated from *H. heterodoxa* and *H.*

*ionasii*. However, no reliability can be placed upon this character. Observations of living plants of *H. minor* on Chimantá Massif and Auyan-tepui furnish evidence of the effect of the environment on habit of growth with reference to the elongation of the caudex. Field observations and voucher herbarium material indicate that the plants growing in desiccated areas exposed to full sun, especially during the months of the dry season, form rosettes with a shortened axis, whereas those plants inhabiting the moister cliff faces, where water is dripping or where more shade occurs, develop more elongated axes with cauline pitchers, as exemplified by the specimen of *H. minor* (Steyermark, Huber & Carreño 128666) from Chimantá Massif. Some specimens of *H. nutans* (Delascio & Brewer 4733) from Kukenan-tepui have a pitcher attached 5 cm above the rosette clump, and in Maguire 33379 (VEN) the caudex is elongated at least 5 cm below the leafy rosette.

Although the cauline axis is more commonly elongated in *H. heterodoxa*, the degree of elongation varies with the habitat. One can find rosette-forming plants with a shortened axis in *H. heterodoxa* var. *heterodoxa*, especially in open wet or exsiccated savanna-like habitats (Maguire & Wurdack 33890 [VEN], Steyermark & Dunsterville 104240 [VEN]), and in var. *exappendiculata* (Steyermark 74888 [VEN] and Steyermark & Wurdack 441 [VEN]).

*Height of plant.* The height of the plants in *Heliampora* varies, of course, according to the elongation of the cauline axis. There is considerable variation in this respect among the several taxa. Dwarfed plants of *H. minor* may attain only 1 dm in height (including the inflorescence), 3 dm in *H. nutans*, and 3 dm in *H. heterodoxa*, but *H. nutans* may reach a height of 5 dm, *H. minor* may attain 8.5 dm, and *H. heterodoxa* as much as 9 dm.

The taxa (*H. tatei* and *H. neblinae*) in Territorio Federal Amazonas generally attain a relatively taller height, reaching an average of between 1–2 m in *H. tatei*, and, on occasion (according to Maguire in Maguire et al., 1978: 56–57) to 4 m. However, in the same colonies of *H. tatei*, smaller plants, only 3–6 dm tall, may occur, as exemplified by individual specimens from Cerro Duida (Steyermark et al. 126392, Farinas, Velasquez & Medina 277) and Cerro Marahuaca (Steyermark et al. 126356). In Steyermark, Liesner & Brewer-Carías 124564 from Cerro Duida, plants of *H. tatei* are noted to vary

from 0.5 to 1.5 m in height, and plants of *H. neblinae* from Cerro de la Neblina may vary from 0.5 to 1.5 m, smaller individuals (*Steyermark 103745*) having been referred by Maguire (in Maguire et al., 1978: 56–57) to *H. neblinae* var. *parva*.

So far as height and elongation of the caudex are concerned, there is intergradation between populations of plants of *H. tatei* from Cerro Duida, Cerro Huachamacari, and Cerro Marahuaca, and of *H. neblinae* from Cerro de la Neblina. These two taxa do not reveal any real differences in anther length, as stated by Maguire, but do exhibit a distinct character in their type of pubescence occurring on the upper interior surface of the pitcher.

*Branching of axis.* In his key to *Heliamphora* Maguire (in Maguire et al., 1978: 51) alludes to the stems of *H. tatei* as being “dendroid, much branched,” as contrasted with “stems not dendroid, simple or little branched” in *H. neblinae*. The terminology “dendroid, much branched,” as employed by Maguire, is in need of clarification and modification. If a “dendroid, much-branched” stem leads one to expect a much-branched, tree-like habit, certainly there is nothing evident from herbarium material or photographs to justify this description. Therefore, in order to verify, clarify, and re-examine this habitual character, the present writer was given the opportunity during separate helicopter trips to the summits of Cerro Duida and Cerro Huachamacari in 1981, 1982, and 1983, where thousands of individual plants of *H. tatei* occur, to observe, record, collect, and make detailed photographs of the growth habit of this species.<sup>2</sup> As a result of an examination of numerous individuals, the following conclusions have been drawn:

The ramification noted by Maguire is subject to various interpretations. In many individuals there is no indication of branching (Fig. 3) and only a simple, solitary stem is seen, as exemplified by *Steyermark 129428-C* and *D* (VEN). In other individuals a shortened lateral axis is developed which bears an abbreviated rosette or leaf cluster. This lateral leaf cluster on a shortened axis may occur along the side of the stem

(*Steyermark 129428-A* and *E* [VEN]), or near or at its apex (*Steyermark 129428-B* [VEN]), in the latter case producing a bifurcate aspect (Fig. 4). This short attachment, usually either one or sometimes two, developed part way up the main stem or producing a bifurcation when developed at or near the apex, provides the basis for Maguire’s use of the term “branched.” However, no individuals were found, among the numerous ones examined, which could be described as “much branched.” Many specimens were seen with several leafy plants growing from the base of the stem, and these basal growths attained different lengths of leafy tufts (Fig. 5). Such individuals, however, cannot be considered as having a branched stem, but merely as having leafy offshoots arising from their base. Moreover, of the numerous individual specimens observed, a larger proportion exhibited only simple, unbranched stems which lack any attached leafy rosettes or leafy clusters.

Thus, the usual growth habit which was observed on the *Heliamphora tatei* plants from the summits of Cerro Duida and Cerro Huachamacari is that of a simple, monopodial stem which continues to elongate upward, the older dead pitchers, which occur along the longitudinal vertical axis of the stem, persisting and remaining attached to the axis for many years, while the new pitchers, which form the green leafy growth, appear in the uppermost and apical portion of the same axis. In some plants a shortened leafy rosette may be produced, but no elongated ligneous “dendroid” branches are present.

*Ebracteate and bracteate scape.* A character used by Maguire in his key (in Maguire et al., 1978: 50–51) to distinguish the taxa of Territorio Federal Amazonas from those in the Estado Bolívar is that of the presence of a bract which is commonly found below the middle of the inflorescence in the taxa from Territorio Federal Amazonas, while it is absent among the taxa from Estado Bolívar. Actually, each pedicel of the inflorescence in *H. neblinae* and *H. tatei* is subtended by a leafy bract, but the lowest bract is more elongated and more foliose than the others. However, in the majority of specimens examined, no other bract occurs below the lowest

<sup>2</sup> I am deeply grateful to the Terramar Foundation for their generous support in supplying helicopter trips to the summit of Cerro Huachamacari, particularly to Armando and Fabian Michelangeli. Special thanks are here acknowledged to Walter Smitter who photographed the plants of *Heliamphora tatei* on Cerro Huachamacari. I am also greatly thankful to Dr. Charles Brewer-Carías, who supplied helicopter support to the summit of Cerro Duida.



FIGURE 3. Completely unbranched axis of *Heliamphora tatei*.

one subtending the lowest pedicel. In the majority of specimens examined, the lowest bract occurs above the middle of the scape. After an examination of ample material in VEN, I have had to conclude that this character has no taxonomic value. In fact, a bract may sometimes be present on the scape below the inflorescence on some of the taxa from Estado Bolívar, as exemplified in *H. minor* by Steyermark *et al.*

116001 from Auyan-tepui, Steyermark, Huber & Carreño 128269 and 128666 from Chimantá Massif, *H. heterodoxa* var. *heterodoxa* (Steyermark & Nilsson 338 and Steyermark 121104) and *H. nutans* (Delascio & Brewer 4967) from Ilu-tepui, and may be absent, on the other hand, on many specimens from the Territorio Federal Amazonas.

*Floral bract.* The applicability of the relative



FIGURE 4. Lateral leaf cluster on stem of *Heliamphora tatei*.

length of the floral bracts as compared with the length of the pedicel, as used by Maguire (in Maguire et al., 1978: 50–51) is generally useful with reference to the lowest floral bract only, but an unreliable character for separating the taxa of Estado Bolívar from those of Territorio Federal Amazonas when applied to the bracts other than the lowest one. While the lowest floral bract is shorter than the lowest pedicel in *H. ionasii*, *H. heterodoxa*, and *H. nutans*, all originating from Estado Bolívar, it varies greatly in *H. minor*, also from Estado Bolívar. Thus, in *H. minor* the lowest bract is found to either exceed the lowest pedicel or it may be shorter. This variation may depend on the relative age of the plant, since longer pedicels are often correlated with the lowest flowers which are the first to appear in anthesis, whereas the flowers on the shorter upper pedicels come into anthesis at a later stage of flower succession. Moreover, in the taxa from the Territorio Federal Amazonas the floral bract, on some specimens, may only equal or slightly exceed the pedicel.

This floral bract varies in length from 2–6 cm

in *H. nutans*, *H. minor*, and *H. ionasii*, and from 2–10 cm in *H. heterodoxa*, whereas in the taxa from Territorio Federal Amazonas, variation extends in length from (4.5–)6 to 21 cm. In the taxa originating from Territorio Federal Amazonas the floral bract is usually provided with an appendage similar to that of the pitcher, whereas this appendage is lacking in the taxa from the Estado Bolívar. However, some specimens of the taxa from Territorio Federal Amazonas may have only a cuspidate apex instead of a definite appendage. In *H. minor*, *H. ionasii*, and *H. heterodoxa* the apex of the floral bract is rounded or cuspidate, although mainly cuspidate in *H. heterodoxa* but rarely so in *H. minor*. So far as specimens examined are examined, it is cuspidate in *H. nutans*.

*Pedicel length and indument.* The presence or absence of pubescence on the pedicel was used by Maguire in his key (in Maguire et al., 1978: 50–51) to differentiate some of the taxa. Within certain limits this character appears to have value. It is found to be useful in the majority of specimens examined, although showing variability. The pedicels are glabrous in *H. ionasii*, *H. heterodoxa*, and *H. nutans*, but rarely pubescent in *H. heterodoxa* (*Steiermark & Wurdack 374, 375 [VEN]* and *Steiermark 74888 [VEN]*) and in *H. nutans* (*Delascio & Brewer 4967 [VEN]*). They are nearly always pubescent in *H. minor*, and usually so in the taxa from the Territorio Federal Amazonas referred to *H. tatei* and *H. neblinae*, but in *H. tatei* may vary from pubescent to glabrate. In Maguire's key (in Maguire et al., 1978: 50) the difference in pedicel glabritiy has been inadvertently transposed, and should actually read "pedicels glabrous" for *H. nutans* and "pedicels pubescent" for *H. minor*, instead of vice-versa as given in the key.

The length of the pedicel varies according to the maturity of the inflorescence, the lowest one maturing earlier than the others, which results in the lowest fruiting pedicel attaining the longest length. This length varies with the different taxa, the maximum of 16 cm recorded for *H. heterodoxa*, 12 cm for *H. ionasii*, 10 cm for *H. minor* and *H. tatei*, 7.5 cm for *H. neblinae*, and 7 cm for *H. nutans*, but minimum lengths of 1–2 cm are known in the flowering pedicels of all the taxa, except for *H. ionasii*, where 8 cm is recorded.

*Number of flowers in an inflorescence.* The greatest number of flowers on one scape has been recorded for *H. ionasii*, in which 8–10 occur. In



FIGURE 5. Several leafy shoots growing in clump at base of plant of *Heliampora tatei*.

*H. heterodoxa*, 2–7 flowers may be present, in the taxa from Territorio Federal Amazonas, referred to *H. tatei* and *H. neblinae*, 2–4 flowers appear; in *H. nutans* we find 4, and in *H. minor* the number ranges from generally 2 to 5, rarely solitary.

*Appendage of the pitcher.* The shape and size of the pitcher appendage is extremely variable,

and, except for *H. heterodoxa* var. *exappendiculata*, in which it is scarcely developed, is an unreliable taxonomic character to serve for the differentiation of taxa, although it was used originally by Gleason (1931: 367) in his key to separate the various taxa in size and shape. *Heliampora nutans* and *H. minor* may have the appendages as short as 2–3 mm long, but vary

in *H. nutans* from a minimum length of 3–7 mm to a maximum length of 10 mm and in *H. minor* to 20 mm. On the other hand, the taxa from the Territorio Federal Amazonas show relatively longer or broader appendages, varying from 10–40 mm by 5–20 mm in the taxon referred to *H. tatei* var. *macdonaldae*, and from 10–40 mm by 10–42 mm in the taxon referred to *H. neblinae* var. *neblinae*. However, in *H. neblinae* var. *parva* the appendage is much smaller, 6–28 mm by 6–20 mm, thus breaking down the difference between the taxa from the Territorio Federal Amazonas and *H. heterodoxa* var. *heterodoxa* with appendages 9–40 mm by 7–30 mm and *H. ionasii* with appendages 16–20 mm by 10–30 mm.

*Perianth.* While the usual number of perianth segments (tepals) is 4, specimens occur with 5 or 6. In *H. minor* and *H. heterodoxa* the tepals vary from 4 to 5, and in a glabrous variety of *H. heterodoxa* (*Cardona 2661* [VEN]) 6 tepals are present. In his key to *H. neblinae*, Maguire (in Maguire et al., 1978: 57) states that the perianth segments are “commonly 5–6” in *H. neblinae* var. *neblinae* and “commonly 4” in var. *viridis*. However, although the isotype of var. *neblinae* (*Maguire, Wurdack & Bunting 37151*) at VEN has 6 tepals, most of the other specimens examined (*Maguire, Wurdack & Bunting 37035* and *Steyermark 103956*) and cited by Maguire as var. *neblinae*, have only 4 segments, whereas *Steyermark 103775* and *Maguire, Wurdack & Maguire 42465* show both 4 and 5 segments. Since the number of tepals is a variable character within these varieties, and no other taxonomic differences are indicated, they may be considered only as variations of tepal number within the same taxonomic variety.

The inner perianth segments, usually 2, are shorter and narrower than the generally 2 outer ones. They are always smaller in anthesis than in fructification. The tepals of *H. minor* and *H. nutans*, when in flower, are generally smaller than any of the other taxa, with an average length of 25–35 mm, but attain 45–50 mm in fruit. The largest perianth segments are encountered in *H. heterodoxa* of Estado Bolívar, attaining a maximum length of 60 mm, and in the taxa from Territorio Federal Amazonas, attaining a maximum length varying from 55–60 mm. In fructification these same taxa (*H. heterodoxa*, *H. tatei*, and *H. neblinae*) attain greater lengths of 80, 72, and 70 respectively. Since the minimum and maximum lengths show a wide range and intergrade between the various taxa, this character

has not been found applicable for purposes of differentiation.

The perianth segments in *H. minor* are lanceolate, broadest at the base, and acuminate to cuspidate in anthesis. Those of *H. nutans* are similar in shape but less acuminate or cuspidate, while in *H. heterodoxa* the segments have a slightly broader oblong-lanceolate or ovate-oblong shape, varying from broadest at or near the base to broadest toward the middle, and from an acute to cuspidate apex. The taxa from Territorio Federal Amazonas, because of their generally broader outer tepals, have an oblong-elliptic or lance-oblong form, obviously broadest around the middle and vary at the apex from acute to obtuse.

*Other variations.* Within the genus *Heliamphora*, the interior upper surface of the pitcher is generally covered by a zone of numerous, closely packed, minute trichomes or with longer trichomes placed more distantly between one another. In *H. heterodoxa* var. *glabra*, *H. heterodoxa* var. *exappendiculata* f. *glabella*, *H. minor* f. *laevis*, and *H. tatei* var. *macdonaldae* this ordinarily pubescent zone is replaced by one nearly or completely glabrous, excluding the basal aggregation of elongate, retrorse hairs located at the summit of the glabrous lower interior portion of the pitcher.

Observations of large colonies of *H. tatei* and var. *macdonaldae* on Cerro Duida in 1981 and 1982 reveal a great inconstancy in the occurrence of glabry on the upper interior surface of the pitcher. As indicated on the label accompanying the specimens of *Steyermark, Guariglia, Holmgren, Luteyn & Mori 124564*, not only do internally glabrous pitchers occur within the same colony, but even on the same plant. In this author's opinion, the internally glabrous plants should be considered at most a form, rather than a variety, of *H. tatei*. The glabrous variation of *H. heterodoxa*, described as a variety by Maguire, likewise may be considered as merely a glabrous state of the species and recognized as only a form.

*Results.* A re-examination of herbarium and living material of *Heliamphora* collected on recent expeditions by the author have shown a high degree of variability and plasticity among the several taxa within the genus. The characters employed by Maguire (in Maguire et al., 1978: 50–51) in the most recent treatment of the genus fail to provide for this degree of variation. It is thus necessary to modify and realign the taxa based

on less variable characters. As a result, the following key and changes in nomenclature are given:

***Heliamphora tatei*** Gleason, Bull. Torrey Bot. Club 58: 368. 1931.

***Heliamphora tatei*** Gleason var. ***tatei*** f. ***tatei***.

*Heliamphora tyleri* Gleason, Bull. Torrey Bot. Club 58: 368. 1931.

***Heliamphora tatei*** Gleason var. ***tatei*** f. ***macdonaldae*** (Gleason) Steyermark, stat. nov. *Heliamphora macdonaldae* Gleason, Bull. Torrey Bot. Club 58: 367. 1931.

*Heliamphora tatei* var. *macdonaldae* (Gleason) Maguire, Mem. New York Bot. Gard. 29: 57. 1978.

***Heliamphora tatei*** Gleason var. ***neblinae*** (Maguire) Steyermark, stat. nov. *Heliamphora neblinae* Maguire, Mem. New York Bot. Gard. 29: 57. fig. 54. 1978.

*Heliamphora neblinae* Maguire var. *viridis* Maguire, Mem. New York Bot. Gard. 29: 59. 1978.

***Heliamphora tatei*** Gleason var. ***neblinae*** f. ***parva*** (Maguire) Steyermark, stat. nov. *Heliamphora neblinae* var. *parva* Maguire, Mem. New York Bot. Gard. 29: 59. fig. 49: G–H, 50: A–C. 1978.

***Heliamphora heterodoxa*** Steyermark var. ***heterodoxa*** f. ***glabra*** (Maguire) Steyermark, stat. nov. *Heliamphora heterodoxa* var. *glabra* Maguire, Mem. New York Bot. Gard. 29: 54. 1978.

***Heliamphora minor*** Gleason f. ***laevis*** Steyermark, f. nov. TYPE: Venezuela. Bolívar: crece en zonas pantanosas, Cerro Auyan, 2,100 m, Jan. 1949, *F. Cardona 2661* (holotype, VEN). PARATYPES: Venezuela. Bolívar: Piar, stream margin at edge of wet savanna, Macizo del Chimantá, cumbre del altiplanicie en la base meridional de los farallones superiores del Apacará-tepui, sector N del macizo, 5°20'N, 62°12'W, 2,200 m, *Steyermark, Huber & Carreño 128416* (VEN); lugares muy húmedos, sabana y bosque, Salto Angel, alrededores caída de agua, Auyan-tepui, 13 Aug. 1968, *Foldats 7008* (VEN); summit, Auyan-tepui, 2,100 m, 18 Feb. 1984, *Luteyn & Steyermark 9590* (NY, VEN).

A *H. minor* amphoris intus zona media barbata excepta glabris, tertia vel quarta supera ventricosa occupatis recedit.

This form differs from typical *H. minor* in the completely glabrous inner face of the upper expanded portion of the pitcher, except for the zone of elongate hairs at the constriction at the base of the upper expanded portion. In *Steyermark et al. 128416* this glabrous upper expanded portion occupies about a fourth of the length of the pitcher. In typical *H. minor*, the interior upper ventricose face of the pitcher is usually pubescent with a zone of scattered elongate hairs. In the newly described form these hairs are completely absent except for the zone of hairs at the base of the ventricose portion at its constriction. The *Steyermark, Huber & Carreño 128416* collection occurred in a shaded zone of shrubbery by the border of a savanna where another collection of *H. minor* (*Steyermark, Huber & Carreño 128417*) was growing. This last collection exhibits a diminished number of hairs, tending toward the f. *laevis*.

I have referred the *Cardona, Foldats, Luteyn & Steyermark*, and *Steyermark et al.* collections to *H. minor* rather than to *H. heterodoxa*, since the upper ventricose zone is limited to 1/4–1/3 of the total length of the pitcher instead of having this upper portion 3/8–1/2 of the total length as a characteristic of *H. heterodoxa*.

***Heliamphora heterodoxa*** var. ***exappendiculata*** f. ***glabella*** Steyermark, f. nov. TYPE: Venezuela. Bolívar: Auyan-tepui, cumbre de la parte norte de la sección sur (division occidental), suelo arenisco entre “Drizzly Camp” y “Second Wall,” 1,600–1,800 m, 11 May 1964, *Steyermark 93712* (holotype, VEN).

A var. *exappendiculata* ascidiis interiis in dimidio superiore glaberrimis recedit.

This form differs from var. *exappendiculata* in having the interior of the pitcher glabrous, except for some hairs at the basal zone of the expanded portion, whereas in var. *exappendiculata* the expanded interior of the upper portion of the pitcher is densely covered with trichomes.

*Concluding remarks.* As an auctoconous genus, isolated on the ancient Roraima formation of the Guayana Shield of South America, and evidently separated since remote geological time from its nearest North American relatives, *Heliamphora* would appear to be a genus of ancient



KEY TO THE SPECIES, VARIETIES, AND FORMS OF *HELIAMPHORA*

1. Anthers mainly 16–20; lowest floral bract usually equalling or much exceeding the lowest pedicel; plants of Territorio Federal Amazonas ..... 2
2. Upper interior portion of pitcher glabrous above the pubescent ring .. *H. tatei* var. *tatei* f. *macdonaldae* ..... 2
2. Upper interior portion of pitcher densely pubescent above the pubescent ring ..... 3
3. Upper pubescent zone of hairs with a mainly uniform length of 0.8–2 mm ..... *H. tatei* var. *tatei* f. *tatei*
3. Upper pubescent zone of hairs not uniform, the indument toward the apical half consisting of hairs 0.2–1 mm long, but the lower portion with more elongate hairs 1–1.5 mm long ..... 4
4. Exterior surface of pitcher more or less pubescent ..... *H. tatei* var. *neblinae* f. *neblinae*
4. Exterior surface of pitcher glabrous ..... *H. tatei* var. *neblinae* f. *parva*
1. Anthers (4–)7–15(–16); lowest floral bract usually shorter than the lowest pedicel; plants of Estado Bolívar ..... 5
5. Interior of the upper ventricose portion of pitcher glabrous or nearly so, except for the basal zone of hairs ..... 6
6. Appendages of the pitchers absent or scarcely developed ..... *H. heterodoxa* var. *exappendiculata* f. *glabella*
6. Appendages of the pitchers obviously developed, 3–40 mm long ..... 7
7. Anthers 3–5 mm long; upper ventricose portion of pitcher occupying  $\frac{1}{4}$ – $\frac{1}{2}$  of the total length ..... *H. minor* f. *laevis*
7. Anthers (4.5–)5–8 mm long; upper ventricose portion of pitcher occupying  $\frac{3}{8}$ – $\frac{1}{2}$  of the total length ..... *H. heterodoxa* var. *heterodoxa* f. *glabra*
5. Interior of the upper ventricose portion of pitcher usually pubescent ..... 8
8. Pubescent upper interior face of the pitcher (excluding the basal ring of hairs) with some or all of the hairs elongated to 2–5 mm and scattered or relatively distant from each other, or deciduous over a glabrous surface ..... 9
9. Pedicels glabrous; scapes 8–10-flowered; pitchers 40–50 cm long; upper pubescent zone of the interior of the pitcher 14.5–19 cm long, extending from  $\frac{3}{8}$  or more of the length of the pitcher ..... *H. ionasii*
9. Pedicels more or less pubescent; scapes 1–5-flowered; pitchers 5–22(–30) cm long; upper pubescent zone of the interior of the pitcher 2–8 cm long, extending from  $\frac{1}{4}$ – $\frac{3}{8}$  the length of the pitcher ..... *H. minor*
8. Pubescent upper face of the interior of the pitcher (excluding the basal ring of hairs) with a dense minute, more or less uniform velvety indument of hairs 0.5–1 mm long ..... 10
10. Anthers 3–3.5 mm long; upper pubescent zone of the interior of the pitcher occupying  $\frac{1}{2}$ – $\frac{3}{8}$  the length of the pitcher, 6–8.5 cm long; most of the indument of the upper pubescent zone consisting of more or less uniform hairs 0.7–1 mm long ..... *H. nutans*
10. Anthers (4.5–)5–8 mm long; upper pubescent zone of the interior of the pitcher occupying  $\frac{3}{8}$ – $\frac{1}{2}$  the length of the pitcher, 7–18 cm long; most of the upper indument of the upper pubescent zone consisting of hairs 0.5–0.7 mm long, the lower portion with longer hairs 0.7–1 mm long ..... *H. heterodoxa*

geological origin. However, judging by the high degree of variation and plasticity shown by the known taxa of the genus, it would indicate that these taxa have become separated from one another in only relatively recent times, and that they are still in the process of evolutionary instability as shown by the similarity of their floral characters and high degree of vegetative variation. The degree to which the taxa have diverged during their evolutionary history has been relatively insufficient to have resulted in their sharp differentiation from one another.

## LEGUMINOSAE

## CAESALPINOIDEAE

**Aldina berryi** Cowan & Steyerl., sp. nov. TYPE: Venezuela. Bolívar: cumbre, Cerro Guai-

quinima, sector suroeste central, bosque de galería y bosque alto, a lo largo del afluente suroccidental del Río Carapo, 5°45'N, 63°35'W, 950 m, 26 May 1978, common in the tall forest of trees 20–25 m tall, *Steyermark, Berry, Dunsterville & Dunsterville 117468* (holotype, VEN; isotype, US).

Arbor 20-metralis; ramis, petiolis, rhachibus et foliolis glabris; foliis 1–3-foliolatis; petiolis 2.5–6 cm longis; foliolis 7–9.5 cm longis 3–5 cm latis, inflorescentiis terminalibus racemosis 8–11-floris 7–11 cm longis; pedicellis 3–7 mm longis dense badio-tomentosis; calyce 1.2–1.5 cm longo dense fusco-tomentoso, in anthesi inaequaliter 4–5-lobato, petalis 5–7 oblanceolatis vel obovatis apice rotundatis 25 mm longis 12–13 mm latis glabris; ovario lineari-elliptico 4–5 mm longo 1.5–2 mm lato glabro vel basi pilis paucis minutis adpressis munito, stipite 5 mm longo glabro; stylo subulato 2–3 mm longo glabro.

Tree 20 m tall; branches, petioles, rachis of leaves and leaflets glabrous; leaves 1–3-foliolate or the uppermost sometimes simple, mainly alternate; petioles 2.5–6 cm long; lateral petiolules 7–11 mm long, terminal 22–30 mm long, thickened portion 11–13 mm long; leaflets chartaceous, gray green beneath, ovate or oblong-ovate, obtusely acuminate at apex, acumen 4–5 mm by 2–3 mm, 7–9.5 cm by 3–5 cm; lateral nerves inconspicuous to obsolete, 10–14 on each side, tertiary venation absent; inflorescence terminal, simply racemose, 8–11-flowered, 7–11 cm long; peduncle 1.5–2 cm long, densely brown-tomentose; flowers pedicellate, pedicels 3–7 mm long, articulate at apex, densely brown-tomentose; calyx (in bud) obovoid to ellipsoid, densely dark brown tomentose; unequally 4–5-lobed in anthesis with reflexed lobes, 1.2–1.5 cm long (tube olive green, 7–9 mm long, 10–11 mm wide at summit; 3 lobes broadly lanceolate, subacute, 9–10 mm by 4–5 mm, fourth lobe ovate to broadly ovate, subobtuse, 10 mm by 9 mm, all lobes glabrous and white within except for pilosulous margins above middle); petals white, 5–7, oblanceolate or obovate, rounded at apex, 25 mm by 12–13 mm, glabrous; stamens numerous, uniform, filaments white, fasciculate, 15–18 mm long, glabrous; anthers yellow, linear, rounded at upper end, asymmetrically bilobed at base, dorsifixed, 4.5–6 mm by 1 mm; ovary linear-elliptic, 4–5 mm by 1.5–2 mm, glabrous or with a few, minute appressed hairs basally, stipe glabrous, 5 mm long; stigma terminal; fruit not seen.

This taxon is named for Paul Berry, who accompanied the author on the present expedition, and who rendered great collecting assistance. *Aldina berryi* is very conspicuous when flowering with its masses of fragrant, white flowers at the summits of the tall forest on Cerro Guaiquinima. It is distinguished by the complete glabry of the ovary and vegetative parts.

PAPILIONOIDEAE

**Dipteryx phaeophylla** Steyermark., sp. nov. TYPE: Venezuela. Bolívar: Cerro Guaiquinima, cumbre, Salto de Río Szczerbanari, parte central del cerro, 5°44'4"N, 63°41'8"W, 750 m, 20–25 Jan. 1977, *Steyermark, Dunsterville & Dunsterville 113200* (holotype, VEN). PARATYPE: same locality and date, *Steyermark, Dunsterville & Dunsterville 113248* (VEN).

Arbor 4–20-metralis; foliis petiolatis 5-foliolatis paribus lateralibus oppositis, foliolis oblongo-vel lanceolato-ellipticis apice caudatis acumine tenui 1–2 cm longo basi obtusis 7–10.5 cm × 2–3.5 cm subtus minute adpresso-puberulis; petiolis rhachidique minute adpresso-puberulis; infructescentia pedunculata 12–21 cm longa minute dense adpresso-puberulis; fructu fusiformi-elliptico extremitatibus subacutis 4–6 cm × 1.2–1.8 cm minute adpresso-puberulis.

Tree 4–20 m tall; leaves petiolate, 5-foliolate, the two lateral pairs opposite; leaflets dark green above, brown below, oblong- to lance-elliptic; caudate at the apex with a slender acumen 1–2 cm long, obtuse at base, 7–10.5 cm by 2–3.5 cm, glabrous above, minutely appressed-puberulent below on surface and midrib; lateral nerves 8–10 each side, obsolete below, slightly evident above; midrib elevated below, depressed above; tertiary venation minutely and obsolete reticulate below; petiole and leaf-rachis 3.5–5 cm long, minutely appressed-puberulent; petiolule 5–10 mm long, minutely appressed-puberulent; infructescence paniculate, 12–21 cm long, the fertile portion 7–15 cm long, densely appressed-puberulent, pedunculate; peduncle 4.5–8 cm long, densely and minutely appressed-puberulent; legume mustard brown, fusiform-elliptic, subacute at both ends, finely reticulate, 4–6 cm by 1.2–1.8 cm, minutely appressed-puberulent; flowers not seen.

This taxon is characterized by the minutely dense puberulence which occurs on the infructescence, lower leaf surface, rachis and petioles of the leaves, and the caudate-tipped leaflets.

LINACEAE

**Ochthocosmus berryi** Steyermark., sp. nov. TYPE: Venezuela. Amazonas: tall forest along stream, NE shoulder at base of bluff, Cerro Aratitoyope, 90 km SW of Ocamo, 1,000 m, 26 Feb. 1984, *Steyermark, Berry & Delascio 130228* (holotype, VEN).

Arbor 8-metralis; foliis obovatis apice rotundatis retusis basi cuneatim angustatis 3.5–6.5 cm × 2–4 cm, marginibus utroque latere obsolete 6–7-crenatis; inflorescentiis multifloris folio brevioribus epedunculatis vel pedunculatis usque 5 mm longis; sepalis inaequalibus quattuor 0.8–1 mm × 0.5 mm glanduliferis, sepalo quinto longiore 1.2–2.5 × 0.5–0.6 mm glandulifero; petalis late obovatis 3.5 mm × 1.8 mm; filamentis 2–3.5 mm longis.

Tree 8 m tall. Leaves obovate, subcoriaceous, pale green below, rounded at the retuse apex,

cuneately narrowed at base, 3.5–6.5 cm by 2–4 cm, dull green above with inconspicuous nervation, faintly nerved below, obscurely 6–7-crenately toothed along each margin; petioles 3–5 mm long. Inflorescence paniculate, many-flowered, the flowering portion 2.5–3 cm long, 2–3 cm broad, shorter than the leaves, epedunculate or the peduncle to 5 mm long, flowers white. Pedicels 1.2–2.5 cm long. Sepals unequal, 4 of them ligulate-oblong, rounded at apex, 0.8–1 mm by 0.5 mm, prominently glandular on the thickened margins; fifth sepal longer, ligulate-oblong, 1.2–2.5 mm by 0.5–0.6 mm, eglandular. Petals broadly obovate, rounded at apex, 3.5 mm by 1.8 mm. Filaments 2–3.5 mm long. Style 1.4–1.8 mm long, usually longer than the ovary. Ovary 1.1 mm long.

This species is related to *O. floribundus* Gleason, from which it differs in the shorter inflorescence, shorter than the leaves, inflorescence epedunculate or at most to 5 mm in length, the eglandular, elongated fifth sepal contrasting with the other four shorter glandular sepals, which are more prominently thickened and more abundantly glandular than in *O. floribundus*, and the relatively smaller and more broadly obovate petals.

The other species known from Territorio Federal Amazonas of Venezuela, *O. multiflorus* Ducke, together with its variations, is a small ligneous plant of the savannas with entire or nearly entire leaf margins. *Ochthocosmus berryi* is a tree in a woodland habitat.

#### RUTACEAE

***Rutaneblina* Steyererm. & Luteyn, gen. nov. TYPE: *R. pusilla* Steyererm. & Luteyn.**

Inflorescentia terminalis multiflora subsessilis subcapitata. Flores actinomorphi hermaphroditi. Sepala 5 imbricata libera dorsaliter carinata inaequalia, exterioribus majoribus, petala 5 libera imbricata dorsaliter oblique carinata. Stamina 5, antheris basifixis, filamentis basi intus glanduliferis. Discus obsoletus. Pistillum sessile, stigmatum capitato obscure 5-lobato, stylo simplici. Ovarium subglobosum, carpellis 5 basi connatis supra medium liberis unilocularibus. Ovulum in quoque locule solitarium. Folliculi 4–5 divaricati glabri, folia simplicia 3-verticillata. Fruticulus. Folia ternata, integerrima vel obscure crenulata, nervis lateralibus nullis.

***Rutaneblina pusilla* Steyererm. & Luteyn, sp. nov. TYPE: Venezuela. Amazonas: altiplanicie en**

la cumbre del brazo noroccidental, Cerro de la Neblina, al norte del campamento base a lo largo del Río Mawarinuma, afluente del Río Baria, 0°52–53'N, 66°05'W, 1,880 m, 8 Feb. 1984, *Steyermark 129798* (holotype, VEN). PARATYPE: same locality and date, *Luteyn 9451* (NY, VEN). Figure 6.

Frutex pusillus 0.7–1 metralis; foliis 3-verticillatis breviter petiolatis, obovatis apice truncatis vel subtruncatis mucronulatis basi acutis vel subacutis 1–2.5 cm longis 1–1.5 cm latis glabris; petiolis 1–2 mm longis; inflorescentia terminali 1.1 cm longa 1.3–1.5 cm diam. bracteata; bracteis lanceolatis 4–5 mm longis 1.2–1.5 mm latis; pedicellis 2 mm longis; bracteolis ovato-deltaideis acutis 1 mm longis; sepalis in fructu persistentibus non auctis, exterioribus ovato-triangularibus subobtusis acutis 2.1 mm × 1–1.5 mm, interioribus lanceolatis 2 mm × 1 mm, marginibus subscariosis; petalis elliptico-oblancoelatis subacutis 3–3.5 mm longis 1.1–1.5 mm latis intus utroque latere 4–6 nervis instructis; staminibus 2 mm longis, filamentis 1.4–1.5 mm longis glabris, antheris deltoideo-ovoideis apice obtuse apiculatis 0.7 mm longis; pistillo 1.5 mm longo, stylo 0.3 mm longo, ovario 1 mm longo 1.2 mm lato; folliculis rugulosis punctatis oblongis 7 mm longis 5 mm latis.

Low shrub 0.7–1 m tall with irregularly curving branches. Leaves 3-verticillate, with fragrance of bitter orange, coriaceous, rich green both sides with pale yellow-green midrib above, obovate, truncate or subtruncate at apex with mucro 0.5 mm long, narrowed to an acute or subacute base, 1–2.5 cm by 1–1.5 cm, glabrous, entire or obscurely crenulate, midrib sulcate above, elevated below, lateral nerves absent, tertiary venation minutely reticulate on both surfaces; petiole 1–2 mm long; inflorescence 1.1 cm long, 1.3–1.5 cm diam., subtended at base by a few bracts; bracts coriaceous, lanceolate, acute, carinate, 4–5 mm long, 1.2–1.5 mm wide; flowers subtended by bracteoles ovate-deltoid, acute, 1 mm long; pedicels 2 mm long, 1.5 mm wide; sepals dull lavender, unequal, the outer ovate-triangular, 2.1 mm by 1.4–1.5 mm, the inner lanceolate, 2 mm by 1 mm, subobtusely acute, dorsally carinate, margins slightly paler subscariosus, persistent and not enlarged in fruit; petals creamy white, elliptic-oblancoelate, subacute, dorsally carinate, 3–3.5 mm long, 1.1–1.5 mm wide, the inner surface with a broad median portion and 4–6 lateral branches; stamens 2 mm long, anthers deltoid-ovoid, bluntly apiculate at apex, bilobed basally, filaments 1.4–1.5 mm long, 0.4 mm wide, glabrous with glandular patches at

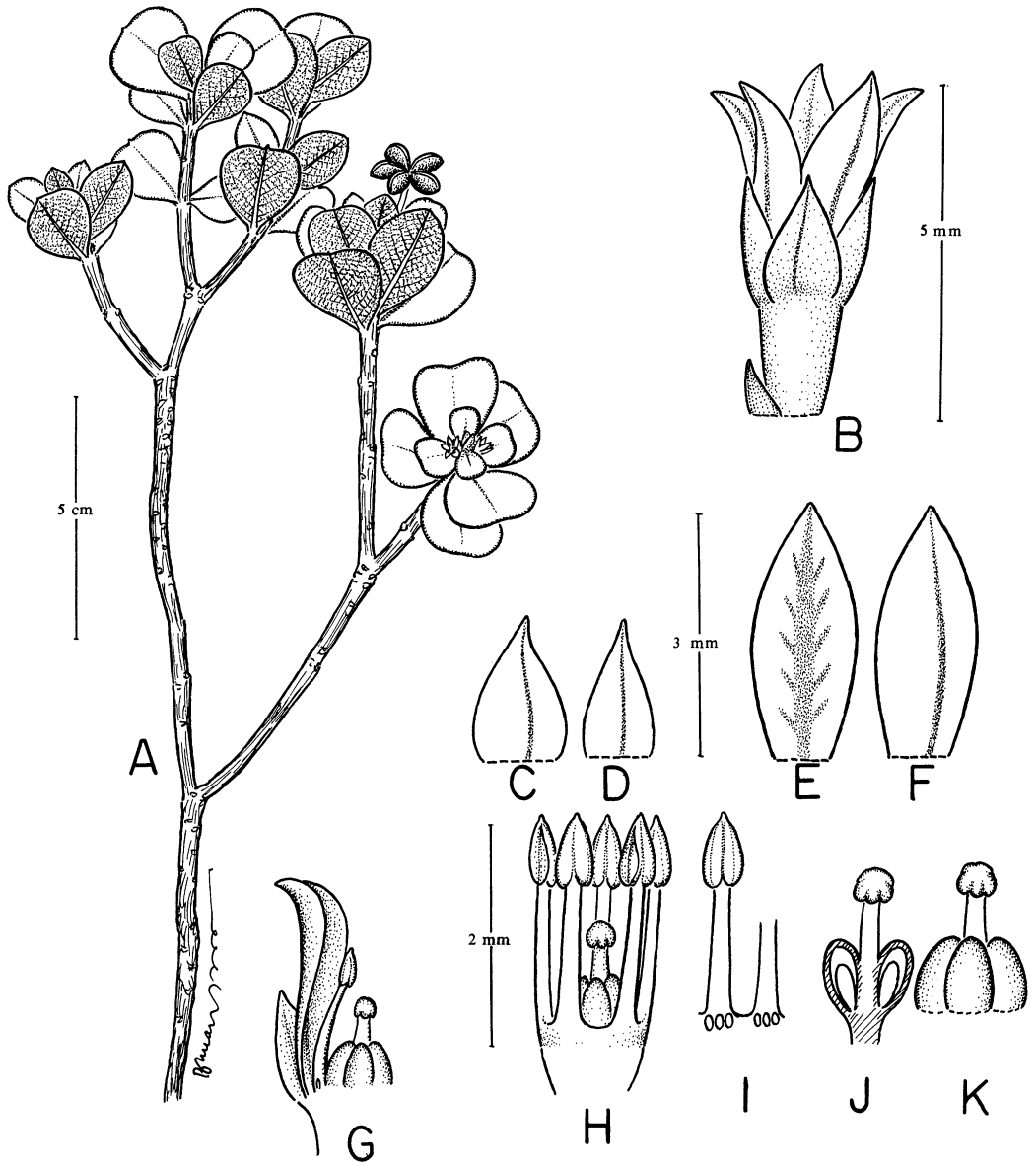


FIGURE 6. *Rutaneblina pusilla*.—A. Habit.—B. Flower, natural position.—C. Outer sepal, dorsal view.—D. Inner sepal, dorsal view.—E. Petal, ventral view.—F. Petal, dorsal view.—G. Portion of flower, showing relation of parts.—H. Stamens and pistil, with petals and sepals removed.—I. Portion of androecium, with glandular dark patches at base of filaments within.—J. Vertical section through gynoecium.—K. Gynoecium, natural position.

base within; gynoecium sessile, 1.5 mm long; stigma capitate, obscurely 5-lobulate, rounded, 0.3 mm long; style simple, 0.3 mm long; ovary subglobose, 1 mm high, 1.2 mm wide; fruit brown, the 4–5 divaricate follicles 7 mm long, 5 mm wide, glabrous, rugulose within.

This low shrub is common on the drier rocky elevation near the periphery of the summit, but also occurs in the slightly depressed and wetter valley portion. The inner portion of the cortex is orange and the leaves have a fragrance reminiscent of bitter orange.

The new genus cannot be placed generically in the treatment by Cowan (1967) of the Rutaceae of the Guayana Highland. Nor does it fit into any of the genera treated by Bentham and Hooker (1862) and by Engler (in Engler & Prantl, 1896). The genus is characterized by its combination of simple 3-verticillate leaves, 5 stamens equal in number to the imbricate sepals and petals, the free sepals and petals, the slightly unequal obliquely carinate sepals, the uniovulate 4–5 carpels connate below and free above, the follicular dehiscent spreading fruits, and the apparent absence of a disk which is represented apparently by only gland-like dark areas at the base of the filaments. The relationship of the genus is obscure and at this time not apparent.

**Raveniopsis cowaniana** Steyererm. & Luteyn, sp. nov. TYPE: Venezuela. Río Negro: Cerro de la Neblina, altiplanicie en la cumbre del brazo noroccidental, al norte del campamento base a lo largo del Río Mawarinuma, afluente del Río Baria, 0°52–53'N, 66°5'W, 1,880 m, 7–8 Feb. 1984, *Luteyn 9413* (holotype, VEN; isotype, NY). PARATYPE: same locality and date, *Steyermark 129814* (VEN).

Planta sublignea, caule simplici 0.3 m alto apicem versus dense pubescenti; foliis digitate trifoliatis, foliis oblanceolatis 1.5–3.8 cm × 0.5–1.1 cm supra glabris valde sulcatinervis subtus dense lanuginosis pilis simplicibus munitis; inflorescentia coarctata subsessili 1–2 cm longa, pedunculo 1–5 mm longo dense pubescenti; corolla rubra 15 mm longa (tubo 7 mm × 2–3 mm sparse pilosa pilis simplicibus reflexis munito; lobis duobus anguste lanceolatis 4 mm × 1–1.5 mm; lobis tribus oblongo-vel obovato-ellipticis 5 mm × 3–3.5 mm extus sparse pubescentibus pilis simplicibus reflexis munitis).

Subligneous, simple-stemmed plant, 0.3 m tall; leaves revolute, dark green above with sulcate nerves, buff-woolly below, digitately trifoliate, shortly petiolate to subsessile; leaflets oblanceolate, subacute to obtusely acute or mucronate at apex, sensibly narrowed to the base, 1.5–3.8 cm by 0.5–1.1 cm, glabrous, strongly sulcate-nerved and strongly punctate above, densely buff woolly below; petiole well-developed; inflorescence terminal, subterminal, or axillary, subsessile or shortly pedunculate, congested, cincinnate, unilaterally racemose, 1–2 cm long; peduncle 1–5 mm long, densely woolly pubescent; flowers sessile or pedicellate to 2 mm long; calyx lobes 5 unequal, imbricate, densely buff-olive pubescent, the outer two lobes broadly lanceolate, 9–11 mm by 3–4 mm, the interior 3 lobes narrowly

lanceolate, subacute, 5 mm by 1.5–2 mm; calyx tube 1–2 m long; corolla red, 15 mm long, zygomorphic with 2 narrower and 3 broader lobes, tube cylindric, 7 mm by 3 mm except 2 mm wide at base, sparsely pilose with simple reflexed hairs, the 2 narrower lobes narrowly lanceolate, 4 mm by 1–1.5 mm, the 3 broader lobes oblong- or obovate-elliptic, subacute, 5 mm by 3–3.5 mm, pubescent without, exterior pubescent with simple, sparse, reflexed hairs, interior of corolla tube 5-ridged with thickened pubescent ridges; fertile anthers lanceolate, narrowed to apex, 2 mm by 0.6 mm, filaments 0.6 m long; ovary depressed-subglobose, 1.5 mm long; style 10 mm long; stigma capitate.

The only other known trifoliate species of *Raveniopsis* are *R. trifoliolata* Cowan of Cerro de la Neblina and *R. stelligera* Cowan of Cerro Yutaje. The new taxon here described from Cerro de la Neblina differs from *R. stelligera* in the simple pubescence with much longer corollas and petioles, and from *R. trifoliolata* in the congested, short, densely pubescent inflorescence, smaller, narrower leaves with very short or even sessile petioles, deeply sulcate upper leaf surface, and densely pubescent lower leaf surfaces and upper portion of the stems.

The species commemorates the name of Dr. Richard S. Cowan, for his excellent work on the genus *Raveniopsis* and other genera of Rutaceae of the Guayana Highland.

NOTE ON *RAVENIOPSIS FRATERNA*  
AND *R. SERICEA*

*Raveniopsis fraterna* Cowan is distinguished from *R. sericea* Cowan on the basis of its longer corolla tube (9 mm), larger calyx (5.5 mm by 3 mm), together with its tomentose branchlets and lower leaf surface, as contrasted with the smaller corolla tube (5.5 mm), smaller calyx (3–3.5 mm by 2–3 mm), together with the sericeous pubescence of stems and lower leaf surface of *R. sericea*. Cowan (in Maguire et al., 1960: 32) states that paratypes of *R. sericea* (*Steyermark & Wurdack 811* and *Steyermark 75905*) do not conform to the uniform type of tomentum shown by the type collection (*Steyermark & Wurdack 646*) from Chimantá. The collections of *Steyermark et al. 128764* and *128902* from Chimantá Massif have the smaller measurements of *R. sericea*, but it is doubtful if the two taxa can be maintained separately as species. It is probable that only one taxon can be recognized which var-

ies in size of calyx and corolla and type of tomentum.

EUPHORBIACEAE

**Phyllanthus jablonskianus** Steyererm. & Luteyn, sp. nov. TYPE: Venezuela. Amazonas: Río Negro, Cerro de la Neblina, altiplanicie en la cumbre del brazo noroccidental, al N del campamento base a lo largo del Río Mararinuma, afluente del Río Baria, 0°52'–53'N, 66°5'W, 1,880 m, 8 Feb. 1984, *Steyermark 129816* (holotype, VEN; isotype, NY). PARATYPE: same locality and data, *Luteyn* (VEN, NY). Figure 7A–E.

Suffrutex 0.2–0.4-metralis; ramificatione phyllanthoidea; foliolis ellipticis, obovati-ellipticis vel anguste oblanceolatis apice rotundatis basi acutis vel obtusis glandulis hypophyllis destitutis 10–25 mm × (3–)6–9 mm supra nitidis; *floribus masculinis*: laciniis calycinis ligulato-oblongis 1.5 mm × 0.8 mm, disco 6 glanduloso, glandulis distinctis, quadrato-oblongis; staminibus 3, antheris 0.2 mm longis thecis globosis, filamentis liberis laciniis calycinis brevioribus; *floribus foemineis*: disco annulari undulato subcaroso, laciniis calycinis 6 suborbicularibus apice rotundatis 1.8–2 mm × 1.2–1.5 mm; stylis 3 ad basin profunde bifidis 1.2 mm longis; capsulis 5–6.5 mm diam.

Wiry-stemmed shrub 0.2–0.4 m tall; leaflets elliptic to obovate-elliptic or narrowly oblanceolate, rounded at apex, narrowed to an acute or obtuse base, 10–25 mm by (3–)6–9 mm, 2–3.5 (rarely 5) times longer than broad, lustrous and prominently impressed-nerved above, less impressed-nerved below, lateral nerves 4–5 each side, sublaminar gland absent; petioles 1–2 mm long; *staminate flowers*: solitary or 2–3-fasciculate, 3.5–3.8 mm diam., 6 segments spreading, ligulate-oblong, 1.5 mm by 0.8 mm; disk with 6 distinct quadrate-oblong glands rounded-truncate at distal end, 0.4 mm by 0.3 mm; 3 anthers 0.2 mm long with globose anther sacs 0.4 mm wide; filaments free, stout, 0.8 mm long, shorter than the perianth segments; pedicels filiform, 2–5 mm long; *pistillate flowers*: 3 mm high, 4 mm across, 6 perianth segments ascending, suborbicular, rounded at apex, 1.8–2 mm by 1.2–1.5 mm; pedicel 8–10 mm long in anthesis, 10–15 mm long in fruit; 3 styles deeply bifid to the base, each style subulate, spreading, 1.2 mm long; ovary subglobose 1.3 mm diam., disk annular, 6-undulate-lobulate, 2 mm across at base of ovary; capsule subglobose, 6 mm high, 5–6.5 mm diam., the style and columella persistent; mature seeds 3-sided, dorsally convex, lateral sides flat, 2.1–2.5 mm long, 1.5–2 mm broad, smooth.

From *P. maguirei* Jabl. of Neblina the new taxon differs in the broader leaflets mainly 2–3.5 times longer than broad which are mainly obovate-elliptic to elliptic, and in the well-developed pistillate disk. From *P. neblinae* Jabl., also of Neblina, this new taxon differs in the much narrower, non-emarginate leaflets which are usually elliptic to obovate-elliptic and lustrous above. In leaflet shape, conspicuous nervation and lustrosity above, it resembles *P. longistylus* Jabl., but lacks the long style and sublaminar gland of that species. Additionally, it differs from *P. strobilaceus* Jabl. in the short anthers with globular anther sacs and free styles bifid to the base.

The species commemorates the name of the dedicated worker on the Euphorbiaceae of the Guayana Highland, Dr. Eugene Jablonski.

**Phyllanthus vacciniifolius** (Müll.-Arg.) Müll.-Arg. subsp. *vinillaensis* Steyererm., subsp. nov. TYPE: Venezuela. Amazonas: Serrania Vinilla, N of Cerro Aratitiope, on sandstone scrub-covered slopes, 440 m, 1 Mar. 1984, *Steyermark, Berry & Delascio 130328* (holotype, VEN). Figure 7F–I.

A *P. vacciniifolius* ramulis deciduis usque 13 cm longis, foliolis 15–30 gerentibus recedit.

Shrub or treelet 2–2.5 m tall, branchlets with 15–30 leaflets, to 13 cm long; leaves broadly obovate, rounded at apex, acutely narrowed to base, 7–12 mm by 5–9 mm, laminal gland on lower side 1.5 mm below apex, lateral nerves 7–10 each side; petiole 1.5 mm long; *staminate flower*: pedicel 1.5 mm long, outer perianth segments 2.1 mm by 1.8 mm, inner ones 2.1 mm by 1 mm; 3 anthers narrowly oblong, long-apiculate, nearly 3 times longer than wide, filaments scarcely developed, disk glands 3 separate, subreniform; *pistillate flower*: pedicel 4.5–5 mm long; outer perianth segments 2.2 mm by 0.8 mm, inner ones 2.5–1.1 mm; ovary continuing into a conic style, 1.5 mm long, style 1 mm long, 6 disk glands 0.4 mm long, separated, shallowly crenulate on summit; capsule subglobose, 3 mm high, 4 mm diam.

This new subspecies is disjunct in its distribution, where it is isolated in the Territorio Federal Amazonas. Typical *P. vacciniifolius* is otherwise known only from the sandstone table mountains and the Gran Sabana of Estado Bolívar in eastern Venezuelan Guayana. The subspecies *vinillaensis* has the same elongate extension of the anthers, the erect short conical style,

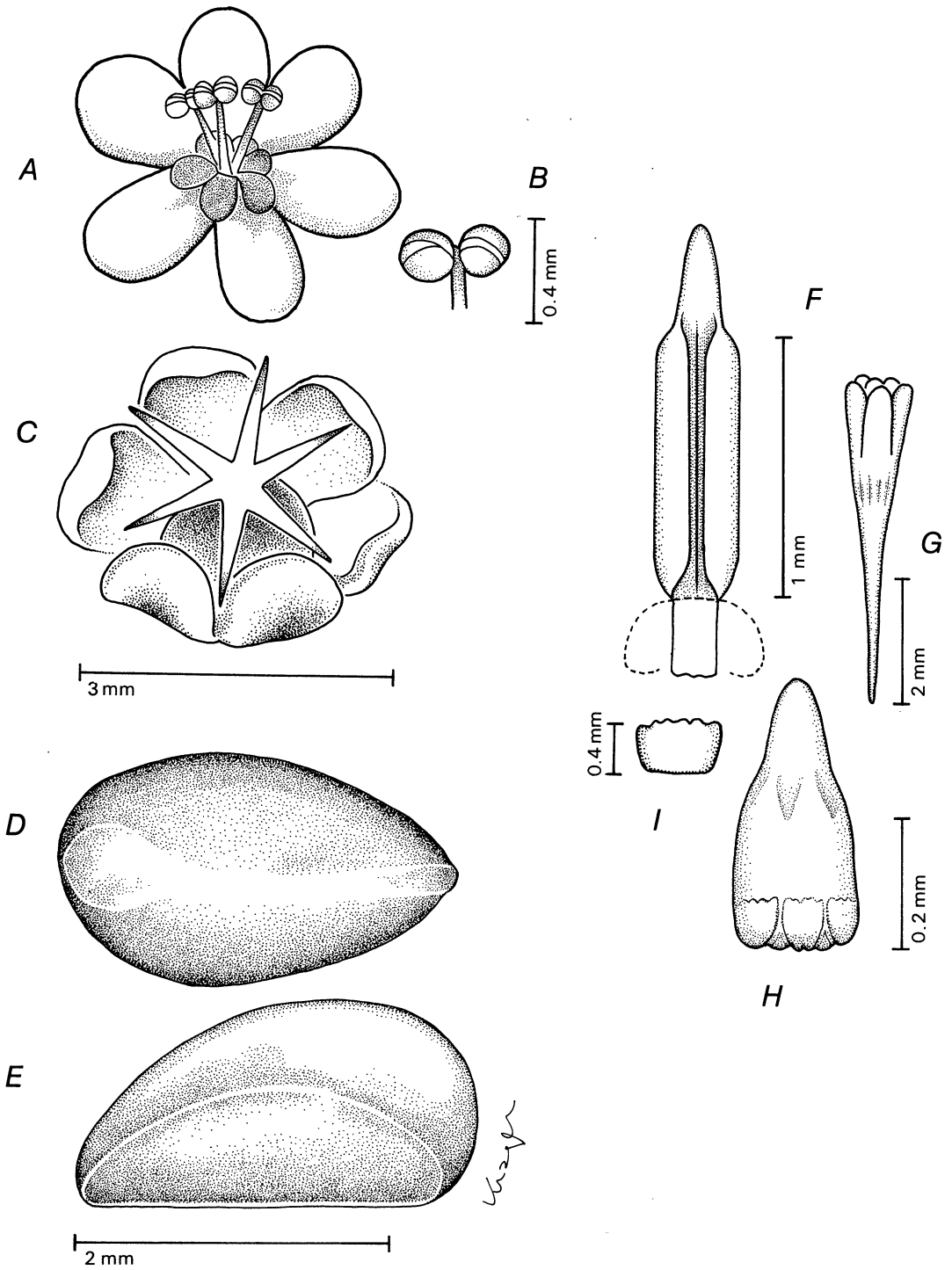


FIGURE 7. *Phyllanthus*. A-E. *P. jablonskianus*.—A. Staminate flower.—B. Stamen.—C. Pistillate flower.—D. Seed, ventral view.—E. Seed, dorsal view. F-I. *P. vacciniifolius* subsp. *vinillaensis*.—F. Stamen with disk gland indicated by dashed lines.—G. Pistillate flower with pedicel.—H. Pistil, showing disk glands in place.—I. One of disk glands.

and the same size and shape of the leaflets of typical *P. vacciniifolius*. It differs in the number of leaflets on the deciduous branchlets, these varying from 15–30, whereas in typical *P. vacciniifolius* the leaflets vary from 5–15(–20), although Jablonski (in Maguire et al., 1967: 89) placed that species in the part of the key having “deciduous branchlets with 5–12 leaflets.” *Phyllanthus strobilaceus* Jabl. has 20–30 leaflets on the deciduous branchlets, thus simulating subsp. *vinillaensis*, but the anthers are rounded at the summit and the style is depressed and 3-lobed instead of erect and conical.

#### OCHNACEAE

**Perissocarpa** Steyermark & Maguire, gen. nov. TYPE: *P. steyermarkii* (Maguire) Steyermark & Maguire.

Flores sessiles vel fere sessiles. Sepala 3 plus minusve persistentia. Petala 5 valde imbricata alba. Stamina 5. Stylus brevis simplex conicus basi latus. Fructus indehiscens lignescens non lobatus 2–3-locularis. Arbor vel frutex.

The name is derived from *perissos* = odd, in the sense of different or extraordinary, and *karpōs* = fruit.

The new genus is related to *Elvasia*, but that genus has the flowers distinctly pedicellate, sepals quickly deciduous in anthesis, yellow petals, more numerous stamens (7–25), an elongated filiform or subulate style, and a distinctly 5-lobed fruit.

*Elvasia steyermarkii* Maguire (1968: 297, fig. 6) was described from flowering material collected from the Peninsula of Paria, Estado Sucre, Venezuela, by Steyermark and Rabe in 1966. Because of its reduced number of stamens, Sastre (pers. comm.) doubted its placement in the genus *Elvasia*. Subsequently, fruiting specimens from the summit of Cerro Sarisarinama and Jaua in the Venezuelan Guayana and from the state of Táchira, Venezuela, were collected between 1974 and 1981, but remained unrecognized as to either family or genus until 1982 and 1983, when newly collected flowering material provided evidence of the conspecificity between the flowering and fruiting specimens.

A study of the specimens known at the present time reveals the existence of at least two species and one subspecies. One of the undescribed species occurs on the summits of some of the sandstone table mountains of the Guayana while a new subspecies, related to the taxon of the

northeastern portion of Venezuela, occurs in the sandstone hills of the state of Táchira in the western Venezuelan Andes.

#### KEY TO THE SPECIES OF *PERISSOCARPA*

1. Inflorescence umbellately or subumbellately branched, epedunculate; apex of the petals subtruncate, broadly rounded, or very slightly emarginate; petiole 1–8 mm long ... *P. umbellifera*
1. Inflorescence paniculately branched, pedunculate; apex of petals deeply emarginate; petiole 5–25 mm long ..... 2
  2. Petals with a narrow sinus at apex, 2 mm wide above the middle, 3.5–4 mm long; plants of northeastern Venezuela ..... *P. steyermarkii* subsp. *steyermarkii*
  2. Petals with a broad sinus at apex, 4–5 mm wide above the middle, 3 mm long; plants of the western portion of the Andes of Venezuela ..... *P. steyermarkii* subsp. *tachirensis*

**Perissocarpa steyermarkii** (Maguire) Steyermark & Maguire, comb. nov. *Elvasia steyermarkii* Maguire, Acta Bot. Venez. 3: 297. fig. 6. 1968.

Tree 8–15 m. Leaf-blades oblong-obovate to broadly elliptic, rounded to acuminate at apex, cuneately narrowed at base, 9–18 cm long, 4–10 cm wide; petioles 1–2.5 cm long. Inflorescence paniculate, in anthesis to 15 cm long, in fructification 15–23 cm long with 6–12 ascending axes 3–8 cm long; peduncle stout in fructification, 3.5–10 cm long, 3–6 mm diam. Flowering axes subspicate, densely flowered, pedicels very short, ca. 1 mm long. Sepals ovate-oblong, suborbicular, or oblong-subpandurate, apex incurved with a bilobate scarious appendage, 3–4 mm long, 1.5–2 mm wide, at first erect, at length reflexed. Petals white, suborbicular- to rhomboid-obovate, broadest above the middle, narrowed to base, emarginate or bilobate at apex with a narrow to broad sinus, strongly incurved-imbricate, convolutely adherent, 3–4 mm long, 2–5 mm wide above the middle. Stamens with filaments 0.3–0.5 mm long, anthers 1.2–2 mm long. Style 0.5–0.8 mm long. Fruit ferruginous-brown, subglobose-pyriform, when mature 1.5–1.6 cm long (high), 1.5–2 cm broad. Seeds 3, trigonous, 1.5 cm long, 1.5 cm broad.

#### KEY TO THE SUBSPECIES OF *PERISSOCARPA STEYERMARKII*

- Petals narrowly emarginate at apex, 2 mm wide above the middle, 3.5–4 mm long, plants of northeastern Venezuela ..... *P. steyermarkii* subsp. *steyermarkii*



Petals broadly emarginate at apex, 4–5 mm wide above the middle, 3 mm long; plants of the western portion of the Andes of Venezuela .....  
 ..... *P. steyermarkii* subsp. *tachirensis*

**Perissocarpa steyermarkii** (Maguire) Steyerm. & Maguire subsp. **steyermarkii**, *Elvasia steyermarkii* Maguire, Acta Bot. Venez. 3: 297. fig. 6. 1968. TYPE: Venezuela. Sucre: Cerro de Humo between Los Pocitos and La Roma, Peninsula de Paria, 700–800 m, 11 Aug. 1966, *Steyermark & Rabe 96342* (holotype, NY; isotype, VEN).

Distribution: evergreen forests of the Peninsula de Paria, Estado Sucre, and Cerro Turumiquire, Estado Monagas, northeastern Venezuela.

*Specimens examined.* VENEZUELA. SUCRE: Cerro de Humo between Los Pocitos and La Roma, Peninsula de Paria, 700–800 m, 11 Aug. 1966, *Steyermark & Rabe 96342* (holotype, NY; isotype, VEN). MONAGAS: Acosta, Serranía del Turumiquire, altiplanicie en la Fila de Montana, cabeceras del Río Negro (afluente del Río Colorado) en el borde sur de la meseta, 10°02'N, 63°52'W, 1,600 m, 12 May 1982, *Huber, Canales & Vasquez 6317* (VEN).

**Perissocarpa steyermarkii** subsp. **tachirensis** Steyerm. & Maguire, subsp. nov. TYPE: Venezuela. Táchira: between dam site and narrow ridge, along Río San Buena, wooded sandstone hills, area of Presa Las Cuevas (Desarrollo Dorados Camburito y Complementario Agua Linda), ca. 10 km E of La Fundación, 7°47'–48'N, 71°46'–47'W, 550–600 m, 21 June 1981, *Steyermark & Manara 125174* (holotype, VEN). Figure 8.

A subsp. *steyermarkii* petalis supra medium 4–5 mm latis apice bilobato sinu lato recedit.

Distribution: sandstone slopes in evergreen forest, foothills of the southwestern-facing slopes of the Andes, 450–1,000 m, Estado Táchira, western Venezuela.

*Specimens examined.* VENEZUELA. TACHIRA: Uribante, forest along road from La Siberia to entrance to Las Cuevas Represa, 10 July 1983, *van der Werff & Gonzalez 5282* (MO, VEN); on Río San Buena, 10 km W of La Fundación around Represa Dorada, 700–1,000 m, 7°47'–48'N, 71°46'–47'W, 13–15 Mar. 1980, *Liesner, Gonzalez & Smith 9655* (MO, VEN); 10 (airline) km ESE of La Fundación, 23 km by road, around Represa Dorada, 0–3 km below dam, 459–650 m, 7°47'N, 71°46'–47'W, 29 Apr. 1981, *Liesner & Guariglia 11577* (MO, VEN), 600–900 m, 30 Apr. 1981, *Liesner & Guariglia 11593* (MO, VEN), 600–1,000 m, 10–13 Mar. 1981, *Liesner & Gonzalez 10249* (MO,

VEN); between dam site and narrow ridge, along Río San Buena, area of Presa Las Cuevas, ca. 10 km E of La Fundación, 7°47'–48'N, 71°46'–47'W, 550–600 m, 21 June 1981, *Steyermark & Manara 125174* (holotype, VEN).

**Perissocarpa umbellifera** Steyerm. & Maguire, sp. nov. TYPE: Venezuela. Amazonas: Cerro Duida, between rim and camp, occasional along ridge trail from Culebra, Río Cunucunuma, 1,400 m, 18 Nov. 1950, *Maguire, Cowan & Wurdack 29529* (holotype, VEN; isotype, NY).

Frutex 1.5–3-metralis; foliis obovato-ellipticis, elliptico-oblongis vel late oblongis apice rotundatis truncatis vel obtusis mucronulatis basi cuneatim acutis vel obtusis 2.5–11 cm longis 1.8–6 cm latis; petiolis 1–8 mm longis; inflorescentia sessili subumbellatim ramosa expedunculata 2–6.5 cm longa, axibus 3–9 valde adscendentibus 2–6 cm longis; floribus brevipedicellatis, pedicellis 0.5 mm longis; sepalis suborbiculari-ovatis 2 mm longis; petalis flabellatis apice nihil vel leviter emarginatis 2.5 mm longis apice 2.5–3 mm latis; fructu subgloboso-pyriformi 6–11 mm longo 8–11 mm lato (immature).

Shrub 1.5–3 m tall. Leaves alternate, opposite, or pseudo-verticillate, elliptic-oblong, broadly elliptic to subovate-oblong, rounded, truncate, or obtuse at the mucronulate apex, cuneately acute to obtuse at base, 2.5–11 cm long, 1.8–6 cm wide, midrib subelevated below, finely impressed above; petioles 1–8 mm long. Inflorescence terminal, sessile, epedunculate, subumbellately branched with 3–9 strongly ascending, candelabra-like axes 2–6 cm long, 2–5 mm thick, the rachis 1–2 mm thick, closely flowered from base to apex. Floral bracts triangular-lanceolate to triangular-ovate, acute to long acuminate, 1.5–2 mm long, 0.5–1.2 mm wide. Pedicels 0.5 mm long. Sepals suborbicular, rounded, incurved, eventually reflexed, 1.5 mm long, 1.3–1.5 mm wide. Petals white, flabellate, scarcely or not at all emarginate at apex, 2.5 mm long, 2.5 mm wide at apex. Fruit brown, rugulose, immature, subglobose-pyriform, 6–11 mm long, 6–11 mm broad.

Distribution: dwarf forest and rocky openings on sandstone mesetas of the Venezuelan Guayana in Territorio Federal Amazonas (Sipapo, Duida) and Estado Bolívar (Sarisarinama) at altitudes of 1,250–1,400 m.

*Specimens examined.* VENEZUELA. BOLÍVAR: Certo Sarisariñama, cumbre, porción noreste, 4°41'40"N, 64°13'20"W, 1,410 m, 10 Feb. 1974, *Steyermark, Carreño & Brewer-Carías 108902* (VEN), 14 Feb. 1981,

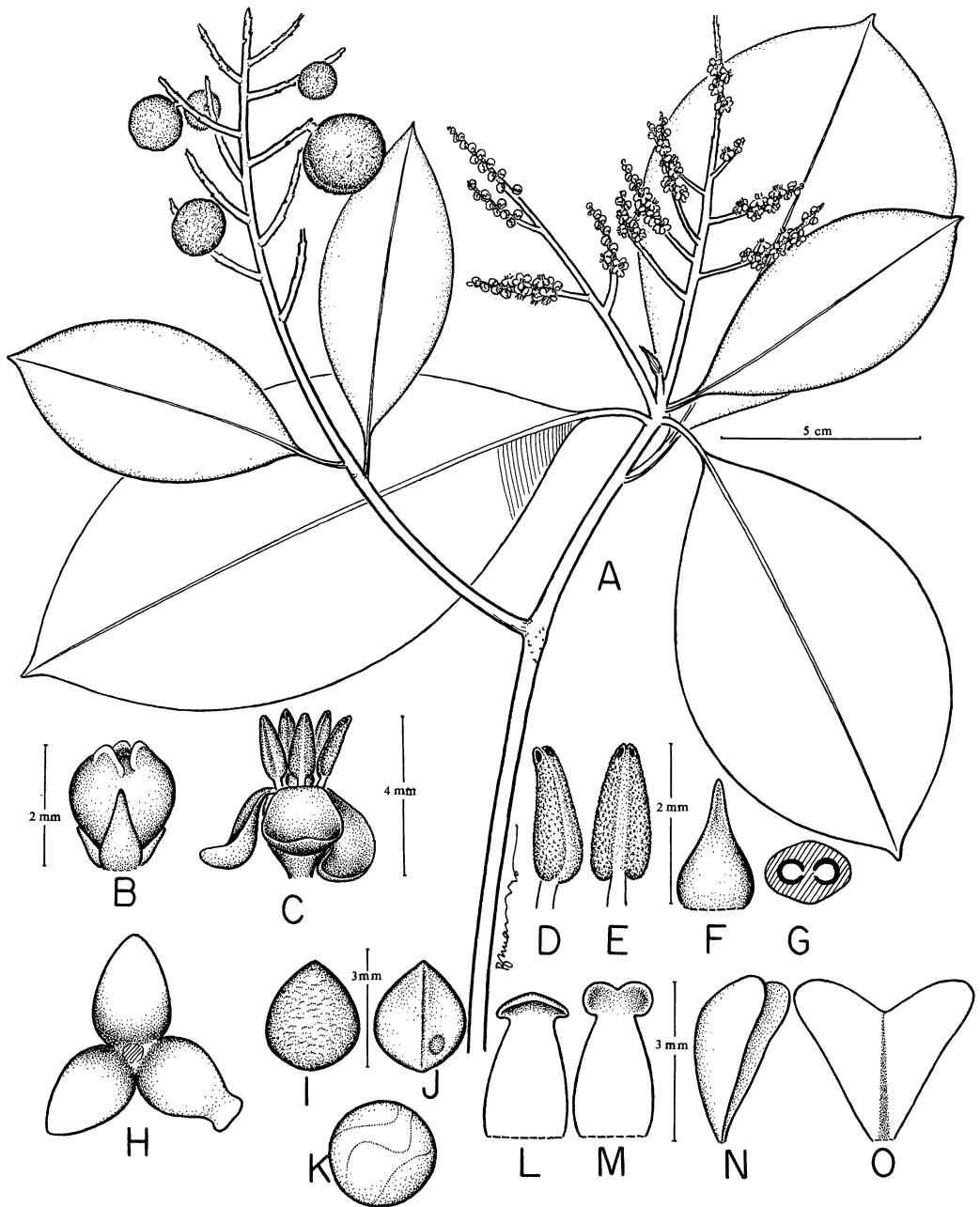


FIGURE 8. *Perissocarpa steyermarkii* subsp. *tachirensis*.—A. Habit of branch with inflorescence and infructescence.—B. Flower in late bud.—C. Flower, late anthesis, natural position.—D, E. Stamen.—F. Pistil.—G. Cross-section of ovary.—H. Calyx, dorsal view.—I. Seed, dorsal view.—J. Seed, ventral view.—K. Corolla in bud.—L. Calyx lobe, interior view showing involute appendage.—M. Calyx lobe, exterior view.—N. Petal, lateral view.—O. Petal, ventral view.

*Steyermark, Liesner & Brewer-Carias 124300* (VEN). AMAZONAS: Cerro Sipapo (Paraque), lower Caño Negro, 1,400 m, 11 Jan. 1949, *Maguire & Politi 28091-A* (NY, VEN); Cerro Duida, between rim and camp, occasional along ridge trail from Culebra, Río Cunucunuma, 1,400 m, 18 Nov. 1950, *Maguire, Cowan & Wurdack 29529* (holotype, VEN; isotype, NY); arriba de la Culebra, 1,250 m, Oct. 1983, *Colonnello 738* (VEN).

***Tyleria breweriana* Steyererm., sp. nov. TYPE:**

Venezuela. Bolívar: Sucre, Meseta de Jaua, cumbre, sección oriental-central, afloramientos de piedra arenisca en sitios expuestos con vegetación herbácea y arbustos achaparrados, 4°35'N, 64°15'W, 2,020 m, 14 Feb. 1981, *Steyermark, Brewer-Carías & Liesner 124326* (holotype, VEN). Figure 9.

Frutex 1–1.5 m altus glaberrimus, ramis nigris 3–3.5 mm diam.; foliis petiolatis, petiolis 1.5–2 cm longis 1 mm latis; stipulis membranaceis lineari-lanceolatis aristatis 2.5 cm longis 4 mm latis integris valde convolutis caducis; laminis late ellipticis longiaristatis, arista 4–8 mm longa, basi cuneatim decurrentibus 4–5 cm longis 1.7–2.2 cm latis, marginibus minute con-

fertimque adpresso-serrulatis glabris; inflorescentia erecta, 5-flora 3 cm longa; calyce quincunciali, sepalis 5, ovato-oblongis apice obtusis vel rotundatis 7 mm longis 3–4 mm latis; petalis albis ad centrum flavis 5 obovato-oblongis 15 mm longis 10 mm latis.

*Tyleria breweriana* belongs to the aristate-leaved group of species represented by *T. aristata*, *T. pendula*, and *T. tremuloidea* of Cerro de la Neblina of Venezuela and *T. silvana* of adjacent Brazilian Serra Pirapucú. It appears most closely related to *T. pendula* Maguire & Wurd., from which it differs in its erect, few-flowered, shorter inflorescence, shorter, broadly elliptic leaf blades, and shorter petioles.

This is the second species of *Tyleria* to be recorded from the Meseta de Jaua, the first being *T. phelpsiana* Maguire & Steyererm. (in Steyererm et al., 1972: 868. fig. 9), a species of quite different leaf morphology of the group related to *T. floribunda* and *T. spathulata* of Cerro Duida.

The following key is presented to indicate the position of *T. breweriana* with respect to the other known members of the aristate-leaved group.

KEY TO THE SPECIES OF *TYLERIA*

1. Leaves sessile; petals 15–20 cm long, rose or pink ..... *T. spectabilis*
1. Leaves petiolate; petals 4 cm or less long, white or white with yellow at base ..... 2
2. Sepals acute to subacute at apex ..... 3
3. Sepals glandular-scarious at apex; arista of leaf blade 16–22 mm long ..... *T. silvana*
3. Sepals non-glandular at apex; arista of leaf-blade 5–8 mm long ..... 4
4. Flowers solitary; petals 1.6–1.8 cm long, 0.8–1 cm wide; petiole 3–5 mm long; pedicels 7–9 mm long ..... *T. aristata*
4. Flowers 2–4, racemose; petals 2.5–4 cm long, 1.8–3 cm wide; petiole 1.2–1.8 cm long; pedicels 12–15 mm long ..... *T. tremuloidea*
2. Sepals obtuse to rounded at apex ..... 5
5. Inflorescence pendulous, many-flowered, 10–15 cm long; leaf blades 7–11 cm long, oblanceolate; petiole 2–4 cm long ..... *T. pendula*
5. Inflorescence erect, 5-flowered, 3 cm long; leaf blades 4–5 cm long, broadly elliptic; petiole 1.5–2 cm long ..... *T. breweriana*

NOTES ON *ADENANTHE BICARPELLATA*

This monotypic genus, endemic to the summit of the Chimantá Massif, Estado Bolívar, of the Venezuelan Guayana, shows quantitative variation in both vegetative and floral characters. A recent collection from the summit of the Macizo de Chimantá (*Steyermark, Hüber & Carreño 128637*) manifests maximum extremes of measurements. The plants noted here grew in dense thickets of moist forest along a small stream on Amuri-tepui, one of the sectors of Chimantá Massif. In such forested habitats plants of *Ad-*

*enanthe* attain a height of 5 m as contrasted with a usual height of 1–2 m. Correlated with the greater size of the plants are larger leaves, stipules, and fruits, as well as an increase in the relative number of flowers with a greater degree of branching of the inflorescence and with the lateral axes branched from the base; normally the inflorescence is unbranched.

These quantitative differences may be appreciated when one compares the measurements taken from collections originating from the usual open or savanna-like habitats of the species on Chimantá Massif with those from the wet forests.

*Open or savanna-like habitats*

Petals 1.5 cm by 0.8–1 cm  
 Sepals 5–8 mm long  
 Anthers 3.5–4 mm long  
 Stipules 8–10 mm by 7 mm  
 Leaves 2.5–4.5 cm by 1–2 cm  
 Inflorescence 5–15 cm by 5–6 cm  
 Inflorescence bears 7–10 lateral axes  
 Lateral axes usually unbranched  
 Inflorescence 17–22-flowered  
 Capsule 8–14 mm

*Collection of Steyermark, Huber & Carreño 128637 from wet forest*

2.3 cm by 1.3 cm  
 8–12 mm long  
 4–6 mm long  
 20–27 mm by 8–15 mm  
 10–13 cm by 3–4 cm  
 15–22.5 cm by 7 cm  
 Inflorescence bears 10–12 lateral axes  
 Lateral axes branched  
 Inflorescence up to 50-flowered  
 Capsule 16–18 mm long

Such differences, at first glance, might indicate that the collection of *Steyermark, Huber & Carreño 128637* merits some taxonomic recognition. However, most of these apparent differences break down when other specimens originally included in the type description of this taxon (Maguire et al., 1961, fig. 27: A, B) are examined. In only two characters, i.e., the much larger stipules and the larger capsules, does the *Steyermark et al. 128637* collection manifest any noteworthy contrast. Such contrasts may be the result of development in the more shaded and moister forest habitat instead of the more exposed, often drier ambience under which *A. bicarpellata* usually occurs. Pending future observations and a more intensive study of the different habitats in which this species occurs, no separate taxonomic category is being established at present for this unusually robust collection of *Adenanthe*.

## THEACEAE (BONNETIACEAE)

***Acopanea* Steyermark, gen. nov. TYPE: *A. ahogadoi* Steyermark.**

Fruticulus demissus. Folia basalia rosulata ut videtur enervata in sicco multi parallelo-pinnato-nervia. Caulis florifer simplex reptans radicans horizontalis vel leviter decumbens bracteatus. Bractee foliosae subsecundae 1–2 flores gerentes. Flores pedicellati, quoque pedicello terete unibracteato et 3-bracteolis subtendenti. Sepala inaequalia. Stamina numerosa uniseriata, filamentis monadelphis basaliter ad membranam affixis. Ovarium 3-loculare, placentatione axillari gemina, stylo 3-partito. Capsula septicidalis. Semina lineari-oblonga 1–3 anguste alata.

Restricted to Acopán-tepui of the Chimantá Massif of southeastern Venezuelan Guayana.

***Acopanea ahogadoi* Steyermark, sp. nov. TYPE: Venezuela. Bolívar: Piar, Macizo del Chi-**

mantá, sector SEE, altiplanicie suroriental del Acopán-tepui, cabeceras del Río Arauca, praderas húmedas sobre turberas, 5°11'N, 62°00'W, 1,920 m, 14–16 Feb. 1984, *Steyermark, Luteyn & Huber 129924* (holotype, VEN; isotype, NY). PARATYPE: same locality and date, *Huber, Steyermark & Luteyn 9023* (VEN, NY). Figure 10.

Planta pusilla, caule brevi ligneo 2–11 cm longo 1–2 cm crasso apice foliis rosulatis coronato; foliis adscendentibus supra sordido-viridibus subtus glaucifarinosis marginibus pallido-purpureis naviculatis subinvolutis elliptico-lanceolatis vel elliptico-oblancoelatis apice subobtusis vel obtuse acutis basi paulo angustatis, 4.5–8.5 cm longis 0.8–2 cm latis, subtiliter paralleloneuris infra medium pinnatinervatis, praecipue marginibus superioribus minute ciliolato-serrulatis glanduliferis, ciliis caducis; inflorescentia basi vel infra rosulam foliorum exorienti, caule elongato reptanti radicante simplici vel semel ramoso 55–70 cm longo 2 mm lato supra medium vel parte superiore 3–13 bracteis foliosis instructa; bracteis alternis oblanceolatis vel lanceolatis acutis vel subacutis coriaceis 1.5–7 cm distantibus 1–2(–3) cm longis 3–6(–9) mm latis, marginibus minute serrulatis; pedicellis 2–5 mm longis 1.5–2 mm latis; bracteis 3 naviculatis vel dorsaliter obtuse carinatis ligulatis vel lineari-lanceolatis apice abrupte breviter cuspidatis 4.5–5 mm longis 1.2–1.3 mm latis dentibus 1–2-setulosis adscendentibus instructis; sepalis vinaceo-rubris vel marronionis exterioribus duobus ovatis acuminatis 7 mm × 3 mm, ceteris late oblongo-ellipticis 7.5 mm × 3.5–4 mm, fructiferis 20–25 mm × 6–7 mm; petalis albidis roseolisque late flabelliformibus apice late rotundatis vel subtruncatis basin versus angustatis 10–13 mm longis supra medium 11–16 mm latis basi 2 mm latis; staminibus numerosis, filamentis albidis 1.5–2.5 mm longis basaliter ad membranam 1.5 mm longam affixis; antheris aureis suborbicularibus 0.7–0.8 mm longis 0.8 mm latis; ovario anguste ovoideo 3–3.5 mm × 1.5–2 mm glabro; styli ramis albidis divaricate adscendentibus 1.8–2 mm longis; stigmatibus truncatis apice breviter fimbriatis; capsula sublignea subcoriacea ovoidea 2–2.2 cm × 1–1.2 cm, mesocarpio subligneo 2–3 mm crasso; seminibus anguste oblongis una extremitate truncata cetera extremitate acutate obtusa 1.5

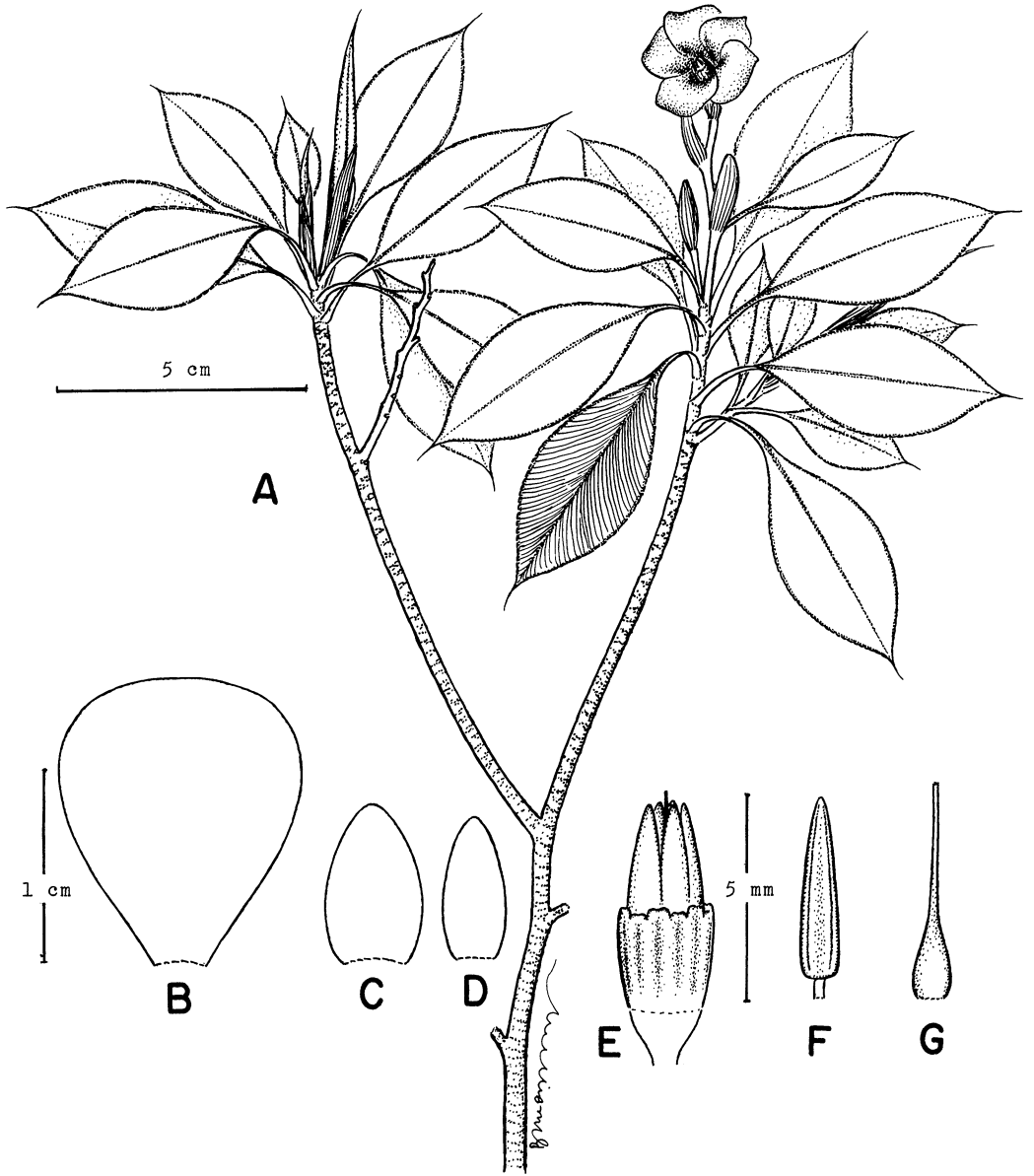


FIGURE 9. *Tyleria breweriana*.—A. Habit of flowering branch.—B. Petal.—C. Outer sepal.—D. Inner sepal.—E. Upper half showing natural position of stamens, lower half showing staminodia united, 5 larger ones alternating with 5 smaller.—F. Stamen.—G. Pistil.

mm × 0.5 mm 1–3 anguste porcatis vel alatis, pagina minute punctata.

This unusual species is dedicated to Antonio Ahogado, who is chief of the planning program for the Electrification of the Caroni river basin of the state of Bolívar in Venezuela, the admin-

istration known as EDELCA. Through the efforts of Mr. Ahogado, the expedition to Acopán-tepui was made possible.

This genus is characterized by the trailing and rooting, unbranched inflorescence on an elongated axis and the 1-seriate monadelphous fila-

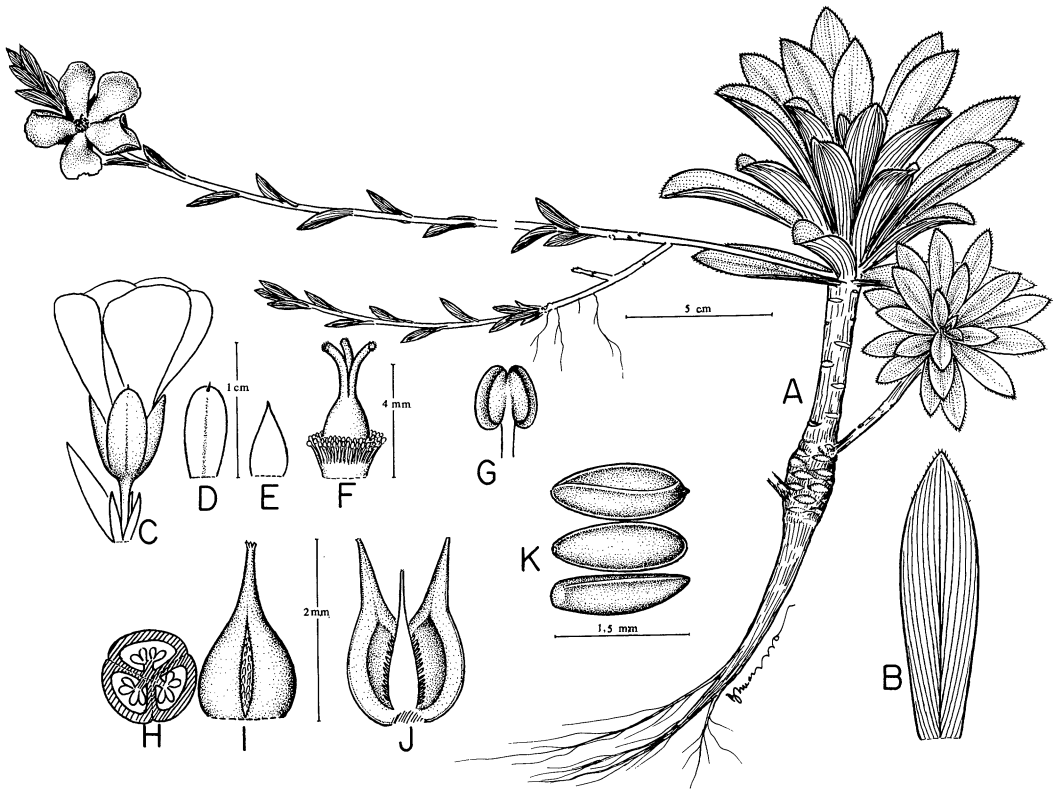


FIGURE 10. *Acopanea ahogadoi*.—A. Habit.—B. Leaf showing parallel and pinnate venation.—C. Flower in natural position, with single bract subtending 3 bracteoles.—D. Inner sepal, dorsally cuspidate.—E. Outer sepal, dorsal view.—F. Androecium and gynoecium.—G. Anther with upper portion of filament.—H. Cross section of ovary.—I. Septicidal capsule at beginning of dehiscence.—J. Showing two valves of the dehiscent capsule with persistent columella and adherent seeds.—K. Seeds, various positions.

ments attached to a basal membrane. The trailing, rooting, unbranched inflorescence is unknown elsewhere in the family and immediately distinguishes the genus from any of its congeners of *Neotatea*, *Neogleasonia*, *Neblinaria*, *Bonnetia*, and *Archytaea*. It is at present known only from the summit of Acopán-tepui, one of the subdivisions of the large Chimantá Massif.

Characters which the new genus shares with its congeners are noted as follows:

*Whorled bracteoles.* These are found in *Neblinaria* and some species of *Bonnetia*.

*Terete peduncle or pedicel.* Present in both *Neogleasonia* and *Neotatea*, and some species of *Bonnetia*.

*Leaf venation.* *Neogleasonia* and *Neblinaria* have a similar type of venation both multiparallel and finely pinnate below the middle.

*Ciliolate upper margins of the leaves.* These

are to be noted in some specimens of *Neogleasonia*.

*Leaf scars.* Located on the thickened stem below the leaf rosette of the new genus, they likewise appear on some specimens of *Neogleasonia*.

The elongate, bracteate, simple, trailing and rooting axis of the inflorescence bearing alternately arranged, 3–13 foliose bracts with 1–2 flowers in each bract is not duplicated elsewhere in the family. The attachment of the 1-seriate monadelphous filaments to a basal membrane may be considered as approaching the pentadelphous stamens of *Archytaea* and sets it apart from *Bonnetia*, *Neblinaria*, *Neotatea*, and *Neogleasonia*. On the other hand, the 3-celled ovary with axile geminate placentation, septicidal capsule with persistent columella, the narrowly winged seeds, numerous stamens and sessile or subsessile, alternate, densely crowded, rosulate

leaves are common to its closest congeners of *Neblinaria*, *Neogleasonia*, *Neotatea*, and *Archytaea*.

NOTES ON *BONNETIA*

In his treatment of *Bonnetia* for the flora of the Guayana Highland Maguire (in Maguire et al., 1972: 139–154) has identified certain collections with *B. wurdackii* Maguire and *B. tepuiensis* Kobuski & Steyererm., which upon further study, supplemented by newly made field observations and collections, reveal the existence of three new species and one variety. They are described below.

***Bonnetia chimantensis*** Steyererm., sp. nov. TYPE: Venezuela. Bolívar: Chimantá Massif, Torono-tepui, savanna below summit of W escarpment, 2,090 m, 9 Feb. 1955, *Steyermark & Wurdack 680* (holotype, VEN; isotypes, F, NY).

Frutex 1-metralis; foliis dense rosulatis sessilibus ellipticis vel oblongo-ellipticis apice acutis basi obtusis 12–27 mm × 5–8 mm; stylis 3-partitis.

Leaves rigidly coriaceous, elliptic or oblong-elliptic, acute at apex, slightly narrowed to an obtuse base, sessile, 12–27 mm by 5–8 mm, pinnately nerved below, enervate above; flowers 3 at the apex, pedicellate; pedicels 4 mm by 1.5 mm; sepals ovate, obtusely acute, 7–8 mm by 4–4.5 mm, dorsally convex; petals white with pink, oblong-obovate, rounded at apex, narrowed to the base, 9–9.5 mm by 4–6 mm; stamens numerous, filaments fascicled, free, 1.5–2 mm long; pistil 5.5 mm long, ovary 3.5 mm by 2.5 mm, styles 3, distinct, 2 mm long.

This species differs from *B. tepuiensis* Kobuski & Steyererm., with which it was identified by Maguire in having the style 3-parted, leaves narrowed to an acute, non-retuse apex, obtuse and not rounded base, leaves smaller, elliptic or oblong-elliptic instead of broadly ovate or oblong, leaves clustered into a conspicuous rosette at apex, and shorter filaments.

***Bonnetia huberiana*** Steyererm., sp. nov. TYPE: Venezuela. Bolívar: Chimantá Massif, Torono-tepui, summit at edge of escarpment in and among zanjones, 2,165–2,180 m, 9 Feb. 1955, *Steyermark & Wurdack 633* (holotype, VEN; isotypes, F, NY, US). PARATYPES: Venezuela. Bolívar: Chimantá

Massif, E section of Chimantá-tepui, 5°18'N, 62°03'W, 2,450–2,500 m, 9 Feb. 1983, *Steyermark, Huber & Carreño 128973* (VEN); Amuri-tepui, 5°10'N, 62°07'W, 3 Feb. 1983, *Steyermark, Huber & Carreño 128559* (VEN); Acopán-tepui, NW portion, highly eroded sandstone strata around zanjones, 1,960 m, 16 Feb. 1984, *Steyermark, Luteyn & Huber 129991* (VEN).

Frutex 1.5–2.5-metralis; foliis concoloribus lineari-oblancoelatis apice subacutis 10–26 mm × 2.5–7 mm, marginibus superioribus crenulato-subspinulosis dentibus duobus minutis adpressis in quoque 1 mm munitis; floribus solitariis; petalis luteis flabelliformibus 8 mm longis supra medium 7 mm latis basi 2 mm; stylis tribus 1.8–2.5 mm longis usque ad basem divisis.

Leaves sessile to subpetiolate 1 mm long, ascending to spreading, coriaceous or subcoriaceous with the margins thinner, concolorous or slightly paler green below, linear-oblancoelate, subacute at apex, gradually narrowed to the base, 10–26 mm long, 2.5–7 mm wide, upper margins subspinulose-crenulate with 2 minute appressed teeth to every 1 mm; flowers solitary, fruiting pedicels terete, 8–16 mm long; bracts sepeloid, closely subtending calyx, oblancoelate; petals yellow, flabelliform, rounded at apex, 7 mm wide above middle, 2 mm wide at base; stamens numerous, multiseriate, filaments free, 0.5–1.5 mm long, anthers subreniform 0.6 mm by 0.2–0.3 mm; styles 3, subulate 1.8–2.5 mm long, divided to the base; capsule 8.5 mm long.

This species was originally identified by Maguire (in Maguire et al., 1972: 148) as *B. wurdackii*. It differs from that species in the smaller petals, narrowly linear-oblancoelate, subacute leaves with subspinulose appressed teeth on the leaf margins. It is related to *B. roraimae* Oliver from which it is distinguished by the yellow petals and concolorous yellow-green leaves. Maguire employed the character of the leaf-margin as one of his criteria in differentiating *B. roraimae* from *B. wurdackii*, those of *B. roraimae* being described as “scario-spinulose” and of *B. wurdackii* as “narrowly scarios, feebly or not at all spinulose.” The leaf margins of *B. roraimae* are more numerous subspinulose-crenulate than those of *B. wurdackii*, the new taxon resembling more those of *B. wurdackii*.

***Bonnetia tepuiensis*** Kobuski & Steyererm. subsp. **minor** Steyererm., subsp. nov. TYPE: Venezuela. Bolívar: Chimantá Massif, *Bonnetia*

thicket along upper part of branch tributary to Caño Mojado, E of N escarpment of Torono-tepui, 1,975 m, 20 Feb. 1955, *Steyermark & Wurdack 990* (holotype, VEN; isotypes, F, NY, US). PARATYPES: Venezuela. Bolívar: Chimantá Massif, Río Tirica above middle falls below summit camp, central section, summit, 1,863 m, 5 Feb. 1955, *Steyermark & Wurdack 481* (F, NY, VEN).

*A. B. tepuiensis* foliis minoribus 1–2 cm longis 0.8–1.4 cm latis nervis subtus desunt supra inconspicuis vel desunt; sepalis dorsaliter carinatis recedit.

Shrub to small tree 1–4 m; leaves spreading, ovate, obtuse, obtusish or retuse at apex, narrowed to a rounded or obtuse base, 1–2 cm long, 0.8–1.4 cm wide, nerves below not evident, faintly impressed above, margins thin-scarious with deciduous dark cilia, the bases of which often persist; flowers solitary, sessile; flowers sessile, solitary; sepals dorsally keeled, the outer broadly ovate, acute, or cucullately incurved, subobtuse ventrally (when viewed dorsally), 8–10 mm by 4–5 mm, the inner sepals suborbicular, abruptly acute, 6 mm by 5 mm; petals white with pink margins, obovate, abruptly mucronate at apex, 10 mm by 4.5–5 mm; stamens fasciculate in separate phalanges, filaments 2–2.5 mm long; pistil 5 mm long, style undivided, 2 mm long.

*Bonnetia tepuiensis* was described (Kobuski, 1948: 399) from specimens collected by Steyermark from the slopes of Carrao-tepui of Estado Bolívar. The leaves on the type (*Steyermark 60871*) and paratype (*60902*) are 2–2.8 cm by 1.5–1.8 cm and the sepals are dorsally convex and not keeled. Subsequent collections show leaves up to 6.5 cm by 3 cm. The lateral nerves and veins of subsp. *tepuiensis* are impressed on both surfaces being inconspicuous to scarcely manifest on the lower surface and more conspicuous on the upper surface.

In the subsp. *minor* the leaves are smaller, and enervate or with nerves scarcely evident on the upper surface and absent or essentially so on the lower surface, while the sepals are dorsally carinate. The known specimens of the subsp. *minor* are restricted to the summit of the Chimantá Massif, whereas subsp. *tepuiensis* occurs farther to the east in the Venezuelan Guayana in Cerro Venamo, Ilu-tepui and Ptari-tepui.

***Bonnetia toronoensis*** Steyer., sp. nov. TYPE: Venezuela. Bolívar: Chimantá Massif, Torono-tepui: dryish open savanna, N-facing

slopes, summit above valley of Caño Mojado, 2,030–2,150 m, 21 Feb. 1955, *Steyermark & Wurdack 1047* (holotype, VEN; isotypes, F, NY, US).

Frutex 1.5–2-metralis; foliis conferte imbricatis oblongo-lanceolatis apice subacutis vel acutis basi leviter angustatis obtuse 1.7–3.1 cm by 0.7–1.3 cm subtus valde pinnatinervatis nervis elevatis supra impressi-nervis, marginibus minute conferteque denticulatis; sepalis ovato-oblongis obtusis vel rotundatis 8–9 mm × 4–5 mm; petalis rosaceis subdeltoideo-obovatis 11–12 longis apicem versus 9–10 mm latis; stylo partim 3-partilo.

Leaves deep green above, pale yellow-green below with wine-red margins, sessile, closely imbricate, spreading to ascending, coriaceous, oblong-lanceolate, subacute to acute at apex, slightly narrowed to an obtuse base, 1.7–3.1 cm by 0.7–1.3 cm, strongly nerved below with fine elevated nerves, less prominently impressed nerved above, lateral nerves 9–12 each side, anastomosing with less prominent tertiary veins, margins finely and closely denticulate with slender setulose teeth ca. 10 to each 5 mm of margin; sepals unequal, ovate-oblong, obtuse or rounded at apex, minutely denticulate around apex, convex dorsally, 8–9 mm by 4–5 mm; petals pink, subdeltoideo-obovate, subtruncate at apex, narrowed to base, 11–12 mm long, 9–10 mm wide near apex, 2.5 mm wide at base; style 3-parted one-third distance from the top.

In the size and close imbrication of the leaves, this species resembles *B. tepuiensis* subsp. *minor* but is distinguished from that subspecies by the 3-parted instead of entire style. The prominently nerved lower leaf surface is also in marked contrast to the enervate lower surface of the leaves of *B. tepuiensis* subsp. *minor*. Additionally, the sepals of *B. toronoensis* are obtuse to rounded at the apex and the leaf apex is subacute to acute.

NOTES ON SOME GENERA OF THE  
THEACEAE (BONNETIACEAE)

In his key to the genera of the Bonnetiaceae, a family which Maguire (in Maguire et al., 1972: 131–165) recognized as distinct from the Theaceae, the distinction is drawn between *Bonnetia* on the one hand, and *Neblinaria*, *Neogleasonia*, and *Neotatea* on the other, primarily on the basis of the leaf venation and secondarily on whether the flowers are solitary and axillary or “solitary or the inflorescence variously compound.” As regards the character of the venation, the leaves are stated to be “pinnately veined” in the case



of *Bonnetia* and "closely parallel-nerved (veined)" for *Neblinaria*, *Neogleasonia*, and *Neotatea*.

In an attempt to apply this distinction to the various taxa within the genera above treated, one encounters difficulties in separating one group from another. For example, *Neotatea* obviously has closely parallel nerves but at the same time they are pinnately arranged. *Bonnetia lanceifolia* has leaves scarcely or inconspicuously nerved, difficult to classify. *Neogleasonia duidae* has finely nerved leaves both pinnately nerved as well as closely parallel and strongly simulate those of *Neotatea longifolia*, the major difference in venation being that the angle of the nerves with respect to the midnerve is greater in *Neogleasonia duidae*. In their original diagnosis Kobuski and Steyermark (in Kobuski, 1948: 411) described the leaves of *Bonnetia duidae* (basonym of *Neogleasonia duidae*) as having the "veins lateralibus numerosis, proximis (ca. 20 per cm), parallelibus, subangulo acutissimo adscendentibus." This character influenced Maguire to transfer this species to the genus *Neogleasonia*, although its placement in that genus he considered at the time to be tentative (Fig. 11).

With respect to the genera *Neblinaria* and *Neogleasonia* having "closely parallel-nerved (veined)" leaves, it should be stressed that although the nerves are closely parallel, yet they emerge at various higher levels from the central zone of the leaf in *Neogleasonia* than in *Neblinaria*, those of the latter genus having nearly all of the parallel nerves arising at or close to the leaf base, whereas in *Neogleasonia* the uppermost nerves, although parallel to the others, arise pinnately and ascend strongly from 1.5–3 cm above the base of the leaf. In *Neogleasonia* a midnerve is more evident on the lower leaf surface, whereas in *Neblinaria* scarcely any midnerve is developed (Fig. 11).

So far as the parallel leaf venation is concerned, there is little to separate *Neblinaria* from *Neogleasonia*. So far as characters used to separate *Neblinaria* from *Neogleasonia* and *Neotatea*, we are informed (Maguire et al., 1972) that in *Neblinaria* the "peduncles" are "strongly ancipitous and exceeding the leaves; bracts conspicuous, whorled, surmounting the peduncle and subtending a short pedicel; pachycaulous treelet," whereas *Neogleasonia* and *Neotatea* differ by having "Peduncles terete, shorter than the subtending leaves; bracts inconspicuous or lacking; nonpachycaulous shrubs or small trees."

The importance attached to the character of the peduncle as terete or ancipital in differentiating the above three genera would appear to be weak and inconsistent in view of the fact that in his key to the species of *Bonnetia* Maguire (in Maguire et al., 1972: 139) divides the various taxa into those with ancipital peduncles as contrasted with ones having terete peduncles. Also, among the species of *Bonnetia*, are some, such as *B. stricta* and *B. cubensis*, with whorled conspicuous bracts as in *Neblinaria*, and others, such as *B. paniculata*, *B. celiae*, and *B. kathleenae*, with inconspicuous bracts as in *Neogleasonia* and *Neotatea*.

Finally, the importance of the pachycaulous character of *Neblinaria* versus the nonpachycaulous *Neogleasonia* and *Neotatea* may be judged as relatively very weak in distinguishing these genera. The thick, corky epidermis, present in a striking degree of development in *Neblinaria*, may be viewed as having evolved as a response to particular environmental conditions. Instances of corky pachycaulous stems are found in many species of plants, such as in the cork oak, *Quercus suber*, *Gnetum schwackeanum*, species of *Cissus*, and many others, but such species are not considered generically distinct because of such a development. In *Neogleasonia wurdackii* a relatively thick or pachycaulous stem is developed, but does not possess the corky nature seen in *Neblinaria*. Actually, the pachycaulous stems of *Neblinaria* do not possess a woody resistance as in a true shrub or tree, but quickly snap off or break when knocked or brushed against. Moreover, those who have collected *Neogleasonia wurdackii* and *Neotatea* testify that their stems may be termed pachycaulous as in *Neblinaria*.

In view of the fact that the various criteria used by Maguire to differentiate *Bonnetia* from *Neblinaria*, *Neogleasonia*, and *Neotatea* intergrade in such characters as leaf venation, ancipital versus terete peduncles, whorled conspicuous bracts contrasted with inconspicuous bracts, and the degree of pachycauly, it is concluded that such criteria cannot be maintained. Moreover, all the above genera share the same basic floral morphology, such as a 3- rarely 4-celled ovary, axile placentation with numerous exalbuminous ovules, geminate placentae, mainly 4-celled anthers, tricolpate pollen, and septicidally dehiscent capsules with a persistent columella. Moreover, vegetatively they all have alternate, exstipulate leaves. Only the lactiferous nature of *Neotatea* may be considered as a strong generic

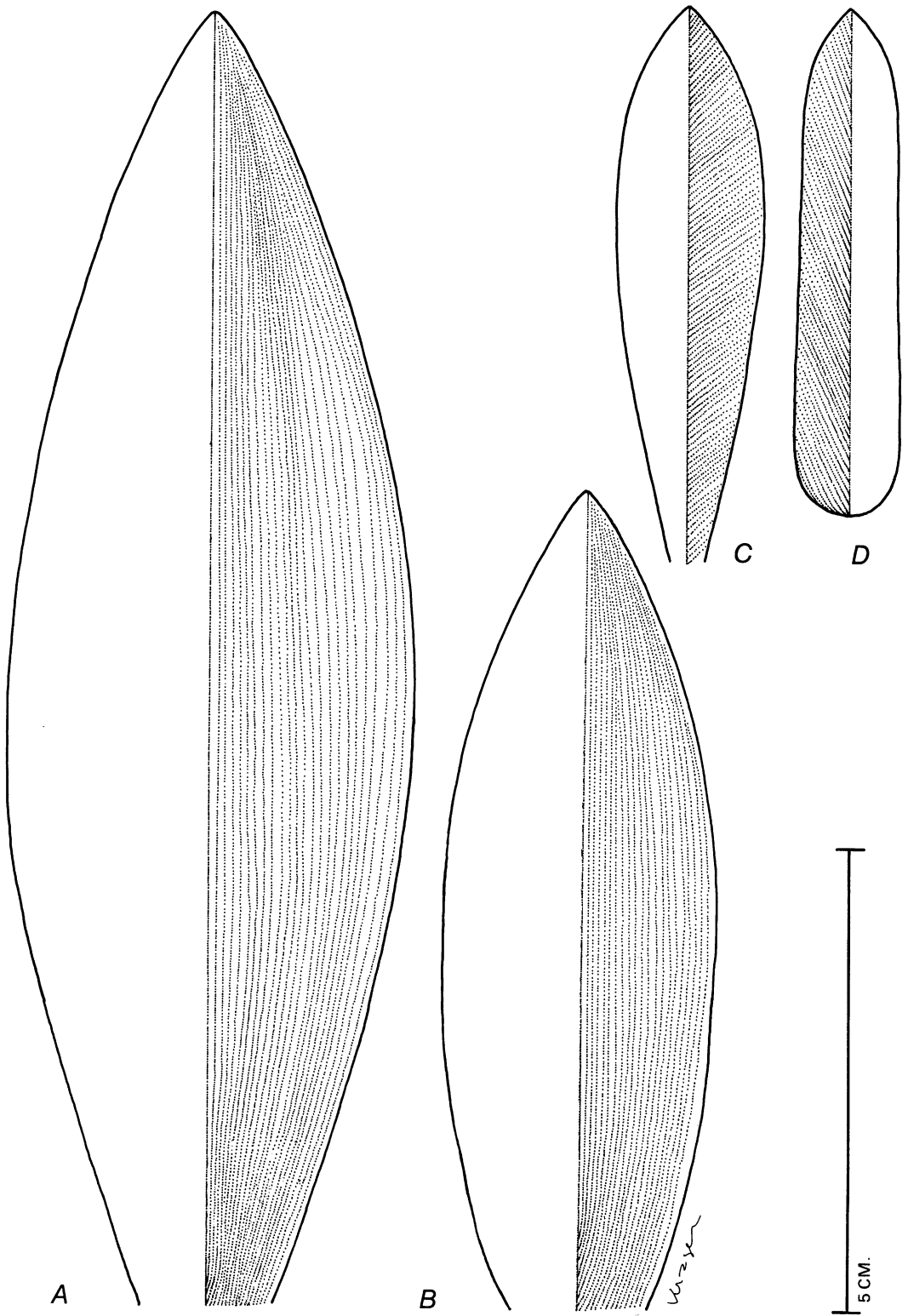


FIGURE 11. Leaf nervation.—A. *Neblinaria celiae*.—B. *Neogleasonia wurdackii*.—C. *Neotatea longifolia*.—D. *Neogleasonia duidae*.

character of sufficient significance to warrant its separation from *Neblinaria*, *Neogleasonia*, and *Bonnetia*. Historically, we may note that many specimens earlier determined by Maguire as pertaining to the genus *Bonnetia* were later transferred by him to *Neogleasonia* and *Neotatea*.

The following nomenclatural changes are necessary as a result of the above conclusions:

***Bonnetia maguireorum*** Steyerl., nom. nov. *Neblinaria celiæ* Maguire, Mem. New York Bot. Gard. 23: 157. 1972 non *Bonnetia celiæ* Maguire, Mem. New York Bot. Gard. 23: 143. 1972.

***Bonnetia multinervia*** (Maguire) Steyerl., comb. nov. *Neogleasonia multinervia* Maguire, Mem. New York Bot. Gard. 23: 158. 1972. *Neogleasonia wurdackii* Maguire, Mem. New York Bot. Gard. 23: 160. 1972 non *Bonnetia wurdackii* Maguire, Mem. New York Bot. Gard. 23: 147. 1972.

It is not possible to retain *Neogleasonia multinervia* and *Neogleasonia wurdackii* as distinct taxa. Both species show ciliation of the leaves, one of the characters used in the separation of the two taxa, the youngest upper ones of a rosette often having ciliation in the upper half or near the apex, whereas the lower margins or older leaves are eciliate. Maguire's description of the leaves of *Neogleasonia multinervia* as "lanceolate" was based on a single collection, as opposed to "ovate, sublanceolate, oblanceolate" for *N. wurdackii* based on many collections. However, comparison of many collections of *N. wurdackii* with the isotype of *N. multinervia* (Maguire 33329) show little, if any, difference in leaf shape; those of *N. wurdackii* have leaves on the older lower portion of the rosette becoming sublanceolate, while the young new leaves of the rosette tend to be more ovate. Another character employed by Maguire for differentiating the two taxa was that of petal length "petals 3 cm long, showy" in *N. wurdackii*. This character is found to intergrade as additional collections from Chimantá Massif have become available.

***Bonnetia neblinensis*** Steyerl., nom. nov. *Neotatea neblinæ* Maguire, Mem. New York Bot. Gard. 23: 163. 1972 non *Bonnetia neblinæ* Maguire, Mem. New York Bot. Gard. 23: 148. fig. 23. 1972.

***Bonnetia colombiana*** (Maguire) Steyerl., comb. nov. *Neotatea colombiana* Maguire, Mem. New York Bot. Gard. 23: 164. 1972.

## MYRTACEAE

***Calycolpus calophyllus*** (H.B.K.) Berg var. ***angustifolius*** Steyerl., var. nov. TYPE: Venezuela. Amazonas: Atabapo, Salto Matsushi, Río Cunucunuma, vía la comunidad de Huachamacari, río arriba de la comunidad de Culebra, 3°43'N, 65°40'W, 220 m, 5 Apr. 1983, *Steyermark & Delascio 129391* (holotype, VEN).

A *C. calophyllus* foliis anguste lanceolato-ellipticis apice attenuato-acuminatis basi cuneatis 5–9 cm longis 1–2.1 cm latis 4–5-plo longioribus quam latioribus recedit.

*Calycolpus calophyllus* is a shrub or small tree of the Territorio Federal Amazonas of Venezuela with leaves ovate to elliptic-ovate, abruptly short-acuminate or obtusely acute at apex, 2–4 cm wide, and generally 1.5–2.5 times longer than broad.

***Myrcia bonnetiasylvestris*** (Steyerl.) Steyerl., comb. nov. *Gomidesia bonnetiasylvestris* Steyerl., Fieldiana, Bot. 28(3): 1016. 1957.

Recent collections from Chimantá Massif indicate that this taxon should be placed more logically in the genus *Myrcia*. A more detailed examination of the anthers indicates a 2-locular instead of 4-locular condition. The calyx lobes were described in the original publication as suborbicular and rounded but a re-examination of the type collection as well as newly collected, more mature specimens, reveals that the calyx lobes are ovate-lanceolate and acute. I am indebted to Dr. Landrum for his observations and kind suggestions.

*Specimens examined.* VENEZUELA. BOLÍVAR: Chimantá Massif, Chimantá-tepui, sector central-noreste, headwaters of Río Chimantá, 5°18'N, 62°09'W, 2,100 m, 27 Jan. 1983, *Steyermark, Huber & Carreño 128117*; Amuri-tepui, 5°10'N, 62°07'W, 1,850 m, 2 Feb. 1983, *Steyermark, Huber & Carreño 128472*; 5°09'N, 62°07'W, 2,170 m, 6 Feb. 1983, *Steyermark, Huber & Carreño 128756*; Chimantá-tepui, E sector, 5°18'N, 62°03'W, 2,450 m, 7 Feb. 1983, *Steyermark, Huber & Carreño 128885*.

## RUBIACEAE

***Aphanocarpus steyermarkii*** (Standley) Steyerl. f. ***glabrior*** Steyerl., f. nov. TYPE: Venezuela. Bolívar: cumbre de Aprada-tepui, 5°22'N, 62°20'W, 2,460–2,500 m, 25 Feb. 1978, *Steyermark, Carreño, McDiarmid & Brewer-Carias 115968* (holotype, VEN).

*A. steyermarkii* foliis subtus glabris vel glabrescentibus recedit.

*Aphanocarpus steyermarkii*, known from the Gran Sabana and sandstone slopes and summits of a few of the eastern tepuis (Auyan-tepui, Chimantá-tepui, Ptari-tepui) of Estado Bolívar, has leaves densely gray-silvery sericeous pubescent on both upper and lower surfaces. The present collection of the species, newly recorded for Aprada-tepui, has the lower leaf surface glabrous or nearly so. Some of the youngest leaves may exhibit traces of pubescence on the midrib or surface, but are generally glabrescent or glabrous. A collection from Auyan-tepui (*Steyermark et al. 116000*) has the lower leaf surface only sparsely to moderately sericeous-pubescent, but not glabrous throughout as in the case of *A. glabrior*.

***Aphanocarpus steyermarkii* f. *elongatus*** Steyermark, f. nov. TYPE: Venezuela. Bolívar: Piar, Macizo de Chimantá, sector centro-noreste del Chimantá-tepui, cabeceras orientales del Cano Chimantá, 5°18'N, 62°09'N, 2,000 m, 26–29 Jan. 1983, *Huber & Steyermark 6945* (holotype, VEN). PARATYPE: same locality and date, *Steyermark, Huber & Carreño 128188* (VEN).

*A. steyermarkii* pedunculis 9–13 cm longis prolongatis duos capitulos discretos gerentibus recedit; involucri bracteis foliosis usque 10–17 mm longis.

Collections of this endemic species of the Venezuelan Guayana generally have simple monocephalous peduncles 1.3–5(–7) cm long. On a recent expedition to the summit of the Chimantá Massif, specimens were obtained with very elongated peduncles measuring 9–13 cm long which exceeded the leaves. Moreover, the specimens with the unusually longer peduncles bear more than one head of flowers with an elongated proliferation or axis which terminates in an additional inflorescence. Two of the involucre bracts, which subtend the inflorescences of these specimens with elongated peduncles, are foliose and attain a length of 10–17 mm, whereas generally the involucre bracts of *A. steyermarkii* are shorter and only 3–10 mm.

#### NOTES ON *PSYCHOTRIA CRASSA* BENTH.

*Psychotria crassa* Benth. is a characteristic sprangling to subscandent shrub of wet forests on the summits and upper slope forests of the sandstone table mountains throughout the Ven-

ezuelan Guayana and adjacent northern Brazil. Throughout this range it exhibits some variation in leaf size and shape. Generally the leaf blades vary from ovate or elliptic-obovate to broadly oblong-elliptic and from 1.5–5 cm wide. Moreover, the peduncle, axes of the inflorescence, and pedicels are red, the calyx and hypanthium often roseate or reddish, and the fruit dark red.

Among the extensive collections of this species in the Herbario Nacional de Venezuela (VEN) are two variations of noteworthy comment. One is a narrow-leaved variation with leaf blades narrowly lanceolate or elliptic-lanceolate and 0.5–1.2 cm wide. The other variation departs from the usual coloration in having the peduncle, axes of the inflorescence, pedicels, calyx and hypanthium, and fruit completely white. The variations may be considered merely as taxonomic forms as follows:

***Psychotria crassa* Benth. f. *angustior*** Steyermark, f. nov. TYPE: Venezuela. Bolívar: Piar, Macizo de Chimantá, sección oriental del Chimantá-tepui, cabeceras del afluente derecho superior del Río Tirica (“Cano del Grillo”), 5°18'N, 62°03'W, 2,450 m, 7–9 Feb. 1983. *Steyermark, Huber & Carreño 128992* (holotype, VEN). PARATYPES: Venezuela. Bolívar: cumbre del Macizo de Chimantá, sector nororiental, Tirepón (Torono)-tepui, 5°22'N, 61°58'W, 2,540 m, 24 Feb. 1978, *Steyermark, Carreño, McDiarmid & Brewer-Carías 115867* (VEN); altiplanicie en la base meridional de los farallones superiores del Apacará-tepui, sector norte del macizo, 5°20'N, 62°12'W, 2,200 m, 30 Jan.–1 Feb. 1983, *Huber & Steyermark 7006* (VEN).

*A. P. crassa* foliorum laminis anguste lanceolatis vel elliptico-lanceolatis 0.5–1.2 cm latis recedit.

Other collections which approach this form are from Chimantá Massif (*Steyermark, Huber & Carreño 127983, Huber & Steyermark 7128, Steyermark et al. 115768*), from Ilú-tepui (*Delascio & Brewer-Carías 4954*), from Kukenan-tepui (*Delascio & Brewer-Carías 4910*), from Roraima (*Delascio & Brewer-Carías 4853, Steyermark, Brewer-Carías & Dunsterville 112450*), and Ptari-tepui (*Steyermark et al. 115704*).

***Psychotria crassa* f. *alba*** Steyermark, f. nov. TYPE: Venezuela. Bolívar: Piar, Macizo de Chimantá, sector centro-noreste del Chimantá-

tepui, cabeceras orientales del Caño Chimantá, 5°18'N, 62°09'W, 2,000 m, 26–29 Jan. 1983, *Steyermark, Huber & Carreño 128062* (holotype, VEN).

A *P. crassa* inflorescentiae pedunculis axibusque, pedicellis calyce hypanthioque frutis albidis recedit.

**Remijia berryi** Steyererm., sp. nov. TYPE: Venezuela. Amazonas: Estación Experimental de Santa Barbara del Orinoco, a 1–2 km al sur de Trapichote, 130 m, 26 Feb.–2 Mar. 1976, *Berry & Chesney 2116* (holotype, VEN).

Arbor 10-metralis, ramulis junioribus adpresso-pubescentibus; foliis ovatis, elliptico-ovatis vel lanceolato-ellipticis apice subacutis basi cuneatim angustatis 8–14 cm × (2.5–)6.5–8.5 cm praeter costam medium inferioram axillasque foliorum utrinque glabris; nervis lateralibus utroque latere 11–12; infructescencia trichotome ramosa longipedunculata, pedunculo 9–10 cm longo sparsim pilosulo; capsulis 10–15 mm × 5–7 mm tenuiter pubescentibus.

Tree 10 m, younger branches appressed-pubescent; leaves broadly ovate or elliptic-ovate to lanceolate or lance-elliptic, subacute at apex, cuneately narrowed at base, 8–14 cm long, (2.5–)6.5–8.5 cm wide, glabrous on both sides except sparsely pilose along midrib and leaf axils below, lateral nerves 11–12 each side, divaricately ascending at an angle of 30°; infructescence axillary, trichotomously branched, long pedunculate, to 12 cm long (including peduncle), broader than long, 3.5–4 cm high, 4–7 cm broad, the 3 main axes slender, 1.5–2.5 cm long, sparsely pilose; peduncle slender, 9–10 cm long, 2 mm wide, sparsely pilosulous; bract subtending base of infructescence lance-triangular, 1.5 mm long, pilosulous; fruiting pedicels appressed-pilosulous; fruiting calyx and hypanthium 1.5–3 mm long, appressed-pilosulous without; fruiting calyx lobes ovate-lanceolate, subacute, 1.2–1.7 mm long, 0.5 mm wide, appressed pilosulous without, glabrous within; capsule oblong-elliptic, 10–15 mm by 5–7 mm, finely pubescent, dehiscent downward from apex; seeds fusiform, 6–8 mm by 1.5–2 mm.

This taxon is characterized by the relatively small leaves acute or subacute at both ends, their glabry except for the sparsely pilose lower midrib and leaf-axils, the sparsely and finely pubescent upper branches, peduncles, and capsules, the slender elongated peduncles, and the relatively short infructescence.

**Remijia delascioi** Steyererm., sp. nov. TYPE: Venezuela. Amazonas: Cerro Vinilla, sandstone outcrops along small stream in gallery forest, N of Cerro Aratitiope and SW of Ocamo, 440 m, 1 Mar. 1984, *Steyermark, Berry & Delascio 130339* (holotype, VEN).

Planta lignea 1–1.5-metralis, caule simplici; foliorum laminis lineari-ellipticis vel anguste lanceolato-ellipticis apice subobtusis basi acutis 11–21 cm × 1–2.5 cm 10-plo longioribus quam latioribus, maturis supra glabris subtus praeter costam medium inferior-em strigosam glabris, nervis lateralibus utroque latere 11–15, petiolis 6–15 mm longis, pedunculo dense strigoso 6.5–9.5 cm; calyce hypanthioque dense sericeo 6 mm × 1.5 mm, calycis tubo cylindrico spathaceo obscure leviterque dentato 4 mm longo; capsulis oblongo-cylindricis 12 mm × 5 mm strigillosis.

Single-stemmed ligneous plant 1–1.5 m tall; leaves petiolate, petioles tawny, 6–15 mm by 1 mm, tomentose to glabrous above; leaf blades erect, pale yellow-green below with buff midrib, linear-elliptic to narrowly lance-elliptic, narrowed to a subobtuse apex, narrowed to an acute base, 11–21 cm by 1–2.5 cm, averaging 10 times longer than broad, glabrous above at maturity, glabrous below except for the subelevated strigose midrib, the youngest leaves sparsely strigose above on surface, densely strigose on midrib, moderately to densely strigose below on surface and midrib; lateral nerves 11–15 each side, ascending at an angle of 60°; tertiary venation finely reticulate beneath; inflorescence axillary, immature; peduncle densely strigose 6.5–9.5 cm long in fruiting stage; bracts brown-maroon, in pre-anthesis broadly lanceolate, obtusish, 6 mm by 2 mm, sericeous without; 2 bracteoles subtending flowers lanceolate, obtusish, 3.5 mm by 1 mm, densely sericeous without; calyx and hypanthium brown-maroon, densely sericeous, 6 mm by 1.5 mm; calyx tube cylindrical, spathaceous, unequally and shallowly obscurely dentate, glabrous within, 4 mm long, with scattered linear-oblong glands at base of calyx tube within; fertile portion of inflorescence in bud 4 cm long, in fruit 4.5–9 cm long; capsules oblong-cylindric, 2 mm by 5 mm, strigillose.

This taxon differs from other known species of the genus in the extremely narrow, linear-elliptic to narrowly lance-elliptic leaves which are narrowed at both ends and only 1–2.5 cm wide, averaging 10 times longer than broad. The mature leaves are glabrous on both surfaces with only the midrib beneath strigose. The spatha-

ceous calyx-tube is well developed with shallow, scarcely evident teeth at the summit.

**Sipanea carrenoi** Steyererm., sp. nov. TYPE: Venezuela. Bolívar: Gran Sabana, open densely covered slopes, al pie del Salto del Aponguao, 42.5 km al NE de la Misión de Santa Teresita de Kavanayén, 1,130 m, 22 Feb. 1978, *Steyermark, Carreño, Dunsterville & Dunsterville 115598* (holotype, VEN).

Planta herbacea, caulibus prostratis vel decumbentibus effusis elongatis repentibus ad nodos radicanibus pubescentibus; laminis elliptico-oblongis apice obtusis vel subacutis 1–2 cm × 0.6–0.9 cm omnino glabris; nervis lateralibus utroque latere 2–3; inflorescentia plerumque 3–7-flora, raro 1-flora; corolla 15–21 mm longa, tubo 1–13 mm longo extus superne sparsim pilosa intus orificio barbato; capsulis 9 mm × 2.5 mm dense hirsutululo pilis adscendentibus instructis.

Herbaceous 0.2 m; stems sprawling or trailing, densely or moderately pilose with subspreading-ascending hairs; stipules triangular-lanceolate, 2–3 mm by 0.5 mm, densely strigose without; leaves short-petiolate, petioles 0.5–1.5 mm long, margins pilose-ciliate; leaf blade elliptic-oblong, obtuse to subacute at apex, acutely narrowed to the base, 1–2 mm by 0.6–0.9 mm, glabrous both sides, revolute on margins; lateral nerves 2–3 each side, lightly impressed on lower surface, not evident on upper surface; inflorescence terminal, rarely axillary, cymosely 3–7-flowered, rarely 1-flowered, sessile or with short lateral branches; bract subtending inflorescence narrowly elliptic-oblong, acute, 0.4 mm by 0.9 mm, ciliate; calyx 7–7.5 mm long, lobes 4.5 mm by 0.7–0.8 mm, linear-lanceolate, acuminate, glabrous except for ciliate margins; corolla hypocrateriform-infundibuliform, 15–21 mm long, tube 10–13 mm long, sparsely pilose without in upper portion, glabrous within except at orifice; orifice within furnished with a dense brush of hairs which are not exerted; lobes suborbicular, rounded or obtuse, 6–6.5 mm by 5–7 mm, glabrous without; anthers linear, 3–3.5 mm; style 10 mm long, glabrous in lower half, papillate above; squamellae solitary, inserted in the sinus between each calyx lobe, lanceolate, obtuse; capsule cylindrical, 9 mm by 2.5 mm, densely hirsutulous with ascending hairs.

This taxon is related to the common *S. prattensis* Aubl., from which it differs in the creeping rooting habit of the stems and the densely crowded, smaller, glabrous, obtuse to subacute, fewer-nerved leaves. The species is named in com-

memoration of my valued field assistant, Victor Carreño Espinosa.

#### COMPOSITAE

A re-examination of *Achnopogon quelchioides* Aristeg., based on *Steyermark 93497* from Auyan-tepui, shows that it cannot be separated from *A. steyermarkii* Aristeg., also from Auyan-tepui. Steyermark noted in his collection of *A. quelchioides* that the flowers are "clustered as in *93496* (*Quelchia bracteata*) but with larger size of flowers and leaf pubescence as in *93512* (*A. steyermarkii*)," leading to the supposition that it was a putative hybrid between these two collections.

However, there appears to be no differences in separating *A. quelchioides* from *A. steyermarkii*, both having sessile, 2–3-flowered heads, white corollas, glabrate bracts in several series, subsessile to shortly petiolate, broadly oblong to oblong-obovate leaf blades, rounded at the apex with a minute mucro, and densely lanulose, brown stems and leaf bases.

Some collections of *Achnopogon steyermarkii* (*Steyermark et al. 116088, 116139, and Foldats 7117*), all from the summit of Auyan-tepui, have been misidentified as *Quelchia × grandifolia* Maguire, Steyererm. & Wurd., considered by their authors to be a putative hybrid between *Quelchia bracteata* and *Q. eriocaulis*. The latter species has sessile inflorescences with red or pink corollas, densely ferruginous lanate stems, and a tawny-brown lanulose lower leaf surface, whereas *Q. bracteata* has pedunculate inflorescences with white corollas, closely or densely sericeous stems with malpighioid hairs, and the lower surface of the leaves pubescent to glabrous, but not densely lanate.

In habit, *Achnopogon steyermarkii*, *A. quelchioides*, *Quelchia eriocaulis*, and *Q. bracteata* simulate one another in their simple, ligneous stems enveloped in their upper portion by densely crowded, ascending, subsessile to shortly petiolate leaves, which conceal the inflorescences present at their base. However, the corollas immediately distinguish these four taxa, *Quelchia* having the inflorescence 1-flowered with regular 5-lobed corollas, whereas *Achnopogon* has 2–5-flowered inflorescences with bilabiate corollas.

The synonymy of *Achnopogon steyermarkii* follows:

**Achnopogon steyermarkii** Aristeg., Acta Bot. Venez. 2(5–8): 350. fig. 30. 1967.

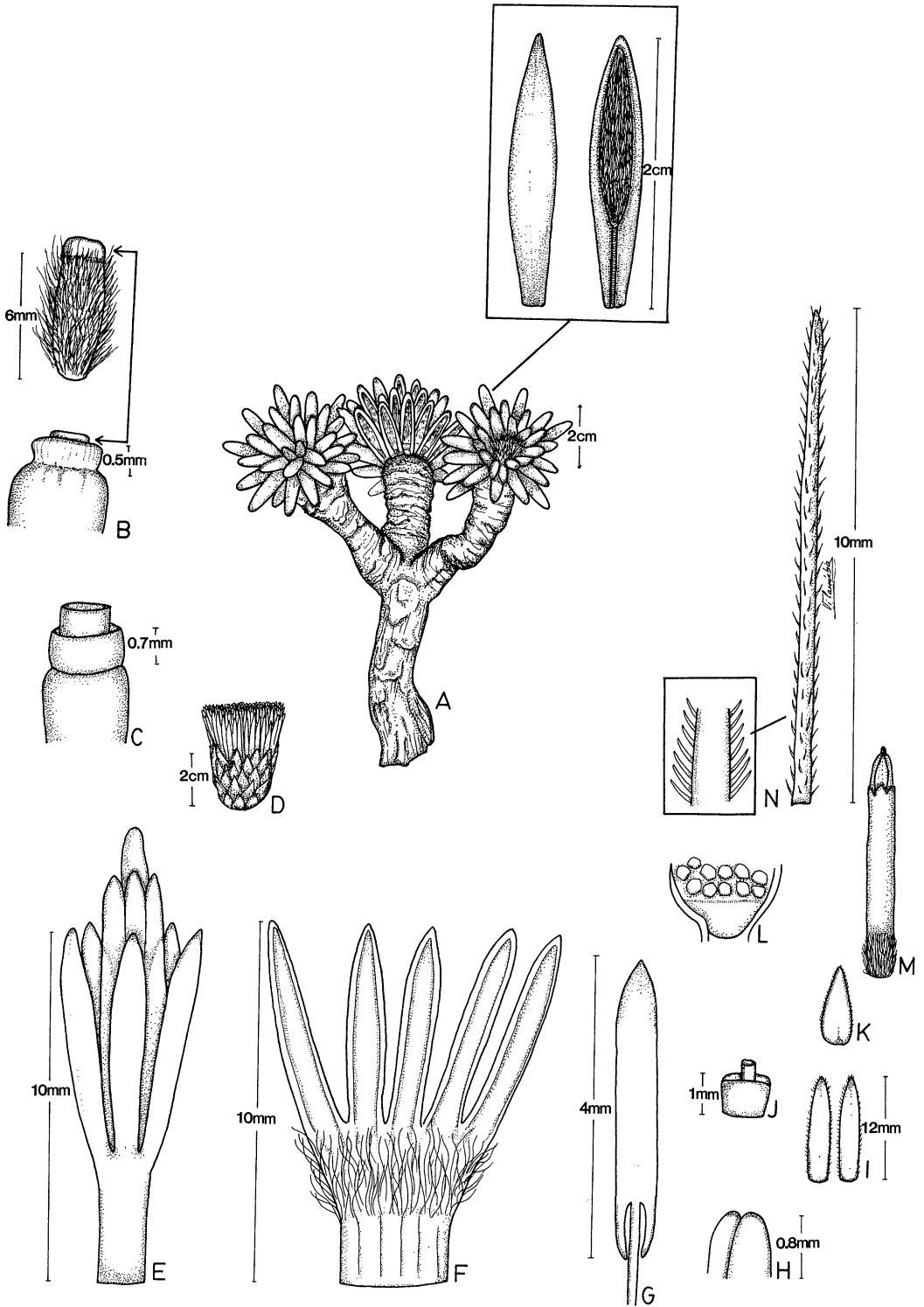


FIGURE 12. *Chimantaea huberi*. —A. Habit. —B. Upper half, mature achene; lower half with crown of achene and styler base. —C. Upper part of achene in late bud stage, showing corona and styler base. —D. Capitulum of

*Achnopogon quelchiioides* Aristeg., Acta Bot. Venez. 2(5-8): 348. fig. 29. 1967.

***Chimantaea acopanensis* Steyer., sp. nov. TYPE:**

Venezuela. Bolívar: Piar, Macizo de Chimantá, sector SSE, altiplanicie, sur-oriental del Acopán-tepui, cabeceras del Río Arauac, praderas húmedas y arbustales enanos sobre turberas, bosquecillos ribereños y vegetación sobre rocas abiertas, 5°11'N, 62°00'W, 1,920 m, 14-16 Feb. 1984, *Steyermark, Luteyn & Huber 129932* (holotype, VEN).

Planta pusilla rosulata caespitosa usque ad 10 cm alta; foliis linearibus apice rotundatis vel obtusis 35-40 mm × 3.5-6 mm valde revolutis supra non-sulcatis glabris subtus brunneo-lanuginosis; capitulis terminalibus sessilibus solitariis 28-floris 2 cm altis 2.5 cm latis; involucrio 5-seriato, bracteis lineari-lanceolatis acuminatis intimis 14 mm × 2.5 mm extimis 10 mm × 2 mm tertia parte superiore dense lanulosis; receptaculo plano alveolato; paleis tribus inter flores exteriores subulatis 19 mm × 0.5-1.5 mm in dimidio superiore pilosis marginibus omnino ciliolatis; corollis 14 mm longis, lobis lineari-ligulatis subobtusis 10 mm × 1 mm; antheris 5 mm longis basi bicaudatis; stylo 16 mm longo; achaeniis fusiformi-cylindricis 4-4.5 mm × 1 mm laxe pilosis; pappi setis 12-14 mm longis.

Perennial dwarf caespitose plant with long taproot, acaulescent, to 10 cm tall; leaves olive green and non-sulcate above, buff-brown lanulose below, coriaceous, strongly revolute, linear, rounded or obtuse at apex, slightly contracted into a subsessile densely lanate base, 35-40 mm by 3.5-6 mm; heads sessile, solitary, terminating the leaf rosette, campanulate, 28-flowered, 2 cm high, 2.5 cm wide; involucrio 5-seriate, bracts linear-lanceolate, attenuate to an acuminate dark magenta apex, densely buff tomentose in the upper third, glabrous in lower third, innermost 14 mm by 2.5 mm, outermost 10 mm by 2 mm; receptacle flat, shallowly alveolate; heads homogamous; paleae 3, inserted between the outer florets, subulate, 19 mm by 0.5-1.5 mm, pubescent in upper half; corollas 14 mm long, the tube 4 mm long, 1.8 mm wide at summit, 1.2 mm wide at base, lobes equal, linear-ligulate, subobtusely, 10 mm by 1 mm; anthers dark magenta-wine red, 5 mm long; style lavender, 16 mm long, stigmas ligulate-oblong, obtuse; achene slenderly

fusiform-cylindric, 4-4.5 mm by 1 mm, loosely pilose; pappus tawny, the numerous bristles 12-14 mm long, minutely serrulate.

This taxon may possibly prove to be a putative hybrid between *C. huberi* Steyer. and *C. humilis* Maguire, Steyer. & Wurd., both species occurring in the immediate area. The non-sulcate upper leaf surface and densely buff tomentose involucrial bracts together with the deep brown lanulose pubescence are shared with *C. humilis*, whereas the dwarf caespitose, rosulate habit and non-sulcate upper leaf surface are shared with *C. huberi*.

***Chimantaea huberi* Steyer., sp. nov. TYPE:**

Venezuela. Bolívar: Piar, Macizo del Chimantá; pequeñas altiplanicies on la base septentrional de los farillones superiores del Amuri-tepui (sector occidental del Acopán-tepui), 5°10'N, 62°07'W, rocky exposed outcrops of savanna on heliport just W of campsite, 1,850 m, 2-5 Feb. 1983, *Steyermark, Huber & Carreño 128815* (holotype, VEN; isotypes, K, MO, NY, U, US). PARATYPES: same locality, 2-5 Feb. 1983, *Huber & Steyermark 7118* (K, MO, NY, U, US, VEN); altiplanicie suroriental del Acopán-tepui, cabeceras del Río Arauac, praderas húmedas sobre turberas, 5°11'N, 62°00'W, 1,920 m, 14-16 Feb. 1984, *Steyermark, Luteyn & Huber 129924* (VEN); Apacará-tepui, 5°20'N, 62°12'W, 2,300 m, 1 Feb. 1983, *Steyermark, Huber & Carreño 128419* (VEN).

Planta pusilla rosulata caespitosa 1-3 cm alta; foliis linearibus vel lineari-oblancoelatis apice subobtusis cum apiculo diminuto obtusiusculo acuto 10-20 mm × 2-4 mm supra glabris subtus albo-pannosis valde revolutis; capitulis sessilibus 2 cm × 0.7-0.8 cm; involucrio campanulato 6-7-seriato in base tomentosa albida insidenti; phyllariis ca. 30 praeter margenes ciliatos glabris, exterioribus late triangulari-lanceolatis acuminatis 7 mm × 4 mm intimis anguste ligulato-subspatulatis 14 mm × 2 mm; receptaculo plano alveolato glabro; paleis non visi; floribus 7-15 actinomorphicis, corolla albida 10 mm longa trans medium fissa 5-nervata, tubo 3 mm × 2 mm, limbo 1 mm × 2 mm, lobis erectis ligulato-lanceolatis subobtusis 6.5 mm × 0.9-1 mm, tubo lobisque extus glabris, tubo intus fauce dense lanuginoso-barbata ceterum gla-

←

flowers with involucrio.—E. Floret, exterior view.—F. Interior of floret.—G. Stamen.—H. Stigmas.—I. Middle involucrial bracts.—J. Styler base surrounded by coronal disk.—K. Outermost involucrial bract.—L. Alveolate portion of receptacle.—M. Corolla in bud with lanulose tomentum of involucrial base.—N. Pappus seta and portion enlarged.



bro; achaeniis 6 mm × 2 mm densissime albo-sericeis; pappo ochroleuco pluriseriato, setis 8–10 mm longis.

Dwarf perennial, caespitose rosulate plant 1–3 cm tall, forming large mats; stems greatly reduced, subligneous, or not evident, simple or branched, 0.5–1.5 cm diam.; leaves numerous, stiff-coriaceous, erect, strongly revolute, crowded, sessile, linear, linear-sublanceolate or linear-ob lanceolate, subobtuse at apex with a minute obtusely acute thick apiculum, slightly narrower and subunguiculate toward the base, 10–20 mm by 2–4 mm, shining and rich green above, white pannose tomentose below for 7–16 mm but the narrower, sulcate, basal 2–5 mm portion below glabrous; flower heads homogamous, sessile, terminal, 2 cm by 0.7–0.8 cm; mature involucre shortly campanulate, 6–7-seriate, on a white tomentose base; involucral bracts maroon-purple, rigidly chartaceous, ca. 30, glabrous except for the ciliate margins, the outer broadly triangular-lanceolate, acuminate, convex, 7 mm by 4 mm, intermediate ligulate-lanceolate, acute or obtuse, 12 mm by 2.5 mm, interior narrowly ligulate-subspathulate, 14 mm by 2 mm; receptacle flat, alveolate, glabrous; pales not seen; flowers 7–15; corolla white, 10 mm long, cleft more than halfway down, 5-nerved, tube salverform, 3 mm by 1.5–2 mm, throat 1 mm by 2 mm, lobes erect, ligulate-lanceolate, subobtuse, the apex and margins somewhat thickened, 2-nerved, 6–6.5 mm by 0.9–1 mm, tube and lobes glabrous without, lobes glabrous within, tube densely barbate-lanuginose within at the throat, elsewhere glabrous; anthers lavender-brown, linear, 4 mm by 0.6 mm, acute at apex, sagittate at base, basal appendages free, somewhat incurved at the apex, 1 mm long, glabrous; pollen grains tricolpate, not spinose; style pale green at apex, surrounded by an entire fleshy collar 0.7 mm high and 1 mm wide at base; achenes cylindric 6 mm by 2 mm at apex with a short slightly undulate to entire crown 1 mm high, densely white-sericeous; pappus buff, multiseriate, the awns subequal, 8–10 mm long, barbellate, slightly coherent at base.

It is a great pleasure to name this unusual taxon for Dr. Otto Huber, dedicated student of the Guayana flora, under whose successful management the expeditions to Chimantá were completed.

This taxon may be considered a very reduced member of the genus *Chimantaea* and derived from a still further reduction of an evolutionary

branch of *Chimantaea rupicola* Maguire, Steyererm. & Wurd. From the other known species of the genus, all of whose taxa but one (*C. cinerea* (Gl. & Blake) Maguire, Steyererm. & Wurd. of Auyan-tepui) are known from the Chimantá Massif, *C. huberi* differs in the very dwarfed, rosulate, caespitose plants growing in dense mats less than 3 cm high, the short corolla and corolla lobes, the absence of paleae, and the much shorter, narrower leaves. Anatomical studies of the leaves and palynological examination agree with the placement of this species in *Chimantaea*.

In their original description of the genus *Chimantaea*, Maguire, Steyermark & Wurdack (in Maguire et al., 1957: 428) described the receptacle as pubescent with few (2–5) marginal pales, tips of the corolla lobes more or less barbellate, and pollen grains spinulose. Later, Aristeguieta (1964: 831, 879) correctly described the generic characters in broader terms and allowed for an absence or presence of pales on the pubescent or non-pubescent receptacle, as well as for a glabrous or pilose apex of the corolla-lobes. Moreover, the pollen, stated in the original description of the genus to be spinose (in Maguire et al., 1957b: 428), may be nearly psilate in some species, such as *C. similis*, as shown by Carlquist (1957: 446–447, fig. 93c). Senora Maria Léa Labouriau of IVIC (Instituto Venezolano de Investigaciones Científicas) of Caracas, Venezuela, an authority on pollen, has kindly supplied me with a description of the pollen of *C. huberi* as follows: subprolate, non-spinose lobate grains with salient poles. Fossa perturate. Grains very dark colored. Apertures: 3 colporate. Colpi long, conspicuous large elongate pores with sharp ends. Exine non-spinose with vestigial spinules, very thick at the polar region. Sexine very thick with two layers: tegillum and infrategillar bacula layer; bacula visible from ×400 up. She concludes that the grains are very similar to those of Carlquist's description of *C. similis*.

The anatomical study of the leaves was made by Senorita Luisa Lopez of the Direccion de Investigaciones Biológicas of the Jardín Botánico in Caracas, Venezuela, whose description is as follows:

Epidermis adaxial sclerified with one layer of cells, with prominent cuticular membrane, hypodermis adaxial with 3–4 cells in thickness, thickened walls, constituting a band along the length of the leaves: mesophyll undifferentiated

with a spongy parenchyma and palisade cells of tubular form sometimes present. Subhydermal sclereids are scattered in small groups in the mesophyll. Epidermis abaxial monostratified with the stomata sunk below a tomentum of simple hairs with slender walls. Toward the leaf margin an exceptional development of sclerenchyma occurs which facilitates the revolute portion of the leaf to function. She notes that the marked sclerophyll type of leaf enables the plant to adapt to loss of water, high evaporation, and unfavorable edaphic conditions. The scleromorphic leaves of the species are small and coriaceous and are provided with cutinized cell walls. She notes that there is evidence to show that a lack of nitrogen is responsible for the appearance of scleromorphous characters, and that nitrogen deficiency is associated with sclerophylly.

*Chimantaea huberi* possesses characters common to both of the genera *Chimantaea* and *Stomatochaeta*. In common with *Stomatochaeta* it possesses small flower heads, glabrous corolla lobes, and an entire styler base 1 mm or less high, but differs from *Stomatochaeta* in having a 5-nerved corolla tube, non-malpighioid pubescence, and densely pubescent achenes. While sharing with *Chimantaea* a 5-nerved corolla tube, free anther tails, and similar tomentum on the lower side of the strongly revolute leaves, it differs from the other species of *Chimantaea* in the smaller, fewer-flowered heads and an entire, instead of 5-lobed basal corona of the style. However, it shares the glabrous receptacle with both *C. eriocephala* and *C. similis* and the glabrous apices of the corolla lobes with *C. cinerea* and *C. similis*. The epaleaceous receptacle of *C. huberi* manifests its still further reduction from its most closely derived taxon, i.e., *C. rupicola* which possesses 1–2 deciduous marginal paleae. *Chimantaea huberi* represents the extreme reduction in a series from a tall arborescent "espeletoid" type to 3 m tall, as shown by *C. mirabilis* and *C. lanocaulis*, to a nearly herbaceous rosulate habit, a tendency suggested by Maguire, Steyermark and Wurdack (in Maguire et al., 1957a: 377).

*Chimantaea huberi* occurs in open exposed situations, on bare open, exsiccated, flat sandstone outcrops (as noted in Steyermark et al. 128419 and 128815) or in open swampy ground of savanna-like habitats where the soil is more saturated with water (as in Steyermark et al. 129924). It is frequently associated with a species of Eriocaulaceae, *Syngonanthus obtusifolius*,

which it resembles strikingly in such characters as erect, olive green, stiff-coriaceous leaves, and white tufts of tomentum at the base of the leaf rosette. In such instances, the convergence of morphological characters is so close that one must observe the two with especial perception in order not to confuse the two families. Where *Chimantaea huberi* grew on the dry sandstone ledges, it was also associated with *Brocchinia reducta*, *Stegolepis ligulata*, *Ledothamnus decumbens*, *Achnopogon virgatus*, and other xeromorphic species. On the wet swampy savanna-like habitat it was associated with such species as *Epidendrum alsum*, *Tepuia venusta*, *Myrtus alternifolia*, *Stegolepis ligulata*, *Tillandsia stenoglossa*, *Stomatochaeta cymbifolia*, and others.

**Chimantaea cinerea** (Gl. & Blake) Maguire, Steyermark & Wurd. f. **glabra** Steyermark, f. nov.  
TYPE: Venezuela. Bolívar: Auyan-tepui, lado derecho del Salto Angel, 15 Aug. 1968, Ernesto Foldats 7100 (holotype, VEN).

A *C. cinerea* corollae lobis secus margines pilosulis; achaeniis glabris recedit. Folia obovata apice rotundata basi angustata petiolata, 5–7 cm × 2.5–3.5 cm supra glabra subtus dense cinerea, nervis lateralibus obscuris utroque latere 8–10; petiolis 5–7 mm × 3–3.5 mm cinereo-tomentosis; corollis 19–20 mm longis, tubo 5 mm longo intus basi loborum dense piloso aliter glabro; achaeniis 6–7 mm longis glabris; pappi setis 18–20 mm longis.

This form has the glabrous achenes of *C. similis* Maguire, Steyermark & Wurd. but the margins of the corolla lobes are pilosulous, as in *C. cinerea*. The differences separating *C. cinerea* and *C. similis* are perhaps not sufficient for specific recognition. The achenes of *C. cinerea* vary from densely or moderately sericeous to only sparsely so, while the corolla lobes may vary from usually pilose to glabrous, as in the collection of Pannier & Schwabe 1927-A from Auyan-tepui. The corolla lobes of *C. similis*, on the other hand, while ordinarily glabrous, may also show some pilosity. The two taxa are isolated on separate tepuis, *C. cinerea* occurring on Auyan-tepui and *C. similis* on the Chimantá Massif.

NOTES ON HYBRIDIZATION IN  
*CHIMANTAEA* AND *QUELCHIA*

On the extensive series of plateaus which comprise the Chimantá Massif (Macizo de Chimantá) there have evolved many genera and species known nowhere else in the Venezuelan Guayana. Of these, one of the most remarkable genera is

the mutisoid composite, *Chimantaea*. Except for the occurrence of two species, one found on the nearby (but distant) Auyan-tepui, the other on Aprada-tepui, both in the state of Bolívar, the remainder of the taxa are known only from Chimantá Massif of Bolívar state. It is on the Chimantá Massif where the main evolutionary process has developed in the genus.

Although eight species have been described as the result of two major expeditions there in 1953 and 1955, recent explorations during 1983 and 1984 have provided further opportunities for additional collections and observations of the genus. These have resulted in the discovery of at least two new taxa pertaining to the genus, one with a remarkable dwarf rosette, *C. huberi*, which resembles an eriocaulaceous taxon (*Syngonanthus obtusifolius*), with which it is often associated, and the second one, similarly dwarfed, but suspected to be of hybrid origin, namely *C. acopanensis*.

Actually, the more abundant collections of many more individual plants of the genus on Chimantá Massif have furnished increasing evidence to substantiate grounds which support the belief in 1) the occurrence of some hybridization taking place between the various taxa and 2) variation in vegetative characters which show degrees of intergradation, making it difficult to assign individual specimens to a definite category. Although it is true that the eight previously described taxa may be readily recognized as distinct entities as such, nevertheless some specimens appear as more or less intermediate in character or combine characters common to different taxa. This is apparent in such collections as *Steyermark, Huber & Carreño 128518* which appears intermediate between *C. eriocephala* Maguire, Steyermark & Wurd. and *C. humilis* Maguire, Steyermark & Wurd. The leaves of *C. humilis* vary in width, some having the greater width of *C. eriocephala* or *C. humilis*, others having the narrower width of *C. mirabilis*. This latter type is exemplified by the collection of *Steyermark, Huber & Carreño 128511* which shows an intermediate stage between *C. humilis* and *C. mirabilis*. Another collection, *Steyermark et al. 128332-A*, has leaves too narrow for *C. similis* but resembles that taxon in other characters.

The newly described taxon, *C. acopanensis*, was found growing near the newly described *C. huberi*, and in the near vicinity *C. humilis* occurred. The dwarf habit of *C. acopanensis* suggests *C. huberi*, but the larger leaves and flow-

er-heads, as well as the densely tomentose involucre bracts, indicate characters shared with *C. humilis*. Nevertheless, *C. acopanensis* may be readily recognized from other taxa of the genus by its combination of a dwarf rosette habit, tomentose involucre bracts, and shape and size of leaves and heads.

Likewise in the genus *Quelchia* a putative hybrid has been recorded as *Quelchia* × *grandifolia* (Maguire et al., 1957b: 436). This manifests characters of both *Q. eriocaulis* Maguire, Steyermark & Wurd. and *Q. bracteata* Maguire, Steyermark & Wurd., both of which taxa occur in the immediate vicinity.

NOTE ON *GONGYLOLEPIS BENTHAMIANA*  
VS. *G. PANICULATA*

Aristeguieta (1964: 895) separated *G. paniculata* Maguire & Phelps from *G. benthamiana* Schomb. on the basis of leaf length and width, length of involucre, and number of seriate bracts. In an examination of material in VEN, the size of leaves for *G. benthamiana* varies from 7.5–16.5 cm by 2–5.5 cm (Aristeguieta, 1964: 900 gives 7.5–16.5 cm by 2–5.5 cm) and for *G. paniculata* varies from 12–27 cm by (2.5–)5–8(–9) cm.

In the key to *Gongylolepis*, Maguire (in Maguire et al., 1953: 155), in addition to separating these taxa by leaf dimensions, employs an additional character not used by Aristeguieta, namely, leaf venation. Thus, for *G. paniculata* the primary veins are stated as “extending little beyond the middle, then anastomosing and with the secondary veins reticulate, veins on upper surface merely prominulous,” whereas for *G. benthamiana* the primary veins are stated as “extending nearly to the margins before anastomosing, veins on upper surface prominent, strongly reticulate.” An examination of material in VEN verifies this difference in venation given by Maguire. The differences mentioned for size of involucre and number of seriate bracts likewise is borne out by an examination of material at VEN.

Previously, all material of *G. benthamiana* has been known to occur only in Estado Bolívar of eastern Guayana of Venezuela, from the Gran Sabana west to Cerro Guaiquinima, Cerro Marutani (on the Brazilian-Venezuelan frontier at the headwaters of Río Paramichi, an affluent of the Río Paragua), and Cerro Marajanu of the Meseta de Jaua in the Upper Caura. In contrast,

*G. paniculata* is known only from the sandstone table mountains of the Territorio Federal Amazonas. It was, therefore, a great surprise while collecting on the savanna-covered sandstone substrata of the Serrania Vinilla in Territorio Federal Amazonas to find *G. benthamiana* as one of the common species and far removed from its occurrence in eastern Guayana. These collections, represented by *Steyermark, Berry & Delascio 130329*, have the leaves with the size and venation typical of *G. benthamiana*, and, additionally, the smaller involucre with 6-seriate bracts of that species. Two other collections from the Serrania Vinilla (*Huber 6044* and *6175*) also are typical *G. benthamiana*, although they were originally misidentified as *G. paniculata*, probably because *G. paniculata* is a widespread species in Territorio Federal Amazonas.

An additional observation made in connection with a study of these two taxa is that the heads of *G. paniculata* are narrowed at the base, whereas those of *G. benthamiana* are more rounded basally, producing a shallowly campanulate shape to the involucre.

This disjunct distribution separates *G. benthamiana* about 300 km southwest of its nearest outpost in Estado Bolívar.

***Mikania michelangeliana* Steyer., sp. nov.**

TYPE: Venezuela. Amazonas: Cerro Marahuaca, summit, borde noroeste, meseta sureste, valle Yekuana, bordering small stream, 2,560 m, 10 Oct. 1983, *Steyermark 129456* (holotype, VEN).

Planta scandens, caulibus saltem juvenilibus papillatis tomentellis; foliis elliptico-ovatis apice acutis vel acuminatis basi cuneatis 3–5-plinervatis 2–3.2 cm × 1.3–2 cm utrinque glabris subtus negro-punctatis, marginibus minute denticulatis; inflorescentiis cymosis 4–4.5 cm × 4–4.5 cm, axibus pedicellis que dense breviter tomentellis papillatis; capitulis 4–5-floris 7–9 mm × 3 mm; corollis 4.5 mm longis; achaeniis 4–4.5 mm longis sparsim vel dense papillato-puberulis.

Stems, especially the young ones papillate-tomentellose; leaves elliptic-ovate, acute to acuminate at apex, cuneate at base, 3–5-plinerved, 2–3.2 cm by 1.3–2 cm, glabrous both sides, black-punctate below, margins minutely denticulate with 4–5 teeth on each side, tertiary venation absent or obscure; petioles 4–6 mm long, glabrous or sparingly puberulent; inflorescence terminal and axillary, cymose, 4–4.5 cm by 4–4.5 cm, axes short-tomentose mixed with papillate hairs; pedicels 2–4 mm long, densely tomentel-

lose, heads 4–5-flowered, 7–9 mm by 3 mm; involucre bracts ligulate, subacute at apex, slightly unequal, 4–5 mm by 0.8–1 mm, longitudinally 3-nerved, densely minutely puberulent without; corollas infundibuliform, 4.5 mm long, tube in upper portion glabrous without, lower constricted portion sparsely glandular, lobes broadly lanceolate, acute, 1 mm long; achenes linear, quadrangular, 4–4.5 mm long, sparsely to densely papillate-puberulous; pappus cream-colored, bristles numerous, 4–5.5 mm long, serrulate.

In leaf size and shape this taxon approaches *M. lucida* Blake, and in stem pubescence is similar to that of *M. lucida* f. *hirticaulis* Steyer. From both of these taxa *M. michelangeliana* differs in the more sharply acute leaf apex, the minutely denticulate leaf margins, the conspicuously black-dotted lower leaf surface, and the short tomentum intermixed with a papillate indument on most of the stem and axes of the inflorescence.

I take pleasure in associating the name of Armando Michelangeli with the new species. Through his efforts as administrator of the Terramar Foundation, exploration of the summit areas of Cerro Marahuaca has been made possible.

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