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SMITHSONIAN CONTRIBUTIONS TO BOTANY • NUMBER 100

Flora of Guaramacal (Venezuela): Monocotyledons

L. J. Dorr

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ABSTRACT. Dorr, L. J. Flora of Guaramacal (Venezuela): Monocotyledons. *Smithsonian Contributions to Botany*, number 100, xiv + 289 pages, 26 figures, 316 maps, 2014.—The present volume is a taxonomic study of the monocotyledons that occur in Guaramacal National Park (officially El Parque Nacional "General Cruz Carillo en Guaramacal"), which protects the Ramal de Guaramacal, an outlier of the more extensive Cordillera de Mérida in the Venezuelan Andes. The park covers 215 km^2 in Trujillo and Portuguesa states and includes forest and páramo found between 1,600 and 3,100 m elevation. In all, 25 families, 135 genera, and 315 species (316 taxa) are treated; the greatest species diversity occurs in Orchidaceae (147 species), Poaceae (57 species), and Cyperaceae (28 species). Twenty species are currently known only from Guaramacal and might be endemic. Four new combinations are made: *Cyperus hortensis* (Salzm. ex Steud.) Dorr, *Acronia archidiaconi* (Ames) Carnevali & G. A. Romero, *Crocodeilanthe gelida* (Lindl.) Carnevali & I. Ramírez, and *Fernandezia schultesii* (L. O. Williams) Carnevali & Dorr.

RESUMEN. Dorr, L. J. Flora de Guaramacal (Venezuela): Monocotiledóneas. *Smithsonian Contributions to Botany*, número 100, xiv + 289 páginas, 26 figuras, 316 mapas, 2014.—El presente volumen es un estudio taxonómico de las monocotiledóneas que se encuentran en el Parque Nacional Guaramacal (oficialmente El Parque Nacional "General Cruz Carrillo en Guaramacal"), que protege el Ramal de Guaramacal, un parte aislada de la más extensa Cordillera de Mérida en los Andes venezolanos. El parque ocupa 215 km^2 en los estados Trujillo y Portuguesa e incluye bosques y páramos que se encuentran entre 1.600 y 3.100 m sobre el nivel del mar. Un total de 25 familias, 135 géneros, y 315 especies (316 taxones) son aquí tratados; las familias con mayor diversidad de especies son Orchidaceae (147 especies), Poaceae (57 especies), y Cyperaceae (28 especies). Veinte especies son conocidas sólamente de Guaramacal las cuales podrían ser endémicas. Cuatro nuevas combinaciones son efectuadas: *Cyperus hortensis* (Salzm. ex Steud.) Dorr, *Acronia archidiaconi* (Ames) Carnevali & G. A. Romero, *Crocodeilanthe gelida* (Lindl.) Carnevali & I. Ramírez, y *Fernandezia schultesii* (L. O. Williams) Carnevali & Dorr.

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Flora of Guaramacal (Venezuela): Monocotyledons

L. J. Dorr

INTRODUCTION

This is the first volume of several that we project will treat all of the ~1,300 species of vascular plants that are found in Guaramacal National Park (officially El Parque Nacional "General Cruz Carillo en Guaramacal"). The park was created in 1988 in order to protect the Ramal de Guaramacal, an outlier of the more extensive Cordillera de Mérida in the Venezuelan Andes and an important watershed for the Boconó and Tucupido reservoirs at the base of the mountains. The park covers 215 km^2 in Trujillo and Portuguesa states and is primarily composed of very steep slopes between 1,600 and 3,100 m elevation. The two principal vegetation types found in the park, forest and páramo, have been intensively studied from an ecological perspective (Cuello A., 2002, 2010; Cuello A. and Cleef, 2009a, 2009b, 2009c, 2011).

Family circumscriptions follow the classification proposed by the Angiosperm Phylogeny Group (2009) as updated by Stevens (2013). In several of the larger families (i.e., Araceae, Arecaceae, Bromeliaceae, Orchidaceae, and Poaceae), subfamilial placement of a genus is indicated in square brackets following the generic description. This is done to suggest at a very crude level the phylogenetic relationships of the genera found within the boundaries of the park.

For each species or infraspecific taxon recognized, the accepted name is given in bold type. In addition, the basionym (if different) is cited, along with homotypic and heterotypic synonyms that have mostly been used in Venezuelan botanical literature. These synonymies are intended to help the user understand the application of names within Venezuela. Hence, synonymies are not complete, nor are they intended to be complete. References to standard Venezuelan floras such as the *Flora de Venezuela* (Foldats, 1969, 1970a, 1970b, 1970c, 1970d; Smith, 1971; Maas, 1982), *Flora of the Venezuelan Guayana* (Berry et al., 1995, 1997, 1998, 1999, 2001, 2003, 2004, 2005), *Libro Rojo de la Flora Venezolana* (Llamozas et al., 2003), and *Botánica y Ecología de las Monocotiledóneas de los Páramos en Venezuela* (Morillo et al., 2010, 2011) are included as these often provide more extensive descriptions and synonymies, as well as illustrations of the taxa treated here. Finally, names used in the two earlier enumerations of plants occurring in Guaramacal (Ortega et al., 1987; Dorr et al., 2000) are cited, but only when they differ from the name recognized in this volume.

Synonymies of orchids are more involved than those of other plant families because the Venezuelan orchid literature is rich. Thus, in addition to citing treatments in the *Flora de Venezuela* (Foldats, 1969, 1970a, 1970b, 1970c, 1970d), we also cite descriptions and illustrations in *Venezuelan Orchids Illustrated* (Dunsterville and Garay, 1959, 1961,

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1965, 1966, 1972, 1976; Dunsterville, 1986), *Orchids of Venezuela* (Dunsterville and Garay, 1979a, 1979b, 1979c) or its second edition (Romero-González and Carnevali Fernández-Concha, 2000), and *Orquídeas Nativas del Táchira* (Fernández, 2003).

Distributional statements are intended to be global, but detail by country-level political unit is reserved generally for South America. Country-level political units in South America are listed from north to south. Distribution within Venezuela is by state and federal district (Distrito Federal) and is often grouped into the major Andean mountain chains within the country (i.e., Cordillera de Mérida, Sierra de Perijá, and Cordillera de la Costa). We appreciate that administratively, the Distrito Federal was abolished in 1999, but most records of Venezuelan plant distribution are based on this former federal district and not the Distrito Capital and Vargas state that replaced it. The maps are intended to quickly convey distributions within Venezuela, and a single dot is placed in the center of the state or federal district for which we have a record of occurrence. Localities within the park have been simplified from those given on herbarium labels; the north slope faces Boconó and the south slope faces the Llanos. The Páramo de Guaramacal is the highest area (3,000–3,100 m elevation) within the park and is more or less located in the park's geographical center. The Fila de Agua Fría (2,600–2,800 m) is the highest peak to the northeast of the Páramo de Guaramacal, whereas the Páramo del Pumar (2,600 m) is an unusually low and interesting páramo on an exposed ridge to the southwest of the Páramo de Guaramacal. Other named localities are described in Dorr et al. (2000). Elevations cited are for park records and are not to be interpreted as the total elevational range of a species or infraspecific taxon. Also, elevations cited are mostly taken from labels on specimens and rounded to 50 m intervals.

Common names cited in this flora are those that were communicated to us by the people living or working in the park. Likewise, the uses of plants that are presented were all provided to us by Ramón Caracas, one of the park guards who lives within the boundaries of the park.

References are selective. Monographs and revisions are cited as are papers that provide the justification for a particular phylogenetic circumscription of a family or genus. Regional treatments of families and genera are only cited when they concern taxa found in Venezuela or neighboring Colombia.

Abbreviations and Commonly Used Symbols

auct.	auctorum (i.e., in the sense of a subsequent author and not the original author)
comb. nov.	combinatio nova (i.e., new combination of name and epithet)
emend.	emendatus (i.e., emended)
f.	forma (i.e., form)
fol.	folio
ibid.	ibidem (i.e., in the same place)
ICN	*International Code of Nomenclature for Algae, Fungi, and Plants* (McNeill et al., 2012)
in litt.	in litteris (i.e., in correspondence)
in sched.	in schedula (i.e., on a label)
MYA	million years ago
nom. cons.	nomen conservandum (i.e., name conserved by the ICN)
nom. cons. prop.	nomen conservandum propositus (i.e., proposed conserved name)
nom. illeg.	nomen illegitimum (i.e., illegitimate name)
nom. nov.	nomen novum (i.e., replacement name)
nom. nud.	nomen nudum (i.e., designation of a new taxon published without a description or diagnosis or reference to a description or diagnosis)
nom. & orth. cons.	nomen & orthographia conservanda (i.e., name and orthography conserved by the ICN)
nom. rej.	nomen rejiciendum (i.e., name rejected by the ICN)
nom. rej. prop.	nomen rejiciendum propositus (i.e., proposed rejected name)
pers. comm.	personal communication
pers. obs.	personal observation
qda.	quebrada (i.e., ravine)
qu.	quarto
sect.	section
s.l.	sensu lato (i.e., in the broad sense)
sp., spp.	species (singular and plural)
s. str.	sensu stricto (i.e., in the strict sense)
subgen.	subgenus
subsp.	subspecies
t., tt.	tabula, tabulae (i.e., plate, plates)
var.	variety
vs.	versus
♦	signifies that a taxon (or its basionym) was described from material collected in Guaramacal National Park
•	signifies that a taxon is an introduced element in the flora of Guaramacal National Park
=	heterotypic synonym (i.e., synonym based on a different type)
≡	homotypic synonym (i.e., synonym based on the same type)
±	more or less
×	hybrid or times (when used with numbers)

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SYSTEMATIC TREATMENT

KEY TO THE FAMILIES OF MONOCOTYLEDONS

1a. Plants achlorophyllous; mycoheterotrophic herbs . . . . . **Burmanniaceae**
1b. Plants chlorophyllous; autotrophic herbs, shrubs or trees 2
2a. Plants woody, shrubby or arborescent; stems unbranched; mature leaf blades usually pinnately compound . . . . **Arecaceae**
2b. Plants herbaceous or woody, never arborescent; stems branched or not; mature leaf blades simple or, if compound, palmately compound 3
3a. Plants with a *Musa*- or *Zingiber*-like habit (i.e., with long, usually oblong, broad leaf blades with a pronounced midrib) 4
4a. Functional stamens 6 or 5 . . . . . **Heliconiaceae**
4b. Functional stamens 1 or ½ 5
5a. Anthers 2-thecate; flowers zygomorphic; sepals connate below 6
6a. Foliage aromatic; leaves distichous; leaf sheaths usually open; labellum formed by the fusion of 2 staminodes from the inner floral whorl . . . . . **Zingiberaceae**
6b. Foliage not aromatic; leaves spirally arranged; leaf sheaths initially closed; labellum formed by the fusion of 5 staminodes from both staminal whorls . . . . . **Costaceae**
5b. Anthers with 1 functional theca, the other anther half petaloid; flowers asymmetric; sepals distinct 7
7a. Flowers borne in mirror-image pairs; stems without mucilage canals; petioles distinctly pulvinate; ovary 3-locular or 1-locular by abortion; ovule 1 per locule; seeds arillate (our species) or not . . . . . **Marantaceae**
7b. Flowers not paired; stems with mucilage canals; petioles epulvinate; ovary 3-locular; ovules few to numerous; seeds not arillate . . . . . **Cannaceae**
3b. Plants without a *Musa*- or *Zingiber*-like habit 8
8a. Plants with spathes (i.e., bract-like modified leaves) and flowers aggregated in spadices (i.e., spikes with small flowers crowded on a thickened axis) 9
9a. Leaf blades plicate and/or bifid apically; spadices subtended by 2–6 mostly caducous spathes (basal spathes sometimes persistent) . . . . . **Cyclanthaceae**
9b. Leaf blades not plicate or bifid apically; spadices subtended by a single mostly persistent spathe . . . . . **Araceae**
8b. Plants without spathes and spadices 10
10a. Leaf blades broad, secondary venation ± reticulate; leaf sheaths not obvious; petioles usually well defined 11
11a. Petioles forming a sheath that usually terminates in a pair of tendrils; inflorescences umbellate, solitary or aggregated in a raceme; fruit a berry . . . . . **Smilacaceae**
11b. Petioles not forming a sheath that terminates in a pair of tendrils; inflorescences spikes or racemes; fruit a capsule (our species) . . . . . **Dioscoreaceae**

10b. Leaf blades narrow or broad, secondary venation parallel; leaf sheaths present; petioles not well defined, usually absent 12
12a. Flowers greatly reduced; perianth inconspicuous; ovary superior 13
13a. Plants cushion-like (our species); inflorescences composed of 1 to several terminal, involucrate heads; peduncles enclosed at base by a tubular sheath; flowers usually unisexual . . . . . **Eriocaulaceae**
13b. Plants not cushion-like; inflorescences and peduncles not as above; flowers unisexual or bisexual 14
14a. Perianth biseriate (tepals 6 [4] in 2 whorls), small but evident; flowers not borne in spikes or spikelets; ovary 1- or 3-locular; ovules 3 to many; fruit dehiscent . . . . . **Juncaceae**
14b. Perianth not as above; flowers sessile, borne in the axis of scalelike bracts (spikes or spikelets); 1-locular; ovule 1; fruit indehiscent 15
15a. Stems usually triangular in cross section, solid, rarely cylindrical and hollow (*Eleocharis*); leaf sheaths usually closed; flowers subtended by a single scale, usually spirally or less frequently distichously arranged; fruit an achene . . . . . **Cyperaceae**
15b. Stems usually cylindrical in cross section, never triangular, hollow or occasionally solid; leaf sheaths usually open; flowers subtended by a pair of scales, distichously arranged; fruit usually a caryopsis, rarely utricle-like . . . . . **Poaceae**
12b. Flowers generally well developed; perianth (at least some parts) usually petaloid; ovary superior or inferior 16
16a. Ovary superior 17
17a. Segments of the perianth differentiated into petals and sepals 18
18a. Leaves all basal or rosulate, not succulent; leaf sheaths open 19
19a. Stamens 3; staminodes 3; leaves equitant . . . . . **Xyridaceae**
19b. Stamens 6, in 2 series; staminodes absent; leaves polystichous, often in rosettes or tank-forming (i.e., collecting water) . . . . . **Bromeliaceae**
18b. Leaves basal or cauline, not forming rosettes, usually scattered along the stem, ± succulent; leaf sheaths closed, sometimes perforated by the peduncle . . . . . **Commelinaceae**
17b. Segments of the perianth similar, not differentiated into sepals and petals 20
20a. Inflorescences lax, corymbiform panicles; flowers pendulous; tepals blue (rarely white); filaments with a central swelling . . . . . **Xanthorrhoeaceae**
20b. Inflorescences racemes; flowers ± erect; tepals greenish-yellow; filaments without a central swelling . . . . . **Tofieldiaceae**
16b. Ovary inferior or at least partially inferior 21
21a. Stamens 1 or 2, adnate to the style in a column; pollen aggregated into pollinia or distinct sticky masses; fruit 1(3)-locular; seeds minute . . . . . **Orchidaceae**
21b. Stamens 3 or 6; not adnate to the style; pollen free (shed as single grains); fruit usually 3-locular; seeds various, not minute 22
22a. Stamens 3; leaves equitant . . . . . **Iridaceae**
22b. Stamens 6; leaves not equitant 23
23a. Leaves cauline or basal and cauline 24
24a. Twining herbs (vine-like); leaves cauline only, resupinate; fruit a semifleshy, leathery capsule; seeds usually with a red-orange sarcotesta . . . . . **Alstroemeriaceae**
24b. Terrestrial herbs, not twining or vine-like; leaves basal and cauline, not resupinate; fruit a capsule; seeds bicaudate or winged . . . . . **Bromeliaceae**
23b. Leaves basal only, often in a rosette 25
25a. Terrestrial or epiphytic herbs; leaf blades with peltate scales (at least when young) **Bromeliaceae**
25b. Terrestrial herbs; leaf blades without peltate scales 26
26a. Leaf blades ovate, elliptic, ovate-elliptic or elliptic-lanceolate; flowers white, subpendulous; staminal cup conspicuous, 1–1.5 cm long . . . . . **Amaryllidaceae**
26b. Leaf blades linear to lanceolate; flowers yellow or greenish-yellow, erect or ascending; staminal cup absent . . . . . **Hypoxidaceae**

ALSTROEMERIACEAE

L. J. DORR AND B. STERGIOS

Perennial herbs; twining or erect; mostly glabrous; rhizomatous. Roots with tuber-like swellings for water and carbohydrate storage. Leaves alternate, spirally arranged or distichous, often clustered near the ends of elongated stems, simple, entire, ovate-lanceolate to lanceolate or linear-lanceolate, membranous, papery, subcoriaceous or rarely somewhat fleshy; sometimes appearing petiolate, not sheathing; veins parallel, arcuate-parallel or ± reticulate; leaf blades generally semiresupinate or resupinate. Inflorescences terminal (our species) or axillary, helicoid cymes in an umbellate arrangement, the flowers often numerous, rarely solitary. Involucral bracts foliaceous or reduced. Flowers actinomorphic or zygomorphic, epigynous, bisexual. Tepals 3 + 3 (rarely 4 + 4), petaloid, free, outer whorl often different than inner whorl; perigonal nectaries present. Stamens 6 in 2 whorls, basifixed or pseudobasifixed; filaments filiform, elongate; anthers 2-thecate. Ovary syncarpous, inferior, ½-inferior or superior, 3-locular, placentation axillary (rarely 1-locular with parietal placentation); septal nectaries absent. Style filiform, triquetrous at the base, with 3 stigmatic branches at the apex or capitate. Tepals, stamens, and style usually caducous. Ovules numerous, in 2 rows in each locule, anatropous or hemianatropous. Fruit a dry, leathery or somewhat fleshy loculicidal capsule (our species) with a circular scar from the tepals or a berry. Seeds globose or ovoid, with or without a sarcotesta.

A family of 4 genera and ~200 species that occur in Mexico, Central America, the West Indies, South America (all country-level political units), New Zealand, and Australia (including Tasmania). Two genera and ~12 species are found in Venezuela.

REFERENCES. Aagesen and Sanso (2003); Bayer (1998); Chacón et al. (2012); Conran and Clifford (1998); Hofreiter (2007); Sanso and Hunziker (1998); Sanso and Xifreda (2001).

Our concept of Alstroemeriaceae includes *Luzuriaga* Ruiz & Pav. and *Drymophila* R. Br., which have been segregated as Luzuriagaceae. Alstroemeriaceae is principally American with a few exceptions; *Bomarea* Mirb. and *Alstroemeria* L. are wholly American, three species of *Luzuriaga* are found in Chile and one in New Zealand, and one species of *Drymophila* is found in Australia and another one in Tasmania.

Bomarea Mirb.

Bomarea Mirb., Hist. Nat. Pl. 9: 71. 1804.

Twining herbs; prostrate, climbing, scandent or erect; stems often tortuous; roots fibrous, often tuberous at the tip. Leaves resupinate; petioles relatively short; leaf blades ovate-lanceolate to linear-lanceolate, margins entire, membranous, papery or subcoriaceous, nerves parallel, glabrous, hirsute or glandular-puberulent. Inflorescences umbellate, simple or compound, few- to many-flowered. Involucral bracts foliaceous or greatly reduced. Flowers actinomorphic or slightly zygomorphic; often nutant. Perianth funnelform or tubular, whitish to orange, pink, red, purple or greenish; outer tepals oblong, uniform, concolorous, sometimes shorter than the internal ones, hooded or not; inner tepals clawed or spathulate, lowermost tepal smaller than the other tepals, differently colored, often maculate. Stamens erect or curved, as long as the perianth; filaments glandular-puberulent or glabrous. Ovary inferior (our species), 3-locular. Fruit a semifleshy, leathery capsule. Seeds numerous, usually with a red-orange sarcotesta.

Found in Mexico, Central America, the West Indies, and South America (Colombia, Venezuela, the Guianas, Ecuador, Peru, Bolivia, Brazil, Chile, Paraguay, and Argentina); introduced into New Zealand where 1 species is now an invasive weed. The genus includes 100–110 species, of which ~10 occur in Venezuela. These Venezuelan species are almost exclusively montane; only *Bomarea edulis* (Tussac) Herb. and *B. ovata* (Cav.) Mirb. are found at lower elevations.

REFERENCES. Alzate et al. (2008a, 2008b); Baker (1888); Garbiso and Estrada (2001); Hofreiter (2006); Hofreiter and Tillich (2002).

Bomarea is closely related to *Alstroemeria* but can be separated by its actinomorphic (sometimes slightly zygomorphic) flowers, straight filaments, leathery to somewhat fleshy capsules or berrylike fruits, and sarcotesta. *Alstroemeria* has zygomorphic flowers, curved filaments, dry capsules with explosive dehiscence, and a dry seed coat.

Baker (1888) proposed a classification of *Bomarea* based on morphology in which he recognized three subgenera. Hofreiter and Tillich (2002) added a fourth subgenus, also based on morphology. However, Alzate et al. (2008a) recovered three clades in a molecular phylogenetic analysis of the genus, none of which correspond to the subgeneric groupings based on morphology.

KEY TO THE SPECIES OF *BOMAREA*

1a. Inflorescences compound umbels, rays 1–3-branched; bracteoles (floral bracts) present; tepals <3 cm long 2
  2a. Cauline leaves 0.8–1.6(–2.5) cm wide, glabrous above, glaucous below with a whitish, scalelike pubescence; rays 1-branched . . . . . ***B. amilcariana***
  2b. Cauline leaves 2–2.5(–3) cm wide, glabrous above and below or with hairs on the nerves below; rays 1–3-branched . . . . . ***B. edulis***
1b. Inflorescences simple umbels, rays unbranched; bracteoles (floral bracts) absent; tepals >4 cm long . . . . . ***B. salicifolia***

♦ ***Bomarea amilcariana*** Stergios & Dorr, Acta Bot. Venez. 26: 32, figs. 1, 2. 2003 [2004]; Briceño, in Morillo et al., Bot. Ecol. Monocot. Páramos Venez. 1: 51–52, fig. 1. 2011.

FIGURES 1, 23A

Bomarea sp. B; Dorr et al., Contr. U.S. Natl. Herb. 40: 36. 2000 [2001].

Bomarea pauciflora auct., non (Kunth) Herb.; Garbiso and Estrada, Plant-ULA 3: 25–27. 2001, pro parte, excluding type.

Twining herbs; prostrate, climbing or scandent. Leaf blades linear-lanceolate (rarely narrowly ovate-lanceolate), 9–11(–15) × 0.8–1.6(–2.5) cm, subcoriaceous, glabrous above, glaucous below

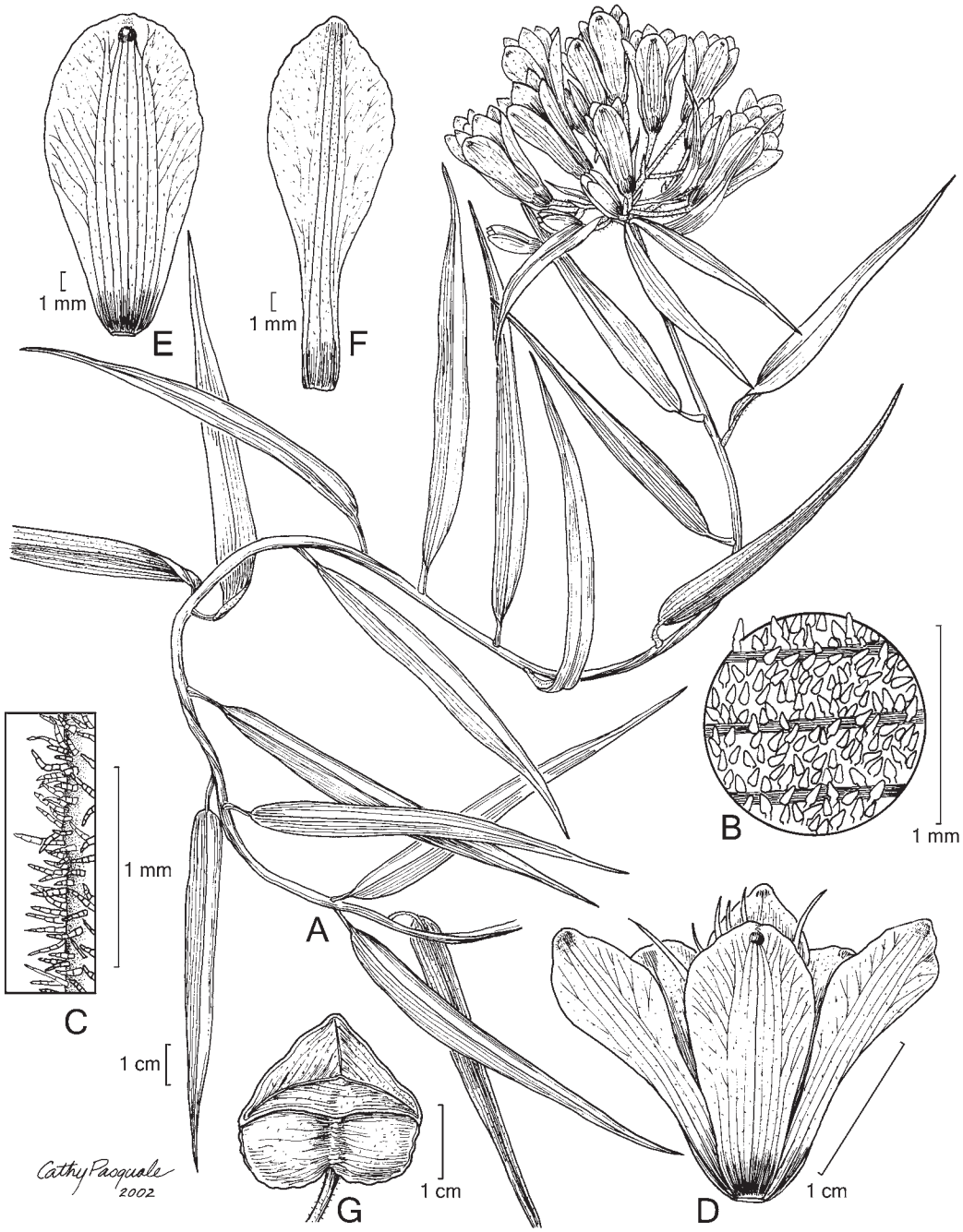
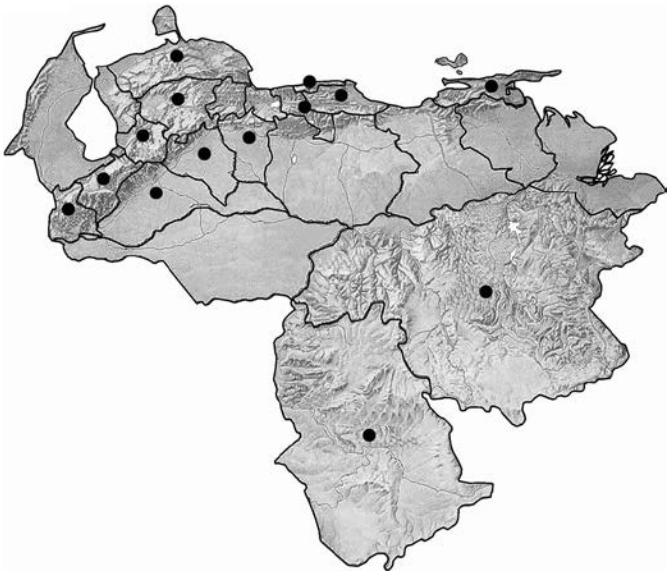


FIGURE 1. Alstroemeriaceae, *Bomarea amilcariana* Stergios & Dorr. **A.** Habit. **B.** Leaf undersurface showing scale-like pubescence. **C.** Detail of multicellular pubescence on umbel rays. **D.** Perianth. **E.** Outer tepal (abaxial view). **F.** Inner tepal (abaxial view). **G.** Fruit. (A–F, *Stergios & Dorr 8387*; G, *Dorr & Barnett 8073*.)

MAP 1. *Bomarea amilcariana* occurrence in Venezuela.



MAP 2. *Bomarea edulis* occurrence in Venezuela.

with a whitish, scalelike vestiture; petioles to 7 mm long. Involucral bracts foliaceous, 2–5 cm long. Umbels lax, ~10–11 cm in diameter; rays 6–12(–14), 1-branched, (3–)5–8.5 cm long, ± densely hirsute-pubescent; floral bracteoles 5–7 mm long. Tepals equal or subequal; outer tepals obovate to broadly spathulate, 2–2.3 × 1 cm, dark or bright red with yellow on the midvein distally; inner tepals spathulate, 2.3–2.6 × 0.7–0.8 cm, green with brown maculations distally. Capsules triangular-turbinate, 1–2 cm in diameter.

Endemic to the Andes of Venezuela (Trujillo; Map 1). Known from cloud forest and páramo on both slopes of Guaramacal as well as from the Páramo del Pumar and the Fila de Agua Fría; (1,600–)1,900–3,100 m.

Bomarea edulis (Tussac) Herb., Amaryllidaceae 111. 1837; Meerow, in Berry et al., Fl. Venez. Guayana 6: 5, fig. 2. 2001. *Alstroemeria edulis* Tussac, Fl. Antill. 109, t. 14. 1808.

♦ *Bomarea truxillensis* Stergios & Dorr, Acta Bot. Venez. 26: 36. 2003 [2004].

Bomarea obovata auct., non Herb.; Dorr et al., Contr. U.S. Natl. Herb. 40: 36. 2000 [2001].

Twining herbs; scandent, prostrate or creeping. Leaf blades lanceolate to linear-lanceolate, (5–)11–12(–20) × 2–2.5(–5) cm, membranous or papery, glabrous above and below or with hairs on the nerves below; petioles 5–8 mm long. Involucral bracts foliaceous, 2–4 × 0.3–0.5 cm. Umbels lax, ~9–11 cm in diameter; rays 3–23, 1–3-branched, 3–15(–26) cm long; secondary and tertiary rays always shorter than primary ones; floral bracteoles to 1.5 cm long. Tepals subequal to unequal; outer tepals broadly ovate, 1.9–3 × 0.6–1.3 cm, pink, pink-orange or pink-purple; inner tepals spathulate, 2–2.7(–3) × 0.5–0.7(–1) cm, white or green with a subapical row of dark maculations. Capsules turbinate or 3-angled, 2–3 cm in diameter.

Found in Mexico, Central America, the Greater Antilles, and South America (Colombia, Venezuela, the Guianas, Peru, Bolivia, Brazil, Paraguay, and Argentina). In Venezuela, found in Amazonas, Aragua, Barinas, Bolívar, Cojedes, Distrito Federal, Falcón, Lara, Mérida, Miranda, Portuguesa, Sucre, Táchira, and Trujillo (Map 2). In the park, found on both slopes of Guaramacal; 1,900–2,900 m.

This species has the widest distribution in the genus and is morphologically variable, two factors that have contributed to an extensive synonymy. The tuberous roots have been used as food, and this may be the reason for its extensive geographic range.

Several species are confused with *Bomarea edulis*. Nearly closed, cucullate flowers distinguish *B. obovata* Herb. from *B. edulis*, which has funnel-shaped flowers. Also, in herbaria, *B. edulis* often is confused with *B. ovata*, but the outer tepals are broadly ovate in the former and narrowly ovate in the latter. Also, the ovary is glabrous or nearly glabrous in *B. edulis* but densely pubescent in *B. ovata*. *Bomarea ovata* appears to be confined to Peru, Bolivia, and Argentina, whereas *B. edulis* is more widespread.

Bomarea salicifolia Killip, Natl. Hort. Mag. 15: 120. 1936.

Twining herbs; scandent or prostrate. Leaf blades linear-lanceolate, 11–13(–24) × 0.8–0.9(–1.5) cm, subcoriaceous, glabrous above and below; petioles 8–10 mm long. Involucral bracts ± dimorphic, outer bracts subfalcate, 4–5 cm long, inner ones linear-lanceolate, 1–1.5 cm long. Umbels congested, ~20 cm in diameter, with 10–40 rays, rays 5–5.5 cm long, unbranched; floral bracteoles absent. Tepals subequal; outer tepals oblanceolate, 4.8–5.1 × 0.8–1.2 cm, pink; inner tepals spathulate, ~4.5 × 1 cm,

MAP 3. *Bomarea salicifolia* occurrence in Venezuela.

green with purple spots near the margins and distally. Capsules not seen.

Endemic to the Andes of Venezuela (Trujillo; Map 3). In the park, found along the Boconó–Guaramacal road; 2,600 m.

This species is rarely collected. It was first gathered in 1846 at an unspecified locality in Trujillo state, described 90 years later, and only collected a second time (our voucher, *Niño et al. 1390*) in 2000. When Killip (1936) described *Bomarea salicifolia,* he misinterpreted its habit as erect rather than prostrate, which is understandable given the limited amount of material that was available to him.

• AMARYLLIDACEAE

L. J. DORR AND B. STERGIOS

Perennial, mostly geophytic herbs; terrestrial (our species), sometimes aquatic or epiphytic; bulbs tunicate. Leaves annual or persistent, distichous or spirally arranged; leaf blades sessile and linear or lorate, or petiolate and lanceolate to widely elliptic; sometimes with a sheath at the base and forming an aerial pseudostem; usually glabrous. Inflorescences scapose, pseudoumbellate (i.e., reduced helicoid cymes); scapes terminated by 2 or more spathe-like, usually marcescent bracts (rarely bracts absent); inner bracteoles usually present and successively shorter and narrower. Flowers 1 to many, usually showy, sessile or pedicellate, actinomorphic or zygomorphic, protandrous, each flower subtended by a bracteole, bisexual. Perianth crateriform, salverform, funnelform, tubular or ventricose, composed of 6 tepals in 2 whorls (3 + 3), connate below to form a tube or rarely free to the base; inner tepals shorter than outer ones; outgrowth of perianth sometimes present, forming a conspicuous crown or relatively inconspicuous rim of scales at the throat. Stamens 6 (3 + 3; rarely more), subequal, inserted in the throat of the perianth or below; filaments variously connate; anthers usually dorsifixed, introrse, dehiscing longitudinally or rarely poricidally. Style filiform. Stigma capitate, 3-lobed or deeply trifid. Ovary syncarpous, inferior, 3-carpellate, 3-locular (rarely 1-locular); septal nectaries present; placentation axile or basal; ovules anatropous. Fruit a capsule, loculicidally dehiscent or sometimes indehiscent, rarely berrylike. Seeds globose or subglobose, fleshy or hard, or flattened and winged, usually with a black or brown phytomelanous seed coat.

A family of ~73 genera and ~1,600 species found in tropical and temperate regions worldwide. Nine genera and 25 native and naturalized species are reported to occur in Venezuela.

REFERENCES. Kubitzki (1998a); Meerow and Snijman (1998); Meerow et al. (1999, 2000); Rahn (1998).

Our concept of Amaryllidaceae includes Alliaceae and Agapanthaceae, but our family description emphasizes characters of taxa most likely to be encountered in the neotropics. Amaryllidaceae is not well represented in Venezuela, although there are a number of taxa cultivated as ornamentals, some of which have escaped and become naturalized.

• *Eucharis* Planch. & Linden

Eucharis Planch. & Linden, in Linden, Cat. Pl. Exot. 8: 3. 1853, nom. cons.

Perennial, geophytic herbs; bulbs usually offsetting vigorously. Leaves persistent, glabrous; petioles subterete, winged distally by attenuation of the base of the leaf blade; leaf blades ovate, elliptic, ovate-elliptic or elliptic-lanceolate, margins frequently undulate, membranous or papery, lustrous, parallel-veined, smooth or plicate between the veins. Inflorescences scapose, pseudoumbellate (i.e., 1 to several reduced helicoid cymes); scapes solid, terminating in 2 green or greenish-white ovate-lanceolate, marcescent bracts. Flowers 2–12, pedicellate or rarely subsessile, pendulous or declinate, white, sometimes fragrant; perianth campanulate or crateriform; perianth tube cylindrical, dilating abruptly above the middle; perianth limb of 6 tepals in 2 series, spreading widely from the throat or partly imbricate; outer tepals longer than inner tepals. Stamens 6, variously connate below; free filament linear, subulate or otherwise petaloid; anthers oblong to linear, subbasifixed or dorsifixed, eventually versatile, introrse. Style filiform, included within, equal to or exserted from the staminal cup. Stigma obtusely 3-lobed. Ovary inferior, green or white, ellipsoid-oblongoid, sometimes trigonous, 3-locular; ovules (2–)7–20 per locule; placentation axile. Fruit a 3-lobed loculicidal capsule, thin walled or leathery, green or bright orange. Seeds few per locule, globose or ellipsoid, lustrous (rarely dull) black, dark brown or blue.

A neotropical genus of 17 species and various natural hybrids found in Central America, the West Indies, and South America (Colombia, Venezuela, Trinidad and Tobago, Suriname, Ecuador, Peru, Bolivia, and Brazil). In Venezuela, 2 species are cultivated or naturalized.

References. Meerow (1989); Meerow and Deghan (1984).

The genus *Eucharis* as circumscribed by Meerow and Snijman (1998) and Meerow (1989) may not be monophyletic (Meerow et al., 2000).

• ***Eucharis amazonica*** Linden ex Planch., Fl. Serres Jard. Eur. 12 [sér. 2, 2]: 69, tt. 1216, 1217. 1857.

Herbs, 40–50 cm tall; bulbs 3–5 cm in diameter, tunics brown. Leaves 2–4; petioles slender, 15–20(–50) cm long; leaf blades elliptic, 15–17(–50) × 8–9 cm, bases attenuate, margins ± undulate, apices acuminate, shallowly or inconspicuously plicate, dark green above, lighter green below. Scapes 28–32(–80) cm long, narrowing distally. Flowers 4–6(–8), subpendulous, white, sweet scented; pedicels 15–17(–25) mm long, slightly curved; perianth tube strongly curved, cylindrical below, dilating in upper ⅓, white; perianth limb spreading widely from the throat of the tube, 9–10 cm wide; tepals ovate; outer tepals apiculate, 4–4.5 × 2–3 cm; inner tepals acute, 3.5–4 × 2.5–3.5 cm. Staminal cup widely cylindrical, 1–1.5 cm long; stamens with 2 obtuse lobes, 1 on each side of the subulate free filament. Style white, exserted from the staminal cup. Ovary oblong-ellipsoid, 0.7–1.3 cm long; ovules 9–15 per locule, superposed. Fruit and seed unknown.

Native to northern Peru but widely cultivated and now naturalized in Central America (Panama), the West Indies, and South America. In Venezuela, known from gardens in Aragua, Carabobo, Distrito Federal, Nueva Esparta, and Trujillo; naturalized in Trujillo, at least (Map 4). In the park, found near the Laguna de Aguas Negras; ~1,850 m.

Eucharis amazonica is widely and incorrectly known in the horticultural trade as *E. grandiflora* Planch. & Linden. Meerow (1989) considered this latter taxon, which has not been found in Guaramacal, to be a hybrid (i.e., *E.* ×*grandiflora* Planch. & Linden) that originated in Colombia. The parents of this hybrid are *E. moorei* (Baker) Meerow and *E. sanderi* Baker.

MAP 4. *Eucharis amazonica* occurrence in Venezuela.

Araceae

L. J. DORR AND B. STERGIOS

Terrestrial, epiphytic, hemiepiphytic or lithophytic herbs, rarely aquatic; latex milky or watery; rhizomes, corms or stolons present; stems aerial and erect, climbing or scandent. Leaves spirally arranged or sometimes distichous; cataphylls (i.e., bladeless leaves corresponding in appearance to petiole sheaths) usually present, deciduous or persistent, intact or weathering into fibers; petioles often geniculate apically; blades simple, lobed or compound, sometimes perforate, margins entire, usually glabrous, primary lateral nerves pinnate, lesser nerves striate or reticulate. Inflorescences 1 to several terminal (sometimes appearing axillary) spadices (i.e., densely congested, unbranched spikes of minute, ebracteolate flowers), each spadix subtended or enveloped by a single, often colored spathe (i.e., bract-like modified leaf), free or sometimes partially adnate to the spadix, spreading, reflexed or convolute, sometimes constricted below the middle and differentiated into a proximal tube and distal blade, often persistent. Flowers bisexual or unisexual, when unisexual then plant usually monoecious and staminate flowers distal to the pistillate ones; staminate and pistillate flowers contiguous or separated by sterile flowers. Perianth absent or present; when present composed of 4–6 free or rarely united tepals. Stamens 2–6(–9), free or united in synandria (i.e., staminate flowers composed of connate stamens). Pistil 1, free. Ovary usually superior, 1–3(to many)-loculed; ovules 1 to many; placentation axile, parietal, basal or apical. Style 1, inconspicuous. Stigma ± discoid. Fruit a berry, 1- to many-seeded. Seeds various; testa thin to thick.

A cosmopolitan family of ~120 genera and ~3,800 species, with its greatest diversity in the tropics. The family is found in all country-level political units in the Americas except for Greenland. Twenty-four genera and ~290 species occur in Venezuela.

References. Bunting (1979); Cabrera et al. (2008); Croat and Lambert (1986); Cusimano et al. (2011); Madison (1978b); Mayo et al. (1997, 1998); Nauheimer et al. (2012); Nicolson (1982); Rothwell et al. (2004); Schott (1860); Wilson (1960).

The family circumscription adopted here includes Lemnaceae, which long was considered to be a separate family composed exclusively of aquatic plants (see, e.g., Landolt in Hokche et al., 2008). Molecular data, however, indicate that these floating aquatics belong in Araceae (Rothwell et al., 2004), and they are now treated as a distinct clade (subfamily Lemnoideae) sister to the "true" Araceae (Cusimano et al., 2011).

A subfamily classification based on nonmolecular characters proposed by Mayo et al. (1997) recognized seven subfamilies (not including Lemnoideae), and it was largely confirmed in a molecular analysis by Cabrera et al. (2008). However,

reanalysis of molecular data by Cusimano et al. (2011) with more complete gene sampling identified 44 larger clades, most of which are informally named. These clades undoubtedly will eventually serve as the basis for a new subfamily classification.

KEY TO THE GENERA OF ARACEAE

1a. Spathe undifferentiated; flowers bisexual 2
  2a. Spathe persistent after anthesis; flowers with 4 tepals . . . . . ***Anthurium***
  2b. Spathe marcescent or deciduous soon after anthesis; flowers achlamydeous 3
    3a. Leaf blade entire, never perforate; ovules numerous per locule . . . . . ***Rhodospatha***
    3b. Leaf blade often perforate, sometimes perforations laterally open to the margins; ovules 2 per locule . . . . . ***Monstera***
1b. Spathe differentiated into a convolute tube proximally and an expanded blade distally; flowers unisexual 4
  4a. Climbing, hemiepiphytic or epiphytic herbs; spathe and/or spadix secreting resin at anthesis; staminate flowers with 2–6 free stamens . . . . . ***Philodendron***
  4b. Terrestrial ± arborescent herbs (our species); spathe and spadix dry at anthesis; staminate flowers with 4–6 connate stamens . . . . . ***Xanthosoma***

Anthurium Schott

Anthurium Schott, Wiener Z. Kunst 1829: 828. 1829.

Epiphytic, hemiepiphytic, lithophytic or terrestrial herbs; rarely rhizomatous; stems erect, creeping or climbing; laticifers absent. Leaves often clustered near the apex of stems; cataphylls entire (membranous) or rotting and forming a fibrous mass, usually ± persistent; petioles geniculate apically, terete to angled; sheaths conspicuous in juvenile leaves and very short in mature ones; blades simple, dissected or compound, variously shaped, linear to orbicular in outline, primary lateral veins pinnate, forming 1 or more submarginal collective veins, basal ribs often present in cordate leaves, higher-order venation reticulate, coriaceous, membranous or stiff and brittle. Inflorescences solitary. Peduncles elongate. Spathe simple, usually linear to elliptic or ovate, erect, spreading or reflexed, not enclosing the spadix, usually persistent, sometimes marcescent or deciduous. Spadix sessile to long-stipitate, cylindrical to conical, less commonly clavate or globose, very short to very long (>1 m long). Flowers bisexual, perigoniate (i.e., with a floral envelope in which there is no differentiation between sepals and petals); tepals 4, fornicate (i.e., with scalelike appendages) in 2 decussate whorls. Stamens 4, free. Ovary ovoid to oblong or obovoid, 2-locular; ovules 1 or 2(rarely more) per locule, anatropous to campylotropous. Stylar region inconspicuous. Stigma small, subcapitate. Berry globose to oblong-fusiform. Seeds 2–4, variously colored; testa thin, smooth or subverrucose, often sticky.

A neotropical genus of 900–1,000 species found in Mexico, Central America, the West Indies, and South America (all country-level political units except Uruguay); introduced in tropical Asia. Seventy-five species are found in Venezuela.

References. Carlsen (2011); Croat (1985, 1991); Croat and Bunting (1979); Croat and Carlsen (2013); Croat and Sheffer (1983); Engler (1898, 1905); Madison (1978a); Sheffer et al. (1980).

The genus *Anthurium* is monophyletic (Carlsen, 2011). *Anthurium* and several smaller genera found in Madagascar, Asia, and Australasia are currently placed in a clade that corresponds to the subfamily Pothoideae (Cusimano et al., 2011), which is sister to the Monsteroideae. In the scheme outlined by Cusimano et al. (2011) these two subfamilies form a larger clade that is informally named the bisexual climbers clade.

Infrageneric classification of *Anthurium* is less well resolved. Carlsen (2011), using molecular evidence, determined that for the most part the sectional classification of *Anthurium* proposed by Croat and Sheffer (1983) is artificial and does not reflect the phylogeny of the genus.

KEY TO THE SPECIES OF *ANTHURIUM*

1a. Leaves palmately compound . . . . . ***A. eminens***
1b. Leaves simple 2
  2a. Bases of leaf blades obtuse to subtruncate or slightly cordate, not lobed 3
    3a. Leaf blades dark glandular-punctate above and below 4
      4a. Stems and leaves tightly adhering to substrate (usually tree trunks); leaf blades 1.2–3(–5.5) cm wide; spadix <2 cm long . . . . . ***A. scandens***
      4b. Stems and leaves not tightly adhering to substrate, usually erect; leaf blades 3.5–18 cm wide; spadix >2.5 cm long 5

5a. Leaf blades ovate to broadly ovate, 11–18 cm wide; petioles much longer than leaf blades . . . . . ***A. bernardii***
5b. Leaf blades lanceolate to narrowly ovate, 4–5 cm wide; petioles shorter than leaf blades . . . . ***A. gehrigeri***
3b. Leaf blades not dark glandular-punctate 6
6a. Leaf blades brownish glandular-punctate above and below (punctations often difficult to see); petioles much longer than leaf blades . . . . . ***A. longegeniculatum***
6b. Leaf blades without glandular punctations, dark or otherwise; petioles ± equal to or shorter than leaf blades 7
7a. Leaf blades <15 cm wide, collective vein continuous from near base to apex; cataphylls deciduous; bases of leaf blades cuneate to narrowly attenuate, truncate or rounded; petioles subterete, <0.5 cm in diameter . . . . . ***A. amoenum***
7b. Leaf blades >20 cm wide, collective vein not continuous; cataphylls persisting, fibrous; bases of leaf blades long-attenuate; petioles sulcate-triangular, ≥1 cm in diameter . . . . . ***A. crassinervium***
2b. Bases of leaf blades lobed; lobes unequal, separated by a sinus 8
8a. Spathe lanceolate to narrowly or broadly lanceolate, recurved at anthesis 9
9a. Spathe bright or brick-red (less commonly reddish-pink); peduncles 14–17.5(–36) cm long . . . . ***A. julianii***
9b. Spathe green; peduncles 32–53 cm long . . . . . ***A. smaragdinum***
8b. Spathe ovate or ovate-lanceolate, erect, not recurved at anthesis 10
10a. Cataphylls remaining intact; leaf blades ovate to broadly ovate, never constricted 11
11a. Spathe white or pinkish-white; spadix shorter than spathe . . . . . ***A. nymphaeifolium***
11b. Spathe light greenish-cream to greenish-yellow; spadix longer than spathe . . . . . ***A. ramoncaracasii***
10b. Cataphylls disintegrating into a mass of fibers (at least below); leaf blades obpyriform to triangular-ovate, constricted or not 12
12a. Leaf blades obpyriform, slightly to strongly constricted; sinus between basal lobes parabolic to broadly parabolic, lobes divergent, never overlapping . . . . . ***A. ginesii***
12b. Leaf blades triangular-ovate, not constricted; sinus between basal lobes hippocrepiform to spathulate, lobes not divergent, sometimes overlapping . . . . . ***A. nubicola***

Anthurium amoenum Kunth & C. D. Bouché, Index Seminum [Berlin] 1848: 11. 1848.

FIGURE 23B

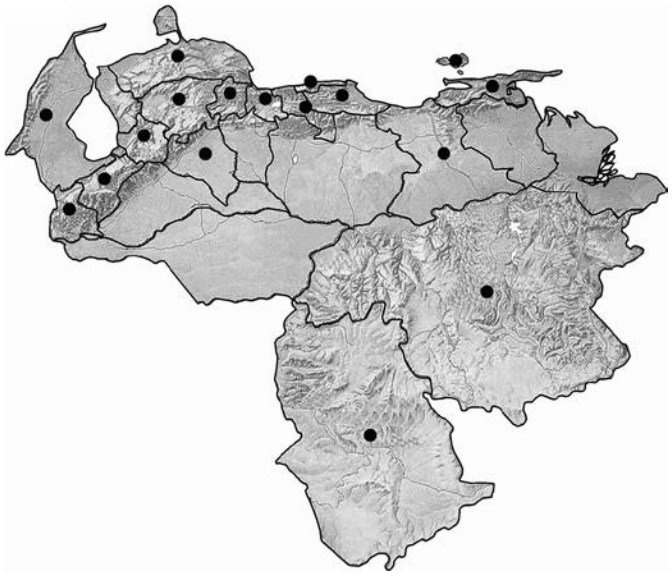
Anthurium humile Schott, Prodr. Syst. Aroid. 442. 1860. *Anthurium amoenum* var. *humile* (Schott) Engl., Bot. Jahrb. Syst. 25: 380. 1898; Dorr et al., Contr. U.S. Natl. Herb. 40: 37. 2000 [2001].

Terrestrial, climbing or epiphytic herbs; stems typically creeping. Leaves simple; cataphylls deciduous; petioles 25–38(–50) cm long, ± equal in length to leaf blades; leaf blades elliptic to broadly elliptic or obovate, 28–42 × (6.5–)9–16 cm, bases cuneate to narrowly attenuate, truncate or rounded, apices long-acuminate, apiculate, primary lateral veins ascending, collective vein slightly sinuate, weakly loop connected at primary lateral veins, 3–8 mm from the margin, membranous, without glandular punctations. Inflorescences erect, slightly longer than petioles. Peduncles 20–50(–68) cm long. Spathe broadly lanceolate, 4–9 × 1–1.7 cm, recurved, green or pale green. Spadix not stipitate, cylindrical, slightly tapering to the apex, 4–8.5(–11) cm long, green or greenish-yellow.

Restricted to South America (Colombia, Venezuela, Ecuador, Peru, and Bolivia). In Venezuela, collected in the Andes (Barinas, Lara, Mérida, Portuguesa, and Trujillo) and the Cordillera de la Costa (Aragua, Distrito Federal, Falcón, Miranda, and Yaracuy; Map 5). In the park, found in montane forest on both slopes of Guaramacal; (1,600–)1,800–2,100 m.

MAP 5. *Anthurium amoenum* occurrence in Venezuela.

MAP 6. *Anthurium bernardii* occurrence in Venezuela.



MAP 7. *Anthurium crassinervium* occurrence in Venezuela.

Engler (1898) recognized two varieties of this species, which he distinguished on relatively minor differences in leaf shape. Although we accepted this distinction earlier (Dorr et al., 2000), it now appears to us that there is only a single, variable, and widespread Andean species; differences in leaf base shapes that we cited as being diagnostic occur within populations.

Anthurium bernardii Croat, Aroideana 8: 120. 1985 [1986].

Anthurium bredemeyeri auct., non Schott; Ortega et al., BioLlania 5: 33. 1987.

Anthurium fernandezii auct., non Croat; Dorr et al., Contr. U.S. Natl. Herb. 40: 37. 2000 [2001].

Terrestrial, climbing or epiphytic herbs; stems erect, to 20(–30) cm tall. Leaves simple; cataphylls persisting as a network of fibers that surround the lowermost internodes; petioles 28–48 cm long, much longer than leaf blades; leaf blades ovate to broadly ovate, 22–32 × 11–18 cm, bases acute to rounded, apices acuminate, primary lateral veins pinnate-parallel, collective vein straight or weakly loop connected at primary lateral veins, 2–8 mm from margin, subcoriaceous, blackish glandular-punctate above and below. Inflorescences erect, shorter than petioles. Peduncles 18–35 cm long. Spathe lanceolate, to 1 × 6 cm, erect to reflexed, clasping at base, dark green outside to reddish-green or reddish-brown inside. Spadix sessile to short-stipitate, cylindrical, slightly tapering apically, 5.5–10 cm long, reddish-brown to purple.

Endemic to the Cordillera de Mérida in Venezuela (Barinas, Mérida, and Trujillo; Map 6). In the park, found in montane forest and cloud forest on both slopes of Guaramacal, including the karst area above the Río Amarillo; (1,200–)1,600–2,350 (–2,700) m.

This species is superficially similar to *Anthurium smithii* Croat, which has a more extensive range in Andean Venezuela and Colombia, but the two species are easily distinguished because the latter has dark glandular punctations on only the lower surface of the leaf blades.

Anthurium crassinervium (Jacq.) Schott, Wiener Z. Kunst 1829: 828. 1829. *Pothos crassinervius* Jacq., Collectanea 4: 122. 1790 [1791] ("*crassinervia*").

Terrestrial, lithophytic or epiphytic herbs; stems short, leaves erect to spreading from a rosette-like base. Leaves simple; cataphylls persisting ± intact, weathering into a network of fibers; petioles 3–35 × 0.5–1 cm, generally quadrangular in cross section, thicker than broad, sulcate; leaf blades oblanceolate, 25–150 × 10–50 cm, bases acute to obtuse, margins undulate, apices gradually acuminate or rounded, primary lateral veins ascending, collective vein arising in the upper ⅓–¼ of blade, coriaceous. Inflorescences erect to spreading. Peduncles 20–98 × 0.5–1 cm, usually longer than petioles. Spathe lanceolate, 8–15 × 1.5–2 cm, spreading to reflexed, green, sometimes suffused with purple, deciduous. Spadix sessile to short-stipitate, gradually attenuate, (5–)12–35 × 0.7–1.5(–2.5) cm, dark purple or greenish-purple. Infructescence pendent; berries red.

Native to Mexico, Central America, and South America (Colombia, Venezuela, Curaçao, Guyana, and Peru); introduced in Australia (Queensland). Widespread in Venezuela (Amazonas, Anzoátegui, Aragua, Bolívar, Carabobo, Distrito Federal, Falcón, Lara, Mérida, Miranda, Nueva Esparta, Portuguesa, Sucre, Táchira, Trujillo, Yaracuy, and Zulia; Map 7). Found in montane forest and cloud forest on both slopes of Guaramacal; 1,850–1,950 m.

This species is part of a complex that has an extensive geographical distribution. If considered in its narrowest sense (e.g., Mayo, 1982), the range of our taxon would be restricted to Colombia and western Venezuela.

Anthurium crassinervium s.l. is cultivated and available in the horticultural trade as bird's nest anthurium.

Anthurium eminens Schott, Oesterr. Bot. Wochenbl. 5: 273. 1855; Bunting, in Berry et al., Fl. Venez. Guayana 2: 608. 1995.

Anthurium wittianum Engl., nom. nud., in sched.

Anthurium ascensus G. S. Bunting, nom. nud., in sched.

All Venezuelan material is referred to the nominate subspecies.

Anthurium eminens subsp. ***eminens.***

Epiphytic, hemiepiphytic or scandent herbs; stems to 10 m long. Leaves palmately compound; cataphylls disintegrating into a network of pale, persistent fibers; petioles 50–75 cm long, canaliculate; leaflets 11–15, radiating from a central nexus; petiolules 4–12 cm long; leaflet blades narrowly oblong to oblong, 5–10 × 20–40 cm, somewhat unequal in size with lateral leaflets smallest, bases cuneate to truncate, apices long-acuminate, almost caudate, primary lateral veins parallel-ascending, collective vein arising near base and extending to apex, 3–4 mm from margin, coriaceous. Inflorescences ± ascending. Peduncles 30–35 cm long, shorter than petioles. Spathe linear-lanceolate, 20–50 × (0.1–)1–3 cm, widest near base and tapering to a fine point apically, reflexed and twisted, green, sometimes suffused with purple, persistent. Spadix short-stipitate, cylindrical, 25–45 cm × 6–12 mm, expanding in fruit, dark dull green or bright purple fading to brownish-gray. Berries purple, often found only at base of spadix.

Found in South America (Colombia, Venezuela, the Guianas, Ecuador, Peru, Bolivia, and Brazil). In Venezuela, known from the Andes (Barinas, Lara, Portuguesa, and Trujillo), the Cordillera de la Costa (Miranda), and the Venezuelan Guayana (Amazonas and Bolívar; Map 8). Found in forest on south-facing slopes in La Divisoria de la Concepción, El Santuario, and other localities in the park; (1,500–)1,800–2,100 m.

Common Name. Guajesito.

Anthurium eminens subsp. *longispadix* Croat & M. M. Mora, described from and evidently endemic to the Chocó region of Colombia, is distinguished by its long, grayish-green spadix that is more slender and about twice as long as that of the nominate subspecies.

Carlsen (2011) demonstrated with molecular data that the palmately divided leaf morphology in *Anthurium* evolved independently at least three times. Nonetheless, most of the species with palmately divided leaves, including *A. eminens*, fall into a single clade, which is recognized as *A.* sect. *Dactylophyllium* (Schott) Engler emend. Croat & Carlsen (Croat and Carlsen, 2013).

Anthurium gehrigeri Croat, Aroideana 8: 129. 1985 [1986]; Morillo and Briceño, in Morillo et al., Bot. Ecol. Monocot. Páramos Venez. 1: 69. 2011.

Epiphytic or climbing herbs; stems erect to ascending. Leaves simple; cataphylls persisting as a network of fibers covering the stem and internodes; petioles 9–18(–23) cm long, generally shorter than leaf blades; leaf blades lanceolate to narrowly ovate, 14–28.5 × 3.5–4.5(–6.5) cm, bases acute, apices acuminate to long-acuminate, primary lateral veins ascending, collective vein straight or weakly arcuate, 5–7 mm from margin, subcoriaceous, blackish glandular-punctate above and below. Inflorescences erect. Peduncles (8.5–)18–30 cm long, longer than petioles (shorter than petioles and blades combined). Spathe lanceolate, 2–5 × 0.5 cm, greenish, recurved. Spadix short-stipitate, narrowly cylindrical, (3–)5–7 cm long, greenish.

MAP 8. *Anthurium eminens* subsp. *eminens* occurrence in Venezuela.

MAP 9. *Anthurium gehrigeri* occurrence in Venezuela.

Endemic to Venezuela, where it is found in the Andes (Mérida and Portuguesa), the Sierra de Perijá (Zulia), and the Cordillera de la Costa (Miranda; Map 9). In the park, found near La Divisoria de la Concepción, Paramito, and La Aguadita; (1,550–)1,700–1,950 m.

This is the smallest *Anthurium* species found in the park apart from *A. scandens*, which has a very different and distinctive climbing habit.

Anthurium ginesii Croat, in Croat and Lambert, Aroideana 9: 30, fig. 53. 1986; Morillo and Briceño, in Morillo et al., Bot. Ecol. Monocot. Páramos Venez. 1: 69–71, fig. 1. 2011.

FIGURE 23G

Terrestrial or epiphytic herbs; stems to 30 cm long. Leaves simple; cataphylls persisting almost intact or disintegrating into strips (not mesh); petioles 25–79 cm long, terete, somewhat flattened apically; leaf blades obpyriform, slightly to strongly constricted between basal lobes and apex, (14–)20–44 × (6–)10–35 cm, bases cordate, margins notably concave, apices gradually to abruptly acuminate, basal sinus parabolic to broadly parabolic, 5–15 cm deep, lobes divergent, never overlapping, collective vein 2–6 mm from margin, subcoriaceous. Inflorescences erect. Peduncles 25–56 cm long, shorter than leaves. Spathe ovate-lanceolate, (3.5–)8–16 × (1.5–)4–5 cm, erect, ± cucullate, green with maroon stripes within, uniformly green without. Spadix stipitate, (3.5–)8–16 cm long, ± equal to spathe, attenuate-terete, brownish-green to green.

Restricted to South America (Colombia and Venezuela). Venezuelan records are from the Andes (Lara, Mérida, Portuguesa, Táchira, and Trujillo) and the Sierra de Perijá (Zulia; Map 10). In the park, widely distributed in the understory of cloud forest; 1,700–2,400 m.

Although *Anthurium ginesii* and *A. nubicola* usually can be distinguished by their leaf morphology (see key), the two species have been confused. This confusion appears to derive from the protologue of the former name, which includes two different elements. The type (*Croat 54927*) and one of the photographs (Croat and Lambert, 1986: fig. 53) represent *A. ginesii*, a species with slightly to strongly constricted leaf blades with parabolic to broadly parabolic sinuses. However, at least one of the paratypes (*Stergios 6564*), incidentally collected in Guaramacal, and the other photographs (Croat and Lambert, 1986: figs. 51, 52, 56) cited in the protologue clearly represent *A. nubicola*, which has triangular-ovate leaf blades with hippocrepiform to spathulate sinuses.

♦ ***Anthurium julianii*** G. S. Bunting, Acta Bot. Venez. 10: 272. 1975; Morillo and Briceño, in Morillo et al., Bot. Ecol. Monocot. Páramos Venez. 1: 71–72, fotos 2, 3. 2011.

Epiphytic or hemiepiphytic herbs; stems to 3 m long. Leaves simple; cataphylls persisting as a network of fibers; petioles 40–88 cm long, subterete or narrowly sulcate, equal to or longer than leaf blades; leaf blades ovate, 43–71(–75) × 24–46 cm, bases cordate, margins slightly undulate, apices acuminate to cuspidate, basal lobes rounded, sinus hippocrepiform to spathulate, 12–20 cm deep, primary lateral veins 8–12 per side, basal veins 4 or 5 per side, first and often second basal veins free, others coalesced 1–3 cm along sinus, primary and secondary veins slightly raised above, primary and secondary veins prominent below, surface ± rugose, collective vein in the apical part of the blade 2–3 mm distant from leaf margin, subcoriaceous. Inflorescences erect or ascending. Peduncles 14–17.5(–36) cm long. Spathe broadly lanceolate, 10–15(–30) × 2–3.5(–7) cm, bases clasping, apices caudate, bright or brick-red (less commonly reddish-pink) within and without, recurved, persistent. Spadix stipitate, stipe 0.5–2.5 cm, slightly tapered apically, 10–19(–32) × 1.2–1.8 cm, expanding in fruit, green (at anthesis).

Endemic to the Andes of Venezuela (Lara, Mérida, Táchira, and Trujillo; Map 11). In the park, found in montane forest near

MAP 10. *Anthurium ginesii* occurrence in Venezuela.

MAP 11. *Anthurium julianii* occurrence in Venezuela.

the Laguna de Aguas Negras, in cloud forest on the Fila de Agua Fría, and elsewhere on the north slope of Guaramacal; 1,800–2,900 m.

This species is similar to *Anthurium smaragdinum* G. S. Bunting; characters to distinguish the two are given in the key to the genus and following the description of the latter species.

A report by Croat and Carlsen in Hokche et al. (2008) of *Anthurium julianii* occurring in the Cordillera de la Costa (Aragua) needs to be verified.

Anthurium longegeniculatum Engl., Bot. Jahrb. Syst. 25: 379. 1898; Morillo and Briceño, in Morillo et al., Bot. Ecol. Monocot. Páramos Venez. 1: 72, fig. 2. 2011.

Terrestrial or epiphytic herbs; stems scandent, to ~1 m long. Leaves simple; cataphylls persisting as a braided network of fibers covering basal nodes; petioles (16–)30–39 cm long, much longer than leaf blades; leaf blades ovate to oblong-ovate, (9–)13–19.5 × (3–)8–8.5 cm, bases slightly cordate, apices long-acuminate, primary lateral veins ascending, collective vein sinuate, loop connected at primary lateral veins, 2–10 mm from margin, noticeably closer at apex than base, subcoriaceous, brownish glandular-punctate above and below (punctations often difficult to see). Inflorescences erect, shorter than petioles. Peduncles 15–19.5 cm long. Spathe linear-lanceolate, ~2–2.5 × 0.8 cm, reflexed, green to greenish-white. Spadix distinctly stipitate, cylindrical, 2–3.5(–7) cm long, green.

Found in South America (Colombia, Venezuela, Ecuador, and Peru). In Venezuela, found only in the Cordillera de Mérida (Trujillo; Map 12). In the park, found in montane forest on the north slope including Qda. Segovia and below Páramo del Pumar; 1,800–2,800(–3,000) m.

MAP 12. *Anthurium longegeniculatum* occurrence in Venezuela.

MAP 13. *Anthurium nubicola* occurrence in Venezuela.

Anthurium nubicola G. S. Bunting, Acta Bot. Venez. 10: 274. 1975; Morillo and Briceño, in Morillo et al., Bot. Ecol. Monocot. Páramos Venez. 1: 73, foto 4. 2011.

Anthurium sp.; Ortega et al., BioLlania 5: 33. 1987 (as to *Stergios 2561*).

Epiphytic or climbing herbs; stems 0.8–3 m long. Leaves simple; cataphylls persisting, degenerating at the base into a fibrous mass; petioles to 60 cm long; leaf blades triangular-ovate, not constricted between basal lobes and apex, 28–37(–52) × 11–15(–28) cm, bases strongly cordate, margins undulate, slightly revolute, apices acute to acuminate, basal sinus hippocrepiform to spathulate, 8–14 cm deep, lobes not divergent, sometimes overlapping, collective nerve present in the upper part of the leaf blade, 5–7 mm from margin, coriaceous. Inflorescences erect or ascending. Peduncles 25–30 cm long. Spathe 6.5–8(–13) × 1.5–4(–6.5) cm, green with maroon nerves inside, green outside, ± erect. Spadix shortly stipitate, 5–11(–20) cm long, purple.

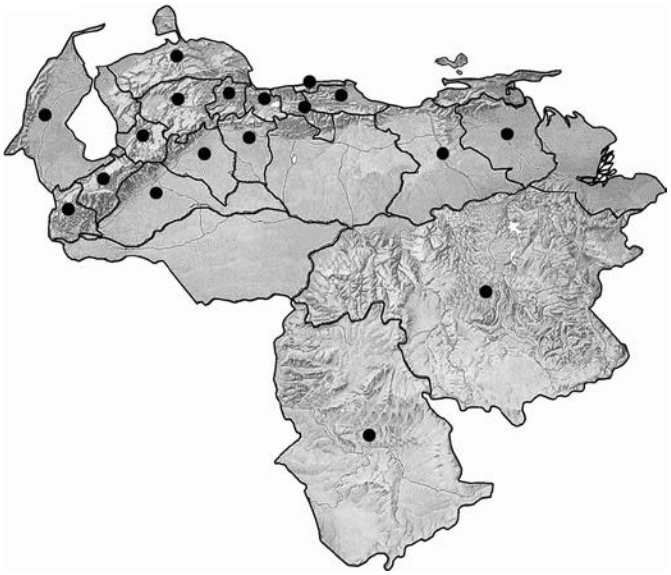
Endemic to the Cordillera de Mérida of Venezuela (Mérida and Trujillo; Map 13). In the park, found in cloud forest on both slopes of Guaramacal, including the Fila de Agua Fría; 2,000–2,900 m.

It appears that *Anthurium nubicola* is misplaced in *A.* sect. *Calomystrium* Schott. Although the cataphylls were described in the protologue as "persistent, not soon deteriorating," material from Guaramacal that matches the type in leaf morphology has cataphylls that disintegrate, at least below, into a mass of fibers.

Anthurium nymphaeifolium K. Koch & C. D. Bouché, Index Seminum [Berlin] 1853: 16. 1853 ("*nymphaefolium*"); Morillo and Briceño, in Morillo et al., Bot. Ecol. Monocot. Páramos Venez. 1: 73–74, fotos 5, 10. 2011.

FIGURE 23C, D

Anthurium sp.; Ortega et al., BioLlania 5: 33. 1987 (as to *Stergios 2547*).



MAP 14. *Anthurium nymphaeifolium* occurrence in Venezuela.

MAP 15. *Anthurium ramoncaracasii* occurrence in Venezuela.

Terrestrial, epiphytic or climbing herbs; stems elongate, to 2 m long. Leaves simple; cataphylls reddish-brown, entire, and persistent; petioles 50–83 cm long, erect, rigid, ± terete; blades ovate to broadly ovate, 42–51 × 24–28 cm, lateral veins prominent, joined near the apex of the blade to form a collective vein, basal sinus hippocrepiform to spathulate, 9–13 cm deep, basal lobes ± as long as wide, sometimes almost touching, coriaceous, nitid. Inflorescences erect. Peduncles 35–76 cm long, equal to or longer than petioles. Spathe ovate to broadly ovate, 10–17 × 4–6.5 cm, erect, apices cuspidate or long-acuminate, white, pinkish-white or greenish-white within, green without. Spadix stipitate, cylindrical, 5.5–12 × ~1.5 cm, shorter than spathe.

Found in South America (Colombia and Venezuela). Widespread in Venezuela (Amazonas, Anzoátegui, Aragua, Barinas, Bolívar, Carabobo, Cojedes, Distrito Federal, Falcón, Lara, Mérida, Miranda, Monagas, Portuguesa, Táchira, Trujillo, Yaracuy, and Zulia; Map 14). Found throughout the park in montane forest and cloud forest; (1,500–)1,800–2,900 m.

This is a variable species for which several varieties have been described, although none are recognized here. Bunting (1979) attempted to correlate some of the morphological variation (spathe color, leaf shape, etc.) that he observed with geography and elevation but stopped well short of proposing a formal subspecific taxonomy. The limits of *Anthurium nymphaeifolium* and related species assigned to *A.* sect. *Calomystrium*, including *A. ramoncaracasii*, deserve further study.

♦ ***Anthurium ramoncaracasii*** Stergios & Dorr, Acta Bot. Venez. 27: 96, fig. 1. 2004 [2005].

FIGURES 2, 23E

Terrestrial herbs; stems scandent, to 2 m long. Leaves simple; cataphylls persistent, entire; petioles (50–)73–80 cm long, subterete, sulcate near base; leaf blades ovate to broadly ovate, (20–)50–65 cm × 25–35 cm wide, bases cordate, margins slightly sinuous, apices acute to acuminate, basal sinus parabolic to spathulate, 8–13 cm deep, basal lobes rounded, primary lateral veins 6–12 per side, basal veins 4–5 per side, all ± free, midvein and basal nerves prominent below, collective vein originating from uppermost basal vein, extending length of apical lobe, 5–12 mm from margin, subcoriaceous. Inflorescences ± pendent. Peduncles 45–68 cm long. Spathe broadly ovate, cymbiform, 10–18 × 5–8 cm, abruptly acuminate, slightly cucullate, light greenish-cream to greenish-yellow, persistent. Spadix stipitate, cylindrical, slightly tapering apically, 14–21 × 1.5–1.8 cm, arcuate, declined 45°–90°, bright wine-red in color, longer than the spathe (especially in fruit).

Endemic to the Cordillera de Mérida in Venezuela (Portuguesa and Trujillo; Map 15). In the park, found on the north slope of Guaramacal; 1,750–2,600 m.

This species is very similar to *Anthurium nymphaeifolium,* from which it can be distinguished by its larger leaf blades, greenish-cream to greenish-yellow spathe, and spadix that exceeds the spathe in length.

Anthurium scandens (Aubl.) Engl., in Martius, Fl. Bras. 3(2): 78. 1878; Bunting, in Berry et al., Fl. Venez. Guayana 2: 609, fig. 545. 1995; Morillo and Briceño, in Morillo et al., Bot. Ecol. Monocot. Páramos Venez. 1: 76–77, foto 6. 2011. *Dracontium scandens* Aubl., Hist. Pl. Guiane 2: 836. 1775. Only the nominate subspecies is found in Guaramacal.

Anthurium scandens subsp. ***scandens***

Epiphytic or climbing herbs; stems <1 m long, scandent or firmly attached to substrate. Leaves simple; cataphylls persisting as a thin lattice or network of fibers around the stems; petioles

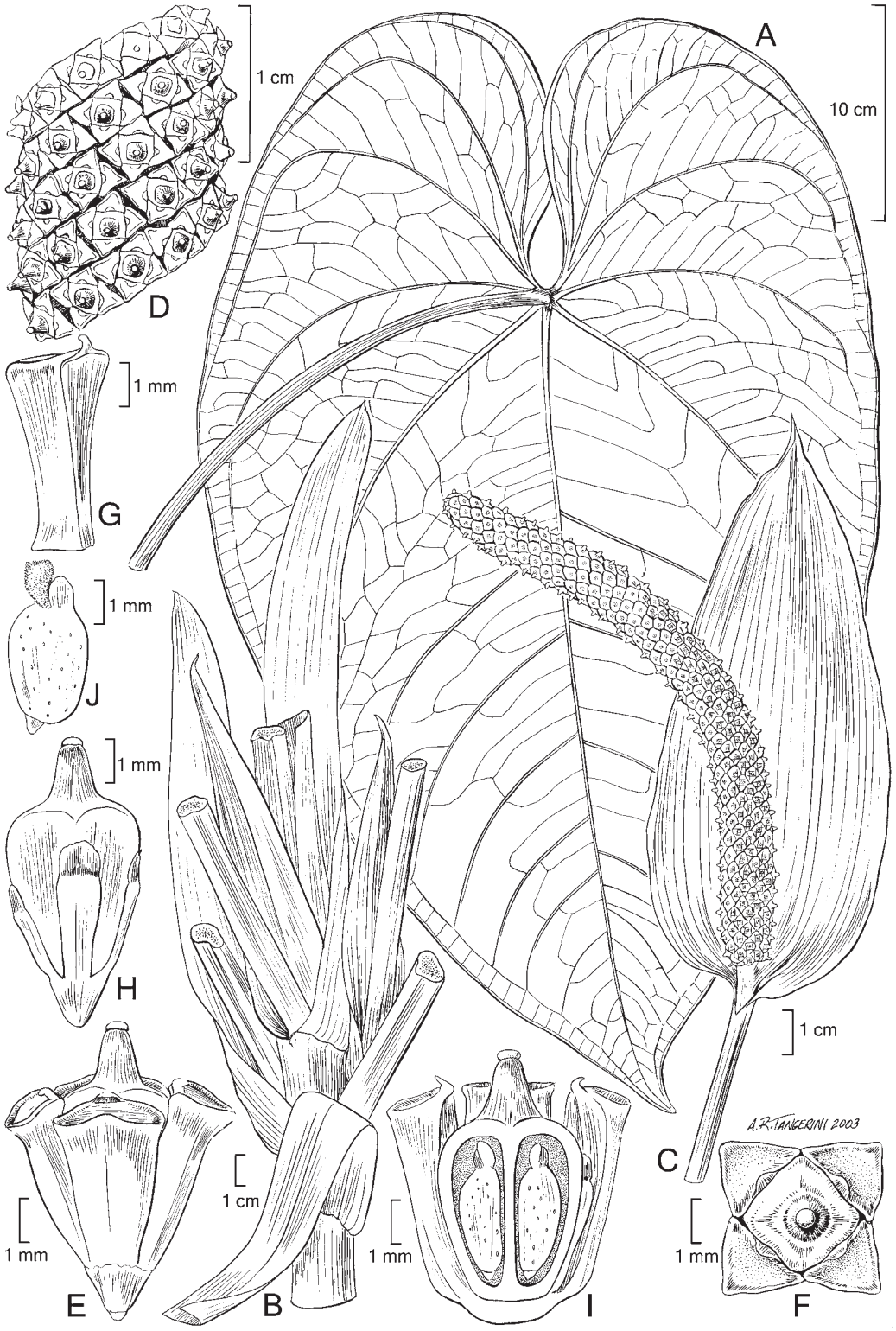


FIGURE 2. Araceae, *Anthurium ramoncaracasii* Stergios & Dorr. **A.** Leaf blade. **B.** Section of stem showing one node and cataphylls. **C.** Spadix and spathe at anthesis. **D.** Detail of spadix showing mature flowers. **E.** Flower (longitudinal view). **F.** Flower (apical view). **G.** Tepal with reflexed tip. **H.** Flower (longitudinal view), tepals removed to show stamens. **I.** Flower (longitudinal section). **J.** Immature seed. (A–J, *Stergios et al. 20101*.)

1.2–3(–5.5) cm long, shorter than leaf blades; leaf blades ovate to ovate-lanceolate, 4.5–10 × 1.2–3(–5.5) cm, bases cuneate, apices acute to acuminate, primary lateral veins pinnate-parallel, ascending, collective vein arising from the base and extending to the apex, 2–3 mm from the margin, subcoriaceous, blackish glandular punctations above and below. Inflorescences often exceeding petioles in length. Peduncles 1.4–3(–4.5) cm long. Spathe lanceolate to oblong-lanceolate, 0.7–1 × 0.2 cm, recurved, light green. Spadix sessile or short-stipitate, cylindrical to slightly attenuate, 0.7–1.5 cm long (expanding in fruit), whitish- or grayish-green. Berries white or pale lavender.

Found in Mexico, Central America, the West Indies, and South America (Colombia, Venezuela, Trinidad and Tobago, the Guianas, Ecuador, Peru, Bolivia, and Brazil). Widespread in Venezuela (Amazonas, Anzoátegui, Apure, Aragua, Barinas, Bolívar, Carabobo, Delta Amacuro, Distrito Federal, Falcón, Lara, Mérida, Miranda, Monagas, Nueva Esparta, Portuguesa, Sucre, Táchira, Trujillo, Yaracuy, and Zulia; Map 16). Found on both slopes of Guaramacal; 1,650–2,300(–3,000) m.

The stems and leaves of *Anthurium scandens* subsp. *scandens* attach themselves tightly to tree trunks, and this alone distinguishes this taxon from all other taxa of *Anthurium* found in the park. In addition, *A. scandens* subsp. *scandens* has the smallest leaves and inflorescences of all of the species of *Anthurium* known to occur in Guaramacal. The white or pale lavender berries are often the most conspicuous part of the very small inflorescences.

Anthurium scandens evidently is a polyploid complex (Sheffer et al., 1980), but generally, correlations between ploidy level and morphology have not been established. A diploid found in Costa Rica was segregated as *A. scanden* subsp. *pusillum* R. Sheffer. Morphologically, it can be distinguished from the nominate subspecies by its smaller (0.2–1 vs. 0.7–1.5 cm long) spadix with fewer (5–12 vs. 16–60) flowers.

Anthurium smaragdinum G. S. Bunting, Acta Bot. Venez. 10: 278. 1975.

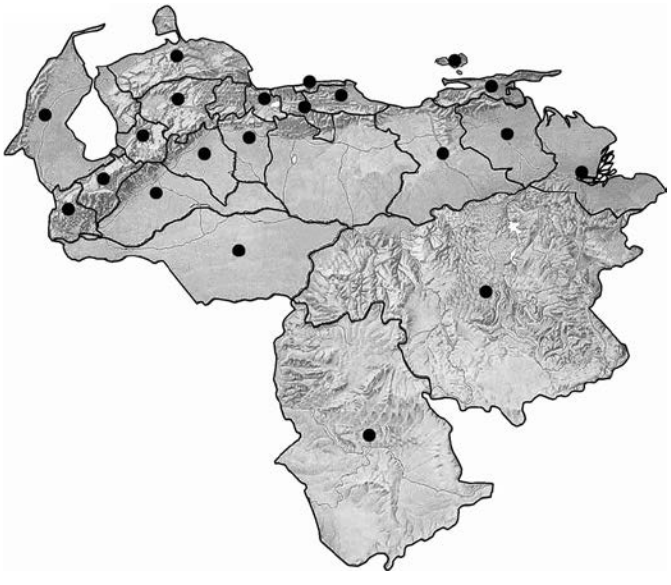
FIGURE 23F

Anthurium humboldtianum subsp. *viridispadix* Croat, in Croat and Lambert, Aroideana 9: 36, figs. 64–66. 1986.

Anthurium subsagittatum auct., non (Kunth) Kunth; Dorr et al., Contr. U.S. Natl. Herb. 40: 38. 2000 [2001].

Epiphytic or climbing herbs; stems to 8 m long. Leaves simple; cataphylls persisting as a network of fibers; petioles 50–61 cm long, terete to broadly sulcate, ± equal to blade in length; leaf blades ovate to ovate-triangular, 48–61 × 26–38 cm, bases cordate, margins undulate, apices acute to acuminate, basal sinus hippocrepiform, 9–12 cm deep, basal lobes rounded, primary veins scarcely raised above, primary and secondary veins prominent below, surface ± rugose, collective vein in the apical part of the blade 5–10 mm from the blade margin, subcoriaceous. Inflorescences erect. Peduncles 32–53 cm long. Spathe lanceolate to narrowly lanceolate, 12–21 × 1.5–3 cm, base clasping, apex long-acuminate, green, spreading, recurved at anthesis. Spadix stipitate, inserted obliquely, narrow, slightly tapered apically, 12–21 × 0.6–0.8 cm (in flower), 21–28 × 1–1.2 cm (in fruit), green.

Restricted to South America (Colombia and Venezuela). In Venezuela, found in the Andes (Lara, Mérida, Portuguesa, Táchira, and Trujillo) and possibly the Sierra de Perijá (Zulia; Map 17). In the park, found in montane forest and cloud forest on both slopes of Guaramacal; 1,600–2,600 m.



MAP 16. *Anthurium scandens* subsp. *scandens* occurrence in Venezuela.

MAP 17. *Anthurium smaragdinum* occurrence in Venezuela.

This species is similar to *Anthurium julianii* and shares the same habitat, but it can be distinguished by spathe color (completely green vs. red) and the distance from which the collective vein is found from the leaf margin (5–10 vs. 2–3 mm).

Monstera Adans.

Monstera Adans., Fam. Pl. 2: 470. 1763, nom. cons.

Epiphytic, hemiepiphytic or scandent herbs; laticifers absent; trichosclereids abundant. Leaves distichous; sheaths long, persistent or rotting and forming a fibrous mass or entirely deciduous; petioles geniculate apically, pulvinus present at base and apex; leaf blades simple, oblong to ovate-elliptic, often oblique, margins entire, blade perforate or not, when perforate perforations sometimes extending to margins of blade, apices various, primary lateral nerves pinnate, running into marginal nerves, secondary lateral nerves parallel to the primary ones or reticulate, membranous to subcoriaceous. Inflorescences 1 to several. Peduncles terete or flattened, shorter than petioles. Spathe ovate or oblong-ovate, usually erect, cuspidate, hemispherical to naviculiform, base ± convolute, white to lilac-pink within, often yellow when mature, deciduous. Spadix sessile, subcylindrical, shorter than spathe, sterile near the base. Fertile flowers: bisexual, perigone absent; stamens 4, free; filaments flattened; gynoecium obovoid to ellipsoid, prismatic; ovary 2-locular; ovules 2 per locule, anatropous; stylar region broader than ovary, apex truncate to shortly attenuate; stigma oblong-elliptic to linear and longitudinal or round. Sterile flowers: staminodia 4, minute; pistillode 2-locular, prismatic; ovules 0. Berry 1–3-seeded, pulp gray or orange. Seeds globose; testa soft, smooth.

A neotropical genus of 20–40 species found in Central America, the West Indies, and South America (Colombia, Venezuela, Curaçao, Trinidad and Tobago, the Guianas, Ecuador, Peru, Bolivia, Brazil, Paraguay, and Argentina). Seven species occur in Venezuela.

References. Engler and Krause (1908); Madison (1977); Tam et al. (2004).

The leaves of *Monstera* are heteroblastic; juvenile and adult leaves can be strikingly different. Adult leaves are as described above, whereas juvenile leaves have very short petioles and their blades are held fast against their substrate in an overlapping, shingle-like pattern.

Monstera has not been sampled extensively for molecular analyses, but the scant data that exist suggest that the genus is monophyletic and part of a clade (*Rhaphidophora* clade) consisting of six paleotropical genera within which *Monstera* forms a subclade with the southeast Asian genera *Amydrium* Schott and *Epipremnum* Schott (Tam et al., 2004; Cusimano et al., 2011). *Rhaphidophora* Hassk. has a more extensive distribution than *Monstera* and is found not only in southeast Asia but also in Australia and West Africa. Current molecular data generally support the evolutionary relationships of *Monstera* that Madison (1977) inferred on the basis of morphology.

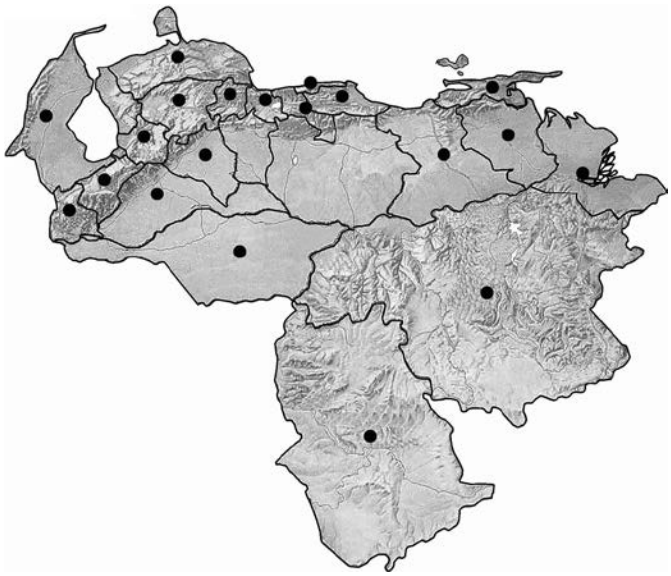
Monstera adansonii Schott, Wiener Z. Kunst 1830: 1028. 1830. *Dracontium pertusum* L., Sp. Pl. 968. 1753, non *Monstera pertusa* (Roxb.) Schott, Wiener Z. Kunst 1830: 1028. 1830.

Monstera adansonii comprises three varieties found in Central America, the West Indies, and South America (Colombia, Venezuela, Curaçao, Trinidad and Tobago, the Guianas, Ecuador, Peru, Bolivia, and Brazil). The nominate variety is restricted to the West Indies, whereas the other two occur in Venezuela. The following variety is the only one known from the Venezuelan Andes.

Monstera adansonii var. ***laniata*** (Schott) Madison, Contr. Gray Herb. 207: 38. 1977; Bunting, in Berry et al., Fl. Venez. Guayana 2: 628. 1995. *Tornelia laniata* Schott, Oesterr. Bot. Z. 8: 179. 1858.

Adult stems elliptic in cross section. Leaves: petioles (20–) 40–45 cm long; sheath wings neatly deciduous; leaf blades ovate to broadly ovate, 15–40 × 20–55 cm (length less than 2× width), bases unequal, one side truncate to subcordate, the other side cuneate to acute, margins entire, perforations absent to many, apices acute to shortly mucronate, central nerve and lateral principal nerves very light in color with respect to the rest of the blade, pale color diminishing toward the apex, subcoriaceous. Peduncles 15–20 cm long, subterete. Mature spathe cream-colored to yellowish, 12–28 × 10–25 cm, ~2× longer than the spadix, coriaceous. Flowering spadix yellowish, cylindrical, 10–12 × 2–3 cm; gynoecium prismatic, truncate apically.

Found in Central America, the West Indies (Grenada), and South America (Colombia, Venezuela, Curaçao, Trinidad and Tobago, the Guianas, Ecuador, Peru, Bolivia, and Brazil). Widespread in Venezuela (Amazonas, Anzoátegui, Apure, Aragua, Barinas, Bolívar, Carabobo, Delta Amacuro, Distrito Federal,



MAP 18. *Monstera adansonii* var. *laniata* occurrence in Venezuela.

Falcón, Lara, Mérida, Miranda, Monagas, Portuguesa, Sucre, Táchira, Trujillo, Yaracuy, and Zulia; Map 18). Found in forest in the karst area above the Río Amarillo near the lower limits of the southern boundary of the park; 1,200–1,400 m.

Our variety can be distinguished from *Monstera adansonii* var. *klotzschiana* (Schott) Madison, the only other variety found in Venezuela, by its leaves. Sheath wings are deciduous and blades are less than 2× as long as wide in our variety, whereas sheath wings are persistent and blades more than 2× as long as wide in *M. adansonii* var. *klotzschiana*.

Philodendron Schott

Philodendron Schott, Wiener Z. Kunst 1829: 780. 1829, nom. & orth. cons.

Epiphytic, hemiepiphytic, climbing, vine-like or terrestrial herbs; stems repent to rhizomatous, sometimes producing flagelliform shoots; laticifers present. Leaves numerous, small to very large; prophylls of mature stems caducous, marcescent and deciduous, or persistent and rotting to form a fibrous mass; petioles sometimes warty or covered with a scaly indumentum, sometimes swollen, rarely geniculate apically; sheaths elongate and slightly ligulate in monopodial leaves or very short and inconspicuous except when subtending inflorescences; leaf blades variable in shape, simple and linear, cordate, sagittate or hastate, or variously dissected, resin canals visible below, primary lateral veins pinnate, forming 1 marginal vein, higher-order venation parallel-pinnate. Flowering branches conforming to 1 of 3 general sympodial patterns: prophyll, many foliage leaves, 1 or 2(3) inflorescences (subgen. *Pteromischum* (Schott) Mayo); prophyll, subsequent internode suppressed, 1 foliage leaf, 1–11 inflorescences (subgen. *Philodendron*); or prophyll, subsequent internode developed or not, 1 foliage leaf, 1(–2) inflorescences (subgen. *Meconostigma* (Schott) Engler). Inflorescences 1–11 per floral sympodium, secreting at anthesis a resinous substance from the spathe or spadix but rarely from both. Peduncles usually shorter than petioles. Spathe erect, persistent, deciduous at base when fruit matures, thickened, usually constricted between blade and tube, tube convolute, cylindrical, often reddish-purple within, blade naviculiform, widely ringent at anthesis then closing, usually white within. Spadix sessile to stipitate, pistillate zone free, shorter than the staminate zone and separated by a sterile zone of staminodial flowers, which is thicker in diameter than staminate zone. Flowers unisexual; perigone absent. Staminate flowers: 2–6-merous; stamens free; anthers sessile or almost sessile. Sterile staminate flowers: staminodes usually prismatic. Pistillate flowers: gynoecium ovoid, subcylindrical or obovoid; ovary usually 4–8-locular; ovules 1–50(or more) per locule, usually hemiorthotropous; stylar region as broad as ovary or broader; stigma sometimes lobed or discoid-hemispheric. Berry subcylindrical to obovoid, 1- to many-seeded, white, whitish translucent, red or orange-red. Seeds ovoid-oblong to ellipsoid, variable in size; testa costate.

A neotropical genus of ~750 species found in Mexico, Central America, the West Indies, and South America (Colombia, Venezuela, Trinidad and Tobago, the Guianas, Ecuador, Peru, Bolivia, Brazil, Paraguay, and Argentina); introduced in Africa, Asia, Australia, and the Pacific Islands. In Venezuela, ~108 species have been recorded.

References. Gauthier et al. (2008); Grayum (1996); Krause (1913).

The relationship between *Philodendron* and *Homalomena* Schott, a genus found in tropical America and Asia, is unresolved (Cabrera et al., 2008; Gauthier et al., 2008). Nonetheless, these two genera and several smaller ones form a strongly supported clade (*Philodendron* clade) that is united synapomorphically by a pistillate-sterile-staminate pattern of spadix floral zonation (Cusimano et al., 2011).

The three subgenera of *Philodendron* (see generic description above) originally recognized on morphological criteria alone are supported as monophyletic by molecular data (Gauthier et al., 2008). However, this classification could change with resolution of the larger problem concerning generic boundaries.

KEY TO THE SPECIES OF *PHILODENDRON*

1a. One foliage leaf per sympodial branch (subgen. *Philodendron*); leaf blades cordate-oblong or cordate-ovate, 25–45 cm long; petioles sheathed at base only . . . . . ***P. fraternum***

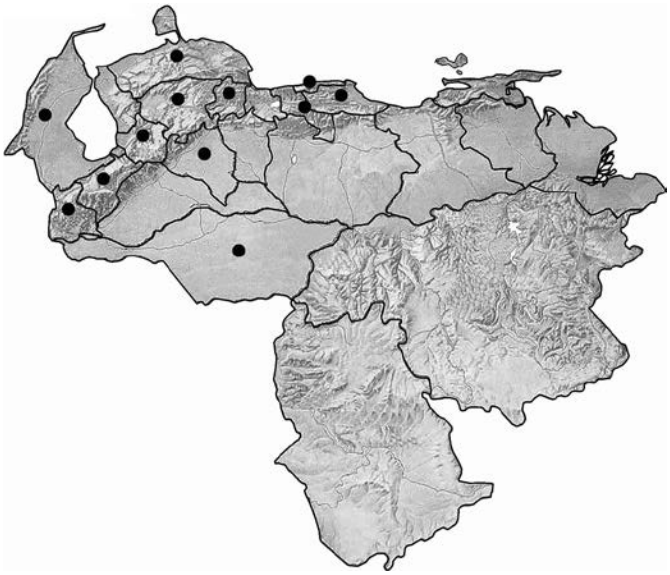
1b. Many foliage leaves per sympodial branch (subgen. *Pteromischum*); leaf blades broadly lanceolate or narrowly ovate to ovate, (9.5–)12–14 cm long; petioles completely surrounded by a winged sheath . . . . . ***P. tuerckheimii***

Philodendron fraternum Schott, Bonplandia (Hannover) 7: 29. 1859.

FIGURE 23H

Hemiepiphytic or scandent liana-like herbs. Leaves simple; petioles 30–35 cm long, sheaths at base only, to 7 cm long; leaf blades cordate-oblong or cordate-ovate, 25–45 × 10–15(–25) cm, basal lobes 3–12 × 5–7 cm, sinus to 12 cm deep, parabolic to subhippocrepiform, margins entire, apices acuminate to long-cuspidate. Inflorescences 2 or 3 per axil. Peduncles 4–7 cm long. Spathe 6–7 cm long, cream to greenish-white within, maroon-purple without (in bud), becoming green to creamy yellow (at anthesis). Spadix ~7 cm long, white.

Found in South America (Colombia and Venezuela). Widespread in Venezuela (Apure, Aragua, Distrito Federal, Falcón, Lara, Mérida, Miranda, Portuguesa, Táchira, Trujillo, Yaracuy, and Zulia; Map 19). In the park, found in montane and cloud forest on both slopes of Guaramacal; 1,800–2,350(–2,750) m.



MAP 19. *Philodendron fraternum* occurrence in Venezuela.

Philodendron tuerckheimii Grayum, Syst. Bot. Monogr. 47: 174, figs. 105–108. 1996.

Philodendron rudgeanum auct., non Schott; Ortega et al., BioLlania 5: 33. 1987.

Greatly branched, scandent hemiepiphytic or vine-like herbs. Leaves simple; petioles (3.5–)5–6 cm long, completely surrounded by a winged sheath; leaf blades broadly lanceolate or narrowly ovate to ovate, (9.5–)12–14 × 4–5 cm, bases cuneate to rounded or truncate, margins entire, apices subfalcate to acuminate. Inflorescences solitary. Peduncles 1–3 cm long. Spathe 7–14 × 1–3 cm, pale green to whitish within, cream to greenish-white or yellow-green without. Spadix 7–12 cm long, white or creamy white.

MAP 20. *Philodendron tuerckheimii* occurrence in Venezuela.

Found in Mexico, Central America, and South America (Colombia, Venezuela, and Ecuador). In Venezuela, found in the Andes (Lara, Mérida, Portuguesa, Táchira, and Trujillo) and the Cordillera de la Costa (Carabobo and Yaracuy; Map 20). In the park, found in montane forest on the south slope of Guaramacal; (1,600–)1,800–1,900 m.

Grayum (1996) acknowledges that this wide-ranging species is not well defined and might eventually prove divisible into two or more species. He also notes that South American material differs from Mexican and Central American material in having more narrowly winged petiole sheaths, longer and proportionally narrower leaf blades, and longer spadices.

***Rhodospatha* Poepp.**

Rhodospatha Poepp., in Poeppig and Endlicher, Nov. Gen. Sp. Pl. 3: 91. 1845.

Scandent or suberect herbs, often with flagelliform shoots; laticifers absent; trichosclereids abundant. Leaves simple, distichous; petioles elongate, bases encircling stem, apices geniculate; sheaths persistent to marcescent; leaf blades oblong or elliptic, ± oblique, margins entire, primary lateral nerves pinnate, running into a ± distinct marginal nerve, secondary and tertiary lateral nerves parallel-pinnate. Inflorescences usually solitary. Peduncles shorter to longer than petioles. Spathe large, broadly ovate or oblong-ovate, cuspidate, yellowish-white, cream or purplish within, scarcely opening at anthesis, soon decaying or caducous. Spadix erect, long-stipitate to sessile, cylindrical-conical. Flowers bisexual or basalmost ones sterile or pistillate and scattered, perigone absent. Stamens 4, free, filaments flattened. Gynoecium compressed, obconical to cylindrical; ovary 2-locular; ovules numerous per locule, anatropous to hemianatropous; stylar region well developed, broader than ovary, prismatic, truncate to convex apically; stigma elliptic to linear. Berry cylindrical-prismatic, truncate, few- to many-seeded. Seeds lenticular; testa smooth or verrucose.

A neotropical genus of ~75 species (many undescribed) found in Mexico, Central America, and South America (Colombia, Venezuela, Trinidad and Tobago, the Guianas, Ecuador, Peru, Bolivia, and Brazil). A dozen species occur in Venezuela.

References. Engler and Krause (1908); Tam et al. (2004).

Molecular data (Cabrera et al., 2008; Cusimano et al., 2011) place *Rhodospatha* in an exclusively neotropical clade (*Heteropsis* clade), which also includes *Alloschemone* Schott, *Heteropsis* Kunth, and *Stenospermation* Schott. This clade, the *Rhaphidophora* clade (see *Monstera* above), and the Spathiphylleae (*Spathiphyllum* Schott and *Holochlamys* Engl.) constitute the Monsteroideae, which is sister to the Pothoideae. Cusimano et al. (2011) call the clade that includes these two subfamilies the bisexual climbers clade.

MAP 21. *Rhodospatha badilloi* occurrence in Venezuela.

Rhodospatha badilloi G. S. Bunting, Acta Bot. Venez. 10: 318. 1975.

Rhodospatha latifolia auct., non Poepp.; Dorr et al., Contr. U.S. Natl. Herb. 40: 38. 2000 [2001].

Scandent herbs; aerial roots arising from basal nodes. Leaves: cataphylls linear-lanceolate, 3–4 cm long; petioles shorter than or equal to the leaf blade, petiolar wings wavy basally but straight and attenuate approaching the geniculum; leaf blades ovate-elliptic, 37–39 × 16–17 cm, entire, cuspidate, primary and secondary nerves impressed above, noticeably raised below where the principal secondary nerves are uniformly parallel on both sides of the midnerve, membranous to semicoriaceous. Spathe and spathe bracts deciduous (not seen). Spadix 20–21(–30) × 2–3 cm; gynoecium asymmetrical.

Endemic to Venezuela, where it is known from the Andes (Lara, Táchira, and Trujillo) and the Cordillera de la Costa (Aragua; Map 21). In the park, found in forest near La Punta of El Santuario; 1,900 m.

Xanthosoma Schott

Xanthosoma Schott, in Schott and Endlicher, Melet. Bot. 19. 1832.

Small to gigantic, sometimes arborescent, terrestrial herbs; rhizomatous or with corms; stems erect or acaulescent; latex milky or watery. Leaves glabrous, rarely pubescent, sometimes aggregated at the apex of aerial rhizomes (our species); blades entire (our species) or divided into 3 to many segments, cordate, sagittate or hastate; basal ribs well developed, often naked proximally; primary lateral nerves pinnate and forming a submarginal collective nerve; petioles sheathed below. Inflorescences 1 to several, always appearing with leaves. Peduncles usually shorter than petioles. Spathe strongly constricted, tube ovoid to ellipsoid, green, red or purplish, persistent, expanded blade naviculiform to oblong-lanceolate, ivory or pink to purplish, marcescent after anthesis and then deciduous. Spadix shorter than spathe; pistillate zone short, separated from staminate zone by sterile staminate flowers; staminate zone longer than pistillate zone and fertile to apex. Flowers unisexual, perigone absent. Staminate flowers: 4–6-merous, stamens united in a truncate synandrium. Pistillate flowers: ovary ovoid, (1–)2–4-locular; ovules (12–)20 or more, anatropous or hemianatropous; stylar region broader than ovary; stigma discoid or 2–4-lobed. Berry cylindric, ± furrowed apically, whitish to orange, many-seeded. Seeds ovoid, small; testa costate.

A neotropical genus of ~60 species found in Mexico, Central America, the West Indies, and South America (Colombia, Venezuela, Trinidad and Tobago, the Guianas, Ecuador, Peru, Brazil, Paraguay, and Argentina). Approximately 22 species are found in Venezuela.

References. Engler and Krause (1920); Gonçalves (2011).

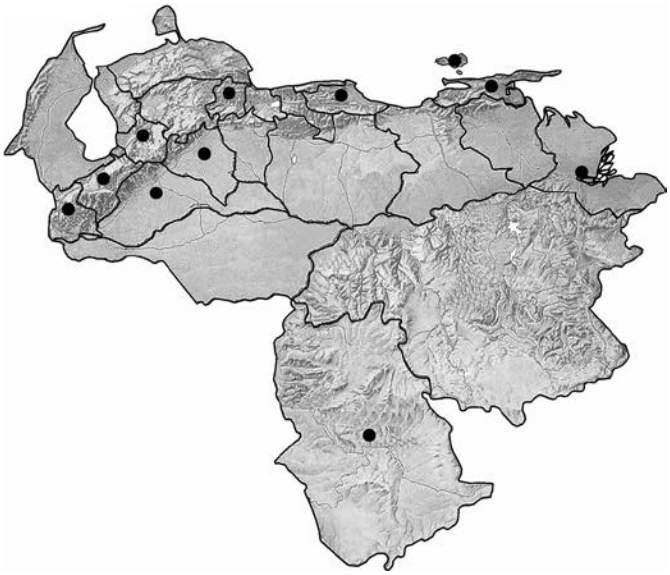
Cusimano et al. (2011) placed *Xanthosoma* in a clade (tribe Caladieae) that they argue is also supported by several anatomical and morphological synapomorphies, including the presence of anastomosing laticifers and a persistent spathe tube with a deciduous or marcescent spathe blade.

A number of *Xanthosoma* species are economically important because their corms are used as food. Nonetheless, no comprehensive revision of the genus exists. Gonçalves (2011) enumerated some of the reasons why the taxonomy of *Xanthosoma* is chaotic and unsatisfactory: (1) Relatively few herbarium specimens are available for study, and those that exist are often poorly prepared. (2) Many species names were based on incomplete material, and the application of these names is a matter of debate. (3) Most species are phenotypically plastic. (4) There has been a great amount of human-mediated selection influencing the morphology and distribution of species that are used as food.

Xanthosoma sagittifolium (L.) Schott, in Schott and Endlicher, Melet. Bot. 19. 1832 ("*sagittaefolium*"); Bunting, in Berry et al., Fl. Venez. Guayana 2: 677. 1995. *Arum sagittifolium* L., Sp. Pl. 966. 1753 ("*sagittaefolium*").

FIGURE 23I, J

Very large, erect herbs, (0.5–)1–3.5 m tall; rhizomes 0.5–2.5 m tall; latex watery, light yellow or whitish (very irritating to the skin). Leaves 4–7 arising from the apex of the rhizome; petioles 1–1.6(–2.5) m long, green, mottled or not mottled; leaf blades broadly ovate, (0.6–)1.2–1.5 × 0.9–1.1 m, reflexed, basal lobes mostly overlapping, with a closed or narrowly obovate sinus, margins slightly undulate, apices obtuse, membranous. Inflorescences 1–3 per axil. Spathe erect, 20–30(–40) cm long, green; tube 13 × 4.7 cm (at base) or 2 cm (at constriction), green



MAP 22. *Xanthosoma sagittifolium* occurrence in Venezuela.

outside and inside or green outside and weakly to heavily tinged purple inside or dark purple outside and inside; blade erect, ovate-elliptic, somewhat cucullate, ivory. Spadix sessile, 15–25 (–30) cm long, white, creamy yellow below.

Found in Central America, the West Indies, and South America (Colombia, Venezuela, Trinidad and Tobago, Suriname, French Guiana, Ecuador, Peru, Bolivia, and Brazil); introduced and/or cultivated in North America (USA), Africa, and Asia. Widespread in Venezuela (Amazonas, Barinas, Delta Amacuro, Mérida, Miranda, Nueva Esparta, Portuguesa, Sucre, Táchira, Trujillo, and Yaracuy; Map 22). In the park, found in forest understory on the south slope near Qda. Honda and La Punta and along the Boconó–Guaramacal road; 1,800–1,900(–2,700) m.

Common Names. Guaje, guaje bravo, and guaje simangue.

The application of the name *Xanthosoma sagittifolium* is problematic. We employ the name here in the sense that it generally has been used in Venezuela (see, e.g., Bunting, 1979; Bunting in Berry et al., 1995). Gonçalves (2011), however, argues that the name often is misapplied, and he restricts the native range of *X. sagittifolium* to the West Indies (the type locality) and argues that the species is rarely cultivated elsewhere. This may be correct, but our material still keys to *X. sagittifolium* in his synopsis of the commonly cultivated species.

Guaramacal material shows remarkable variation in spathe tube color and in the presence or absence of maculations on petioles and peduncles (none of these differences are seen in herbarium material). According to Croat (in litt.), spathe tube color generally is a reliable character in *Xanthosoma*, but in our material it ranges from green inside and outside to weakly to heavily tinged purple inside. The maculations on petioles and peduncles also are inconstant in the Guaramacal populations and, as far as we can tell, are not correlated with any other character. These maculations have not been previously noted in descriptions of *X. sagittifolium*. Irrespective of these color differences, plants found in Guaramacal are relatively uniform in terms of habit and leaf blade shape and size.

Xanthosoma sagittifolium is not currently used as food in Guaramacal (R. Caracas, pers. comm.), but that does not exclude the possibility that it was introduced and used as food in the past.

Xanthosoma pubescens Poepp. also is found in Portuguesa near the park but at much lower elevations (900–1,200 m). It can be distinguished from *X. sagittifolium* by its pilose foliage and much smaller size.

Arecaceae

L. J. DORR AND S. MIGUEL NIÑO

Small, medium-sized or large hermaphroditic, polygamous, monoecious or dioecious plants; stems (trunks) woody, solitary or clustered, erect, sometimes acaulescent or climbing or subterranean; unbranched (our taxa) or rarely branched; stilt roots sometimes present; unarmed or spiny. Leaves spirally arranged, rarely distichous or polystichous; leaf sheaths tubular, closed or open (due to rupturing); petioles present; leaf blades palmate, costapalmate (i.e., with a petiole that extends into the leaf blade), pinnate, bipinnate or entire, plicate in bud, splitting along the adaxial folds (induplicate) or abaxial folds (reduplicate) or not splitting. Inflorescences axillary, solitary or multiple, spicate or 1–6-branched, interfoliar or infrafoliar; prophyll 2-keeled; peduncular bract(s) present, rarely absent. Flowers usually 3-merous; bisexual or unisexual, sessile or stalked. Sepals (2)3(rarely more), free or connate. Petals (2)3(rarely more), free or united. Stamens (3)6(or many). Staminodes present in pistillate flowers. Gynoecium apocarpous or syncarpous, sometimes pseudomonomerous, 3(–10)-locular or frequently with only 1 fertile locule; style distinct or not; stigmas erect or recurved. Fruits 1(2–10)-seeded, fleshy or dry and fibrous, globose or ellipsoid, often hard. Seeds 1(–2 or more); endosperm homogeneous or ruminate; embryo apical, lateral or basal.

A mostly pantropical family of ~190 genera and ~2,500 species with taxa also found in subtropical and temperate regions of North America (USA), South America, Europe, Africa, Asia, and Australia. Thirty genera and ~100 species are known to occur in Venezuela.

References. Baker and Couvreur (2013); Baker et al. (2009, 2011); Braun and Delascio (1987); Dransfield and Uhl (1998); Dransfield et al. (2005, 2008); Henderson et al. (1995); Stauffer (1999); Tomlinson et al. (2011); Wessels Boer (1971).

KEY TO THE GENERA OF ARECACEAE

1a. Stems and/or leaves with spines . . . . . ***Aiphanes***
1b. Stems and leaves unarmed 2
2a. Leaf margins dentate; ultimate leaflets (pinnae) flabellate (i.e., fan-shaped), widely toothed . . . . . ***Wettinia***
2b. Leaf margins entire; ultimate leaflets (pinnae) bifid or simple, never flabellate 3
3a. Arborescent plants, to 15 m tall; stems (trunks) 10–20 cm in diameter; ultimate leaflets (pinnae) simple; sheaths reddish to purple . . . . . ***Prestoea***
3b. Shrubby or arborescent plants, 1–8 m tall, stems 0.5–8 cm in diameter; ultimate leaflets (pinnae) bifid; sheaths green or dark brown 4
4a. Dioecious plants; leaflets (pinnae) alternate or almost alternate, sigmoidal; leaf sheaths closed or only open apically, green or yellowish-green . . . . . ***Chamaedorea***
4b. Monoecious plants; leaflets (pinnae) opposite or subopposite, deltoid; leaf sheaths open, light or dark brown . . . . . ***Geonoma***

Aiphanes Willd.

Aiphanes Willd., Samml. Deutsch. Abh. Königl. Akad. Wiss. Berlin 1803: 250. 1806.

Monoecious, acaulescent or caulescent plants; stems (trunks) solitary or clustered, branched or not; spiny. Leaves spirally arranged or distichous; leaf sheaths open, densely spiny; leaf blades pinnate, rarely entire, spiny; leaflets (pinnae) with serrate apices or irregularly divided. Inflorescences generally 1(2)-branched, rarely spicate, interfoliar, erect. Flowers unisexual, 3-merous. Staminate flowers: sepals 3, free or shortly connate; petals 3, free or shortly connate; stamens 6, in 2 series; filaments basally connate. Pistillate flowers: usually larger than staminate flowers; sepals 3, free, cartilaginous; petals 3, connate ½ their length; staminodes 6, fused; gynoecium 3-locular, 3-ovulate; stigmas 3. Fruits 1-seeded, globose or ellipsoid, red, white, orange or purple. Seeds globose; endosperm homogeneous; embryo lateral. [Arecoideae: Cocoseae: Bactridinae.]

A neotropical genus of ~25 species found in Central America (Panama), the West Indies, and South America (Colombia, Venezuela, Trinidad and Tobago, Ecuador, Peru, Bolivia, and Brazil). Two species occur in Venezuela, one widespread and one localized in the Andes.

References. Bernal and Borchsenius (2010); Borchsenius and Bernal (1996).

Aiphanes is easily recognized because it is the only genus of spiny palm in the Americas with leaflets that have jagged tips.

Aiphanes lindeniana (H. Wendl.) H. Wendl., in Kerchove de Denterghem, Palmiers 230. 1878. *Martinezia lindeniana* H. Wendl., Linnaea 28: 349. 1856 [1857].

FIGURE 3

♦ *Aiphanes stergiosii* M. Niño et al., Sida 21: 1600, fig. 1. 2005.

Aiphanes sp. A; Dorr et al., Contr. U.S. Natl. Herb. 40: 39. 2000 [2001].

Small to medium-sized plants; stems (trunks) solitary (our material) or clustered, 4–6 m × 3–4.5 cm, densely spiny, spines usually retrorse, 1–9 cm long, brownish-black, clustered in the center of internodes. Leaves 4–8(–10) per plant; leaflets (pinnae) 18–24(–45) per side, inserted in groups of 3–4(–7), lanceolate to narrowly cuneate, middle leaflets 10–20(–34) × (1–)5–8.5 cm, margins and midvein above and below spiny, apical leaflets almost always divided 2× or more, with an irregular apical margin. Inflorescences 1-branched; peduncular bracts 80–90(–140) cm × 4–5 mm, tomentose with several scattered spines; peduncles 90–120 cm × 3–5 mm, densely spiny at the base; rachillae densely tomentose. Fruits subglobose, 9–15 mm in diameter, red or orange, smooth and glossy.

Found in South America (Colombia and Venezuela). In Venezuela, known at present only from the Andes (Portuguesa; Map 23). La Divisoria de la Concepción; 1,700–1,900 m.

Common Name. Macanilla.

Our collections of this species are remarkably disjunct from the nearest Colombian population, but we suspect this might be an artifact that can be attributed to inadequate floristic sampling of the east-facing slopes of the Venezuelan Andes.

MAP 23. *Aiphanes lindeniana* occurrence in Venezuela.

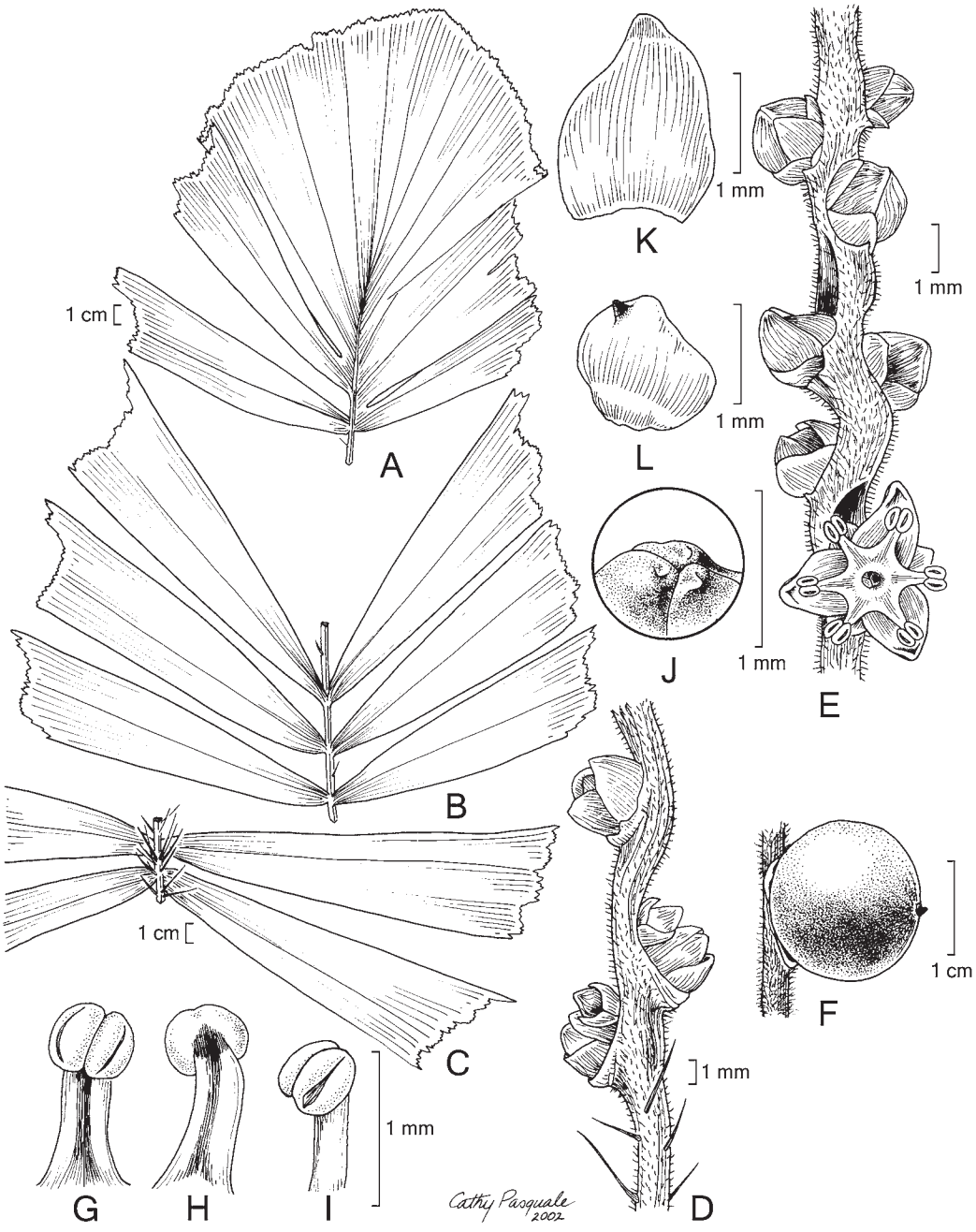


FIGURE 3. Arecaceae, *Aiphanes lindeniana* (H. Wendl.) H. Wendl. **A.** Leaf apex (most apices are eventually divided as a consequence of environmental factors). **B.** Medial portion of leaf. **C.** Leaf base. **D.** Staminate and pistillate flowers. **E.** Staminate flowers. **F.** Fruit. **G–I.** Anthers. **J.** Pistillode. **K, L.** Sepals (staminate flower). (*Niño & Stergios 1431*.)

Chamaedorea Willd.

Chamaedorea Willd., Sp. Pl. 4(2): 638, 800. 1806, nom. cons.

Dioecious, shrubby or sometimes arborescent plants; stems (trunks) solitary or clustered, procumbent or climbing, green, conspicuously ringed with leaf scars, sometimes wholly or partially covered with fibrous leaf bases; unarmed. Leaves bifid or pinnate (our material), rarely entire, reduplicate; leaf sheaths closed or becoming split; leaf blades entire, bifid, and pinnately ribbed or regularly or irregularly pinnately divided (our material); leaflets (pinnae) few or many. Inflorescences spicate or 1(2)-branched (our material), inter- or infrafoliar, 1 to several per leaf axil. Flowers unisexual, 3-merous. Staminate flowers: sepals 3, united basally or free; petals 3, free or variously connate; stamens 6, sometimes with staminodes; filaments short. Pistillate flowers: sepals 3, united basally or free; petals 3, usually connate; staminodes present and toothlike or absent; gynoecium 3-locular, 3-ovulate; stigmas 3, recurved. Fruits 1-seeded, globose or oblong, black at maturity. Seeds globose or ellipsoid; endosperm homogeneous; embryo basal or lateral. [Arecoideae: Chamaedoreeae.]

A neotropical genus of 80–110 species found in Mexico, Central America, and South America (Colombia, Venezuela, Ecuador, Peru, Bolivia, and Brazil). Two species are known from Venezuela, both found in Guaramacal.

References. Cuenca and Asmussen-Lange (2007); Cuenca et al. (2008, 2009); Hodel (1992); Thomas et al. (2006).

Chamaedorea is the most species-rich genus of palm in the Americas. Molecular data (Thomas et al., 2006; Cuenca and Asmussen-Lange, 2007) resolve the genus as monophyletic but fail to support the eight subgenera that Hodel (1992) recognized on floral characters.

KEY TO THE SPECIES OF *CHAMAEDOREA*

1a. Robust plants, stems 2–8 m × 2.5–5 cm; inflorescences infrafoliar, staminate inflorescences ≥3 per node; leaf blades 2–3.5 m long; middle leaflets (pinnae) 30–65(–85) cm long . . . . . ***C. linearis***

1b. Delicate plants, stems 1–3 m × 0.5–2.5 cm; inflorescences infra- or interfoliar, staminate and pistillate inflorescences 1 per node; leaf blades 0.8–1.5 m long; middle leaflets (pinnae) 20–30 cm long . . . . . ***C. pinnatifrons***

Chamaedorea linearis (Ruiz & Pav.) Mart., Hist. Nat. Palm. 2: 5. 1823; Llamozas et al., Libro Rojo Fl. Venez. 328. 2003. *Martinezia linearis* Ruiz & Pav., Syst. Veg. Fl. Peruv. Chil. 297. 1798.

Robust, arborescent plants; stems (trunks) solitary, 2–8 m × 2.5–5 cm. Leaves 3–8, pinnate; leaf sheaths closed, to 1.2 m long; leaf blades 2–3.5 m long; leaflets (pinnae) 25–65 per side, linear, lanceolate, generally curved, acuminate, middle leaflets 30–65(–85) × 2–6.5(–12) cm. Inflorescences 1-branched, infrafoliar, erect; staminate inflorescences ≥3 per node; pistillate inflorescences 1 per node; rachillae whitish (in flower), green or yellowish-brown (in fruit). Fruits globose, 1–2 cm in diameter, red (black at maturity?).

MAP 24. *Chamaedorea linearis* occurrence in Venezuela.

Found in South America (Colombia, Venezuela, Ecuador, Peru, and Bolivia). In Venezuela, evidently restricted to the Andes (Lara, Mérida, and Trujillo) and the Sierra de Perijá (Zulia; Map 24). In the park, found on the south slope of Guaramacal in Qda. Honda; 1,850–1,950 m.

Chamaedorea pinnatifrons (Jacq.) Oerst., Vidensk. Meddel. Dansk. Naturhist. Foren. Kjøbenhavn 1858: 14. 1859. *Borassus pinnatifrons* Jacq., Pl. Rar. Hort. Schoenbr. 2: 65, tt. 247, 248. 1797.

Delicate, shrubby plants; stems (trunks) solitary, 1–3 m × 0.5–2.5 cm. Leaves 3–10, pinnate; leaf sheaths closed ⅘ their length, 6–35 cm long; leaf blades 0.8–1.5 m long; leaflets (pinnae) 7–15 per side, sigmoid or rarely almost lanceolate, apical segments bifid, middle leaflets 25–30 × 2–15 cm. Inflorescences 1-branched, inter- or infrafoliar, staminate and pistillate inflorescences 1 per node, erect to curved (pendulous in fruit); rachillae reddish, orange or yellowish. Fruits globose or ellipsoid, 0.4–0.6(–1) cm in diameter, orange or bright yellow, black at maturity.

Found in Mexico, Central America, and South America (Colombia, Venezuela, Ecuador, Peru, Bolivia, and Brazil). Widespread in northern and western Venezuela (Anzoátegui, Aragua, Cojedes, Distrito Federal, Falcón, Lara, Mérida, Miranda,

MAP 25. *Chamaedorea pinnatifrons* occurrence in Venezuela.

Portuguesa, Táchira, Trujillo, Yaracuy, and Zulia; Map 25). In the park, found on both slopes of Guaramacal; (1,550–) 1,800–2,350 m.

This is one of the most widespread and variable palm species in the Americas. Although it is found only at lower elevations in Guaramacal, *Chamaedorea pinnatifrons* otherwise is found at a greater range of elevations including ones exceeding those of the park.

Geonoma Willd.

Geonoma Willd., Sp. Pl. 4(1): 174, 593. 1805.

Monoecious, small to medium-sized plants; stems solitary or clustered, erect or decumbent; internodes often yellowish and smooth; unarmed. Leaves pinnate, divided or entire; leaf sheaths open, margins fibrous, glabrous or tomentose; leaf blades bifid or with 2 or 3 pairs of leaflets (pinnae) or irregularly divided. Inflorescences solitary, spicate or 1–3(–4)-branched, interfoliar or rarely infrafoliar; peduncles short to long, glabrous or tomentose. Flowers 3-merous, arising in depressions or holes on the peduncular rachis. Staminate flowers: sepals 3, distinct; petals 3, connate for ⅔ their length, valvate; stamens (3) 6. Pistillate flowers: sepals 3, united basally and adnate to the receptacle; petals 3, connate, briefly adnate to the receptacle; staminodes 6-toothed or 6-lobed; gynoecium 3-carpellate, but 2 carpels vestigial at anthesis, 1-locular, 1-ovulate; style tubular; stigmas 3. Fruits 1-seeded, ± globose, sometimes somewhat pointed, green, brown or purple-black. Seeds ± globose; endosperm homogeneous; embryo erect basal. [Arecoideae: Geonomateae.]

A neotropical genus of 68 species (140 taxa) found in Mexico, Central America, the West Indies, and South America (Colombia, Venezuela, Trinidad and Tobago, the Guianas, Ecuador, Peru, Bolivia, Brazil, and Paraguay). Approximately 20 species (25 taxa) are found in Venezuela.

References. Henderson (2011); Roncal et al. (2011); Wessels Boer (1968).

The three species of *Geonoma* found in Guaramacal are closely related and belong to a clade that includes five species found at higher elevations in Central America, the West Indies, and South America (Henderson, 2011).

KEY TO THE SPECIES OF *GEONOMA*

1a. Inflorescences unbranched, simple spikes . . . . . ***G. lehmannii***
1b. Inflorescences unbranched or branched (our material) 2
  2a. Inflorescences 1-branched, interfoliar . . . . . ***G. orbignyana***
  2b. Inflorescences 2-branched, infrafoliar . . . . . ***G. undata***

Geonoma lehmannii Dammer ex Burret, Bot. Jahrb. Syst. 63: 180. 1930.

Only the nominate subspecies is found in Venezuela and Guaramacal.

Geonoma lehmannii subsp. **lehmannii**

Geonoma jussieuana auct., non Mart.; Dorr et al., Contr. U.S. Natl. Herb. 40: 39. 2000 [2001].

Small plants, 1–2(–4) m tall; stems solitary or clustered. Leaves 5–15 per stem, undivided or irregularly pinnate, 30–80 cm long; leaflets (pinnae) 3–5 per side, apical segments bifid. Inflorescences simple spikes, erect; peduncular bracts tubular, 9–50 cm long; peduncles 12–88 cm long. Fruits 5–10 × 5–7 mm, olive-green to black.

Found in South America (Colombia, Venezuela, Ecuador, and Peru). In Venezuela, known only from the Andes (Lara, Portuguesa, and Trujillo; Map 26). Common in the understory of montane and cloud forest throughout the park; (1,600–)1,800–2,600 m.

Common Name. Virtud.

Venezuelan material of *Geonoma lehmannii* is geographically isolated and differs from the closest populations of *G. lehmannii* subsp. *lehmannii* in northern Colombia by a number of morphological characters. Nonetheless, Henderson (2011) chose not to give formal taxonomic recognition to the Venezuelan populations.

Specimens from Central America (Panama) are segregated as *G. lehmannii* subsp. *corrugata* A. J. Hend. and differ significantly

MAP 26. *Geonoma lehmannii* subsp. *lehmannii* occurrence in Venezuela.

MAP 27. *Geonoma orbignyana* subsp. *orbignyana* occurrence in Venezuela.

from the South American ones in a number of morphological characters (Henderson, 2011), most notably longer peduncles.

Geonoma orbignyana Mart., Voy. Amér. *Mér.* 7(3): 22. 1847 [1843]; ibid. 8, Atlas: t. 11, fig. 1. 1847 [1843] ("*Orbigniana*"), t. 22A. 1847 [1844] ("*Orbigniana*"); Morillo, in Morillo et al., Bot. Ecol. Monocot. Páramos Venez. 2: 390, foto 3. 2010.

Only the nominate subspecies is found in Guaramacal.

Geonoma orbignyana subsp. ***orbignyana***

Geonoma jussieuana Mart., Voy. Amér. Mér. 7(3): 24. 1847 [1843]; ibid. 8, Atlas: t. 12 [as "15"], fig. 1. 1847 [1843], t. 23A. 1847 [1844].

Small plants, 1–3(–6) m tall; stems (trunks) solitary or clustered. Leaves 4–20 per stem, undivided or irregularly pinnate, 5–80 cm long; leaflets (pinnae) 3–9 per side, apical segments bifid. Inflorescences 1-branched (our material) or rarely spicate, infrafoliar, erect; peduncular bracts tubular, 3–50 cm long; peduncles 30–80 cm long. Fruits 4–10 × 5–7 mm, slightly pointed apically, olive-green to black.

Found in South America (Colombia, Venezuela, Ecuador, Peru, and Bolivia). In Venezuela, found in the Andes (Lara, Mérida, Portuguesa, Táchira, and Trujillo) and the Cordillera de la Costa (Aragua and Yaracuy; Map 27). In the park, found in the understory of montane and cloud forest on both slopes of Guaramacal; 1,800–2,600 m.

Following Henderson (2011), we now consider *Geonoma jussieuana* to be a synonym of *G. orbignyana* subsp. *orbignyana*; this is a reversal of earlier treatments of the genus (Wessels Boer, 1968; Henderson et al., 1995; Dorr et al., 2000), where the former name was applied to what we treat here as *G. lehmannii* subsp. *lehmannii*. Inflorescence branching, a character previously used to separate these taxa as species, evidently is inconsistent and has no geographical basis.

Henderson (2011) recorded a dozen morphological characters that serve to separate the nominate subspecies, which occurs in South America, from *G. orbignyana* subsp. *hoffmanniana* (H. Wendl. ex Spruce) A. J. Hend., which is restricted to Central America. In particular, Henderson (2011) distinguished *G. orbignyana* subsp. *hoffmanniana* from *G. orbignyana* subsp. *orbignyana* by its longer peduncles.

Geonoma undata Klotzsch, Linnaea 20: 452. 1847; Llamozas et al., Libro Rojo Fl. Venez. 337. 2003; Morillo, in Morillo et al., Bot. Ecol. Monocot. Páramos Venez. 2: 391, foto 4. 2010, pro parte.

Only the nominate subspecies is found in the Andes of Venezuela and Guaramacal.

Geonoma undata subsp. ***undata***

Geonoma weberbaueri Dammer ex Burret, Bot. Jahrb. Syst. 63: 221. 1930; Dorr et al., Contr. U.S. Natl. Herb. 40: 39. 2000 [2001]; Morillo, in Morillo et al., Bot. Ecol. Monocot. Páramos Venez. 2: 392, foto 5. 2010.

Medium-sized plants, 2–8 m tall; stems (trunks) solitary. Leaves 4–17 per stem, undivided or irregularly pinnate, (17–) 60–100 cm long; leaflets (pinnae) 1–60 per side, apical segments bifid. Inflorescences (1–)2–3-branched, infrafoliar; peduncular bracts 7–40 cm long; peduncles 10–35 cm long. Fruits 4–15 × 6–10 mm, black.

MAP 28. *Geonoma undata* subsp. *undata* occurrence in Venezuela.

Found in South America (Colombia, Venezuela, Ecuador, Peru, and Bolivia). In Venezuela, found in the Andes (Barinas, Lara, Mérida, Portuguesa, Táchira, and Trujillo), the Sierra de Perijá (Zulia), and in the Cordillera de la Costa (Aragua, Carabobo, Distrito Federal, Falcón, Miranda, and Yaracuy; Map 28). In the park, found in cloud forest on the south slope and in subpáramo on the Fila de Agua Fría and below Páramo de Vicuyal; (1,600–)1,800–2,800 m.

COMMON NAME. Moriche.

Geonoma undata s.l. as circumscribed by Henderson (2011) is found in Mexico, Central America, the West Indies, and South America. He recognized 10 subspecies after correlating geographical range with differences in vegetative morphology.

Prestoea Hook. f.

Prestoea Hook. f., in Bentham and Hooker f., Gen. Pl. 3: 875, 899. 1883, nom. cons.

Monoecious, small to moderate-sized arborescent plants; stems (trunks) clustered or rarely solitary, ringed with prominent or obscure leaf scars; trunk usually persisting at the base of old shoots; unarmed. Leaves pinnate (our species), rarely simple, 4–12 per plant, usually displayed horizontally; leaf sheaths open, occasionally partially closed; leaflets (pinnae) few to many, variously shaped, generally opposite or loosely alternate, horizontally disposed. Inflorescences branched, rarely spicate, interfoliar, rarely infrafoliar, erect or arching. Flowers unisexual, 3-merous. Staminate flowers: sepals 3, free, briefly imbricate at base; petals 3, free, valvate; stamens 6. Pistillate flowers: sepals 3, free, imbricate; petals 3, free, imbricate, briefly valvate apically; staminodes 6; gynoecium 1-locular, 1-ovulate. Fruits globose or ellipsoid, purple to black at maturity. Seeds globose; endosperm ruminate, rarely homogeneous; embryo subbasal. [Arecoideae: Euterpeae.]

A neotropical genus of 11 species found in Central America, the West Indies, and South America (Colombia, Venezuela, Guyana, Ecuador, Peru, Bolivia, and Brazil). Five species occur in Venezuela.

REFERENCES. Henderson (1999); Henderson and de Nevers (1988); Henderson and Galeano (1996).

Prestoea acuminata (Willd.) H. E. Moore, Gentes Herb. 9: 286. 1963; Morillo, in Morillo et al., Bot. Ecol. Monocot. Páramos Venez. 2: 393–394, fig. 1B, 2, foto 6. 2010. *Oreodoxa acuminata* Willd., Samml. Deutsch. Abh. Königl. Akad. Wiss. Berlin 1803: 252. 1806.

Only the nominate variety is found in Guaramacal.

Prestoea acuminata var. ***acuminata***

Llamozas et al., Libro Rojo Fl. Venez. 342. 2003.

Arborescent plants, to 15 m × 20 cm. Leaves compound; leaf sheaths partially closed, 45–60 cm long, reddish to purple, some almost black; leaf blades 2–2.6 m long; leaflets (pinnae) 23–30 or more per side; central leaflets larger, 55–60 × 4–5.5 cm. Inflorescences to 1.3 m long, horizontal; peduncles 5–20 × 2–3 cm, secondary branches to 50 cm long. Flowers white, 3–4.5 mm long when fruiting. Fruits 1–1.3 cm in diameter.

Found in Central America and South America (Colombia, Venezuela, Ecuador, Peru, and Bolivia). In Venezuela, found in the Andes (Mérida, Táchira, and Trujillo) and the Cordillera de la Costa (Aragua, Distrito Federal, Falcón, Miranda, Monagas, Sucre, and Yaracuy; Map 29). In the park, found in cloud forest in Qda. Jirajara on the south slope of Guaramacal; 1,950–2,250 m.

MAP 29. *Prestoea acuminata* var. *acuminata* occurrence in Venezuela.

Two other varieties of this species are recognized, but neither one is found in Guaramacal. *Prestoea acuminata* var. *dasystachys* (Burret) A. J. Hend. & G. A. Galeano, also found in the Andes, is readily distinguished from the nominate variety by its perianth size in fruit (to 7 mm long) and its significantly larger (1.4–1.8 cm in diameter) ovoid or obovoid fruit. *Prestoea acuminata* var. *montana* (Graham) A. J. Hend. & G. A. Galeano, restricted to the West Indies, is distinguished from the other varieties by its ± terete (vs. angular) rachillae with superficial (vs. somewhat sunken) flowers and fruit.

Wettinia Poepp. ex Endl.

Wettinia Poepp. ex Endl., Gen. Pl. 243. 1837.

Catoblastus H. Wendl., Bonplandia (Hannover) 8: 104, 106. 1860.

Monoecious, shrubby to arborescent plants; stems (trunks) solitary or clustered, conspicuously ringed with leaf scars; unarmed; supported by a dense cone of stilt roots. Leaves pinnate, spreading; leaflets (pinnae) of 2 types, one type undivided, asymmetrical and narrowly elliptical in outline, apices toothed, and the other type divided to the base into narrow segments. Inflorescences spikes or racemes, infrafoliar, 3–8(–15) per node, the central bud larger, the lateral buds progressively smaller. Staminate flowers: sepals 3(4), briefly connate or free; petals 3(4), briefly valvate or free; stamens 6–20. Pistillate flowers: sepals 3(4), imbricate, free or connate basally; petals 3(4), imbricate, free or connate basally; gynoecium of 1(2) fertile and (1)2 abortive carpels; style basal; stigmas 3. Fruits 1(2)-seeded, prismatic or pyramidal, flattened apically. Seeds ellipsoid, globose, prismatic or pyramidal, albuminous; embryo basal and erect. [Arecoideae: Iriarteeae.]

Found in Central America (Panama) and South America (Colombia, Venezuela, Ecuador, Peru, Bolivia, and Brazil). The genus comprises 21 species, with only 1 species found north of the Orinoco River in Venezuela.

Reference. Moore and Dransfield (1978).

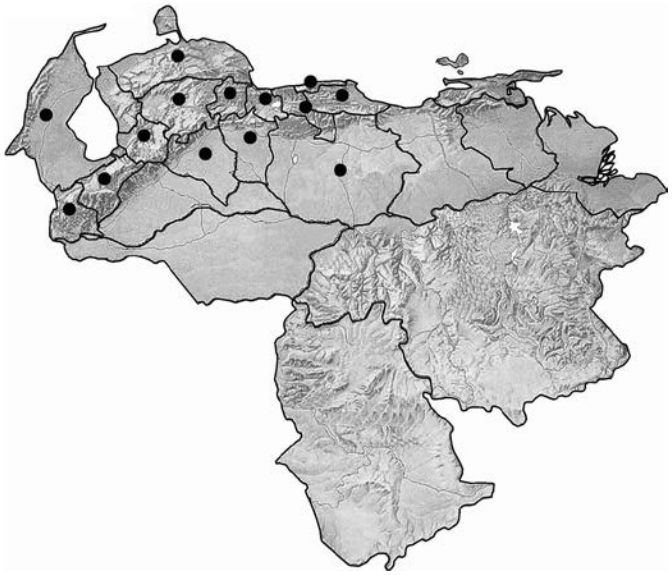
Wettinia praemorsa (Willd.) Wess. Boer, Pittieria 17: 185. 1988; Llamozas et al., Libro Rojo Fl. Venez. 349. 2003. *Oreodoxa praemorsa* Willd., Samml. Deutsch. Abh. Königl. Akad. Wiss. Berlin 1803: 253. 1806. *Catoblastus praemorsus* (Willd.) H. Wendl., Bonplandia (Hannover) 8: 104. 1860.

FIGURE 24A–C

Arborescent plants, 5–15(–20) m tall; stems clustered, occasionally solitary. Leaves 4–6, ascending, grayish-green; leaf sheaths to 1.5 m long; leaf blades to 2 m long; leaflets (pinnae) alternate, undivided, 20–30 per side or occasionally divided into 2–8 segments, glabrous, nerves prominent, ultimate leaf segments flabellate, toothed. Inflorescences pendent; spadix deeply cup-shaped or hooded, smooth, brown, coffee or sometimes purple. Infructescences pendulous. Fruits ~3.5 × 2.5 cm, ellipsoid, green, salmon or yellow when mature, pubescent.

Found in South America (Colombia and Venezuela). In Venezuela, found in the Andes (Lara, Mérida, Portuguesa, Táchira, and Trujillo), the Sierra de Perijá (Zulia), and the Cordillera de la Costa (Aragua, Carabobo, Cojedes, Distrito Federal, Falcón, Guárico, Miranda, and Yaracuy; Map 30). This palm occurs in cloud forest on the north slope of the park, where it is especially noticeable from Qda. Segovia to the Páramo de Guaramacal along the Boconó–Guaramacal road; 1,800–2,600 m.

Common Name. Mapora.



MAP 30. *Wettinia praemorsa* occurrence in Venezuela.

Bromeliaceae

L. J. DORR AND B. STERGIOS

Perennial herbs, acaulescent or caulescent, epiphytic, terrestrial or lithophytic, sometimes tank-forming. Roots present or not, when present modified as holdfasts in epiphytic and lithophytic species. Leaves simple, spirally arranged, polystichous or distichous, usually rosulate or distributed along a stem; leaf sheaths ± dilated below; leaf blades usually ligulate to narrowly triangular, margins entire, spinose or serrate, covered with peltate scales (at least when young); stipules wanting. Inflorescences terminal or rarely lateral, scapose or sessile, simple or compound, panicles, racemes, spikes, capitula or solitary pseudolateral flowers, usually bearing brightly colored bracts. Flowers bisexual (sometimes functionally unisexual), regular or nearly so, 3-merous, often showy; perianth heterochlamydeous. Sepals 3, free or connate, aestivation convolute or imbricate. Petals 3, free or connate, abaxial surface appendaged basally or not (naked). Stamens 6, in 2 series; filaments free or joined to the petals and/or to each other; anthers 2-thecate. Ovary superior to inferior, 3-carpellate, 3-locular; placentation axile; ovules anatropous, numerous. Style terminal, 3-parted; stigmas 3, usually

spiral-conduplicate. Fruit septicidal or loculicidal capsules, berries, or multiple fleshy fruits (*Ananas* Mill.). Seeds winged, plumose or unappendaged, 1 to many per locule; embryo small, embedded in copious endosperm.

Found in subtropical and tropical North America (USA), Mexico, Central America, the West Indies, and South America (all country-level political units) and west tropical Africa (1 species); ~58 genera and ~3,200 species. In Venezuela, there are ~22 genera and 374 species.

References. Barfuss et al. (2005); Givnish et al. (2007, 2011); Holst (1994); Hornung and Gaviria (1999); Horres et al. (2000, 2007); Oliva-Esteva and Steyermark (1987); Smith (1957, 1971); Smith and Downs (1974, 1977, 1979); Smith and Till (1998); Smith and Wood (1975).

We follow Givnish et al. (2007), who recognize eight subfamilies of Bromeliaceae where traditionally there had been three. Representatives of four of these eight subfamilies are found in the park.

KEY TO THE GENERA OF BROMELIACEAE

1a. Margins of leaf blades entire 2
  2a. Plants terrestrial (our species) . . . . . ***Pitcairnia***
  2b. Plants epiphytic (our species) 3
    3a. Petal claws coherent and forming a tube that equals the sepals; flowers usually polystichous 4
      4a. Petal claws with 2 basal scales . . . . . ***Mezobromelia***
      4b. Petal claws without scales . . . . . ***Guzmania***
    3b. Petal claws free or with a very short tube exceeded by the sepals; flowers usually distichous 5
      5a. Petal claws with 2 basal scales . . . . . ***Vriesea***
      5b. Petal claws without scales (our species) 6
        6a. Stamens longer than the petals in length, exserted; sepals symmetric, free or rarely connate . . . . . ***Tillandsia***
        6b. Stamens shorter than or equal to the petals in length, not exserted; sepals asymmetric, free or nearly so . . . . . ***Racinaea***
1b. Margins of leaf blades serrate or armed with spines or prickles (sometimes these are very small and restricted to the base of the leaf blades) 7
  7a. Fruit a dry capsule; seeds winged; ovary superior or nearly superior . . . . . ***Puya***
  7b. Fruit a dry or ± fleshy berry; seeds without wings or appendages; ovary inferior 8
    8a. Epiphytic herbs (our species); inflorescences paniculate, conspicuous . . . . . ***Aechmea***
    8b. Terrestrial herbs; inflorescences corymbose, nearly hidden at the base of lower leaves . . . . . ***Greigia***

Aechmea Ruiz & Pav.

Aechmea Ruiz & Pav., Fl. Peruv. Prodr. 47. 1794, nom. cons.

Acaulescent, epiphytic (our species) or terrestrial herbs. Leaves densely rosulate; leaf sheaths usually well developed; leaf blades usually ligulate, margins long-spiny to spinulose-serrate. Inflorescences simple or compound, lax or dense, not strobilate; scape often well developed. Floral bracts entire, in 2 or more rows. Flowers distichous or polystichous, sessile or pedicellate, bisexual (our species) or rarely unisexual. Sepals often strongly asymmetric, free or shortly connate. Petals regular, free, appendaged (our species) or not; appendages 2, ± adnate to the petals. Stamens included, free or the second series adnate to the petals, unappendaged. Ovary inferior. Fruit a dry berry. Seeds unappendaged. [Bromelioideae.]

A poorly circumscribed neotropical genus of ~240 species found in Mexico, Central America, the West Indies, and South America (all major political units with the exception of Chile); ~30 species occur in Venezuela.

References. Aguirre-Santoro and Betancur (2008); Faria et al. (2004); Givnish et al. (2011); Horres et al. (2007); Sass and Specht (2010); Smith and Downs (1979).

Aechmea, as currently circumscribed (e.g., Smith, 1971; Smith and Downs, 1979), is a highly polyphyletic genus (Smith and Till, 1998; Sass and Specht, 2010; Givnish et al., 2011), and there appear to be as many as six different origins of the species now assigned to what was once thought to be the largest genus in the Bromelioideae. Clades reflect geographic distribution rather than morphological similarity among the taxa of *Aechmea* and closely related genera analyzed by Sass and Specht (2010). The phylogenetic relationships of the sole species of *Aechmea* found in Guaramacal, which has not been sampled in molecular studies, are unknown, but we suspect this species will eventually be included in one of the Central American or northern South American clades instead of the Brazilian clades identified by Sass and Specht (2010).

Aechmea spectabilis Brongn. ex Houllet, Rev. Hort. 47: 311, t. 1875.

Aechmea paniculigera auct., non (Sw.) Griseb.; Ortega et al., BioLlania 5: 35. 1987; Dorr et al., Contr. U.S. Natl. Herb. 40: 40. 2000 [2001].

Robust, tank-forming epiphytic herbs. Leaves densely rosulate; leaf sheaths elliptic, densely brown lepidote; leaf blades ligulate, 0.8–1(–1.4) m × 6–8(–11) cm, margins laxly serrate with

MAP 31. *Aechmea spectabilis* occurrence in Venezuela.

spines to 3 mm long, apex acute with a thick terminal cusp. Inflorescences panicles, 0.6–1 m long, broadly pyramidal, lax, greatly branched; scape flocculose, soon glabrous; primary bracts erect, broadly lanceolate, acute, longer than the internodes. Spikes laxly 1–5-flowered. Floral bracts minute. Sepals 9–12 mm long, strongly asymmetric, shortly connate at base, pale rose. Petals ~25 mm long, bright red to purple; crenate scales present at base. Ovary ~7 mm long, narrowly obovoid or clavate.

Found in South America (Colombia and Venezuela). In Venezuela, known from the Andes (Lara, Mérida, Táchira, and Trujillo) and the Sierra de Periá (Zulia; Map 31). In the park, found in forest at lower elevations on the south slope of Guaramacal; (1,200–)1,600 m.

Aechmea spectabilis is easily recognized within the park as it is the only epiphytic bromeliad with baccate fruit; all the other epiphytic taxa have capsular fruit.

Greigia Regel

Greigia Regel, Index Seminum [St. Petersburg (Petropolitanus)] 1864, Suppl.: 13. 1864.

Terrestrial or rarely epiphytic herbs; caudex short. Leaves spiral, imbricate the length of the stem; leaf blades narrowly triangular or linear, margins partially or completely serrate or serrulate with minute to conspicuous spines. Inflorescences simple or compound, usually axillary, densely spicate, reduced and subglobose, relatively few-flowered. Scapes very short. Flowers bisexual, sessile or subsessile. Sepals free or connate, symmetric. Petals connate ½ their length, usually without appendages. Filaments adnate to the petals. Ovary inferior. Berry fleshy. Seeds unappendaged. [Bromelioideae.]

A genus of 20–30 species found in Mexico, Central America, and South America (Colombia, Venezuela, Ecuador, Peru, Bolivia, Chile, and Argentina). Five species occur in Venezuela.

Reference. Smith and Downs (1979).

Greigia alborosea (Griseb.) Mez, in Martius, Fl. Bras. 3(3): 247. 1891; Smith, Fl. Venez. 12(1): 285–287, t. 19. 1971; Morillo and Briceño, in Morillo et al., Bot. Ecol. Monocot. Páramos Venez. 2: 406–407, fig. 1, foto 1. 2010. *Nidularium alboroseum* Griseb., Nachr. Königl. Ges. Wiss. Georg-Augusts-Univ. 1864: 12. 1864.

Subcaulescent, terrestrial herbs. Leaves rosulate; leaf sheaths subelliptic, covered toward base below with ferrugineous scales; leaf blades ensiform, 0.8–1(–1.3) m × 1.8–2(–4) cm, margins serrate toward base with spines to 3 mm long, entire in the middle, and sparingly spinose-serrate above the middle, apex long-attenuate, pungent, glabrate above, white lepidote below. Inflorescences corymbose, axillary, 10–20-flowered, nearly hidden at the base of lower leaves. Outer floral bracts lanceolate, equaling the sepals. Sepals lance-ovate, ~2 cm long, apex mucronate, sharply carinate. Petals ~3 cm long, blades suberect to spreading, minutely cucullate. Ovary narrowly ellipsoid.

Endemic to Venezuela, where it is found in the Andes (Mérida, Táchira, and Trujillo) and the Cordillera de la Costa (Anzoátegui, Aragua, Distrito Federal, Miranda, and Sucre; Map 32). In the park, found in cloud forest on the north slope of Guaramacal; 2,350 m.

This species is easily distinguished from other bromeliads in the park by its axillary inflorescences hidden among serrate leaves.

MAP 32. *Greigia alborosea* occurrence in Venezuela.

Guzmania Ruiz & Pav.

Guzmania Ruiz & Pav., Fl. Peruv. 3: 37. 1802.

Acaulescent or rarely caulescent, epiphytic or rarely terrestrial, often tank-forming herbs. Leaves densely polystichous; leaf sheaths conspicuous, imbricate; leaf blades mostly ligulate, margins entire. Inflorescences mostly bipinnate or simple, branches polystichously flowered; scape usually conspicuous, sometimes absent. Flowers sessile, bisexual. Sepals free to almost completely connate, symmetric or almost symmetric. Petals unappendaged, claws distinct from the blades, closely agglutinated (not truly connate) in a tube. Stamens included; filaments ± adherent (not adnate) to the petals. Ovary superior; style elongate; ovules many. Fruit a septicidal capsule. Seeds with a basal coma. [Tillandsioideae.]

A genus of 125–175 species found in the USA (Florida), Mexico, Central America, the West Indies, and South America (Colombia, Venezuela, the Guianas, Ecuador, Peru, Bolivia, and Brazil). In Venezuela, 28 species have been reported.

Reference. Smith and Downs (1977).

Guzmania appears to form a monophyletic clade within the Tillandsioideae (Barfuss et al., 2005; Givnish et al., 2011).

KEY TO THE SPECIES OF *GUZMANIA*

1a. Sepals exserted, not completely covered by the floral or primary bracts; leaf blades 40–50(–85) cm long . . . . . ***G. mitis***
1b. Sepals completely covered by the floral bracts and sometimes also by the primary bracts; leaf blades 25–30 cm long . . . . . ***G. squarrosa***

Guzmania mitis L. B. Sm., Contr. Gray Herb. 98: 31, t. 6, figs. 4–5. 1932; Smith, Fl. Venez. 12(1): 256–257. 1971; Morillo and Briceño, in Morillo et al., Bot. Ecol. Monocot. Páramos Venez. 2: 410. 2010.

Acaulescent tank-forming epiphytes, 1–1.5 m tall. Leaf sheaths broadly ovate, ± brownish at base; leaf blades ligulate, 40–50(–85) × 3–5 cm, apex acute, punctulate-lepidote above and below. Inflorescences bipinnate, erect, 10–25 cm long, glabrous; primary bracts strict (rigidly erect), ovate or lanceolate, densely imbricate, foliaceous, longer than internodes; spikes globose or thick-ovoid, short-stipitate, 2.5–3 cm long, densely 12–15-flowered. Floral bracts broadly ovate, shorter than sepals, obtuse. Sepals obovate, ~1 cm long, shortly connate, obtuse. Petals elliptic, ~2 cm long, blades erect, white.

Found in Central America (Costa Rica and Panama) and South America (Colombia, Venezuela, and Ecuador). In Venezuela, found at higher elevations in the western states (Falcón, Lara, Mérida, Portuguesa, Táchira, Trujillo, and Zulia; Map 33). In the park, found in forest mostly on the north slope; 1,800–2,350 m.

Guzmania squarrosa (Mez & Sodiro) L. B. Sm. & Pittendr., J. Wash. Acad. Sci. 43: 403. 1953 [1954]; Smith, Fl. Venez. 12(1): 260. 1971; Holst, in Berry et al., Fl. Venez. Guayana 3: 590, fig. 504. 1997; Morillo and Briceño, in Morillo et al., Bot. Ecol. Monocot. Páramos Venez. 2: 411–412, fig. 3A, foto 3. 2010. *Thecophyllum squarrosum* Mez & Sodiro, Bull. Herb. Boissier, sér. 2, 4: 877. 1904.

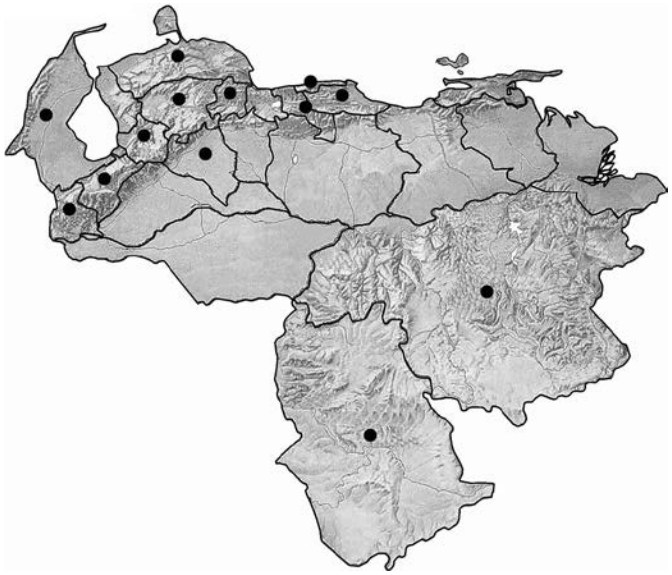
MAP 33. *Guzmania mitis* occurrence in Venezuela.

MAP 34. *Guzmania squarrosa* occurrence in Venezuela.

Guzmania monostachia auct., non (L.) Rusby ex Mez.; Ortega et al., BioLlania 5: 35. 1987.

Caulescent, epiphytic or terrestrial herbs, 40–70(–100) cm tall. Leaves forming a large, almost flat rosette; leaf sheaths narrowly elliptic, covered with brown scales; leaf blades linear, 40–50(–70) × 5–7 cm, apex abruptly acute, subglabrous above, punctulate-lepidote below. Inflorescences bipinnate, ± erect, 20–40 cm long, glabrous; primary bracts ovate, densely imbricate, foliaceous with showy red to orange (rarely yellow) striations, spreading to decurved at apex; spikes short, densely 4–6-flowered glomerules. Floral bracts elliptic, shorter than sepals, obtuse or truncate. Sepals broadly elliptic, ~2 cm long, connate most of their length. Petals obtuse, ~2 cm long, yellow.

Found in South America (Colombia, Venezuela, Guyana, Ecuador, Peru, and Bolivia). In Venezuela, found at higher elevations in the Andes (Lara, Mérida, Portuguesa, Táchira, and Trujillo), the Sierra de Perijá (Zulia), the Cordillera de la Costa (Aragua and Distrito Federal), and the Venezuelan Guayana (Amazonas and Bolívar; Map 34). Found in forest and subpáramo throughout the park; 1,850–3,100 m.



MAP 35. *Mezobromelia capituligera* occurrence in Venezuela.

Mezobromelia L. B. Sm.

Mezobromelia L. B. Sm., Proc. Amer. Acad. Arts 70: 151. 1935.

Medium-sized to large, tank-forming, acaulescent herbs, epiphytic (our species) or rarely terrestrial. Leaves rosulate; sheaths large; blades entire. Inflorescences compound, inflorescence branches polystichously or rarely distichously flowered; scape usually well developed. Flowers sessile or short-pedicellate; bisexual. Sepals ± free or connate, symmetric. Petals tightly conglutinated to the middle, forming a tube below, appendaged; appendages 2 per petal, adaxial. Stamens included; filaments adherent to the petals. Ovary superior; stigma conduplicate-spiral. Fruit a capsule. [Tillandsioideae.]

A genus of 9 species found in Central America (Costa Rica and Panama), the West Indies, and South America (Colombia, Venezuela, Trinidad and Tobago, the Guianas, Ecuador, Peru, and Brazil). Two species occur in Venezuela.

REFERENCES. Luther (1995); Rauh (1992); Smith and Downs (1977).

The genus *Mezobromelia* cannot be distinguished vegetatively from *Guzmania*, but in flower the former is distinguished from the latter by the presence of appendages at the adaxial base of its petals.

Mezobromelia capituligera (Griseb.) J. R. Grant, Phytologia 74: 428. 1993; Holst, in Berry et al., Fl. Venez. Guayana 3: 605, fig. 512. 1997. *Tillandsia capituligera* Griseb., Cat. Pl. Cub. 254. 1866. *Vriesea capituligera* (Griseb.) L. B. Sm. & Pittendr., J. Wash. Acad. Sci. 43: 402. 1953; Smith, Fl. Venez. 12(1): 240–241. 1971; Ortega et al., BioLlania 5: 35. 1987.

FIGURE 24I

Vriesea capituligera var. *lutea* Steyerm., J. Bromeliad Soc. 32: 113. 1982.

Tillandsia compacta auct., non Griseb.; Ortega et al., BioLlania 5: 35. 1987.

Large, tank-forming epiphytes, 40–70(–250) cm tall. Leaf blades ligulate, 30–60(–80) × 4–7(–12) cm, shorter than the scape, apex attenuate, glabrous above, obscurely punctulate-lepidote below. Inflorescences erect, 30–50(–80) cm tall; primary bracts spreading, red or scarlet, showy. Sepals and floral bracts orange or red. Petals ~3 cm long, yellow or yellow-orange.

Found in the West Indies and South America (Colombia, Venezuela, Trinidad and Tobago, Ecuador, Peru, and Bolivia). Widespread in Venezuela (Amazonas, Aragua, Bolívar, Distrito Federal, Falcón, Lara, Mérida, Miranda, Portuguesa, Táchira, Trujillo, Yaracuy, and Zulia; Map 35). Found in forest throughout the park; 1,500–2,600 m.

Pitcairnia L'Hér.

Pitcairnia L'Hér., Sert. Angl. 7. 1788 [1789], nom. cons.

Acaulescent to caulescent, mostly terrestrial (our species) or rarely lithophytic or epiphytic herbs. Leaves polystichous or rarely distichous, fascicled or in dense spirals along the stem; leaf sheaths small, sometimes bulbous-thickened; leaf blades linear to broadly lanceolate, entire (our species) or serrate, attenuate or appearing petiolate. Scape present, often well developed. Inflorescences simple or compound. Floral bracts conspicuous to minute. Flowers long-pedicellate to sessile, showy, bisexual. Sepals convolute, free, attenuate to obtuse. Petals free, long and narrow, usually zygomorphic, convergent over the stamens, unappendaged or with a single scale (or scale remnant) at base, red, rarely white or yellow, very rarely blue or violet. Stamens elongate, either slightly shorter or slightly longer than the petals. Ovary almost wholly superior to wholly inferior; style long and slender; ovules numerous. Fruit a capsule. Seeds numerous, bicaudate or winged, rarely unappendaged. [Pitcairnioideae.]

An overwhelmingly neotropical genus of ~280 species found in Mexico, Central America, the West Indies, and South America (Colombia, Venezuela, the Guianas, Ecuador, Peru, Bolivia, Brazil, Paraguay, and Argentina); 1 species native to west tropical Africa. There are ~41 species in Venezuela, 24 of which are endemic.

References. Givnish et al. (2004); Hornung-Leoni and Gaviria (2013); Smith and Downs (1974).

The sole African species, *Pitcairnia feliciana* (A. Chev.) Harms & Midlbr., appears to have reached tropical West Africa fairly recently (12–9.3 mya) via long-distance dispersal (Givnish et al., 2004, 2007, 2011). It also is the sole representative of the family to occur naturally outside the Americas.

KEY TO THE SPECIES OF *PITCAIRNIA*

1a. Leaf blades sessile, sometimes abruptly attenuate but not appearing petiolate, >2 cm wide; inflorescences racemose, >10 cm long 2
2a. Floral bracts showy, broadly ovate, exceeding the pedicels in length . . . . . ***P. maidifolia***
2b. Floral bracts reduced, stipuliform, at most equaling the pedicels in length . . . . . ***P. brevicalycina***
1b. Leaf blades appearing petiolate, <2 cm wide; inflorescences strobilus-like, <10 cm long . . . . . ***P. hitchcockiana***

Pitcairnia brevicalycina Mez, Repert. Spec. Nov. Regni Veg. 16: 9. 1919; Smith, Fl. Venez. 12(1): 75–76. 1971; Morillo and Briceño, in Morillo et al., Bot. Ecol. Monocot. Páramos Venez. 2: 414, fig. 4A. 2010.

Caulescent, terrestrial herbs, 1.5–1.8 m tall; stems often prostrate. Leaves persistent; leaf sheaths ovate, tomentulose-lepidote, becoming glabrous; leaf blades lanceolate, 1–1.5 m × 2–5 cm, base sometimes abruptly attenuate, not appearing petiolate, minutely lepidote, appearing glabrous. Scape strict; scape bracts triangular, shorter than the internodes and leaving much of the scape naked. Inflorescences simple, dense many-flowered racemes, 0.5–1.5 m long. Floral bracts greatly reduced, equal to or shorter than the pedicels. Sepals oblong, ~1 cm long. Petals broadly ligulate, 3.5–4 cm long, whitish to greenish-yellow or pale yellow, unappendaged or with traces of a scale.

Found in South America (Venezuela, Ecuador, and Peru). In Venezuela, restricted to the higher elevations in the western states (Barinas, Falcón, Lara, Mérida, Portuguesa, Táchira, Trujillo, and Zulia; Map 36). Open areas in cloud forest and subpáramo throughout the park; (1,450–)1,600–2,800 m.

In Guaramacal, hummingbirds visit the flowers of this species (pers. obs.).

Smith and Downs (1974) alluded to the fact that *Pitcairnia caulescens* K. Koch ex Mez, described from garden material that may have originated in Venezuela, might be conspecific with *P. brevicalycina*. If this is true, the former name is the one that would have to be adopted for our species.

Pitcairnia hitchcockiana L. B. Sm., Phytologia 5: 44, t. 6, figs. 1–3. 1954.

More or less acaulescent, terrestrial or rupicolous herbs, 0.5–0.6 m tall; often growing in dense aggregations. Leaves persistent; leaf sheaths narrowly ovate, lepidote, becoming glabrous; leaf blades linear-lanceolate, ~0.8 m × 1.5–2 cm, appearing

MAP 36. *Pitcairnia brevicalycina* occurrence in Venezuela.

MAP 37. *Pitcairnia hitchcockiana* occurrence in Venezuela.

petiolate, floccose when young, becoming glabrous. Scape slender, shorter than the leaf blades; scape bracts erect, foliaceous, exceeding the internodes in length. Inflorescences simple, slenderly ellipsoid, strobilus-like, few-flowered, ~10 cm long. Floral bracts imbricate, much longer than pedicels, red or scarlet. Sepals lanceolate, ~2 cm long. Petals ~4 cm long, red with a narrow white margin, appendaged; scale (appendage) at base.

Restricted to South America (Venezuela and Ecuador). In Venezuela, found only in the Andes (Táchira and Trujillo; Map 37). In the park, found in forest on sandstone formations in sector El Santuario and near La Cueva below Cerro El Diablo; 1,800–2,000 m.

Pitcairnia maidifolia (C. Morren) Decne. ex Planch., Fl. Serres Jard. Eur. 9: 151. 1854; Smith, Fl. Venez. 12(1): 63–65. 1971; Holst, in Berry et al., Fl. Venez. Guayana 3: 644, fig. 556. 1997; Morillo and Briceño, in Morillo et al., Bot. Ecol. Monocot. Páramos Venez. 2: 414, fig. 4C, foto 4. 2010. *Puya maidifolia* C. Morren, Ann. Soc. Roy. Agric. Gand 5: 453, t. 289. 1849.

Terrestrial or rupicolous herbs, to 1.5 m tall. Leaves rosulate, fasciculate, persistent; leaf sheaths narrowly ovate, floccose, becoming glabrous; leaf blades lanceolate, 0.5–1 m × 5–6 cm, appearing petiolate, glabrous. Scape erect; lower scape-bracts foliaceous, exceeding the internodes, upper scape-bracts ovate, acuminate. Inflorescences simple, dense (preanthesis) to lax (postanthesis) racemes, few- to many-flowered, 10–45 cm long. Floral bracts broadly ovate, shorter than the sepals, green or yellow and often tinged with red. Sepals broadly elliptic, asymmetric, 2.5–3 cm long. Petals linear, unequal, 5–6 cm long, white or greenish-white, unappendaged.

Found in Central America and South America (Colombia, Guyana, Suriname, Ecuador, and Brazil). Widespread in Venezuela (Amazonas, Aragua, Barinas, Bolívar, Distrito Federal, Lara, Mérida, Portuguesa, Táchira, Trujillo, and Yaracuy; Map 38). In the park, found at lower elevations on the south slope of Guaramacal; 1,500–1,700 m.

MAP 38. *Pitcairnia maidifolia* occurrence in Venezuela.

Puya Molina

Puya Molina, Sag. Stor. Nat. Chili 160, 351. 1781 [1782].

Acaulescent or more commonly caulescent, terrestrial or lithophytic herbs; stems unbranched or branched. Leaves rosulate to densely polystichous, coriaceous; leaf sheaths distinct; leaf blades narrowly triangular, margins armed with spines or serrations, base never constricted. Scape usually present and well developed. Scape bracts foliaceous, densely imbricate, caducous or persistent. Inflorescences simple or compound, erect or nutant, sometimes massive (e.g., *P. raimondii* Harms). Flowers showy, bisexual. Sepals convolute, free, much shorter than the petals. Petals free, generally spreading at anthesis, spirally twisted after anthesis, unappendaged or with a pair of vertical folds (vestigial appendages). Stamens shorter than petals; filaments free, elongate. Ovary superior or nearly superior, glabrous. Style long and slender. Capsules loculicidal and usually also tardily septicidal. Seeds winged dorsally. [Puyoideae.]

A neotropical genus of ~200 species found in Central America (Costa Rica) and South America (Colombia, Venezuela, Ecuador, Peru, Bolivia, Brazil, Chile, and Argentina). Eight species occur in Venezuela.

References. Hornung-Leoni and Sosa (2006, 2008); Jabaily and Sytsma (2013); Smith and Downs (1974).

Smith and Downs (1974) recognized two subgenera, *Puya* subgen. *Puya* and *P.* subgen. *Puyopsis* (Baker) L. B. Sm.; the latter is distinguished from the former by having inflorescences and branches fertile throughout (vs. sterile toward the apex). This simple morphological classifycation is unlikely to be sustained as Jabaily and Sytsma (2013) using molecular characters found that *Puya* resolves into four major clades, including a central and northern Andes clade. Their data suggest that *Puya* originated in central Chile and moved north and that the northern Andes were colonized only once with no subsequent transitions back to the south. Overall, *Puya* is a classic example of a recent, rapid species-level radiation in the Andes (Jabaily and Sytsma, 2013).

KEY TO THE SPECIES OF *PUYA*

1a. Plants ≥1.5 m tall; inflorescences 2-branched, erect; sepals 2.5–3 cm long; petals white or whitish-green . . . . . ***P. aristeguietae***

1b. Plants <1 m tall; inflorescences simple, nutant (becoming erect in fruit); sepals 1.5–2 cm long; petals blue or greenish-blue . . . . . ***P. venezuelana***

MAP 39. *Puya aristeguietae* occurrence in Venezuela.

MAP 40. *Puya venezuelana* occurrence in Venezuela.

Puya aristeguietae L. B. Sm., Phytologia 7: 2, t. 1, figs. 9–12. 1959; Smith, Fl. Venez. 12(1): 12–13. 1971; Morillo and Briceño, in Morillo et al., Bot. Ecol. Monocot. Páramos Venez. 2: 418, fig. 5, foto 7. 2010.

FIGURE 24D, E

Puya venezuelana auct., non L. B. Sm.; Ortega et al., BioLlania 5: fig. 6. 1987.

Herbs to 3 m tall. Leaves rosulate, in dense clumps; leaf blades ensiform, 35–70 × 1.5–2.5 cm, rigidly coriaceous, margins armed with stout, dark spines. Scape erect, 1.5–3 m long; scape bracts broadly ovate, to 13 × 5 cm, long caudate, deciduous. Inflorescences 2-branched, erect. Sepals 2.5–3 cm long. Petals 5–6.5 cm long, white or yellow-green.

Found in South America (Colombia and Venezuela). In Venezuela, found in the Andes (Lara, Mérida, Táchira, and Trujillo) and in the Sierra de Perijá (Zulia; Map 39). Known from subpáramo and páramo in the park; (2,000–)2,700–3,100 m.

Common Name. Piñuela.

This species is a conspicuous element of the Páramo de Guaramacal and has also been found to the northeast of that locality on the Fila de Los Recostaderos. The type was collected southwest of Guaramacal in the Páramo de Guirigay.

Hummingbirds visit the flowers of *Puya aristeguietae* in the Páramo de Guaramacal (pers. obs.). Also, we strongly suspect that the spectacled bear, or "oso frontino" (*Tremarctos ornatus*), is feeding on the young leaf buds and shoots of this species in the same páramo as we have often observed young plants disturbed in a fashion suggestive of their being eaten.

Puya venezuelana L. B. Sm., Phytologia 7: 3, t. 1, figs. 13, 14. 1959.

FIGURE 24H

Herbs to 0.6(–1) m tall. Leaves rosulate, in compact clumps; leaf blades linear, 20–25 × 0.5–1 cm, subcoriaceous, margins serrulate, spines inconspicuous. Scape erect, to 0.75 m tall; scape bracts foliaceous, to 4.5 × 1.5 cm, caudate, persistent. Inflorescences simple, nutant (becoming erect in fruit). Sepals 1.5–2 cm long. Petals ~3 cm long, blue or greenish-blue.

Found in South America (Colombia and Venezuela). In Venezuela, known only from the Cordillera de Mérida (Mérida and Trujillo; Map 40). Páramo del Pumar; 2,600 m.

Within the park, this species seems to be restricted to Páramo del Pumar even though we reported earlier (Dorr et al., 2000) that it was found on the Fila de Agua Fría. The presence of *Puya venezuelana* on this latter ridge was based on several sterile collections (i.e., *Stergios & Zambrano 17654*, *17664*, *17680*) that we now believe belong to two different taxa, one evidently a *Puya* (not *P. venezuelana*) and the other possibly a *Pitcairnia*.

Our material differs from the type of *Puya venezuelana* in several details and may, on further investigation, prove to be a distinct species. The Páramo del Pumar collections have serrulate (vs. spiny) leaves, scape bracts barely overlapping and exposing (vs. densely imbricate and concealing) the scape, and a cylindrical (vs. globose or strobilate) inflorescence. *Puya venezuelana* was described from the Páramo de Guirigay southwest of Guaramacal, and although it was long thought to be a Venezuelan endemic, Hornung-Leoni and Sosa (2006) extend its range into northern Colombia.

Racinaea M. A. Spencer & L. B. Sm.

Racinaea M. A. Spencer & L. B. Sm., Phytologia 74: 152. 1993.

Tillandsia subgen. *Pseudocatopsis* Baker, Handb. Bromel. 157, 192. [Aug–Oct] 1889 ("*Pseudo-Catopsis*").

Tillandsia sect. *Pseudocatopsis* André, Bromel. Andr. 62, 66. [Sept–Dec] 1889 ("*Pseudo-Catopsis*").

Caulescent to short-caulescent, often tank-forming, epiphytic (our material) or rarely terrestrial herbs. Leaves rosulate; leaf sheaths large, sometimes forming a pseudobulb; leaf blades ligulate to subfiliform, margins entire. Scape bracts lanceolate, appressed-ascending, equal to or barely exceeding the internodes. Inflorescences simple or compound (our species), branches distichously flowered, rarely secund-flowered. Flowers actinomorphic, sessile to short-pedicellate, usually white to yellow, bisexual. Floral bracts equal to or shorter than the sepals. Sepals asymmetrical and broadest apically, free or rarely short-connate at base, convolute. Petals free, unappendaged, ± spreading, shorter or longer than the sepals. Stamens included; filaments free, sometimes adnate to the petals. Ovary completely superior. Style subsessile to short and stout. Stigma papillose, simple-erect type. Capsules septicidal. Seeds appendaged basally, coma white, pappiform. [Tillandsioideae.]

A neotropical genus of 60–70 species found in Mexico, Central America, and South America (Colombia, Venezuela, the Guianas, Ecuador, Peru, Bolivia, and Brazil). Ten species occur in Venezuela.

References. Barfuss et al. (2005, 2011); Smith and Downs (1977); Spencer and Smith (1993).

Spencer and Smith (1993) erected the genus *Racinaea* to accommodate a group of morphologically distinct taxa treated previously as *Tillandsia* subgen. *Pseudocatopsis* Baker (Smith, 1971; Smith and Downs, 1977). Molecular data (e.g., Barfuss et al., 2005) have since confirmed that *Racinaea* is monophyletic, but the overall relationship of *Racinaea* with *Tillandsia* and other tillandsioid genera remains unresolved taxonomically. Accepting *Racinaea* and other monophyletic lineages as genera makes the remainder of *Tillandsia* paraphyletic. Fortunately, there are suggestions (Barfuss et al., 2011) that a reclassification of *Tillandsia* and close relatives is forthcoming.

Racinaea can be distinguished from *Tillandsia* and other tillandsioid genera by its small, inconspicuous, and distichous flowers, free or nearly free asymmetrical sepals broadest toward the apex, included stamens and pistils, and short and stout styles.

KEY TO THE SPECIES OF *RACINAEA*

1a. Leaf blades ligulate; scape often greatly exceeding the leaves; floral bracts equal to or longer than the sepals . . . . . ***R. spiculosa***

1b. Leaf blades lanceolate to narrowly triangular-lanceolate; scape ± equaling the leaves; floral bracts usually shorter than the sepals . . . . . ***R. tetrantha***

Racinaea spiculosa (Griseb.) M. A. Spencer & L. B. Sm., Phytologia 74: 157. 1993; Holst, in Berry et al., Fl. Venez. Guayana 3: 652–653. 1997; Dorr et al., Contr. U.S. Natl. Herb. 40: 41. 2000 [2001]. *Tillandsia spiculosa* Griseb., Nachr. Königl. Ges. Wiss. Georg-Augusts-Univ. 1864: 17. 1864; Smith, Fl. Venez. 12(1): 189–190. 1971.

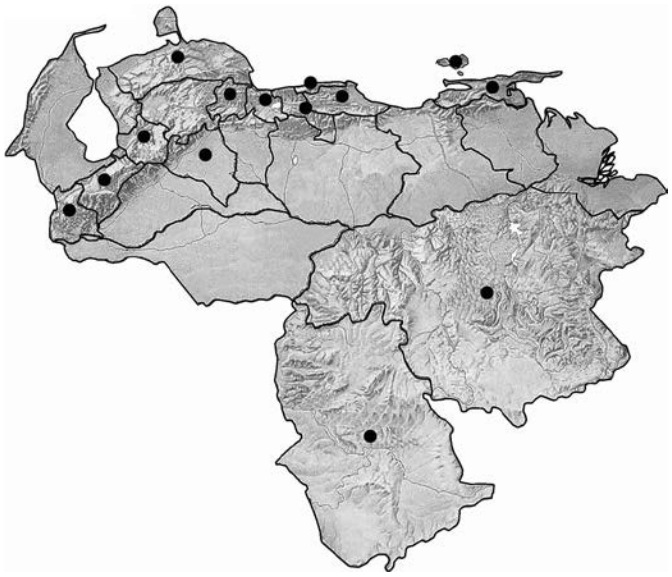
Three varieties of *Racinaea spiculosa* currently are recognized, and all three occur in Venezuela. Guaramacal material can be referred to the nominate variety.

Racinaea spiculosa var. ***spiculosa***

Holst, in Berry et al., Fl. Venez. Guayana 3: 653. 1997.

Acaulescent, epiphytic or lithophytic herbs, to 80 cm tall. Leaves rosulate; leaf sheaths broadly ovate, dark brown; leaf blades ligulate, (12–)20–40 × (2–)3.5–4 cm, apex rounded-apiculate or acute, obscurely punctulate-lepidote. Scape 12–25 cm tall, erect, often greatly exceeding the leaves; scape bracts narrowly elliptic, rounded-apiculate or short-caudate, ± equaling the internodes or the upper bracts slightly shorter. Inflorescences 2- or 3-pinnate, lax; primary bracts narrowly ovate, much shorter than the axillary branches. Spikes linear, lateral branches spreading, densely 7–10(–24)-flowered, usually long-stipitate. Floral bracts broadly ovate, equaling or slightly exceeding the sepals, greenish-red. Sepals broadly elliptic, 0.3–0.7 cm long. Petals orange or yellow. Capsules cylindric, 1.5–2.5 cm long.

Found in Central America (Costa Rica and Panama), the Greater Antilles, and South America (Colombia, Venezuela, Trinidad and Tobago, the Guianas, Ecuador, Peru, Bolivia, and Brazil). In Venezuela, found in the Andes (Mérida, Portuguesa, Táchira, and Trujillo), the Cordillera de la Costa (Aragua, Carabobo, Distrito Federal, Falcón, Miranda, Nueva Esparta, Sucre, and Yaracuy), and the Venezuelan Guayana (Amazonas and Bolívar; Map 41). In the park, found in cloud forest on both slopes of Guaramacal; 1,900–2,300 m.



MAP 41. *Racinaea spiculosa* var. *spiculosa* occurrence in Venezuela.

Racinaea tetrantha (Ruiz & Pav.) M. A. Spencer & L. B. Sm., Phytologia 74: 158. 1993; Holst, in Berry et al., Fl. Venez. Guayana 3: 653. 1997; Morillo and Briceño, in Morillo et al., Bot. Ecol. Monocot. Páramos Venez. 2: 423, fig. 8, foto 12. 2010. *Tillandsia tetrantha* Ruiz & Pav., Fl. Peruv. 3: 39, t. 265. 1802; Smith, Fl. Venez. 12(1): 193–195. 1971.

Acaulescent, epiphytic herbs, 20–50(–80) cm tall. Leaves rosulate; leaf sheaths broadly elliptic-ovate, dark brown; leaf blades narrowly lanceolate to narrowly triangular-lanceolate, 10–30(–45) × (0.5–)1.3–8 cm, apex acute or filiform, grayish-green, often purple spotted, densely appressed-lepidote. Scape 20–30 cm long, usually curved, ± equaling the leaves; scape bracts elliptic or oblong-elliptic, caudate to long-caudate, usually the sheathing bases shorter than the internodes. Inflorescences usually 2-branched, erect or pendulous, axis usually geniculate; primary bracts ovate to ovate-elliptic. Spikes spreading or reflexed, often becoming secund, 2–8(–11)-flowered, stipitate or subsessile. Floral bracts broadly ovate, shorter than the sepals. Sepals obovate or oblong, 0.5–1 cm long. Petals slightly exserted, conglutinated, yellow. Capsules cylindric, 2.5–3 cm long.

Found in Central America (Costa Rica), the Greater Antilles, and South America (Colombia, Venezuela, Ecuador, and Peru).

Racinaea tetrantha is a very variable species morphologically, and as many as seven varieties are recognized, including four in Venezuela. Our material can be assigned to either of two varieties distinguished by the following key.

KEY TO THE VARIETIES OF *RACINAEA TETRANTHA*

1a. Leaf blades narrowly triangular-lanceolate; primary bracts ~½ as long as the spikes; spikes distinctly stipitate . . . . . ***R. tetrantha*** var. ***caribaea***

1b. Leaf blades ligulate; primary bracts exceeding the spikes in length; spikes subsessile . . . . . ***R. tetrantha*** var. ***miniata***

Racinaea tetrantha var. ***caribaea*** (L. B. Sm.) M. A. Spencer & L. B. Sm., Phytologia 74: 158. 1993; Holst, in Berry et al., Fl. Venez. Guayana 3: 654. 1997; Dorr et al., Contr. U.S. Natl. Herb. 40: 41. 2000 [2001]. *Catopsis fendleri* Baker, J. Bot. 25: 175. 1887. *Tillandsia fendleri* (Baker) Mez, in de Candolle, Monogr. Phan. 9: 741. 1896 ("*Fendleri*"), non Griseb., 1865. *Tillandsia caribaea* L. B. Sm., Proc. Amer. Acad. Arts 70: 155. [Aug] 1935; L. B. Sm., Contr. Gray Herb. 106: 155. [Sep] 1935; Smith, Fl. Venez. 12(1): 191–193. 1971. *Tillandsia tetrantha* var. *caribaea* (L. B. Sm.) Gouda, Fl. Guianas, ser. A, Phanerog. 3: 65. 1987.

Racinaea tetrantha var. *tetrantha* auct., non (Ruiz & Pav.) M. A. Spencer & L. B. Sm.; Dorr et al., Contr. U.S. Natl. Herb. 40: 41. 2000 [2001].

MAP 42. *Racinaea tetrantha* var. *caribaea* occurrence in Venezuela.

Leaf blades narrowly triangular-lanceolate, 10–30(–45) × 1.3–2(–4.5) cm. Inflorescences bipinnate, composed of 7–13 spikes; primary bracts ~½ as long as the spikes, red. Spikes 1.5–3.5(–5) cm long, 2–8(–11)-flowered, distinctly stipitate.

Found in Central America (Costa Rica), the Greater Antilles, and South America (Venezuela and possibly Guyana). In Venezuela, found in the Andes (Lara, Mérida, Portuguesa, Táchira, and Trujillo), the Cordillera de la Costa (Aragua, Distrito Federal, Miranda, and Yaracuy), and the Venezuelan Guayana (Amazonas and Bolívar; Map 42). Found in cloud forest throughout the park; 1,700–2,400 m.

The leaves of this variety superficially resemble those of *Tillandsia myriantha* Baker, especially with respect to size and shape. In flower the two taxa are easily separated; the former has an inflorescence with several spreading or reflexed lateral spikes, whereas the latter has a terminal, subglobose inflorescence.

Racinaea tetrantha var. ***miniata*** (André) M. A. Spencer & L. B. Sm., Phytologia 74: 159. 1993; Dorr et al., Contr. U.S. Natl. Herb. 40: 41. 2000 [2001]. *Tillandsia aurantiaca* var. *miniata* André, *Énum. Bromél.* 7. 1888. *Tillandsia tetrantha* var. *miniata* (André) L. B. Sm., Contr. Gray Herb. 89: 15. 1930; Smith, Fl. Venez. 12(1): 195. 1971.

Racinaea tetrantha var. *scarlatina* auct., non (André) M. A. Spencer & L. B. Sm.; Dorr et al., Contr. U.S. Natl. Herb. 40: 41. 2000 [2001].

Racinaea tetrantha var. A; Dorr et al., Contr. U.S. Natl. Herb. 40: 41. 2000 [2001].

Leaf blades lanceolate, 20–30 × 2.5–4 cm. Inflorescences bipinnate, composed of 6–8 spikes; primary bracts exceeding the spikes in length, bright red or rarely pale greenish-yellow. Spikes ~2.5 cm long, 2–4(–8)-flowered, subsessile.

Found in South America (Colombia, Venezuela, and Ecuador). In Venezuela, known only from the Andes (Lara, Táchira, and Trujillo; Map 43). Cloud forest and subpáramo throughout the park; 1,800–3,100 m.

MAP 43. *Racinaea tetrantha* var. *miniata* occurrence in Venezuela.

This variety bears a superficial resemblance to *Tillandsia biflora* Ruiz & Pav., which can be distinguished by the progressively reduced size of the primary bracts from the base to the apex of an inflorescence. The primary bracts of *Racinaea tetrantha* var. *miniata* are not noticeably reduced in size.

Tillandsia L.

Tillandsia L., Sp. Pl. 286. 1753.

Acaulescent to short-caulescent, often tank-forming, epiphytic or rarely terrestrial or lithophytic herbs. Leaves rosulate or less often borne along the stem, polystichous or rarely distichous; leaf sheaths distinct, sometimes forming a pseudobulb; leaf blades ligulate to narrowly triangular or linear, margins entire, peltate or lepidote scales present (usually radially symmetric). Scape usually present, solitary (our species) or several, well developed to reduced or lacking, erect or pendulous. Inflorescences simple or compound, usually distichously flowered spikes or rarely reduced to a single flower, sometimes appearing polystichously flowered. Flowers sessile to short-pedicellate, bisexual. Floral bracts equal to or shorter than the sepals. Sepals asymmetric or rarely symmetric, free to slightly connate. Petals free, usually naked (without appendages) or appendaged. Stamens free or adnate to the base of the petals, rarely basally connate. Ovary superior. Stigma usually conduplicate-spiral or simple erect type, rarely convolute-blade or unique coralliform type. Capsules septicidal. Seeds cylindrical or fusiform, basally appendaged; appendage straight, plumose, and white. [Tillandsioideae.]

A neotropical genus of 600–650 species found in North America (USA), Mexico, Central America, the West Indies, and South America (all country-level political units). Approximately 45 species are found in Venezuela.

References. Barfuss et al. (2011); Grant (1993); Smith and Downs (1977).

There is strong molecular support for the monophyly of Tillandsioideae and its division into four tribes (Barfuss et al., 2005), but the circumscription of genera in this subfamily remains unsettled. Traditional morphologically based taxonomy relied on characters (e.g., spiral vs. distichous arrangement of the flowers, various connations of the corolla tube, inclusion vs. exsertion of stamens and styles, and presence vs. absence of petal appendages) that are of questionable diagnostic value (Grant, 1993; Barfuss et al., 2005). Although molecular data make it clear that *Tillandsia* as circumscribed by Smith (1971) and Smith and Downs (1977) is not monophyletic, sampling remains insufficient to satisfactorily reclassify the genera of the subfamily. There are, however, suggestions (Barfuss et al., 2011) that such a reclassification is forthcoming.

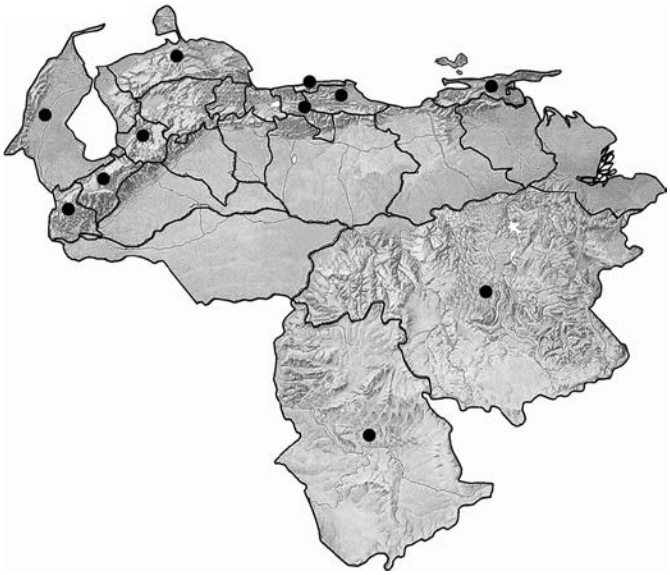
KEY TO THE SPECIES OF *TILLANDSIA*

1a. Several to many scapes arising from a rosette of leaves . . . . . ***T. complanata***
1b. One scape arising from a rosette of leaves 2
  2a. Leaf blades very narrowly triangular, apex acute or filiform . . . . . ***T. myriantha***
  2b. Leaf blades ligulate, apex not acute or filiform 3
    3a. Lateral spikes ascending, densely clustered near scape apex . . . . . ***T. compacta***
    3b. Lateral spikes perpendicular to scape axis or if ascending not densely clustered near scape apex 4
      4a. Large epiphytes, (0.5–)1–3 m tall; leaf blades ≥60 cm long, ≥8 cm wide . . . . . ***T. fendleri***
      4b. Small to medium-sized epiphytes, <0.5 m tall; leaf blades <30 cm long, <2.5 cm wide . . . . . ***T. biflora***

Tillandsia biflora Ruiz & Pav., Fl. Peruv. 3: 41, t. 268, fig. b. 1802; Smith, Fl. Venez. 12(1): 166–167. 1971; Morillo and Briceño, in Morillo et al., Bot. Ecol. Monocot. Páramos Venez. 2: 425, fotos 13, 14. 2010.

Acaulescent, epiphytic herbs, 30–35 cm tall. Leaves rosulate; leaf sheaths ovate; leaf blades ligulate, 15–28 × 2–2.5 cm, apex acute, obscurely punctulate-lepidote, especially near the base, green and mottled with maroon or pink. Scape (16–)23–24 cm long, usually curved; scape bracts foliaceous, densely imbricate, concealing the scape. Inflorescences bipinnate or rarely reduced to a single polystichous spike; primary bracts broadly ovate, inflated. Spikes laxly 1–3-flowered, short-stipitate. Floral

MAP 44. *Tillandsia biflora* occurrence in Venezuela.



MAP 45. *Tillandsia compacta* occurrence in Venezuela.

bracts broadly ovate, obtuse or rarely narrowly acute, much shorter than the sepals. Sepals oblong, ~1–1.5 cm long. Petals ligulate, ~1.5 cm long, blue, lavender or purple. Capsules cylindric, 3–4 cm long.

Found in Central America and South America (Colombia, Venezuela, Ecuador, Peru, and Bolivia). In Venezuela, found in the Andes (Lara, Mérida, Táchira, and Trujillo), the Sierra de Perijá (Zulia), and the Cordillera de la Costa (Anzoátegui, Aragua, Distrito Federal, and Sucre; Map 44). In the park, found in forest and cloud forest on the north slope near El Cafenol and the Páramo de Vicuyal; 1,800–2,750 m.

Tillandsia compacta Griseb., Nachr. Königl. Ges. Wiss. Georg-Augusts-Univ. 1864: 18. 1864; Smith, Fl. Venez. 12(1): 164–165. 1971; Holst, in Berry et al., Fl. Venez. Guayana 3: 661. 1997; Morillo and Briceño, in Morillo et al., Bot. Ecol. Monocot. Páramos Venez. 2: 425–426, foto 16. 2010.

Tillandsia compacta var. *intermedia* L. B. Sm., Phytologia 7: 3. 1959; Smith, Fl. Venez. 12(1): 165–166. 1971; Dorr et al., Contr. U.S. Natl. Herb. 40: 41. 2000 [2001].

Acaulescent, epiphytic or, less common, terrestrial herbs, 30–50(–70) cm tall. Leaves forming a narrowly crateriform rosette; leaf sheaths broadly ovate; leaf blades ligulate, 30–40 × 3–6 cm, apex broadly rounded and apiculate, punctulate-lepidote. Scape 35–70 cm long, curved; scape bracts broadly elliptic, acute, red apically, erect, imbricate, concealing the scape. Inflorescences bipinnate, pendent or erect; primary bracts broadly elliptic, equaling or exceeding the lower spikes. Spikes (5–)7–10-flowered, sessile. Floral bracts broadly ovate, acute, erect, imbricate, exceeding the sepals. Sepals lanceolate, 1.5–2 cm long. Petals ~2 cm long, purple. Capsules prismatic, ~3 cm long.

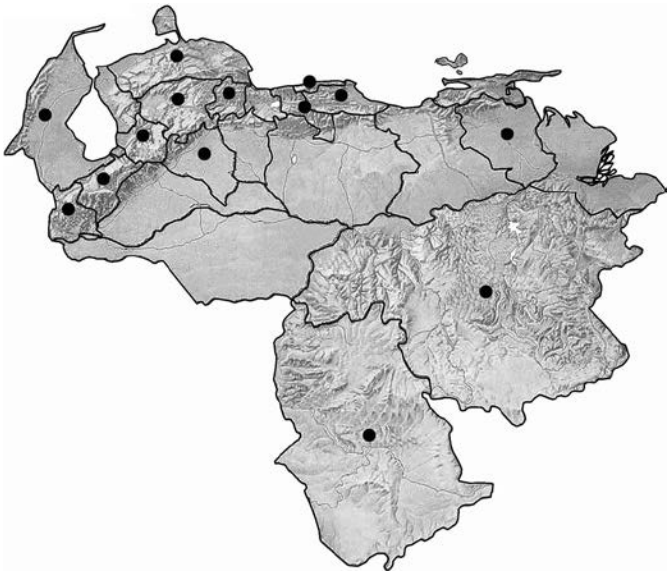
Found in the Greater Antilles and South America (Colombia, Venezuela, Ecuador, and Bolivia). Widespread in Venezuela, including the Andes (Mérida, Táchira, and Trujillo), the Sierra de Perijá (Zulia), the Cordillera de la Costa (Aragua, Distrito Federal, Falcón, Miranda, and Sucre), and the Venezuelan Guayana (Amazonas and Bolívar; Map 45). In the park, found in cloud forest on both slopes of Guaramacal; 2,200–2,900 m.

Tillandsia complanata Benth., Bot. Voy. Sulph. 173. 1844 [1846]; Smith, Fl. Venez. 12(1): 172–173. 1971; Holst, in Berry et al., Fl. Venez. Guayana 3: 661. 1997; Morillo and Briceño, in Morillo et al., Bot. Ecol. Monocot. Páramos Venez. 2: 426, fig. 9, foto 15. 2010.

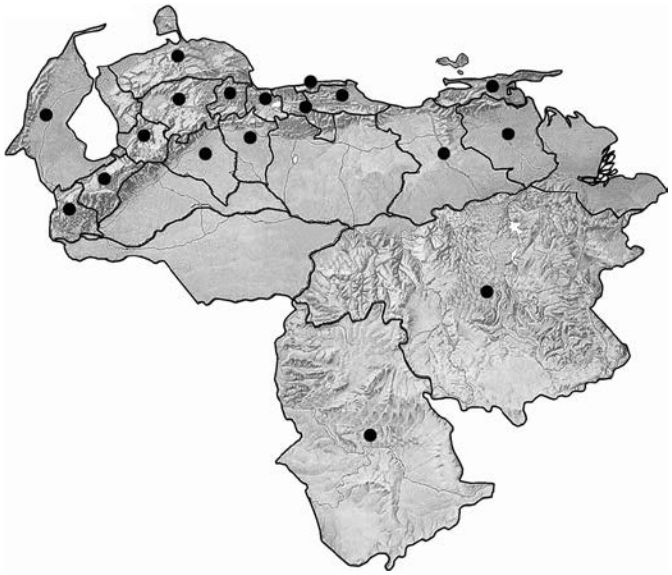
FIGURE 24G

Acaulescent, epiphytic herbs, 30–35(–40) cm tall. Leaves in a dense rosette; leaf sheaths elliptic or narrowly ovate, densely and minutely brown lepidote; leaf blades ligulate, 20–40 × (1.5–) 3–5 cm, exceeding the scapes in length, abruptly apiculate or subobtuse, obscurely punctulate-lepidote, becoming glabrous above. Scapes numerous, 20–40 cm long, arising from the leaf axils, ascending then decurved; scape bracts narrowly lanceolate, acute or attenuate, erect, usually imbricate. Inflorescences simple, densely 4–24-flowered, complanate (i.e., flattened). Floral bracts elliptic, obtuse, erect, imbricate, exceeding the sepals, bright red or pinkish-purple. Flowers subsessile. Sepals lanceolate, 1–1.5 cm long. Petals ligulate, ~2 cm long, rose-red, purple or blue. Capsules narrowly cylindric, ~4 cm long.

Found in Central America (Costa Rica and Panama), the Greater Antilles, and South America (Colombia, Venezuela, Trinidad and Tobago, Guyana, Ecuador, Peru, Bolivia, and Brazil). Widespread in Venezuela and known from the Andes (Lara,



MAP 46. *Tillandsia complanata* occurrence in Venezuela.



MAP 47. *Tillandsia fendleri* occurrence in Venezuela.

Mérida, Portuguesa, Táchira, and Trujillo), the Sierra de Perijá (Zulia), the Cordillera de la Costa (Aragua, Distrito Federal, Falcón, Miranda, Monagas, and Yaracuy), and the Venezuelan Guayana (Amazonas and Bolívar; Map 46). Our records are from cloud forest and subpáramo throughout the park; 1,800–2,750 m.

Plants of this species are easily recognized in the park because they typically have many axillary inflorescences that are distinctly complanate distally.

Tillandsia fendleri Griseb., Nachr. Königl. Ges. Wiss. Georg-Augusts-Univ. 1864: 17. 1864; Smith, Fl. Venez. 12(1): 154–156, t. 10. 1971; Holst, in Berry et al., Fl. Venez. Guayana 3: 662, fig. 564. 1997.

FIGURE 24F

Tillandsia rubra var. *reducta* L. B. Sm., Fieldiana, Bot. 28: 151. 1951. *Tillandsia fendleri* var. *reducta* (L. B. Sm.) L. B. Sm., Mem. New York Bot. Gard. 14(3): 48. 1967; Smith, Fl. Venez. 12(1): 157–158. 1971; Holst, in Berry et al., Fl. Venez. Guayana 3: 662. 1997.

Acaulescent, epiphytic herbs, (0.5–)1–3 m tall; tank-forming. Leaves in a dense crateriform rosette; leaf sheaths subelliptic, densely brown punctulate-lepidote; leaf blades ligulate, 60–100 × 8–11 cm, apex triangular-acuminate, glabrous, sometimes glaucous at base. Scape 1–1.5(–2) m long, erect; scape bracts foliaceous, erect, imbricate, and obscuring the scape. Inflorescences bipinnate, rarely simple or 3-pinnate, erect and showy; primary bracts like scape bracts. Spikes 10–30 × 5 cm, lanceolate to linear, complanate, densely 6- to many-flowered, ± stipitate with reduced sterile bracts at base. Floral bracts obovate, ± equaling the sepals. Flowers short-stipitate. Sepals oblong-lanceolate, 2.5–4.5 cm long. Petals blue apically.

Found in the Greater Antilles and South America (Colombia, Venezuela, Trinidad and Tobago, Guyana, Ecuador, Peru, Bolivia, and Brazil). In Venezuela, found in the Andes (Lara, Mérida, Portuguesa, Táchira, and Trujillo), the Sierra de Perijá (Zulia), the Cordillera de la Costa (Anzoátegui, Aragua, Carabobo, Cojedes, Distrito Federal, Falcón, Miranda, Monagas, Sucre, and Yaracuy), and the Venezuelan Guyana (Amazonas and Bolívar; Map 47). This species occurs in forest on the north slope of the park; 1,800–2,200 m.

This is the largest of the *Tillandsia* species found in the park. It is one of the food plants of the spectacled bear, or "oso frontino" (*Tremarctos ornatus*; Goldstein, 2004; pers. obs.).

Tillandsia myriantha Baker, J. Bot. 25: 242. 1887; Smith, Fl. Venez. 12(1): 167–168. 1971.

Stoloniferous, epiphytic herbs, 20–30 cm tall. Leaves in a spreading rosette; leaf sheaths broadly ovate, cinereous-lepidote; leaf blades very narrowly triangular, 20–30 × 0.5–0.7(–1.5) cm, filiform-attenuate. Scape ~15 cm long, erect or curved; scape bracts ovate, imbricate. Inflorescences densely bipinnate, subglobose, 4–7 cm long; primary bracts erect, like the scape bracts, densely cinereous-lepidote. Spikes 4–6-flowered, elliptic, 2.5 cm long, subsessile. Floral bracts lanceolate, obtuse, ~1 cm long, equaling or slightly shorter than the sepals. Sepals short-connate, ovate, 0.7–0.9 cm long. Petals elliptic, ~1.5 cm long, blue or violet.

Found in South America (Colombia and Venezuela). In Venezuela, found in the Andes (Lara, Mérida, and Trujillo) and the Cordillera de la Costa (Anzoátegui, Aragua, Distrito Federal, Miranda, Nueva Esparta, Sucre, and Yaracuy; Map 48). In the park, found in forest and cloud forest on the south slope of Guaramacal; ~2,000–2,700 m.

MAP 48. *Tillandsia myriantha* occurrence in Venezuela.

Vriesea Lindl.

Vriesea Lindl., Edwards's Bot. Reg. 29: ad t. 10. 1843, nom. cons.

Acaulescent, tank-forming, epiphytic (our material), terrestrial or lithophytic herbs. Leaves rosulate; leaf sheaths large; leaf blades usually ligulate, margins entire, inconspicuously lepidote, scales symmetrical. Scape usually conspicuous. Inflorescences simple or compound, usually distichously flowered spikes or rarely 1 or more polystichously flowered spikes; primary bracts generally conspicuous. Flowers bisexual; mostly short-pedicellate. Sepals convolute, free or almost free, symmetrical or subsymmetrical. Petals free or connate in a tube much shorter than the sepals, appendaged (2 scales at the base), firm and erect, mostly yellow (often with green tips) or white. Stamens included or exserted. Ovary usually superior or nearly superior; ovules many, usually caudate; stigma usually convolute-blade type, rarely simple-erect type. Capsule septicidal. Seeds fusiform; coma basal, long, and straight. [Tillandsioideae.]

A neotropical genus of 250–300 species found in Mexico, Central America, the West Indies, and South America (Colombia, Venezuela, the Guianas, Ecuador, Peru, Bolivia, Brazil, Paraguay, and Argentina). Approximately 30 species are found in Venezuela.

References. Gomes-da-Silva et al. (2012); Smith and Downs (1977).

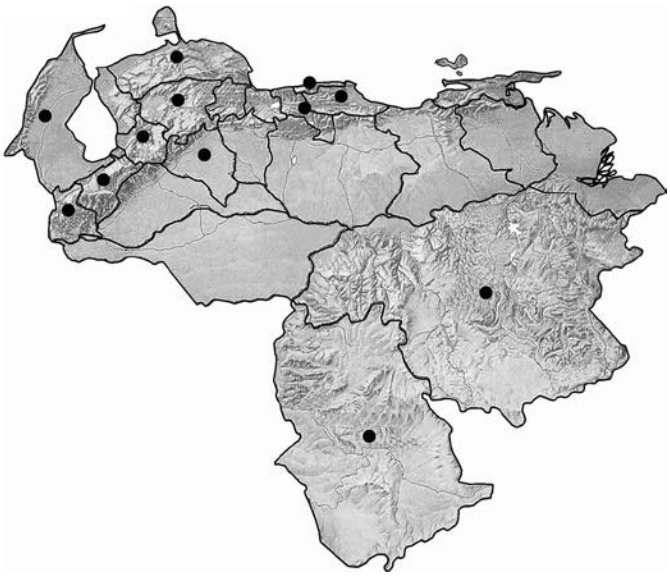
Although *Vriesea* has been treated as a natural group, its circumscription has been problematic because the morphological characters that have been used to define it (e.g., the presence of petal appendages and a connate corolla) are not unique within the Tillandsioideae (Gomes-da-Silva et al., 2012). In addition, phylogenetic analyses (Barfuss et al., 2005; Givnish et al., 2011) based on limited taxon sampling suggest that *Vriesea* is polyphyletic in origin. Nonetheless, molecular data indicate that *Vriesea*, *Alcantarea* (E. Morren ex Mez) Harms, and *Werauhia* J. R. Grant form a monophyletic clade within the Tillandsioideae, and they share a number of morphological characters (e.g., a partly inferior ovary, septicidal capsule, petal appendages usually present, and stigma mainly of the convolute-blade and cupulate types, rarely of the simple-erect type).

Vriesea incurva (Griseb.) Read, Phytologia 16: 458. 1968; Smith, Fl. Venez. 12(1): 219–220. 1971; Morillo and Briceño, in Morillo et al., Bot. Ecol. Monocot. Páramos Venez. 2: 430–431, fig. 10A, foto 21. 2010. *Tillandsia incurva* Griseb., Nachr. Königl. Ges. Wiss. Georg-Augusts-Univ. 1864: 15. 1864.

FIGURE 24J

Epiphytic herbs, (15–)20–45 cm tall. Leaves in a subglobose rosette; leaf sheaths broadly ovate to suborbicular, brown lepidote with a dense covering of tiny scales; leaf blades triangular, 15–19(–35) × (1–)2–3 cm, apex long-attenuate, cinereous. Scape slender; scape bracts obovate or elliptic, ± imbricate. Inflorescences pendent, 20–40 cm long, simple or ± digitate with 2–5 spikes; primary bracts scarcely larger than floral bracts. Spikes 10–24 cm long, strongly complanate. Floral bracts elliptic, 2.5–3.5 cm long, erect or spreading, greenish-yellow, margins pink. Sepals elliptic, 1.5–2 cm long. Petals ligulate, ~3.5 cm long, yellow or olive-green.

Found in Central America (Costa Rica and Panama), the Greater Antilles, and South America (Colombia, Venezuela, Guyana, Ecuador, and Bolivia). In Venezuela, collected in the Andes (Lara, Mérida, Portuguesa, Táchira, and Trujillo), the Sierra de



MAP 49. *Vriesea incurva* occurrence in Venezuela.

Perijá (Zulia), the Cordillera de la Costa (Aragua, Distrito Federal, Falcón, and Miranda), and the Venezuelan Guayana (Amazonas and Bolívar; Map 49). Found in forest on both slopes of Guaramacal; 1,800–2,600 m.

Burmanniaceae

L. J. DORR AND S. MIGUEL NIÑO

Achlorophyllous and mycoheterotrophic or sometimes autotrophic (some *Burmannia* L.) herbs; generally rhizomatous, sometimes with small tubers. Stem almost always solitary but also branched, often terete, colorless or yellowish in mycoheterotrophic taxa. Leaves alternate, simple, sessile, entire, sometimes rosulate, reduced and colorless or yellowish in mycoheterotrophic taxa, green in autotrophic taxa; stipules wanting. Inflorescences terminal, lax to dense, bracteate cymes, usually bifurcate, 1- to many-flowered. Flowers perfect, actinomorphic, sympetalous, composed of a basal tubular part and 6 tepals in 2 whorls. Floral tube cylindric, 3-angled or 3-winged, sometimes throat with an ornamented annulus. Stamens 3, opposite the inner tepals, inserted in the floral tube; anthers 2-thecate, introrse; with or without filaments, filaments very short. Gynoecium 3-carpellate, syncarpous; ovary inferior, 3-locular with axile placentation, 1-locular with parietal placentation or 3 free placental columns in the center of the ovary; ovules numerous, anatropous, minute; septal nectaries often present. Style cylindrical to filiform, as long as or shorter than the floral tube, 3-branched, rarely undivided. Fruit a capsule, winged or not, longitudinally dehiscent by slits or valves, or indehiscent. Seeds numerous, small, fusiform to subglobose.

A family of 8 genera and ~95 species found in tropical and subtropical regions worldwide, including North America (USA), Mexico, Central America, the West Indies, and South America. In Venezuela, 7 genera and 24 species occur.

References. Caddick et al. (2002a, 2002b); Jonker (1938); Maas and Maas-van der Kamer (1988); Maas et al. (1986); Maas-van de Kamer (1998); Merckx et al. (2006, 2008, 2009, 2010); Wood (1983).

Burmanniaceae and Dioscoreaceae are the two families found in Guaramacal that belong to the Dioscoreales. Circumscription of both families has been problematic, with respect to not only which genera are to be included in each family but also the limits of some of these genera. In particular, the phylogenetic schemes of Caddick et al. (2002a, 2002b) and Merckx et al. (2010) present different hypotheses regarding relationships within this order, and we have decided to adopt the most recent hypothesis. In brief, Merckx et al. (2010) recovered seven well-supported clades within Dioscoreales. Six of these clades were found to be sister to Burmanniaceae. The clades were Taccaceae, Thismiaceae, Trichopodiaceae, *Afrothismia* (Engl.) Schltr., Dioscoreaceae, and Nartheciaceae. Trichopodaceae, Taccaceae, and *Afrothismia* were each strongly supported monophyletic groups that also comprise a clade with Thismiaceae (*Thismia* Griff., *Haplothismia* Airy Shaw, and *Tiputinia* P. E. Berry & C. Wood., but not *Oxygyne* Schltr., were sampled). Consequently, our concept of Burmanniaceae, unlike most recent neotropical floras, excludes the genus *Thismia*, which sometimes is also treated as Burmanniaceae tribe Thismieae.

The achlorophyllous genera and species of Burmanniaceae usually are described as being saprophytic, but they are more accurately described as mycoheterotrophic as they have endomycorrhizae (Leake, 1994). Merckx et al. (2010) note that in the Dioscoreales, 14 of 23 genera include achlorophyllous mycoheterotrophic species, and they estimate that the mycoheterotrophic habit evolved at least six times. Furthermore, their data suggest that several extant mycoheterotrophic lineages are relatively ancient and appear to have Late Cretaceous origins. The achlorophyllous nature of Burmanniaceae and relatives generally confounded earlier efforts based on morphology to resolve phylogenetic relationships.

Gymnosiphon Blume

Gymnosiphon Blume, Enum. Pl. Javae 1: 29. 1827.
Cymbocarpa Miers, Proc. Linn. Soc. Lond. 1: 61. 1840.

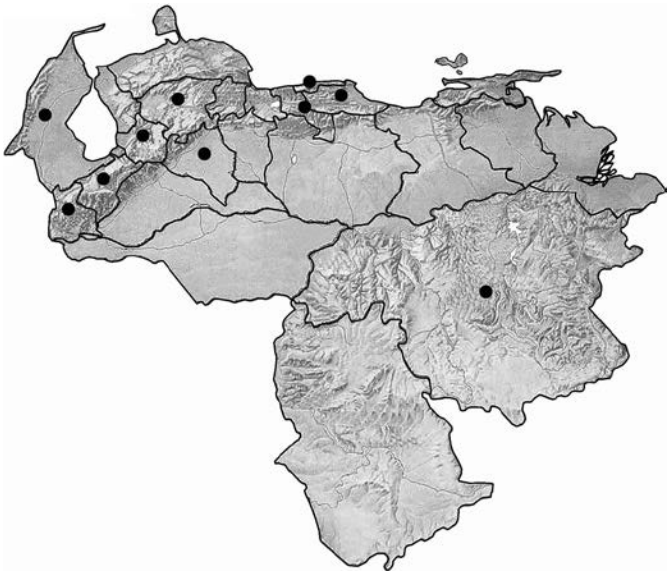
Mycoheterotrophic herbs with cylindrical or slightly tuberous rhizomes. Stems branched or not. Leaves scalelike, ovate or subulate. Inflorescences lax to capitate, 2-branched cincinni, each cincinnus 1–24-flowered, sometimes reduced to a single terminal flower. Flowers erect or recurved, pedicellate or sessile. External tepals 3-lobed, internal tepals minute, sometimes swollen, inserted in the floral tube below the insertion of the outer tepals; floral tube not winged. Anthers 3, sessile, connective without or almost without appendages. Ovary 1-locular, with 3 parietal placentas, the partitions generally with glands. Style 3-branched apically, each branch with a hippocrepiform stigma (as seen from above), with or without 2 apical, tortuous, filiform appendages. Capsules ellipsoid, globose or obovoid, crowned by persistent perianth base, dehiscent either by 3 loculicidal valves separating from apex to base, 6 septicidal valves separating from base to apex or irregularly by withering of the fruit wall. Seeds ellipsoid to ovoid or fusiform.

A pantropical genus of ~30 species, the majority of which are found in the neotropics. In the Americas, the genus is known from Mexico, Central America, the West Indies, and South America (Colombia, Venezuela, the Guianas, Ecuador, Peru, Bolivia, and Brazil). Ten species occur in Venezuela, most in the Amazonian region.

Merckx et al. (2008) argue that diversification of *Gymnosiphon* began during the Eocene and that species migrated from the New to the Old World via boreotropical migration routes (i.e., high-latitude land connections when present-day northern regions supported tropical forest).

Gymnosiphon suaveolens (H. Karst.) Urb., Symb. Antill. 3: 438. 1903; Maas and Maas, in Berry et al., Fl. Venez. Guayana 3: 686. 1997. *Benitzia suaveolens* H. Karst., Linnaea 28: 420. 1856 [1857].

Small, inconspicuous, achlorophyllous herbs, 10–30 cm tall. Stem whitish to purplish, 1–3 mm in diameter, glabrous. Leaves



MAP 50. *Gymnosiphon suaveolens* occurrence in Venezuela.

ovate, 1.5–3(–4.5) × 1.2–2(–3.5) mm. Inflorescences 2-branched cincinni, 2–3.5 cm long, erect or slightly recurved. Flowers white, 7–15 mm long; floral tube with dark lines; pedicels 2–5 mm long. Style orange, 4–5 mm long; stigmas with contorted appendages to 5.5 mm long. Capsules ellipsoid to obovoid, 3.5–5 × 3 mm, longitudinally dehiscent, 3 valves separating from base to apex, valves persistent.

Found in Mexico, Central America, and South America (Colombia, Venezuela, Ecuador, and Peru). In Venezuela, found mostly in montane forest in Aragua, Bolívar, Distrito Federal, Lara, Mérida, Miranda, Portuguesa, Táchira, Trujillo, and Zulia (Map 50). In the park, found in various localities on the south slope of Guaramacal; 1,700–2,350 m.

Gymnosiphon suaveolens is the only species of *Gymnosiphon* found in higher elevations of the Venezuelan Andes, and it is the only species of achlorophylous monocotyledon collected within the boundaries of the park.

CANNACEAE

L. J. DORR AND S. MIGUEL NIÑO

Perennial herbs; rhizomes horizontal, usually branched; aerial stems well developed, unbranched; mucilage ducts present in rhizomes and stems. Leaves distichous or spiral; sheaths open, ligule absent; leaf blades with a prominent midvein and pinnate-parallel veinlets, glaucous or lanuginose. Inflorescences terminal, bracteate, simple or compound thyrses; bracts of main axis subtending flowers or cincinni. Flowers perfect, epigynous, asymmetric, sessile or shortly pedicellate, red, purple, orange, yellow or white, generally showy. Sepals 3, much shorter than petals, imbricate, free, ± equal, green or sometimes colored. Petals 3, connate basally, sometimes free, generally unequal. Fertile stamen 1, petaloid, with a single marginal theca (sometimes appearing 2-thecate); staminodes 1–4(–5), variable-number petaloid, sometimes absent; inner staminode (labellum) usually wider than the other staminodes. Gynoecium 3-carpellate; ovary inferior, 3-locular, warty to tuberculate; placentation axile; ovules few to numerous, anatropous; septal nectaries present. Style 1, petaloid; stigma decurrent along an edge of the style, papillate. Stamen, staminodes, and style united basally, forming a tube. Fruit a capsule, generally loculicidal, sometimes indehiscent, almost always crowned by the persistent sepals; fruit wall warty to tuberculate. Seeds globose to ellipsoid, numerous, black or dark brown, with a lid or collar; aril absent.

The family consists of a single tropical and subtropical genus of 10 species and various ornamental forms and hybrids originating in the Americas but now widely distributed throughout the world because of their appeal as ornamental or edible plants. In the Americas, they are found in North America (USA), Mexico, Central America, the West Indies, and South America (Colombia, Venezuela, the Guianas, Ecuador, Peru, Bolivia, Brazil, Paraguay, Argentina, and Uruguay). Four species occur in Venezuela.

REFERENCES. Kubitzki (1998b); Maas-van der Kamer and Maas (2008); Prince (2010); Rogers (1984); Tanaka (2001).

Canna L.

Canna L., Sp. Pl. 1. 1753.

The characters of the genus are the same as those of the family.

REFERENCE. Segeren and Maas (1971).

The center of diversity for the genus is South America, and thus, it is likely *Canna* originated there. This implies that the sole North American species is the result of long-distance dispersal (Prince, 2010).

The majority of Venezuelan species of *Canna* are given the common name "capacho."

Canna jaegeriana Urb., Repert. Spec. Nov. Regni Veg. 15: 102. 1917, nom. cons.

FIGURE 25A

Canna leucocarpa Bouché, Linnaea 18: 493. 1844 [1845], nom. rej.

Canna paniculata auct., non Ruiz & Pav.; Dorr et al., Contr. U.S. Natl. Herb. 40: 42. 2000 [2001].

Canna sp.; Ortega et al., BioLlania 5: 36. 1987.

Plants to 3(–5) m tall. Leaf blades narrowly elliptic to narrowly ovate, 35–100 × 15–40 cm, base gradually decurrent on the petiole, apex acute to shortly acuminate, glabrous above, glabrous or ± lanuginose below. Inflorescences simple or branched, cincinni 1- or 2-flowered; bracts mostly caducous. Flowers erect, orange, 4–7.5 cm long; floral tube distinctly curved; the free part of staminodes erect; staminodes (3) 4 or 5. Capsules ellipsoid, 4.5–10 × 1.5–4 cm. Seeds narrowly ellipsoid, 4–7 × 2–4.5 mm, shiny, black.

Found in the Greater Antilles and South America (Colombia, Venezuela, Ecuador, Peru, and Bolivia). In Venezuela, known

MAP 51. *Canna jaegeriana* occurrence in Venezuela.

from the Andes (Mérida, Táchira, Trujillo) and the Sierra de Perijá (Zulia; Map 51). Collected on the south slope in Qda. Jirajara near the village of Guaramacal and in El Santuario; ~1,600–1,950 m.

The upper surface of the leaves of *Canna jaegeriana* often turns dark brown to black in herbarium specimens.

Maas-van der Kamer and Maas (2008) noted that this species is often cultivated in Andean countries for its edible rhizome, but we have no evidence that it is used as food in Guaramacal.

COMMELINACEAE

L. J. DORR AND S. MIGUEL NIÑO

Perennial or sometimes annual herbs; usually terrestrial; erect or prostrate, sometimes climbing. Stems simple or branched, sometimes rooting from the nodes. Roots thin and fibrous; rhizomes, bulbs, stolons, and tubercles rare. Leaves basal or cauline, alternate, spiral or distichous, sometimes rosulate; leaf blades simple, entire, parallel-veined, ± succulent, sometimes purple-colored, usually sessile; sheaths closed, generally differentiated, sometimes perforated by the peduncle. Inflorescences terminal, terminal and axillary, or basal, cymose, thyrsiform (sometimes reduced) or umbel-like, rarely flowers solitary; sometimes enclosed in leaflike naviculiform or spathaceous bracts. Flowers heterochlamydeous, actinomorphic or zygomorphic, bisexual or andromonoecious, rarely gynomonoecious; 3-merous. Sepals (2) 3, free or sometimes connate, usually subequal, occasionally petaloid. Petals (2) 3, free or connate, equal or markedly unequal, colored, deliquescent. Stamens 6, sometimes fewer by abortion, in 2 series; anthers basifixed or dorsifixed, dehiscence longitudinal or rarely poricidal; filaments ciliate, sometimes colored; staminodes 2–4, often showy. Ovary syncarpous, superior, (2) 3-locular, sessile or shortly stipitate; placentation axile; ovules 1(2)-seriate, orthotropous; style 1, simple, usually slender; stigma 1, simple or rarely 3-lobed, enlarged or not; septal nectaries absent. Fruit a capsule, 2- or 3-valved, loculicidally dehiscent, rarely indehiscent or fruit fleshy; sometimes brightly colored. Seeds 1 to several per locule, dry.

A tropical and subtropical family of ~42 genera and ~650 species, with representative taxa in temperate regions. The greatest species diversity is found in Africa and Madagascar. In Venezuela, 10 genera and ~30 species are native or naturalized.

REFERENCES. Aristeguieta (1965); Burns et al. (2011); Evans et al. (2000, 2003); Faden (1998); Faden and Hunt (1991); Tucker (1989); Wade et al. (2006).

Most genera and species of Commelinaceae are assigned to the Commelinoideae, which is widespread geographically. Two genera and a dozen species are assigned to the Cartonematoideae, which is restricted to Australasia and continental Africa. Cartonematoideae generally lack raphide canals and glandular microhairs, which are found in Commelinoideae. Also, Cartonematoideae have yellow flowers, whereas Commelinoideae usually have pink or blue to white (rarely yellow to orange) flowers.

KEY TO THE GENERA OF COMMELINACEAE

1a. Flowers subtended by conspicuous naviculiform or spathaceous bracts 2
  2a. Leaves 20–25(–35) × 4–5(–8) cm; peduncles 13–14 cm long, terminated by 2 naviculiform bracts; flowers white; fertile stamens 6 . . . . . ***Tradescantia***
  2b. Leaves 9–12 × 1.5–4 cm; peduncles 2.5–3 cm long, arising from the base of 1 spathaceous bract; flowers blue to white; fertile stamens 3 . . . . . ***Commelina***
1b. Flowers subtended by small, inconspicuous bracts 3
  3a. Stems 8–40 cm long, rooting from the nodes; inflorescences cymose; petals white, pink or rose (rarely blue) . . . . . ***Phyodina***
  3b. Stems 1–3(–5) m long, not rooting from the nodes; inflorescences racemose; petals blue or purple . . . . . ***Dichorisandra***

Commelina L.

Commelina L., Sp. Pl. 40. 1753.
Phaeosphaerion Hassk., Flora 49: 212. 1866.
Commelinopsis Pichon, Notul. Syst. (Paris) 12: 227. 1946.

Perennial or annual herbs; erect or creeping. Stems simple or slightly branched, glabrous. Roots usually fibrous. Leaves usually distichous; leaf sheaths well differentiated; leaf blades broadly to narrowly lanceolate, sessile or petiolate. Inflorescences terminal and leaf-opposed, composed of 1 or 2 cymes

enclosed in naviculiform or spathaceous bracts, proximal cyme several-flowered, distal cyme vestigial or with 1 to several staminate flowers. Flowers bisexual and staminate; markedly zygomorphic, pedicellate; bracteoles inconspicuous or absent. Sepals 3, unequal, free or 2 apical sepals connate. Petals (2) 3, unequal, free, 1 apical petal generally small and clawed, sometimes absent, 2 basal petals larger, usually clawed. Fertile stamens 3; filaments free, glabrous; staminodes 2 or 3. Ovary 2- or 3-locular, glabrous; ovules 1 or 2 per locule, 1-seriate. Capsules (1-) 2- or 3-valved, 2- or 3-locular, loculicidally dehiscent, occasionally indehiscent. Seeds 1(2)-seriate, 1 or 2 per locule, hilum linear.

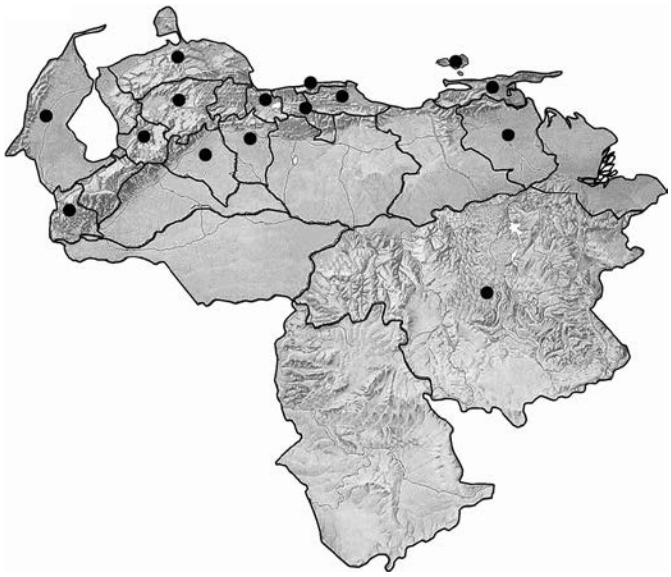
A cosmopolitan albeit mainly tropical genus of ~170 species, with a center of diversity in southern Asia. In the Americas, found in North America (USA), Mexico, Central America, the West Indies, and South America (all country-level political units except Chile). Nine species occur in Venezuela.

REFERENCE. Faden and Hunt (1987).

Throughout Venezuela species of *Commelina* of medium to small size are known by the common names "suelda con suelda" and "cucaracha."

Commelina obliqua Vahl, Enum. Pl. 2: 172. 1805 [1806].
Commelina robusta Kunth, Enum. Pl. 4: 52. 1843.

Terrestrial herbs to 0.6 m tall; generally erect, occasionally creeping, often forming colonies. Stems glabrous to sparsely tomentose, 3–4 mm in diameter. Leaf sheaths 2–4 cm long, pubescent with hairs at the apex and sometimes in a vertical line along the sheath margin; leaf blades lanceolate to oblong-lanceolate, 9–12 × 1.5–4 cm, bases attenuate or oblique, apices acuminate, puberulous above and below, silica crystals above appearing as translucent to whitish dots. Inflorescences clustered at apex of stem (solitary in juvenile plants); peduncles 2.5–3 cm long, pubescent; bracts spathaceous, 1.5–3 × 1.5–2 cm, green, glabrous or almost glabrous. Flowers short-pedicellate. Upper sepal small, ~2 mm long, lower sepals larger, 3–5 mm long. Upper petals 7–9 mm long, blue to white, lower petals reduced. Capsules 4.5–7 mm in diameter; 2-valved, 3-locular. Seeds 1 or 2 per locule, pitted, brown.



MAP 52. *Commelina obliqua* occurrence in Venezuela.

Found in Mexico, Central America, and South America (Venezuela, Trinidad and Tobago, Guyana, French Guiana, Ecuador, Bolivia, Brazil, Paraguay, Argentina, and Uruguay); also recorded as an ephemeral weed in Europe (Belgium). Widespread in Venezuela (Aragua, Bolívar, Carabobo, Cojedes, Distrito Federal, Falcón, Lara, Miranda, Monagas, Nueva Esparta, Portuguesa, Sucre, Táchira, Trujillo, and Zulia; Map 52). In the park, found in swampy areas near the Laguna de Aguas Negras and on the south slope near the village of Guaramacal; 1,850–2,000 m.

Dichorisandra J. C. Mikan

Dichorisandra J. C. Mikan, Del. Fl. Faun. Bras. t. 3. 1820, nom. cons.

Perennial herbs; erect, climbing, clambering or trailing vines (lianas). Stems simple or branched. Roots usually with distal tubers. Leaves spiral or distichous; leaf sheaths conspicuous, usually pubescent; leaf blades generally oblong-lanceolate, acute to acuminate, cuneate, pubescent or not. Inflorescences terminal, axillary or basal, thyrsiform or reduced; without spathaceous bracts. Flowers bisexual, sometimes staminate by abortion, ± actinomorphic, pedicellate, bracteolate. Sepals 3, subequal, free, unequal, the outermost longest, hooded, persistent in fruit, greenish or petaloid. Petals 3, subequal, free, blue or purple, glabrous. Stamens 5 or 6, ± equal or unequal; filaments short, glabrous; anthers elongate, 2-thecate, dehiscing by terminal pores. Ovary sessile, 3-locular; ovules 3–5 per locule. Capsules 3-valved, fleshy, dehiscent. Seeds 2-seriate, black, arillate; aril reddish.

A neotropical genus of 35–50 species found in Mexico, Central America, the Lesser Antilles, and South America (Colombia, Venezuela, Trinidad and Tobago, the Guianas, Peru, Bolivia, Brazil, Paraguay, and Argentina). Three species occur in Venezuela.

REFERENCE. Aona (2008).

Dichorisandra hexandra (Aubl.) Kuntze ex Hand.-Mazz., Denkschr. Kaiserl. Akad. Wiss., Wien Math.-Naturwiss. Kl. 79: 203. 1908; Berry, in Berry et al., Fl. Venez. Guayana 4: 359, fig. 269. 1998. *Commelina hexandra* Aubl., Hist. Pl. Guiane 1: 35, t. 12. 1775.

FIGURE 4C–G

Climbing, clambering or scandent vines. Stems 2–3(–5) m long, glabrous to minutely puberulent. Leaf sheaths conspicuous, 2–2.6 cm long, pilose apically and with a line of hairs along the margins (fused edges); leaf blades elliptic to ovate-elliptic, 12–20 × (2.5–)4.5–5 cm, bases acute to rounded or ± oblique, apices long-acuminate, glabrous above and below; sessile or short-petiolate. Inflorescences terminal, paniculate, 2–6(–10) cm long, ± globose; peduncles 2–3 cm long, pubescent; floral bracts 0.5–1(–2) × 0.2 cm. Flowers few to many, violet to purple. Sepals 5–8(–12) mm long. Petals 7–17 mm long. Stamens 6, all fertile.

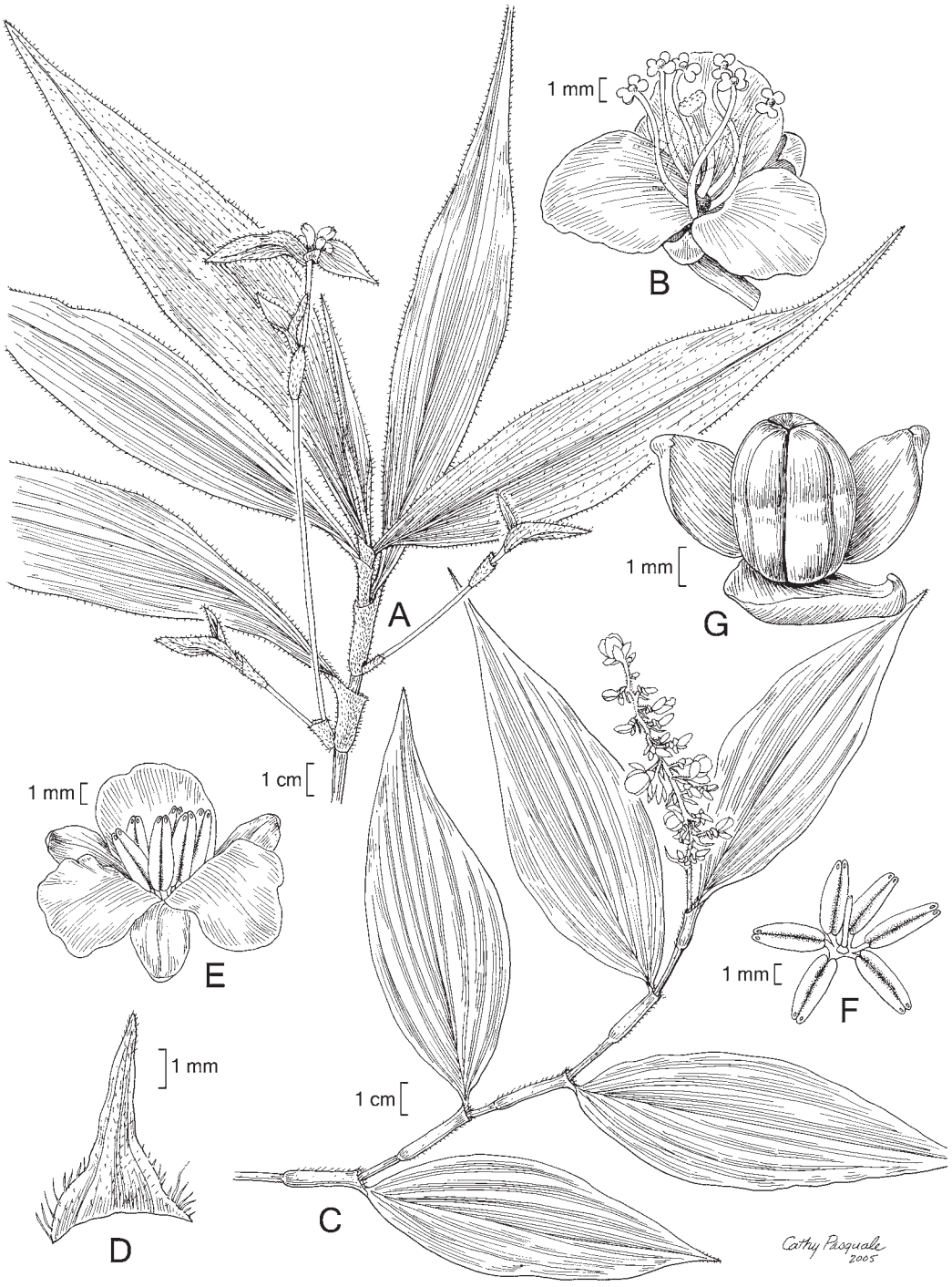
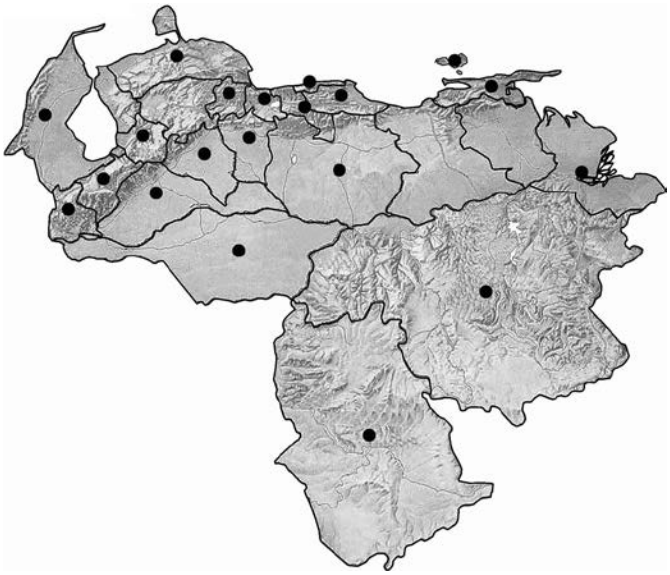


FIGURE 4. Commelinaceae. **A, B.** *Tradescantia zanonia* (L.) Sw. **A.** Habit. **B.** Flower. **C–G.** *Dichorisandra hexandra* (Aubl.) Kuntze ex Hand.-Mazz. **C.** Habit. **D.** Floral bract. **E.** Flower. **F.** Anthers (note terminal pores). **G.** Fruit. (A, *Dorr et al. 8726*; B, *Faden 76/164*; C–G, *Dorr et al. 8519*.)



MAP 53. *Dichorisandra hexandra* occurrence in Venezuela.

Capsules obovoid, ~7 mm in diameter, purple, almost black, glabrous. Seeds 3–5; aril orange.

Found in Mexico, Central America, the Lesser Antilles, and South America (Colombia, Venezuela, Trinidad and Tobago, the Guianas, Ecuador, Peru, Bolivia, Brazil, Paraguay, and Argentina). Widespread in Venezuela (Amazonas, Apure, Aragua, Barinas, Bolívar, Carabobo, Cojedes, Delta Amacuro, Distrito Federal, Falcón, Guárico, Mérida, Miranda, Nueva Esparta, Portuguesa, Sucre, Táchira, Trujillo, Yaracuy, and Zulia; Map 53). In the park, found in forest understory on the south slope of Guaramacal; (1,200–)1,500–1,600 m.

Phyodina Raf.

Phyodina Raf., Fl. Tellur. 2: 16. 1836 [1837].

Perennial or rarely annual herbs; decumbent. Roots fibrous, rarely tuberous. Leaves spiral or distichous; leaf sheaths inflated, sparingly to densely pubescent throughout; leaf blades almost always succulent, usually pubescent, sessile. Inflorescences terminal or terminal and axillary, composed of pairs of sessile cincinni; cincinni subtended by small, inconspicuous bracts <1 cm long. Flowers bisexual, rarely gynomonoecious, actinomorphic, pedicellate or ± sessile; bracts and bracteoles small, scalelike, ciliate. Sepals (2–)4, subequal, free, papery, hyaline. Petals (2) 3, equal, free, not clawed, white, pink or rose (rarely blue). Stamens (3–)6, all fertile, equal or subequal; filaments bearded. Ovary 2- or 3-locular; ovules (1) 2 per locule; stigma capitate. Capsules globose, 2- or 3-valved. Seeds (1) 2 per locule, hilum punctiform.

A monotypic, neotropical genus found in Central America and South America (Colombia, Venezuela, Ecuador, Peru, and Bolivia).

References. Bergamo (2003); Hunt (1986b).

We recognize *Phyodina* here in a narrow sense, including only *P. gracilis* (Kunth) Raf. The genus often is considered a synonym of *Callisia* Loefl., but the latter genus is polyphyletic (Hunt, 1986b; Bergamo, 2003). Molecular data (Bergamo, 2003) suggest that *Phyodina* is more closely related to *Tripogandra* Raf. than it is to *Callisia* s. str. Although there is still uncertainty as to the limits of these and related tradescantioid genera, *Phyodina* can be distinguished from *Tripogandra* by its actinomorphic (vs. zygomorphic) flowers and equal or subequal (vs. alternating short and long) stamens.

Phyodina gracilis (Kunth) Raf., Fl. Tellur. 2: 16. 1836 [1837]. *Tradescantia gracilis* Kunth, in H. B. K., Nov. Gen. Sp. [fol.] 1: 208, t. 672. 1815 [1816]; ibid. [qu.] 1: 261. 1815 [1816]. *Aneilema gracile* (Kunth) Steyerm., Fieldiana, Bot. 28: 152. 1951 ("*gracilis*"), non C. B. Clarke, 1881. *Callisia gracilis* (Kunth) D. R. Hunt, Kew Bull. 38: 131. 1983.

Decumbent herbs; caespitose, generally forming small colonies in open areas. Stems 8–40 × 0.1–0.2 cm, almost always rooting at the nodes. Leaf sheaths 0.5–1 cm long; leaf blades narrowly to broadly ovate, 1–2.5(–4.5) × 0.5–1.5(–2) cm, bases rounded to slightly cordate, margins ciliate, apices apiculate, sparingly pubescent above and below. Inflorescences terminal and axillary; peduncles 1–5 cm long. Flowers pedicellate; pedicels 2–5 mm long, minutely glandular. Sepals 2–3 mm long, ovate, purple, pubescent with multicelled simple and glandular hairs. Petals ~4 mm long, broadly ovate, white, pink or rose (rarely blue). Stamens 6, subequal. Ovary glabrous. Capsules ~2 mm in diameter. Seeds small, reticulate-pitted.

Found in Central America (Panama) and South America (Colombia, Venezuela, Ecuador, Peru, and Bolivia). In Venezuela,

MAP 54. *Phyodina gracilis* occurrence in Venezuela.

restricted to the Andes (Mérida, Táchira, and Trujillo) and the Cordillera de la Costa (Distrito Federal; Map 54). In the park, found in disturbed areas along the Boconó–Guaramacal road and in pastures between Pozo Verde and the Páramo del Pumar; 1,900–2,550 m.

Tradescantia L.

Tradescantia L., Sp. Pl. 288. 1753.
Campelia Rich., Démonstr. Bot. 46. 1808.
Zebrina Schnizl., Bot. Zeitung (Berlin) 7: 870. 1849.
Rhoeo Hance, Ann. Bot. Syst. 3: 659. 1852.
Setcreasea K. Schum. & Syd., Just's Bot. Jahresber. 27(1): 452. 1901.
Cymbispatha M. Pichon, Notul. Syst. (Paris) 12: 224. 1946.

Perennial or rarely annual herbs; erect or ascendent. Stems branched or simple; nodes pronounced. Roots fibrous, sometimes tuberous. Leaves spiral or distichous; leaf sheaths well developed, pubescent; leaf blades broadly lanceolate to linear, sessile or rarely pedicellate. Inflorescences terminal or terminal and axillary, composed of pairs of cincinni; cincinni sessile, subtended by spathaceous or foliaceous bracts; bracteoles persistent. Flowers bisexual, ± actinomorphic; pedicellate or almost sessile. Sepals 3, subequal, distinct, persistent in fruit. Petals 3, equal, free or connate basally, not or rarely clawed, pink, blue, violet or white (our species). Stamens 6, equal or subequal, all fertile; filaments bearded or glabrous. Ovary sessile, 3-locular, glabrous; ovules (1) 2 per locule, 1-seriate. Capsules 3-valved, 3-locular, dehiscent. Seeds (1) 2 per locule, blackish, hard, hilum oblong to linear.

A temperate and tropical American genus of ~70 species found in North America (USA), Mexico, Central America, the West Indies, and South America (Colombia, Venezuela, Guyana, Ecuador, Peru, Bolivia, Brazil, Paraguay, Argentina, and Uruguay); adventive in Africa and Asia. Three species are native or naturalized in Venezuela.

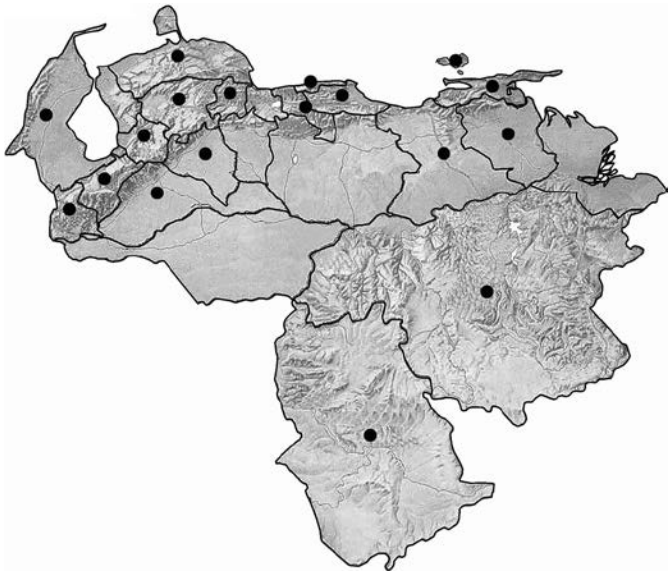
References. Hunt (1975, 1986a).

In Venezuela, in addition to the three native or naturalized species of *Tradescantia*, at least three additional species are known to be cultivated (Campbell in Hokche et al., 2008), but there is no evidence that these latter species have become naturalized.

Tradescantia zanonia (L.) Sw., Fl. Ind. Occid. 1: 604. 1797; Berry, in Berry et al., Fl. Venez. Guayana 4: 363, fig. 274. 1998. *Commelina zanonia* L., Sp. Pl. 41. 1753. *Campelia zanonia* (L.) Kunth, in H. B. K., Nov. Gen. Sp. [fol.] 1: 210. 1815 [1816]; ibid. [qu.] 1: 264. 1815 [1816].

FIGURE 4A, B

Herbs, to 2 m tall; generally erect. Stems often simple, 3–5 mm in diameter, somewhat succulent, usually glabrous. Leaves clustered at the apex of the stems; leaf sheaths 2–2.5 cm long, inflated, sparingly to densely pubescent especially at apex; leaf blades elliptic to narrowly elliptic, 20–25(–35) × 4–5(–8) cm, bases decurrent, margins ciliate, apices long-acuminate, glabrous (or sometimes sparingly to densely pubescent) above and below. Inflorescences axillary, composed of 1 pair of cymes and 2 spathes; peduncles simple or branched, 13–14 cm long; emerging from leaf sheaths; spathes 2–3.5 × 1–2 cm, naviculiform, ± open, green, margins ciliate, otherwise glabrous. Flowers white. Sepals 3–5 mm long, purple (accrescent in fruit). Petals 6–10 mm long, white. Filaments bearded or not. Fruit (including accrescent calyx) globose, 3–5(–7) mm in diameter, fleshy, purple to black, shiny.



MAP 55. *Tradescantia zanonia* occurrence in Venezuela.

Found in Mexico, Central America, and South America (Colombia, Venezuela, Ecuador, Peru, Bolivia, and Brazil); introduced in the West Indies. Widespread at higher elevations in Venezuela (Amazonas, Anzoátegui, Aragua, Barinas, Bolívar, Distrito Federal, Falcón, Lara, Mérida, Miranda, Monagas, Nueva Esparta, Portuguesa, Sucre, Táchira, Trujillo, Yaracuy, and Zulia; Map 55). In the park, always in the understory and principally in humid areas on both slopes of Guaramacal; (1,200–)1,500–2,600 m.

This species is unique in the family in that the pedicel and calyx become fleshy and purplish in fruit, converting the normal tradescantioid capsule into a fleshy "berry." This presumably is an adaptation to bird dispersal.

Tradescantia zanonia occasionally is cultivated as an ornamental; one common cultivar is a selection chosen for its variegated leaves.

Costaceae

L. J. DORR AND B. STERGIOS

Perennial, terrestrial (our species) or rarely epiphytic herbs; rhizomatous; nonaromatic. Indument of unicellular or multicellular, uniseriate hairs, or glabrous. Leaves simple, entire, spirally arranged; sheaths closed, tubular, ligulate; ligules truncate or 2-lobed. Inflorescences open or dense strobiliform or capitate spikes, terminal on a leafy stem (our species) or on a separate

leafless, basal shoot or flowers solitary in leaf axils; bracts imbricate, conspicuous, spirally arranged, with a linear nectariferous callus just below the apex, with or without a foliaceous appendage, subtending 1 (our species) or 2 flowers; bracteoles 1, naviculiform (our species) or tubular at the base. Flowers epigynous, perfect, zygomorphic. Calyx tubular, ± deeply (2) 3-lobed, lobes equal or sometimes unequal. Corolla 3-lobed, the medial lobe larger than the lateral ones, lobes connate basally, forming a distinct tube. Stamen 1; anther 2-thecate; filament often ± petaloid; labellum (i.e., fusion of 5 staminodes) large, petaloid, adnate to corolla, equal to or longer than corolla lobes, ± 3–5-lobed; basal part of the stamen and labellum united into a papillate tube. Ovary (2–)3-locular, inferior, septal nectaries 2, near the apex; placentation axile; ovules numerous, anatropous; style 1, filiform, in a slot between the thecae; stigma 1, 2-lamellate, with a dorsal, 2-lobed appendage or cupuliform and unappendaged, margins ciliate. Fruit a (2–)3-locular capsule, 3-angled, crowned by the persistent calyx, loculicidally dehiscent or indehiscent. Seeds numerous, angular or ellipsoid, black or dark brown, arillate; aril white or yellow.

A family of 7 genera and 70–100 species widely distributed in tropical and subtropical regions of the world. In the Americas, found in Mexico, the West Indies, and South America (Colombia, Venezuela, Trinidad and Tobago, the Guianas, Ecuador, Peru, Bolivia, Brazil, Paraguay, and Argentina). Three genera and 12 native or naturalized species are found in Venezuela.

REFERENCES. Larsen (1998); Specht (2006); Specht and Stevenson (2006); Specht et al. (2001).

Costus L.

Costus L., Sp. Pl. 2. 1753.

Robust herbs, usually >1 m tall. Leaves short-petiolate; ligules usually large and conspicuous. Inflorescences terminal on a leafy stem (our species) or on a separate, leafless basal shoot directly from the rhizome, strobiliform (rarely capitate) spikes; bracts coriaceous (rarely chartaceous), green, yellow, orange or red, terminating in a foliaceous appendage or unappendaged; bracteoles naviculiform (our species) or tubular. Calyx lobes ± equal, rarely exceeding the bracts. Corolla white, yellow, orange or red. Labellum large and spreading or small and tubular. Stigma 2-labiate (our species) or cupuliform. Ovary 3-locular. Capsules ellipsoid to globose, tardily dehiscent or indehiscent and seeds released by decay of the fruit wall. Seeds black or dark brown, ellipsoid; aril conspicuous, lacerate, white.

A pantropical genus of 40–70 species, the vast majority of which are found in the Americas in Mexico, Central America, the West Indies, and South America (Colombia, Venezuela, the Guianas, Ecuador, Peru, Bolivia, and Brazil). Nine species occur in Venezuela.

REFERENCES. Maas (1972, 1977).

KEY TO THE SPECIES OF *COSTUS*

1a. Inflorescence bracts green to red, foliaceous appendages green . . . . . ***C. guanaiensis***
1b. Inflorescence bracts dark red, without appendages . . . . . ***C. spiralis***

Costus guanaiensis Rusby, Bull. Torrey Bot. Club 29: 694. 1902 ("*Guanaiense*").

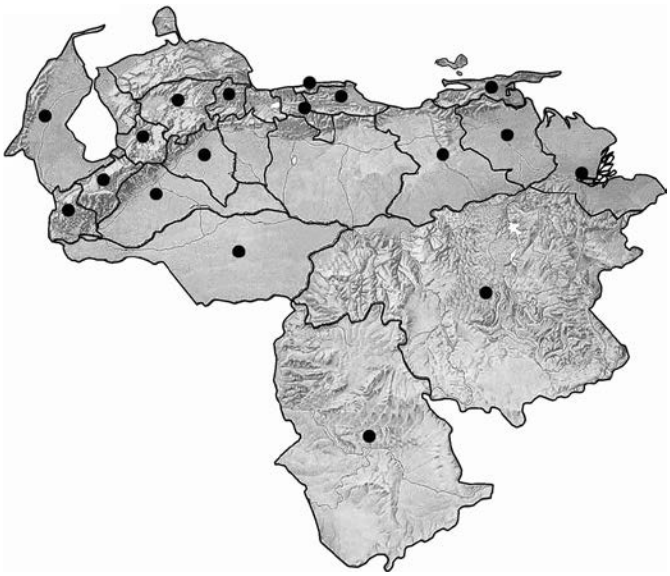
Three varieties of this neotropical species are currently recognized; the following is the only one that has been collected in Guaramacal.

Costus guanaiensis var. ***macrostrobilus*** (K. Schum.) Maas, Fl. Neotrop. Monogr. 8: 52. 1972; Maas, Fl. Venez. 11(2): 239–241. 1982; Maas and Maas, in Berry et al., Fl. Venez. Guayana 4: 428, fig. 341. 1998. *Costus macrostrobilus* K. Schum., in Urban, Symb. Antill. 4: 159. 1903.

Costus guanaiensis var. *tarmicus* auct., non (Loes.) Maas; Maas, Fl. Neotrop. Monogr. 8: 57. 1920.

Plants 1–4(–6) m tall. Leaf blades narrowly ovate to narrowly obovate, 28–42 × 7–10.5 cm, apex shortly acuminate, base cuneate, rounded or rarely cordate, strigose and scabrid to the touch above, densely villous-puberulent below; sheaths ± glabrous to noticeably villous-puberulent. Inflorescences 5–10 (–30) × 4–6(–10) cm; bracts with foliaceous appendages, broadly ovate, green to red. Corolla white, reddish-white or yellowish-white, 70–100 mm long. Capsule 10–20 mm long, densely sericeous to glabrous.

Found in Mexico, Central America, the West Indies (Puerto Rico), and South America (Colombia, Venezuela, Trinidad and



MAP 56. *Costus guanaiensis* var. *macrostrobilus* occurrence in Venezuela.

Tobago, Guyana, Ecuador, Peru, and Brazil). Widespread in Venezuela (Amazonas, Anzoátegui, Apure, Aragua, Barinas, Bolívar, Delta Amacuro, Distrito Federal, Lara, Mérida, Miranda, Monagas, Portuguesa, Sucre, Táchira, Trujillo, Yaracuy, and Zulia; Map 56). In the park, found in cloud forest on the north slope of Guaramacal; ~2,600 m.

Common Names. Ciruelo and saladillo.

The type of this variety comes from Puerto Rico, but because all other West Indian material is cultivated, Maas (1972: 54) speculated that this variety is not native to the West Indies.

Costus spiralis (Jacq.) Roscoe, Trans. Linn. Soc. London 8: 350. 1807. *Alpinia spiralis* Jacq., Pl. Rar. Hort. Schoenbr. 1: 1, t. 1. 1797.

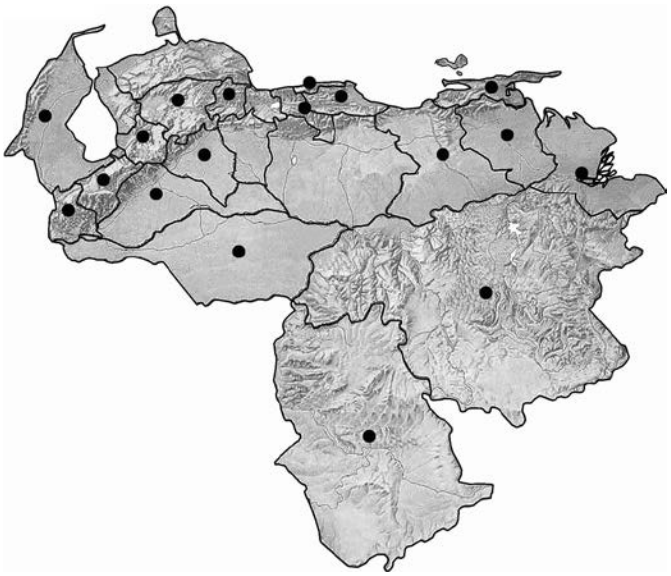
Two varieties of this heterogeneous South American species are currently recognized; the nominate variety is the only one that has been found in Guaramacal and in Venezuela.

Costus spiralis var. ***spiralis***

Maas, Fl. Venez. 11(2): 252–256. 1982; Maas and Maas, in Berry et al., Fl. Venez. Guayana 4: 428, fig. 344. 1998.

Plants 1–3.5(–4) m tall. Leaf blades narrowly elliptic, 10–40 × 5–15 cm, apex acuminate, base cuneate to rounded, glabrous above and below; sheaths glabrescent. Inflorescences 4–10(–20) × 2–5(–8) cm; bracts without appendages, broadly ovate, dark red. Corolla pinkish-red to salmon-red, 45–60 mm long. Capsule 10–15 mm long, glabrous.

Found in South America (Colombia, Venezuela, the Guianas, Peru, Bolivia, and Brazil); cultivated in the Greater Antilles (Cuba). Venezuelan records are from Amazonas, Apure, Aragua, Barinas, Bolívar, Falcón, Mérida, Miranda, Portuguesa, Táchira, Trujillo, Yaracuy, and Zulia (Map 57). Collected once on the south slope of Guaramacal in what appears to be the upper elevational limit of the variety; 1,500 m.



MAP 57. *Costus spiralis* var. *spiralis* occurrence in Venezuela.

Costus spiralis var. *villosus* Maas, which is distinguished from the nominate variety by having leaves barely to densely villous, apparently is restricted to the Guianas and Brazil.

Cyclanthaceae

L. J. DORR AND B. STERGIOS

Perennial, monoecious, terrestrial, hemiepiphytic or epiphytic herbs or lianas. Caulescent or ± acaulescent; stems branched or unbranched, rhizomatous to aerial, usually ± woody. Leaves spirally arranged or distichous; mature leaves with open sheaths; petiolate (our species) or not; leaf blades usually bifid, rarely entire or divided into 4 segments, 1- or 3-costate. Inflorescences axillary or terminal, unbranched, pedunculate spadices subtended by 2–11 persistent or caducous, conspicuous, foliose spathes. Flowers unisexual, densely packed, generally (Carludovicoideae) in spirally arranged groups, each group consisting of 1 pistillate flower surrounded by 4 staminate flowers, or (Cyclanthoideae) in alternate cycles of staminate and pistillate units. Staminate flowers (Carludovicoideae): perianth lobes located on the periphery of the receptacle or only on the outer (abaxial) side, lobes usually in 1 whorl. Staminate flowers (Cyclanthoideae): linear rows of stamens; stamens numerous; anthers basifixed, 2-thecate, usually longitudinally dehiscent; filaments subconnate at the base, swollen to form basal "bulbs." Pistillate flowers (Carludovicoideae): free or partially connate; tepals 4, free (our species) or connate, epigynous to perigynous, heteromorphic, subfleshy; staminodes 4, filiform or subligulate; ovary 1-locular, 4-carpellate, exserted or partially buried in the rachis, with 4 parietal, subapical or apical placentae, or with 1 apical placenta, each placenta with numerous anatropous ovules; styles lacking or 4, free or ± concrescent and forming a common style; stigmas 4, alternating with the tepals; tepals, styles, and stigmas persistent. Pistillate flowers (Cyclanthoideae): not perceptible, coalescent into cycles. Fruits (Carludovicoideae): ± fleshy, free or united into a syncarp. Fruits (Cyclanthoideae): ± dry, united to form hollow rings filled with seeds. Seeds numerous, small to large, flat to terete.

A neotropical family of 12 genera and 200–230 species found in Mexico, Central America, the West Indies, and South America (Colombia, Venezuela, Trinidad and Tobago, the Guianas, Ecuador, Peru, Bolivia, and Brazil). Nine genera and ~40 species occur in Venezuela.

References. Eriksson (1994); Harling (1958); Harling et al. (1998); Rudall and Bateman (2006).

Division of Cyclanthaceae into two subfamilies is based on a morphological phylogenetic analysis (Eriksson, 1994) that has not yet been tested using molecular data. Although both subfamilies are found in the Andes of Venezuela, only taxa of Carludovicoideae are found in Guaramacal. Carludovicoideae includes 11 genera and the vast majority of species, whereas Cyclanthoideae includes a single, monotypic genus (*Cyclanthus*

Poit. ex A. Rich.). Characters for distinguishing the two subfamilies are noted in the family description above.

The leaves of Cyclanthaceae could be confused with those of Arecaceae, but in Guaramacal the two families are easily separated by habit. Our representatives of the former family are either hemiepiphytes or epiphytes or ± acaulescent to shortly caulescent herbs, whereas our representatives of the latter are either shrubby or arborescent and always distinctly caulescent.

KEY TO THE GENERA OF CYCLANTHACEAE

1a. Plants hemiepiphytes, epiphytes or herbaceous lianas; leaves spirally arranged; leaf blades 20–51 cm long .... ***Asplundia***
1b. Plants terrestrial; leaves distichous; leaf blades (30–)70–115 cm long ..... ***Sphaeradenia***

Asplundia Harling

Asplundia Harling, Acta Horti Berg. 17: 41. 1954, nom. cons.

Hemiepiphytic, epiphytic or lianescent herbs; acaulescent or with short or long stems. Leaves spirally arranged; petioles present, usually equal to or shorter than leaf blades; leaf blades bifid (older leaves often secondarily divided in irregular segments), 1- or 3-costate (1-costate in our species), plicate, segments oblong, lanceolate or linear-lanceolate, acute or acuminate. Inflorescences axillary, solitary; peduncles short to ~10 cm long; spathes 3–5(–6), scattered at irregular intervals on peduncles, ovate-lanceolate, subnaviculiform, usually caducous or some of the more basal ones persisting; spadix ellipsoid, ovoid or cylindrical. Staminate flowers: symmetrical, infundibuliform, perianth lobes distributed evenly around the receptacle (our species) or asymmetrical with perianth lobes only on one side; receptacle flat to deeply concave; perianth lobes glanduliferous; stamens few to many. Pistillate flowers: subconnate, separating at maturity; tepals distinctly developed; placentae 4, parietal; styles 4, ± free or completely concrescent, or lacking; stigmas 4, variously shaped. Seeds oblong-ovoid, flattened; seed coat unsculptured.

A genus of ~100 species found in Mexico, Central America, the Lesser Antilles, and South America (Colombia, Venezuela, Trinidad and Tobago, the Guianas, Ecuador, Peru, Bolivia, and Brazil). Approximately 16 species occur in Venezuela.

KEY TO THE SPECIES OF *ASPLUNDIA*

1a. Leaf blades 35–51(–90) cm long, usually divided ⅔–⅘ their length, segments (3–)4.5–6 cm wide, apices acuminate, glabrous above, scattered brown scales sometimes present below ..... ***A. moritziana***
1b. Leaf blades 20–30 cm long, divided ½–⅔ their length, segments 2.5–4.5 cm wide, apices long-acuminate to caudate, glabrous above and below ..... ***A. vagans***

Asplundia moritziana (Klotzsch) Harling, Acta Horti Berg. 17: 42. 1954; Harling, in Berry et al., Fl. Venez. Guayana 4: 474. 1998. *Carludovica moritziana* Klotzsch, Linnaea 20: 468. 1847.

Asplundia vagans auct., non (Klotzsch) Harling; Dorr et al., Contr. U.S. Natl. Herb. 40: 44. 2000 [2001].

Hemiepiphytes, epiphytes or herbaceous lianas. Petioles (8–)12–20(–66) cm long; leaf blades 30–51 cm long, bifid (often older leaves secondarily cleft in irregular lobes), usually divided ⅔–⅘ their length; segments (3–)4.5–6 cm wide, lanceolate, apices acuminate, glabrous above, scattered brown scales sometimes present below. Spadix (in fruit) subcylindrical, 4.5–6 × 1–2 cm. Staminate flowers: 2 mm long, receptacle distinctly concave; perianth lobes obtuse, completely surrounding the receptacle, those on the free side of the flower usually larger than the others; stamens 35–50 or more, almost sessile on "bulbous" bases. Pistillate flowers: 4–6 mm in diameter, obtusely triangular, equal to or slightly shorter than stigmas; stigmas ± laterally compressed, uncinate.

Found in South America (Colombia and Venezuela). In Venezuela, found in the Andes (Lara, Mérida, Portuguesa, Táchira, and Trujillo), the Sierra de Perijá (Zulia), the Cordillera de la Costa (Aragua, Anzoátegui, Carabobo, Distrito Federal, Falcón, Miranda, Monagas, Sucre, and Yaracuy), and the Venezuelan

MAP 58. *Asplundia moritziana* occurrence in Venezuela.

Guayana (Amazonas, Bolívar, and Delta Amacuro; Map 58). In the park, found in forest understory on both slopes of Guaramacal; 1,500–2,600 m.

Material found in Guaramacal and the Cordillera de Mérida appears to be less robust (smaller leaves, narrower leaf segments, smaller spadices in fruit, etc.) than collections made in the Cordillera de la Costa and in the Venezuelan Guayana, and we suspect more than one taxon is subsumed under the name *Asplundia moritziana*. The type of its basionym, *Carludovica moritziana*, is without locality but presumably was gathered in Colonia Tovar (Aragua state). If this is the case and there is more than one taxon involved, then the name *A. moritziana* must be applied to the material found in the Cordillera de la Costa.

Asplundia vagans Harling, Acta Horti Berg. 18: 170, fig. 45h–m, t. 16. 1958.

Asplundia sp. A; Dorr et al., Contr. U.S. Natl. Herb. 40: 44. 2000 [2001].

Hemiepiphytic or epiphytic herbs. Petioles 7–14 cm long; leaf blades 20–30 cm long, bifid, divided ½–⅔ their length; segments 2.5–4.5 cm wide, linear-lanceolate to lanceolate, apices long-acuminate to caudate, glabrous above and below. Spadix (in fruit) subcylindrical, 3–4.5 × 1.5 cm. Staminate flowers: not seen. Pistillate flowers: 5–6 mm in diameter; tepals triangular, acute to acuminate, usually exceeding the stigmas in length, fleshy external appendages present; stigmas ± laterally compressed, uncinate.

Found in Central America and South America (Colombia, Venezuela, Ecuador, Peru, and Bolivia). In Venezuela, evidently restricted to the Andes (Barinas, Portuguesa, and Trujillo; Map 59). In the park, known only from forest understory on the south slope of Guaramacal; (1,200–)1,600 m.

Harling (1958) considered *Asplundia vagans* to be a widespread but rare species that mainly occurred at lower elevations.

MAP 59. *Asplundia vagans* occurrence in Venezuela.

He noted several subtle differences in the collections he examined. The long-acuminate to caudate apices of the leaf segments, however, are distinctive.

Sphaeradenia Harling

Sphaeradenia Harling, Acta Horti Berg. 17: 3. 1954.

Pseudoludovia Harling, Acta Horti Berg. 18: 338. 1958.

Perennial herbs, terrestrial (our species) or epiphytic; stems aerial to rhizomatous. Leaves distichous, usually erect; petioles distinct, without an adaxial groove or sometimes with a band of tissue connecting the margins of the blade with the sheath; leaf blades bifid, 1-costate, stiff, thick, coriaceous; leaf segments linear to broadly lanceolate or triangular, acute to acuminate, eventually (through environmental factors) divided into several irregular lobes. Peduncles short to long, with a collar-like structure at junction with spadix, recurved to straight in fruit. Spathes 2–5, ovate to lanceolate, usually on the distal ½ of a peduncle, usually caducous and leaving a discernable scar. Spadix broadly ellipsoid to cylindrical, often brightly colored (white, green, yellow or red) in fruit. Staminate flowers: asymmetrical, caducous or persisting in fruit; receptacles usually flat to slightly concave; perianth lobes distributed around the receptacle, abaxial lobes usually larger or lobes on abaxial side only, abaxial lobes with tiny glands, adaxial lobes usually without tiny glands, lobes obtuse to acute, apices straight to curved outward; stamens few to many; anthers with or without an apical secretion globule; filaments short to almost absent. Pistillate flowers: connate basally; tepals 4, free from each other or variously connate, lateral tepals usually broader than medial ones; staminodes present, fragrant; ovary embedded in the rachis and protruding at maturity; placenta 1, apical; styles usually concrescent; stigmas proximally connate to free, laterally compressed or not. Seeds terete, broadly ellipsoid to narrowly oblong, straight or curved; testa sculptured.

A genus of ~50 species found in Central America and South America (Colombia, Venezuela, Ecuador, Peru, and Brazil). The greatest species diversity is found in Colombia. Four species occur in Venezuela, of which only one is Andean.

References. Eriksson (1995); Harling (1954).

Sphaeradenia laucheana (Sander ex Mast.) Harling, Acta Hort. Berg. 17: 3. 1954; Morillo, in Morillo et al., Bot. Ecol. Monocot. Páramos Venez. 2: 447–448, fig. 1. 2010. *Salmia laucheana* Sander ex Mast., Gard. Chron., ser. 3, 13: 442. [15 Apr] 1893; ibid., 481, fig. 72. [22 Apr] 1893.

The nominate subspecies is the only subspecies found in Venezuela.

Sphaeradenia laucheana subsp. ***laucheana***

FIGURE 25B

Plants to 3 m tall; stems 0.2–1.5 m tall, sometimes branched. Leaves large, to 2.5 m long; leaf sheaths to 45 cm long; petioles 10–75 cm long; leaf blades (30–)70–115 cm long, deeply bifid (>50% of their length), somewhat coriaceous, segments 4–15 cm wide, linear to oblong or lanceolate, acuminate (to acute).

MAP 60. *Sphaeradenia laucheana* subsp. *laucheana* occurrence in Venezuela.

Peduncles (10–)20–30 cm long; spathes (2–)3–5, 10–15 cm long, reddish or white tinged with red, spathe scars visible near middle and below on peduncles. Spadix narrowly ellipsoid to cylindrical, green or greenish-white or yellowish-green, 2.5–3 × 1–1.5 cm (at anthesis), 4–10 × 1.5–4 cm (in fruit). Staminate flowers: usually caducous, sometimes persistent, receptacles slightly concave to convex; perianth lobes 9–16, 4–10 lobes on the adaxial side, sometimes with tiny glands; stamens numerous (up to 30); filaments to 0.3 mm long, densely aggregated. Pistillate flowers: tepals ± cuspidate or ± triangular, acute to obtuse or truncate, apex incurved and sometimes covering the stigmas; staminodes present; ovary scarcely exserted in mature fruit; stigmas connate (to free), linear to oblong, lanceolate or narrowly triangular. Seeds ellipsoid to oblong, ~4 × 2 mm, curved or unciform.

Found in South America (Colombia, Venezuela, Ecuador, and Peru). In Venezuela, known only from the Andes (Barinas, Portuguesa, Táchira, and Trujillo; Map 60). In the park, found in forest and cloud forest on both slopes of Guaramacal, including La Divisoria de la Concepción; 1,600–2,600(–3,000) m.

Eriksson (1995) distinguished two subspecies: the nominate one (described above) and *Sphaeradenia laucheana* subsp. *irazuensis* (Cufod.) R. Erikss., an epiphytic plant whose staminate flowers persist on the mature spadix and whose stigmas are remarkably uncinate in fruit. The latter subspecies is restricted to Central America (Costa Rica).

Cyperaceae

M. T. STRONG
(*CAREX*: M. T. STRONG AND A. A. REZNICEK)

Grass- or rush-like perennial or annual herbs with rhizomes or stolons. Culms solitary or caespitose, 3-angled or obtusely so, rarely 4- or 5-angled, sometimes terete or flattened, solid or hollow, glabrous or sometimes pubescent. Leaves well developed or reduced to bladeless sheaths, borne at base or both basal and cauline; blades flattened, plicate, involute or subcylindric, linear to lanceolate, glabrous or sometimes pubescent, usually antrorsely scabrous on margins and primary veins or occasionally smooth; sheaths closed, often splitting with age, inner band membranous with a concave to convex orifice or sometimes entirely herbaceous with the summit frequently prolonged as a triangular or tonguelike contraligule (facing away from stem); ligule absent or short, sometimes a narrow band of hairs. Inflorescences diverse, complex, and difficult to interpret, typically umbelliform, anthelate, corymbose, spicate, paniculate, racemose or capitulate, sessile or branching, bearing 1 to many spikelets or reduced spikes from the upper leaflike or sometimes scalelike bracts; spikelets 1- to many-flowered, often with 1 to several empty (sterile) scales at base. Flowers (florets) spirally imbricate or 2-ranked (distichous), bisexual or unisexual (the plant then monoecious or rarely dioecious), borne singly, each from the axil of a spikelet scale; perianth, when present, of 3 to many, smooth or barbed, hypogynous bristles or scaly segments, usually persistent at the base of the mature achene; stamens 1–3; anthers elliptic to linear, apiculate or appendaged apically, basifixed, thecae parallel, longitudinally dehiscent; ovary 2- or 3-carpellate, unilocular, style 2- or 3-branched. Fruit an achene, trigonous (sometimes dorsally compressed), biconvex, globose or cylindric, ellipsoid, oblong or obovoid, usually apiculate apically, smooth, reticulate, puncticulate, papillose, verrucose or transversely rugulose, style base deciduous or persistent apically.

A cosmopolitan family of ~100 genera and ~5,500 species. In Venezuela, 34 genera and ~430 native or naturalized species occur in aquatic or terrestrial habitats.

References. Bruhl (1995); Goetghebeur (1998); Muasya et al. (1998, 2000, 2009a); Simpson et al. (2007); Tucker (1987).

KEY TO THE GENERA OF CYPERACEAE

1a. Inflorescence contracted without evident lateral branches or rays, unispiculate (a solitary spikelet at the summit of the culm), capitate cluster of 2 to many spikelets or a linear contiguous spike at the apex of the culm 2
  2a. Inflorescence a linear, simple contiguous spike; fruit an herbaceous sac (perigynium) tightly enclosing a trigonous achene and vestigial rachilla bearing a hooked rudimentary spikelet at apex . . . . . ***Uncinia***
  2b. Inflorescence unispiculate or a capitate cluster of 2 to many spikelets; fruit a naked achene or if a perigynium, then not enclosing a hooked rudimentary spikelet at apex 3

3a. Elongate leaf blades and involucral bracts wanting, summit of the leaf sheaths merely apiculate or entire; inflorescence unispiculate . . . . . ***Eleocharis***
3b. Elongate leaf blades and/or involucral bracts present; inflorescence multispiculate or unispiculate 4
4a. Fruit an herbaceous prominently veined sac (perigynium), loosely or tightly enclosing an achene, often bidentate apically . . . . . ***Carex***
4b. Fruit a naked achene, not surrounded by a perigynium 5
5a. Achene bearing the persistent expanded base of the style at apex and barbed or plumose bristles at base . . . . . ***Rhynchospora***
5b. Achene merely apiculate or entire at apex, without bristles at base 6
6a. Plants small (<10 cm tall), forming dense cushions or mats in páramo; leaves incurved, stiff, and somewhat cartilaginous; flowers with 2 alternating whorls of scalelike tepals at the base that are often persistent on rachilla after spikelet scales and achenes have shed . . . . . ***Oreobolus***
6b. Plants medium to large or rarely small (10–200 cm tall), not forming dense cushions or mats and occurring in various habitats; leaves flexuous; flowers lacking scalelike tepals, naked at the base . . . . . ***Cyperus***
1b. Inflorescence open or, if contracted, then with at least some evident lateral branches or rays, terminal or with 2 to several lateral partial inflorescences from the upper leaflike bracts, umbelliform, corymbose, paniculate or racemose, 2 to many spikelets solitary or in fascicles, digitate or glomerate clusters, or spikes at branch or ray tips 7
7a. Fruit an herbaceous prominently veined sac (perigynium), loosely or tightly enclosing an achene, often bidentate apically . . . . . ***Carex***
7b. Fruit a naked achene, not surrounded by a perigynium 8
8a. Flowers unisexual; achene globose or ovoid, rarely trigonous, with a smooth white, greenish or purple tinged, bony or crustaceous pericarp . . . . . ***Scleria***
8b. Flowers bisexual; achene trigonous or biconvex with a light brown to brown or blackish puncticulate, cancellate or transversely rugulose pericarp 9
9a. Spikelet scales distichous . . . . . ***Cyperus***
9b. Spikelet scales imbricate 10
10a. Style base persistent at achene apex, triangular to lanceolate; style 2-branched or entire; achene biconvex; bristles 1–6 . . . . . ***Rhynchospora***
10b. Style base disarticulating from the achene, achene apex merely apiculate; style 3-branched; achene trigonous; bristles absent . . . . . ***Fimbristylis***

Carex L.

Carex L., Sp. Pl. 972. 1753.

Grasslike perennial herbs, tufted or with short or elongate creeping rhizomes, sometimes stoloniferous, monoecious, rarely dioecious. Culms triquetrous or trigonous, rarely subterete, solid or sometimes hollow. Leaves 3-ranked; ligule often present at adaxial junction of sheath and blade; blades flattened, V-shaped or folded, narrowly linear, rarely lanceolate or elliptic and subpetiolate. Inflorescence a single terminal spike or a series of 1 to several terminal subcontiguous or remote spikes or panicles from the upper leaflike or scalelike bracts; spikes sessile or peduncled with spirally arranged florets (perigynia), unisexual, androgynous or gynaecandrous, rarely mixed, inflorescences bearing unisexual spikes often with the 1 to several staminate spikes terminal and pistillate spikes below. Flowers unisexual; hypogynous squamellae or bristles absent; staminate florets with 3 stamens subtended by a single scale; pistillate florets a single ovary contained within a tight or inflated, 2-sided, trigonous or rounded, often bottle-shaped perigynium, subtended by a single scale; style 2- or 3-branched, continuous with the ovary and persistent or articulated with it and deciduous, straight or flexuous, often thickened at base, tips of the stigmas exserted from the apex or often bidentate beak of the perigynium; perigynium membranous, chartaceous or coriaceous, often ribbed or nerved with raised or impressed nerves, or smooth, sometimes winged, glabrous, pubescent, hispid, papillose, puncticulate or smooth, sometimes spongy at base, apex often beaked, bidentate or bifurcate. Fruit an achene, lenticular, biconvex or trigonous, generally green, puncticulate or sometimes smooth.

A cosmopolitan genus of ~2,000 species, widespread in temperate zones and montane regions of the tropics; ~30 species occur in Venezuela.

References. Gehrke et al. (2010); Hipp et al. (2006); Kükenthal (1909); Reznicek (1990); Starr and Ford (2009); Starr et al. (2004, 2008); Waterway and Starr (2007); Waterway et al. (2009).

Carex is one of the largest genera of vascular plants known, and not surprisingly, many taxonomic problems surround its limits. Molecular data (Waterway and Starr, 2007; Starr et al., 2008; Starr and Ford, 2009) suggest that *Carex* as currently construed resolves itself into four main clades that are not congruent with previous classifications. None of the taxa present in Guaramacal have figured into any of these molecular studies, although

one unresolved problem that affects our flora concerns how one deals taxonomically with a number of unispiculate *Carex* species that form a monophyletic clade with *Kobresia* Willd., *Uncinia* Pers. (present in Guaramacal), and *Cymophyllus* Mack. Until this problem is resolved, we have opted to recognize *Uncinia* as a distinct, albeit paraphyletic, genus.

KEY TO THE SPECIES OF *CAREX*

1a. Style 2-branched; achene biconvex 2
2a. Spikes 3–4.5 mm wide; perigynia narrowly ovate or lanceolate, rib-margined . . . . . ***C. bonplandii***
2b. Spikes 4–6 mm wide; perigynia broadly obovate or suborbicular, wing-margined . . . . . ***C. longii***
1b. Style 3-branched; achene trigonous 3
3a. Inflorescence open with nodding spikes; spikes (3–)3.5–8(–10) cm long; achene constricted abaxially . . . ***C. jamesonii***
3b. Inflorescence contracted, with erect to spreading spikes; spikes 0.5–2.5(–3) cm long; achene not constricted 4
4a. Terminal spike androgynous; pistillate spikes 2–3 mm wide; perigynia 3.5–4 × 1–1.2 mm . . . . . ***C. tachirensis***
4b. Terminal spike wholly staminate; pistillate spikes 5–9 mm wide; perigynia 3.7–6 × 1.3–1.7 mm . . . . . ***C. tamana***

Carex bonplandii Kunth, Enum. Pl. 2: 380. 1837; Briceño, in Morillo et al., Bot. Ecol. Monocot. Páramos Venez. 2: 456, fig. 6. 2010.

Loosely caespitose, (4–)12–60(–80) cm tall; rhizomes short, horizontally creeping, culms densely set, arising singly or several together. Culms trigonous, 0.7–1.7 mm wide, smooth proximally, antrorsely scabrous on angles distally. Leaves 2–8 per culm, basal and lower cauline, lowermost often bladeless or with short blades, to 30 cm long; sheaths short or elongate, light brown to brown, glabrous, inner band membranous, with a truncate to slightly concave orifice; ligule a thickened band of light brown to brown tissue, acutely oriented; blades linear, V-shaped proximally, subflattened-plicate distally, 1–4.5 mm wide, attenuate. Inflorescence a small aggregate of 3–13(–16) spikes, 1–3.5 × 0.5–1.5(–2) cm; involucral bracts narrowly linear to setaceous, lowermost one 1–4(–8) cm long, often overtopping the inflorescence; spikes gynaecandrous, 6–10 × 3–4.5 mm, with 5–30 subappressed to distally spreading perigynia; pistillate scales ovate to ovate-lanceolate, acuminate, shallowly cucullate, 2–3.3 × 1–1.3 mm, slightly shorter than the perigynia but as wide, submembranous, pale to dark brown, margins narrowly scarious, midcosta wirelike, pale green, shorter than to equaling the slightly emarginate tip. Anthers 1.3–1.7 mm long. Style 2-branched. Perigynia plano-convex or sometimes concave ventrally, narrowly ovate or lanceolate, 2.8–4 × 1–1.3 mm, thick and coriaceous, light green becoming brownish, narrowly wing-margined nearly to the base, faintly or distinctly 7–12-nerved dorsally and sometimes ventrally, often nerved ventrally only at base, tapering gradually into a shortly bidentate tip, margins antrorsely scabrous above the middle, rib-margined and subinvolute proximally. Achenes lenticular, oblong-ovate or ovate-elliptic, 1.5–2 × 0.7–1 mm, narrowly obtuse apically, subabruptly narrowed to a short-attenuate base, puncticulate, yellowish-brown.

MAP 61. *Carex bonplandii* occurrence in Venezuela.

Found in Mexico, Central America, and South America (Colombia, Venezuela, Ecuador, Peru, Bolivia, and Brazil). In Venezuela, restricted to the Andes (Mérida, Táchira, and Trujillo; Map 61). In the park, found on both slopes of Guaramacal, near the Laguna del Pumar, and in the Páramo de Guaramacal; 2,000–3,100 m.

Hipp et al. (2006) presented evidence for a possible allopolyploid origin of the *Carex bonplandii* species complex, which consists of *C. bonplandii* and *C. roraimensis* Steyerm. The latter species is endemic to the Venezuelan Guayana.

Carex jamesonii Boott, Proc. Linn. Soc. Lond. 1: 258. 1845 [1849]; Reznicek, in Berry et al., Fl. Venez. Guayana 4: 519. 1998; Briceño, in Morillo et al., Bot. Ecol. Monocot. Páramos Venez. 2: 459, fig. 9. 2010.

FIGURES 5, 25C

Coarse, stoloniferous, 55–110(–130) cm tall; rhizomes short and knotty, emitting slender, stiff, floccose stolons. Culms solitary or several together, triquetrous distally, channeled medially on sides proximally, 1.7–4.8 mm wide, stiff and hardened proximally, flexuous distally, smooth on angles proximally, scabrous to smooth on angles distally. Leaves 6–10, primarily basal, lowermost often bladeless, 30–120 cm long; sheaths folded and

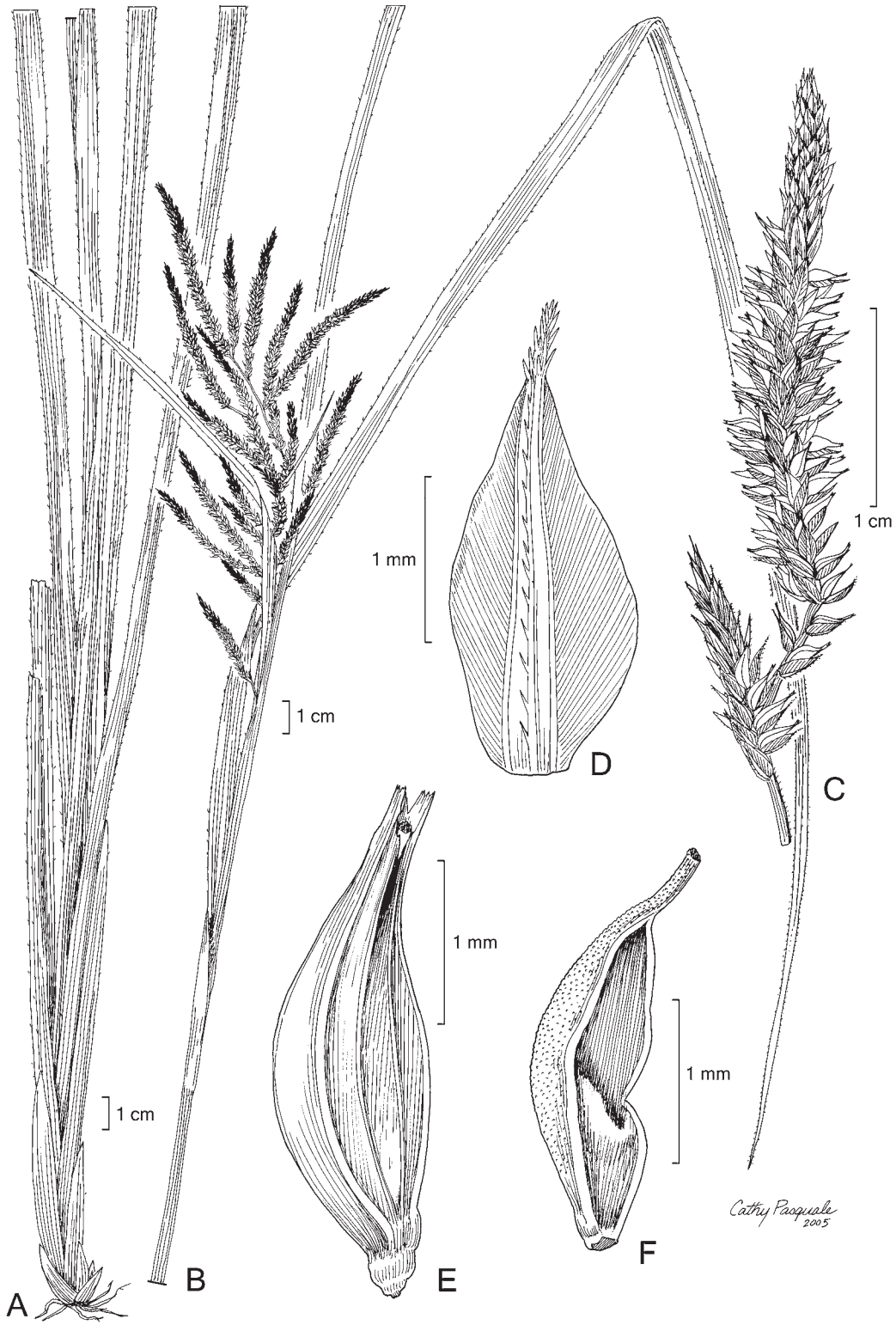


FIGURE 5. Cyperaceae, *Carex jamesonii* Boott. **A.** Habit. **B.** Inflorescence. **C.** Inflorescence spike (detail). **D.** Spikelet scale. **E.** Perigynium. **F.** Achene dissected from perigynium. (A–F, *Stergios et al. 15985*.)

equitant proximally, brownish-red or red-purple; ligule a broad, reddish-brown band of tissue gradually converging from the margins to midblade; blades linear, 5–12 mm wide, elongate, folded proximally, flattened to subplicate distally, glabrous, glaucous, attenuate. Inflorescence a subcontiguous series of 1 to several nodding spikes in short racemes from the upper leaflike bracts; lowermost 1 or 2 involucral bracts well developed, leaflike, uppermost linear to setaceous, their sheaths wanting or at most very short; spikes 11–35, androgynous, linear-cylindric, (30–)35–80(–100) × 5–7 mm, densely flowered, approximate and short peduncled or the lowermost on elongate peduncles and often pendulous; staminate portion of spike 10–30 mm long; pistillate scales lanceolate, 2.7–4.7 × 1–1.3 mm, nearly equaling the perigynia, brown, red-brown or blackish, narrowly scarious, midcosta 3-nerved, green or pale brown, prolonged beyond the acute to acuminate apex as a short setose-scabrous awn. Anthers 1–2 mm long. Style 3-branched. Perigynia ellipsoid-lanceoloid, compressed trigonous, often falcate when mature, (2.7–)3–4.3 × 1–1.5 mm, gradually or abruptly attenuate to a shallowly bidentate apex, cuneate to short-stipitate base, conspicuously nerved with 2 coarse marginal ribs, pale to red-brown or blackish, glabrous or scabrous distally, lustrous. Achenes trigonous, oblong-ellipsoid or oblong-obovoid, 1.5–2.5 × 0.7–1 mm, obtuse to acute at both ends, abaxial face strongly constricted or wrinkled medially, puncticulate, pale brown.

Found in Mexico, Central America, and South America (Colombia, Venezuela, Ecuador, Peru, and Bolivia). In Venezuela, found in the Andes (Apure, Lara, Mérida, Táchira, and Trujillo), the Cordillera de la Costa (Anzoátegui, Aragua, Distrito Federal, Miranda, Monagas, Sucre, and Yaracuy), and the Venezuelan Guayana (Bolívar; Map 62). Found in cloud forest, subpáramo, and páramo in a number of localities throughout the park; (1,500–)2,000–3,100 m.

The inflorescences of several collections made in the park (e.g., *Cuello et al. 1072*, *1359*; *Niño et al. 1359*) are infected with a smut.

• ***Carex longii*** Mack., Bull. Torrey Bot. Club 49: 373. 1922 [1923]; Briceño, in Morillo et al., Bot. Ecol. Monocot. Páramos Venez. 2: 461–462. 2010.

Caespitose, forming small to medium-sized clumps, (15–)30–80(–120) cm tall; rhizomes short. Culms erect, slender, 1.3–3 mm wide, trigonous to sharply so, stiff and hardened, smooth proximally, scabrous on angles at apex. Leaves 4–6, lower cauline 6–40 cm long, basal ones often bladeless; sheaths elongate, tight around culm, proximal ones pale brown, cauline ones green, inner band herbaceous, prominently veined, with concave orifice; ligule rounded, 2–6 mm long; blades linear, 1.5–4(–4.5) mm wide, plicate, glabrous, long-acuminate. Inflorescence a series of (2–)3–10(–11), subcontiguous, sessile, ellipsoid to obovoid spikes at the summit of the culm, (1.4–)2.2–6 cm long; inflorescence bracts setaceous, reduced distally; spikes gynaecandrous, 6–17 × 4–6 mm, obtuse, scales appressed-ascending or slightly spreading; pistillate scales ovate, 2.2–3.7 × 1.1–1.8 mm, obtuse to acute, lustrous, silvery white to pale brown, midcosta 3-nerved, green, midnerve prolonged as a short awn or mucro on proximal scales, ending short of the tip on distal scales. Anthers 1–2.3 mm long. Style 2-branched. Perigynia plano-convex, broadly obovate or suborbicular, broadest near the middle, 3–4.5 × 1.6–2.8 mm, light silvery-green or silvery-brown,

MAP 62. *Carex jamesonii* occurrence in Venezuela.

MAP 63. *Carex longii* occurrence in Venezuela.

3–9-nerved adaxially, 5–13-nerved abaxially, margins thinly winged, abruptly contracted into a scabrous-margined, bidentate beak, 0.7–1.3 mm long, with teeth ~0.2–0.4 mm long. Achenes biconvex, ovate to oblong-ovate, 1.4–1.7 × 0.9–1.1 mm, short-stipitate, pale brown.

Native to North America; adventive in Mexico, Central America, the West Indies, South America (Colombia, Venezuela, Ecuador, Brazil, Argentina, and Uruguay), the Pacific Islands (Hawaii), and New Zealand. All Venezuelan records are from the Andes (Lara and Trujillo; Map 63). In the park, found on both slopes of Guaramacal; 1,900–2,800 m.

Carex tachirensis Steyerm., Fieldiana, Bot. 28: 68, fig. 8I–M. 1951.

Rhizomatous, 3–34 cm tall; rhizomes ascending to horizontal, slender or knotty, clothed with fibrous sheaths. Culms sharply ascending, trigonous, often channeled along 1 margin, antrorsely spinulose-scabrous on angles and often on sides (at least distally). Leaves primarily basal, 2–11 cm long; sheaths short; ligule a narrow band of tissue at adaxial junction of sheath and blade; blades linear-lanceolate, 1.3–3.5 mm wide, stiffly erect, rigid, plicate, attenuate. Inflorescence racemose, of a terminal and 1 or 2 lateral long-pedunculate spikes; involucral bracts 1(2) per spike, leaflike, sheathing; spikes narrowly linear, terminal one androgynous, lateral wholly pistillate, 10–15 × 2–3 mm; pistillate scales widely ovate or lanceolate, 3.5–6 × 1.5–2 mm, castaneous or dark reddish-brown on sides, margins entire, midcosta broad, pale green, 3-nerved with spinulose-scabrous to smooth nerves, prolonged beyond the short-acuminate apex as an elongated setulose awn on lower scales, upper scales short-awned; staminate scales ovate, acuminate, ~3 mm long, like the pistillate scales. Anthers ~1 mm long; style 3-branched. Perigynia obscurely trigonous, elliptic-lanceolate, 3.5–4 × 1–1.2 mm, 3-angled, thinly herbaceous, 3–5-nerved on each side, short-stipitate at base, narrowing distally to a slender, setulose, bidentate beak. Achenes trigonous with the face against the rachilla concave, elliptic to oblong-elliptic or elliptic-obovate, ~2 × 1 mm, obtuse apically, cuneate at base, puncticulate, brown.

Endemic to the Andes of Venezuela (Táchira and Trujillo; Map 64). Páramo near the Laguna del Pumar; 3,000 m.

We have a single collection (*Niño et al. 1515*, PORT) of this species from the park but suspect that *Carex tachirensis* is more common and overlooked by collectors.

Carex tamana Steyerm., Fieldiana, Bot. 28: 70. 1951; Reznicek, in Berry et al., Fl. Venez. Guayana 4: 519. 1998.

Carex acutata auct., non Boott; Ortega et al., BioLlania 5: 40. 1987.

Loosely caespitose to mat-forming, 8–60(–80) cm tall; rhizomes often emitting scaly, cord-like stolons. Culms ascending to erect, trigonous to obtusely so proximally, 1–2.2 mm wide, hardened but subflexuous, smooth, angles bluntly and closely antrorsely scabrous. Leaves 7–12, basal and lower cauline, sharply ascending-spreading, 2–35 cm long; sheaths short, herbaceous, scabridulous, pale brown to brown proximally, inner band membranous, scabridulous, light reddish-brown, orifice concave on proximal sheaths, truncate to convex on distal ones; ligule a submembranous band of tissue acutely oriented; blades thickly herbaceous, subrigid, flattened-plicate, folded to V-shaped proximally, 2.2–4.4 mm wide, scabrous adaxially, smooth abaxially, long-acuminate. Inflorescence a terminal, compact, spicate cluster

MAP 64. *Carex tachirensis* occurrence in Venezuela.

MAP 65. *Carex tamana* occurrence in Venezuela.

of 2–4 pistillate spikes and a single terminal staminate spike, often bearing below a remote lateral pistillate spike on a short peduncle; involucral bracts leaflike, strongly ascending, essentially sheathless, each subtending the base of a spike, overtopping the spikes but becoming successively shorter distally; pistillate spikes erect to spreading, oblong-cylindric or oblong-obovoid, 5–25(–30) × 5–9 mm, perigynia often spreading; staminate spike linear, 1.6–2.7 cm long; pistillate scales ovate-lanceolate to elliptic-lanceolate or lanceolate, glabrous, light brown, margins narrowly scarious medially, midcosta green, slender and finely 3-nerved, lateral nerves indistinct, medial nerve distinct, ending short of or shortly prolonged beyond the narrowly acute to acuminate apex; staminate scales linear, ~8 mm long. Anthers 1.5–2 mm long. Style 3-branched. Perigynia trigonous, lanceoloid, 3.7–6 × 1.3–1.7 mm, adaxial side plane, abaxial sides plane or somewhat swollen, slightly contracted above the middle to a slender, acuminate to long-acuminate beak that is bidentate apically, obtuse to subrounded at base, short-stipitate, distinctly and finely nerved with several coarse nerves, glossy, green to brownish. Achenes trigonous, ellipsoid, with plane or slightly concave sides, ~2 mm long, puncticulate, light brown.

Found in Central America (Costa Rica) and South America (Colombia, Venezuela, and Ecuador). In Venezuela, this species has a disjunct distribution occurring in the Andes (Táchira and Trujillo) and in the Venezuelan Guayana (Bolívar; Map 65). In the park, found near the Laguna del Pumar and in the Páramo de Guaramacal; (2,500–)3,000 m.

Cyperus L.

Cyperus L., Sp. Pl. 44. 1753.
Kyllinga Rottb., Descr. Icon. Rar. Pl. 12. 1773, nom. cons.
Pycreus P. Beauv., Fl. Oware 2: 48. 1816.
Lipocarpha R. Br., in Tuckey, Narr. Exped. Zaire 459. 1818, nom. cons.
Ascolepis Nees, in Steudel, Syn. Pl. Glumac. 2: 105. 1855, nom. cons.

Grasslike perennial or annual herbs, glabrous; rhizomes, when present, short or stoloniferous, horizontally creeping, elongate or short knotty, or tufted. Culms trigonous or sometimes terete, smooth or scabrous, green. Leaves primarily basal with several often lower cauline; sheaths finely veined, sometimes cross-veined, usually glabrous; ligule absent or short; blades herbaceous or stiffened, flattened, V-shaped, plicate, inrolled, terete or crescentform, finely veined abaxially, finely cellular-reticulate and semiglossy adaxially, sometimes septate or cross-veined, margins, abaxial midvein, and adaxial lateral veins, when present, usually antrorsely scabrous. Inflorescence a simple or compound, terminal, umbel-like corymb with spreading rays, rarely congested or pseudolateral and head-like, or subglobose head of 1–3(–4) crowded, sessile spikes; spikes cylindric, ovoid or globose, densely flowered with slender rachis; involucral bracts generally leaflike, approximate, spreading in a radius; spikelets ovate, ovate-lanceolate or linear in shape, flattened, compressed or subcompressed, subcylindric or 4-angled in cross section, palmately, pinnately or imbricately arranged on the rachis, many-flowered, lowermost scale and subtending bract empty; scales 2-ranked, ovate, oblong-ovate or elliptic, acutely keeled, naviculiform or subrounded in cross section, sometimes 2-keeled, often longitudinally veined on sides, with a 1–5-nerved often greenish midcosta, apex acute, obtuse or cuspidate, often mucronulate; rachilla winged from the persistent, decurrent base of the scale or wingless, wings hyaline or sometimes corky or thickened, disarticulating at base from the rachis, whole spikelet falling entire or disarticulating at the nodes or base, internodes, scales, and achenes falling as 1-fruited segments or rachilla persistent on the rachis, scales and achenes deciduous. Flowers bisexual or staminate; hypogynous squamellae or bristles absent; stamens 1–3; anthers oblong-elliptic, narrowly elliptic or linear, apiculate or sometimes minutely appendaged apically. Styles 2- or 3-branched. Achenes trigonous or lenticular, ovoid, obovoid, oblong-obovoid, ellipsoid or narrowly ellipsoid, or usually short-apiculate apically, sometimes shortly stipitate at base, surface puncticulate, reticulate or smooth, rarely transversely wrinkled, or achenes laterally flattened with 1 angle facing the rachilla, narrowly ovate to oblong or elliptic, obtuse to subrounded or subtruncate apically, apiculate, cuneate to rounded at base, substipitate to distinctly stipitate, surface puncticulate.

A cosmopolitan genus of 600–700 species found in temperate, subtropical, and tropical regions. In the Americas, *Cyperus* is found in North America (Canada and USA), Mexico, Central America, the West Indies, and South America (all country-level political units). The genus evidently is adventive in Canada. Approximately 77 species occur in Venezuela.

References. Bauters et al. (2014); Corcoran (1941); Kükenthal (1935–1936); Larridon et al. (2011, 2013, 2014); Muasya et al. (1998, 2001, 2002, 2009b); Tucker (1984, 1994).

Cyperus L. is the second largest genus in the Cyperaceae, principally tropical, and widely distributed. However, molecular data suggest that *Cyperus* as presently construed is not monophyletic as many other smaller cyperoid genera that are currently recognized are embedded within it. *Cyperus* and nine smaller genera form a strongly supported clade with two well-supported subclades: a eucyperoid clade associated with C_3 photosynthesis and a chlorocyperoid clade associated with C_4 photosynthesis. *Pycreus* P. Beauv. and *Kyllinga* Rottb. are deeply embedded in the latter subclade (Muasya et al., 1998, 2001, 2002, 2009b; Larridon et al., 2011, 2013, 2014), which also contains the nomenclatural type of the genus *Cyperus*. Despite strong evidence for these relationships, there has been reluctance to place *Pycreus* and especially *Kyllinga* in synonymy. We have chosen to fold these smaller genera into *Cyperus* and accept a large genus with two infrageneric groups based on C_3 and C_4 anatomy.

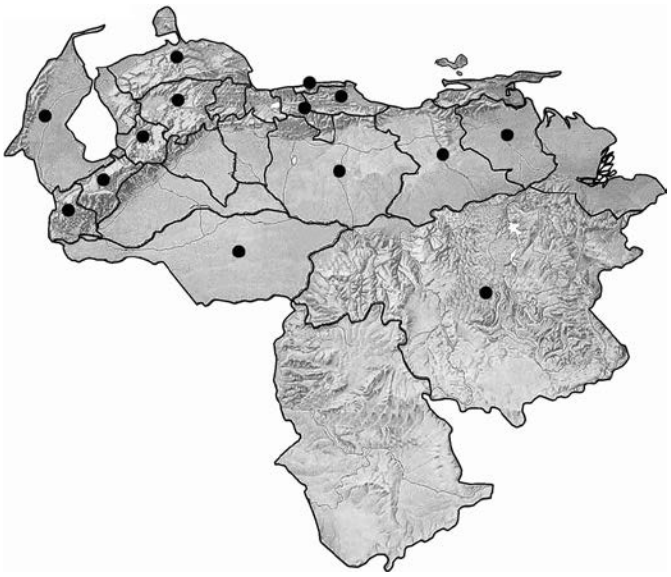
Although three of the generic synonyms of *Cyperus* listed above are conserved names, none of these names is conserved against *Cyperus*.

KEY TO THE SPECIES OF *CYPERUS*

1a. Spikelets 1(2)-flowered; rachilla short; scales conduplicate, conspicuously keeled . . . . . ***C. hortensis***
1b. Spikelets 2- to many-flowered; rachilla elongate; scales navicular 2
2a. Style 3-branched; achenes trigonous with a face against the rachilla; spikelet scales yellow-brown; rachilla narrowly winged . . . . . ***C. hermaphroditus***
2b. Style 2-branched; achenes biconvex with an edge against the rachilla; spikelet scales dark red or dark reddish-brown; rachilla not winged . . . . . ***C. niger***

Cyperus hermaphroditus (Jacq.) Standl., Contr. U.S. Natl. Herb. 18(3): 88. 1916; Tucker, in Berry et al., Fl. Venez. Guayana 4: 530. 1998. *Carex hermaphrodita* Jacq., Collectanea 4: 174. 1790 [1791]. *Mariscus hermaphroditus* (Jacq.) Urb., Symb. Antill. 2(2): 165. 1900.

Rhizomatous, glabrous perennial, 15–90 cm tall; rhizomes short, horizontal, bearing culms singly or sometimes 2 or 3 together. Culms erect, often tuberous-thickened at base, triquetrous, stiff and hardened, 1–3 mm wide, smooth, green. Leaves 3–10, primarily basal, 15–80 cm long; sheaths eligulate, light reddish-brown or purple tinged, inner band membranous, concave at orifice; blades linear, 2–11 mm wide, V-shaped to subflattened, attenuate apically, generally shorter than the culm. Inflorescence a simple or sometimes partially compound umbellike corymb with ascending rays, 3–14 × 5–10 cm; involucral bracts leaflike, 3–8, lowermost 2–4 elongate, spreading, overtopping the inflorescence; rays 3–12, unequal, to 12 cm long, each bearing 1(–3) spikes at tips; spikes loosely to subdensely oblong-cylindric, 1–4.5 × 0.7–2.2 cm, obtuse apically; spikelets linear to narrowly ellipsoid, 4–9 × 1–1.2 mm, quadrate or subterete, divaricately spreading, lowermost spikelets on spike often reflexed, narrowly acute apically, cuneate at base, with 3–8 scales; rachilla deciduous, narrowly winged; scales only slightly overlapping the base of the ones above, strongly ascending to appressed, ovate-elliptic, 2.5–3.3 × 1.2–2 mm, submembranous, pale greenish to golden- or reddish-brown, slenderly 3–4-nerved on sides, with narrow scarious margins, midcosta green, 3-nerved, ending just below the obtuse apex or prolonged as a short mucro. Stamens 3; anthers 0.5–1 mm long. Style 3-branched. Achenes trigonous with flat or slightly concave faces, oblong-ellipsoid to oblong-obovoid, 1.2–1.9 × 0.6–0.9 mm, slightly apiculate, estipitate, puncticulate, light brown or reddish-brown at maturity.



MAP 66. *Cyperus hermaphroditus* occurrence in Venezuela.

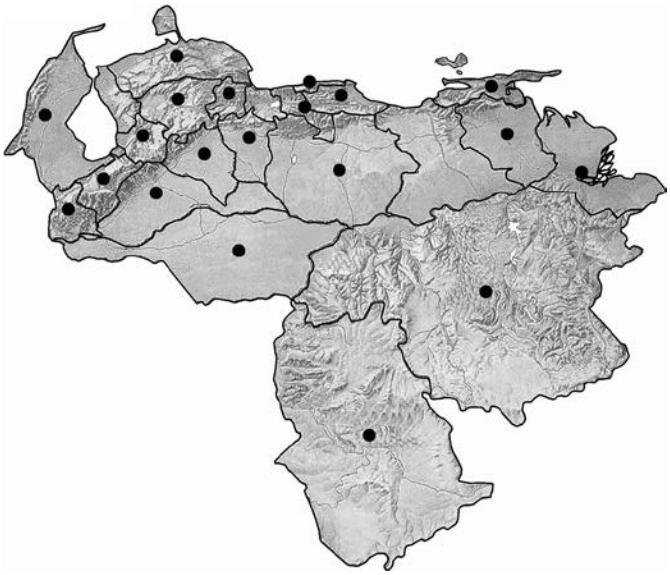
Found in North America (USA), Mexico, Central America, the West Indies, and South America (Colombia, Venezuela, Ecuador, Peru, Bolivia, Brazil, Paraguay, and Argentina). Widely distributed in Venezuela (Anzoátegui, Apure, Aragua, Bolívar, Distrito Federal, Falcón, Guárico, Lara, Mérida, Miranda, Monagas, Táchira, Trujillo, and Zulia; Map 66). Evidently recently adventive in the park, where it has been collected in wet, disturbed areas on the north slope along the Boconó–Guaramacal road and on the south slope near El Campamento below Cerro El Diablo; ~1,800–2,000 m.

Cyperus hortensis (Salzm. ex Steud.) Dorr, **comb. nov.** *Kyllinga hortensis* Salzm. ex Steud., Syn. Pl. Glumac. 2: 68. 1854.

Kyllinga pumila Michx., Fl. Bor.-Amer. 1: 28. 1803; Tucker, in Berry et al., Fl. Venez. Guayana 4: 590. 1998; Dorr et al., Contr. U.S. Natl. Herb. 40: 45. 2000 [2001]; non *Cyperus pumilus* L., Cent. Pl. II. 6. 1756. *Cyperus densicaespitosus* Mattf. & Kük., in Engler, Pflanzenr. IV, 20 (Heft 101): 597. 1936, nom. nov.

Kyllinga viridiflora Steud., Nomencl., 2nd ed., 1: 852. 1840, nom. nud.

Densely tufted annual or short-lived perennial, 7–40(–65) cm tall. Culms firm but flexuous, triquetrous distally, often trigonous near base, 0.7–1.3 mm wide. Leaves 3–5, basal ones often bladeless; sheaths elongate, basal ones pink tinged or reddish with dark red veins; blades 4–20(–30) cm × 1.5–3(–3.8) mm, flattened to V-shaped. Involucral bracts 3–5, leaflike, slightly ascending to horizontal, rarely the lowermost erect; spikes 1–3, globose-ovoid to cylindric, terminal one 5–8(–10) × 4–8 mm, lateral secondary spikes smaller; spikelets 50–150, lanceolate to oblong-lanceolate, (1.9–)2.3–3(–3.8) × 0.7–1.1 mm; fertile scales ovate, 1.8–3.1(–3.4) × 1–1.7 mm, pale brownish to hyaline, laterally 2–4-nerved, keel green, unwinged, with 3–10 antrorsely spinulose-scabrous barbs, up to 0.2 mm long, rarely smooth, prolonged apically as a short mucro. Stamens 2; anthers 0.2–0.4 mm long. Achenes ellipsoid-obovoid to oblong-obovoid, 1–1.2 (–1.4) × 0.5–0.7 mm, subtruncate apically, cuneate to subrounded at base, light brown to yellow-brown.



MAP 67. *Cyperus hortensis* occurrence in Venezuela.

MAP 68. *Cyperus niger* occurrence in Venezuela.

A widespread species found in North America (USA), Mexico, Central America, the West Indies, South America (all country-level political units except Chile), and tropical Africa. It occurs throughout Venezuela (Amazonas, Apure, Aragua, Barinas, Bolívar, Cojedes, Delta Amacuro, Distrito Federal, Falcón, Guárico, Lara, Mérida, Miranda, Monagas, Portuguesa, Sucre, Táchira, Trujillo, Yaracuy, and Zulia; Map 67). Disturbed wet areas of montane forest on both slopes of Guaramacal; 1,900–2,100(–2,600) m.

This species has long been included in *Kyllinga*, which was traditionally circumscribed as including species with head-like inflorescences, deciduous spikelets, and laterally flattened gynoecia. Although the species of *Kyllinga* form a strongly supported monophyletic clade (Larridon et al., 2013, 2014), the clade is nested within a larger *Cyperus* clade composed of species with a C_4 photosynthetic pathway. Furthermore, the morphological characters that were thought to define *Kyllinga* are not unique; capitate inflorescences with reduced, deciduous spikelets are found in various lineages in the larger C_4 *Cyperus* clade, and laterally flattened gynoecia occur in both *Pycreus* and the monotypic *Queenslandiella* Domin. Therefore, there is little reason to support *Kyllinga*.

Cyperus pumilus L. prevents a combination in *Cyperus* based on *Kyllinga pumila,* and the earliest available epithet appears to be the one chosen here. *Kyllinga viridiflora* Roxb. ex Spreng. generally is considered to be a synonym, but references to its publication in a seed list are indirect and imprecise bibliographically, and the indirect references lack validating descriptions. If it can be established that *K. viridiflora* was validly published in a seed list, a combination based on its epithet would be the correct name for *K. pumila* in *Cyperus*.

Cyperus niger Ruiz & Pav., Fl. Peruv. 1: 47. 1798; Briceño, in Morillo et al., Bot. Ecol. Monocot. Páramos Venez. 2: 464, fig. 14. 2010. *Pycreus niger* (Ruiz & Pav.) Cufod., Bull. Jard. Bot. Belg. 40: 1443. 1970.

FIGURE 6

Rhizomatous perennial, 7–30 cm tall; rhizomes short, slender, ascending. Culms solitary or in small clumps of 2 or 3, sometimes decumbent and rooting at lower nodes, triquetrous, smooth, easily compressed. Leaves 3–6, primarily basal, 1–3 cauline, 3–12 cm long; sheaths eligulate, cauline elongate, green abaxially, inner band brown or reddish-brown; blades linear, 1.2–2.5 mm wide, flattened, attenuate apically, generally shorter than the culm. Inflorescence contracted and lobate-capitate or a small umbel-like corymb with ascending rays, 0.6–3.5 cm in diameter, with (1–)3–20 spikelets; involucral bracts leaflike, generally 3, lowermost elongate, ascending to divergent, overtopping the inflorescence; rays 1–4 or absent, when present, short, bearing small clusters of 1–3 spikelets at tips; spikelets ovate-lanceolate to oblong-lanceolate, 3.5–8.5 × 2–2.3 mm, laterally compressed, bluntly acute, 7–18-flowered; rachilla not winged; scales densely distichous, ovate to broadly so, 1.4–2 × 1.3–1.8 mm, dark red or dark reddish-brown, lustrous, smooth on sides, midcosta green, 3-nerved, not prolonged beyond the obtuse apex. Stamens 2; anthers 0.4–0.5 mm long. Style 2-branched. Achenes biconvex, elliptic to broadly elliptic-obovate, 1–1.2 × 0.7–0.8 mm, very finely and indistinctly transversely wrinkled, densely puncticulate, obtuse or rounded to broadly so apically, apiculate, short-cuneate at base, sublustrous, brown or blackish.

Found in North America (USA), Mexico, Central America, South America (Colombia, Venezuela, Ecuador, Peru, Bolivia, Brazil, Chile, and Argentina), and tropical Africa. In Venezuela,

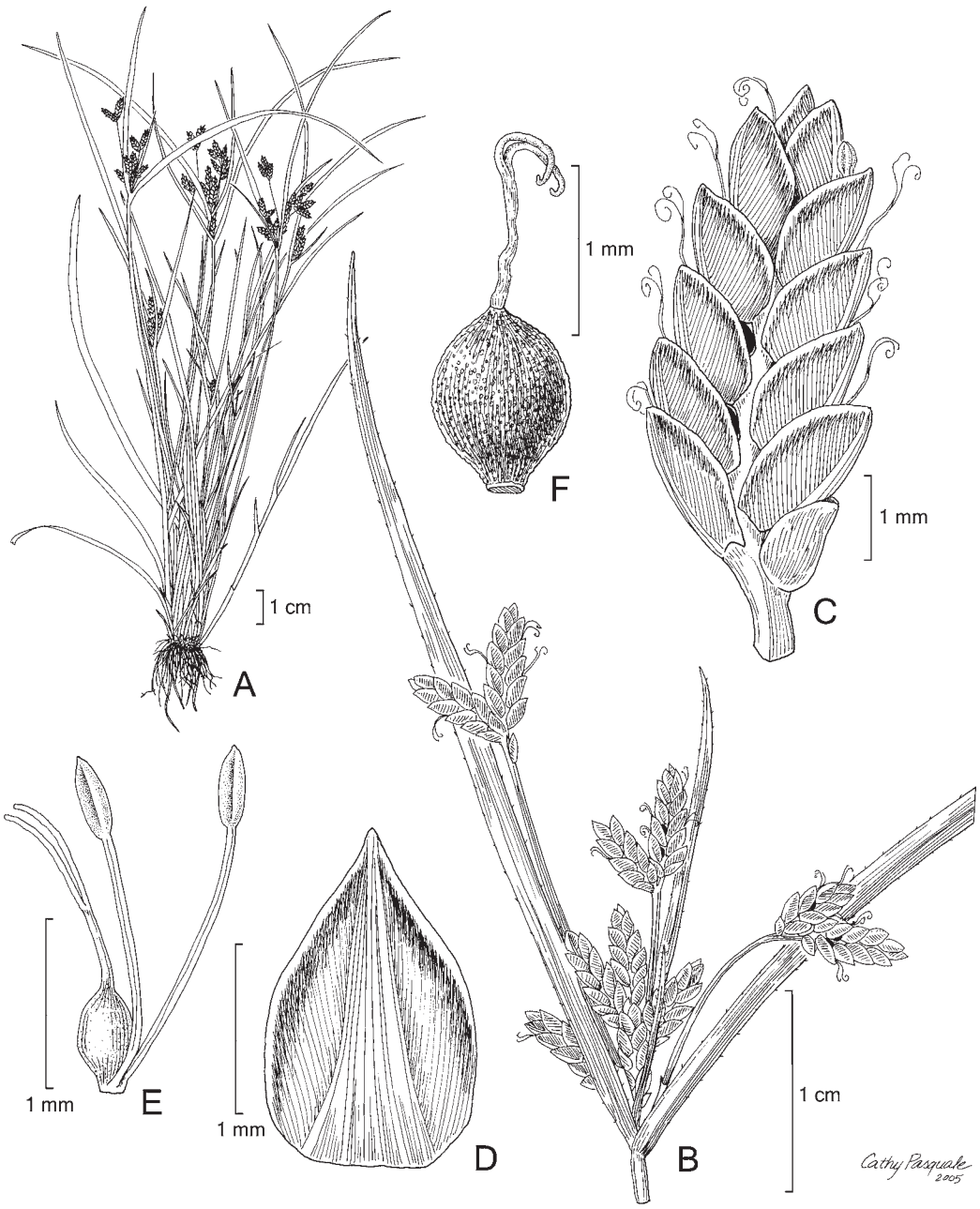


FIGURE 6. Cyperaceae, *Cyperus niger* Ruiz & Pav. **A.** Habit. **B.** Inflorescence. **C.** Spikelet (detail). **D.** Spikelet scale. **E.** Flower. **F.** Achene. (A–C, E, *Stergios et al. 20718*; D, F, *Stergios et al. 19321*.)

known only from the Andes (Barinas, Mérida, Táchira, and Trujillo; Map 68). In the park, found in disturbed areas near montane forest on both slopes of Guaramacal; 1,800–2,000 m.

This species is sometimes assigned to the segregate genus *Pycreus*, but as discussed by Larridon et al. (2013, 2014), *Pycreus* is not monophyletic, and the presence of laterally flattened gynoecia is not sufficient to maintain *Pycreus* as a genus distinct from *Cyperus* s.l.

Eleocharis R. Br.

Eleocharis R. Br., Prodr. 224. 1810.
Websteria S. H. Wright, Bull. Torrey Bot. Club 14: 135. 1887.
Chillania Roiv., Ann. Bot. Soc. Zool.-Bot. Fenn. "Vanamo" 4(7): 2. 1933.
Egleria L. T. Eiten, Phytologia 9: 481. 1964.

Perennial or occasionally annual herbs, rhizomatous, stoloniferous or tufted; culms usually cylindric, sometimes trigonous,

rarely quadrangular, hollow or solid, sometimes transversely septate, smooth, green, glabrous. Leaves reduced to bladeless sheaths; sheaths tubular, orifice truncate to obliquely truncate, dorsally carinate, carina often prolonged as a short apiculus, sometimes with a puckered, scarious appendage above the apex, glabrous. Inflorescence a single, terminal spikelet at the summit of the culm; spikelets ovoid to lanceoloid, rarely obovoid, obtuse to acute, several- to many-flowered, with spirally imbricate or sometimes subdistichous scales, lowermost 1 or 2 sterile; scales oblong, oblong-ovate to lanceolate or obovate, sometimes subrounded, firm or membranous, usually with hyaline margins, carinate or sometimes indistinctly so, nerved or nerveless on sides, glabrous. Flowers bisexual; perianth bristles present or rarely absent, (3–)6(–12), retrorsely barbed, rarely smooth; stamens (2–)3; anthers elliptic to linear. Styles capillary, 2- or 3-branched, with expanded base. Achenes trigonous or biconvex, obovate or elliptic, smooth, cancellate or cellular-reticulate; style base expanded, triangular or conical, sometimes spongy-thickened, persistent at the apex of the achene.

A cosmopolitan genus of ~250 species with one of its centers of diversity in tropical America. The genus is found in all country-level political units in the Americas except Greenland; ~40 species occur in Venezuela.

References. Hinchliff et al. (2010); Roalson and Friar (2000); Roalson et al. (2010); Svenson (1929, 1939).

KEY TO THE SPECIES OF *ELEOCHARIS*

1a. Achenes terete or essentially so, surface with prominent longitudinal ridges separated by numerous slender trabeculae (cross ridges); style base linear-lanceolate, often falcate . . . . . ***E. stenocarpa***

1b. Achenes biconvex (2-sided), surface without prominent longitudinal ridges, smooth to finely cancellate or pitted-reticulate; style base conic or deltate to depressed-deltate 2

2a. Culms lacking septate partitions; orifice of the leaf sheath with a conspicuous, often wrinkled or puckered, scarious appendage; style base conic . . . . . ***E. flavescens***

2b. Culms with septate partitions (sometimes indistinct); orifice of the leaf sheath entire, lacking a scarious appendage, oblique or truncate, with a dark brown rim; style base deltate to depressed-deltate . . . . . ***E. montana***

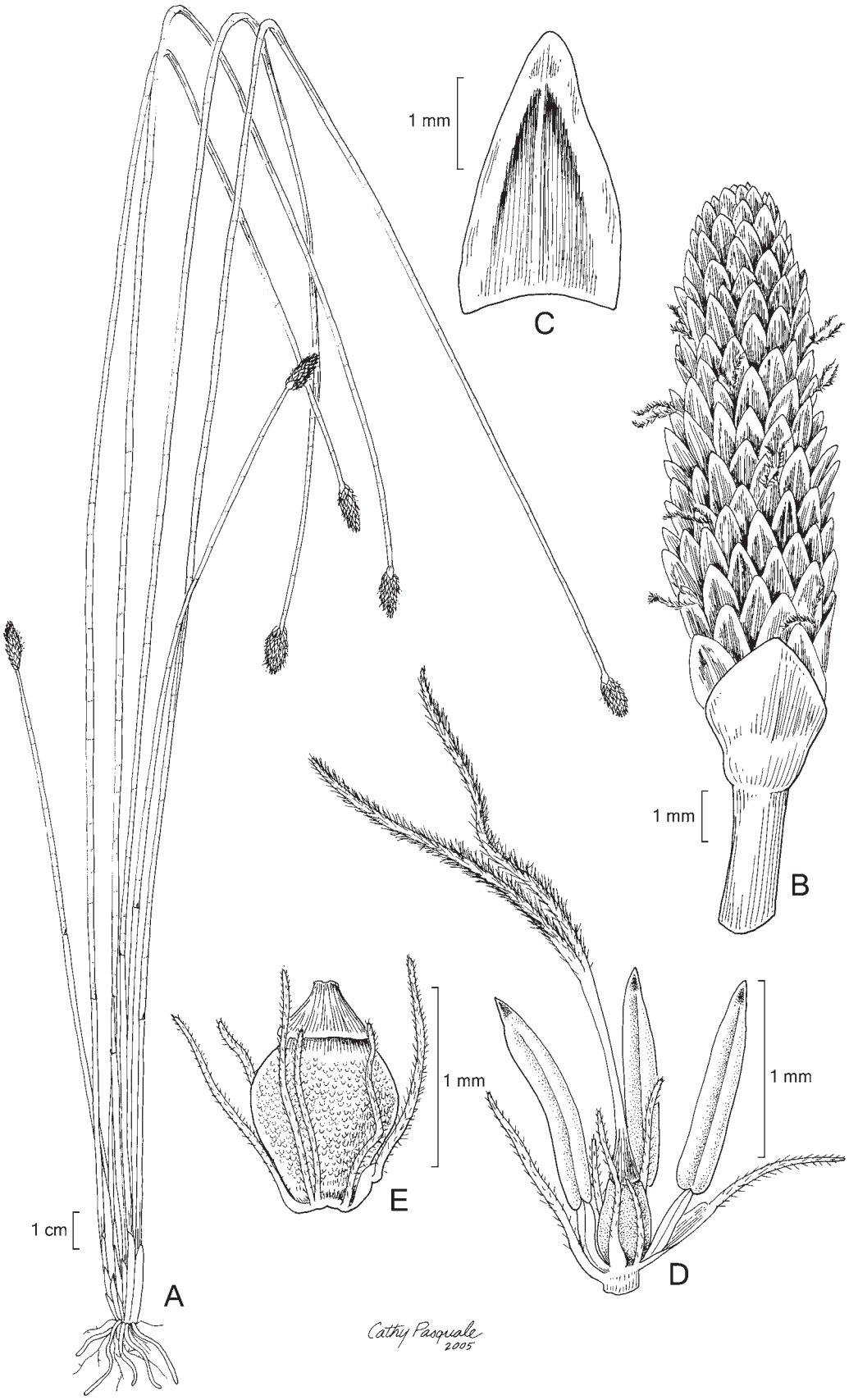
Eleocharis flavescens (Poir.) Urb., Symb. Antill. 4(1): 116. 1903 ("*Heleocharis*"); González-Elizondo and Reznicek, in Berry et al., Fl. Venez. Guayana 4: 554. 1998. *Scirpus flavescens* Poir., in Lamarck, Encycl. 6(2): 756. 1805.

Stoloniferous perennial, (1–)4–40(–50) cm tall; rhizomes horizontal to ascending, 0.6–1.2 mm thick. Culms caespitose or spaced singly along the rhizome, erect to ascending, subcompressed, 0.4–1 mm wide, prominently ribbed. Sheaths subloose, coarsely veined, membranous, green, red tinged near base, with a prolonged, inflated, puckered, scarious appendage above the apex, apex short-mucronate dorsally. Spikelets ovoid to ovoid-ellipsoid, 3–7 × 1.5–3 mm, subacute, with many spirally imbricate florets; fertile scales naviculiform, elliptic to narrowly elliptic, 1.2–2.1 × 0.8–1.1 mm, broadly obtuse dorsally, pale green to stramineous, midcostal region green, narrow, 3–5-nerved, subthickened at tip, ending short of the obtuse to subacute apex. Stamens 3; anthers 0.7–1 mm long. Styles 2-branched. Achenes biconvex, obovate, 0.8–1 mm long (including style base), 0.6–0.7 mm wide, smooth to finely cancellate, lustrous, olive-brown to dark reddish-brown; style base conic, 0.2–0.3 × 0.2 mm at base, light brown; bristles 6–8, rarely absent, whitish to tawny, retrorsely barbed, equaling or exceeding the style base.

MAP 69. *Eleocharis flavescens* occurrence in Venezuela.

Found in North America (USA), Mexico, Central America, the West Indies, and South America (Colombia, Venezuela, Trinidad and Tobago, the Guianas, Bolivia, Brazil, Chile, Paraguay, Argentina, and Uruguay). In Venezuela, found in the Andes (Lara, Mérida, Portuguesa, Táchira, and Trujillo), the Cordillera de la Costa (Anzoátegui, Aragua, Distrito Federal, Falcón, Guárico, Miranda, and Sucre), and the Venezuelan Guayana (Amazonas, Bolívar, and Delta Amacuro; Map 69). In the park, found in wet areas near montane forest on the south slope of Guaramacal; (1,300–)1,800–2,000 m.

Eleocharis montana (Kunth) Roem. & Schult., Syst. Veg. 2: 153. 1817; González-Elizondo and Reznicek, in Berry et al., Fl.


1 mm
C
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D
1 cm
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Cathy Pasquale
2005

FIGURE 7. (*Facing page*) Cyperaceae, *Eleocharis montana* (Kunth) Roem. & Schult. **A.** Habit. **B.** Inflorescence (detail). **C.** Spikelet scale. **D.** Flower. **E.** Achene. (A, E, *Stergios & Caracas 19308*; B–D, *Stergios & Caracas 18989*.)

Venez. Guayana 4: 557. 1998. *Scirpus montanus* Kunth, in H. B. K., Nov. Gen. Sp. [fol.] 1: 182. 1815 [1816]; ibid. [qu.] 1: 226. 1815 [1816].

FIGURE 7

Rhizomatous perennial, (20–)30–80(–120) cm tall; rhizomes decumbent, stout, 4–8 mm thick. Culms erect, cylindric, striate, conspicuously transversely septate or sometimes inconspicuously so, 1–2.5 mm wide. Sheaths elongate, finely striate, purplish-red proximally, stramineous or purple tinged distally, red-dotted, orifice truncate with blackish maculate horizontal band and a toothlike mucro dorsally. Spikelets ovoid-lanceoloid to oblong-lanceoloid, 7–15(–24) × 2–4 mm, acuminate or rarely obtuse, many-flowered, florets spirally imbricate; fertile scales ovate-lanceolate, (1.5–)2–2.5 × 0.8–1.7 mm, light brown, often dark brown medially, reddish-lineolate, margins broadly scarious, midcosta slender, 1-nerved, indistinct, ending short of the obtuse or rounded, slightly dilated apex; sterile basal scale 1, subrounded, herbaceous, margins broadly scarious. Stamens 3; anthers 0.8–1 mm long. Styles 2- or 3-branched. Achenes biconvex, obovate to broadly obovate, 0.9–1.1 × 0.6–1 mm, distinctly and finely pitted-reticulate, yellow to brown or olivaceous; style base flattened, deltate to depressed-deltate, 0.3–0.4 × 0.4–0.7 mm at base, shallowly articulated with apex of achene body; bristles 4–6, unequal, minutely retrorsely spinulose or somewhat smooth, equaling or slightly longer than achene body, ferrugineous or brownish.

Found in North America (USA), Mexico, Central America, the West Indies, and South America (Colombia, Venezuela, Ecuador, Peru, Bolivia, Brazil, Chile, Paraguay, Argentina, and Uruguay). Venezuelan collections are from the Andes (Barinas, Lara, Mérida, Portuguesa, Táchira, and Trujillo), the Cordillera de la Costa (Anzoátegui, Aragua, Carabobo, Distrito Federal, Falcón, Miranda, and Yaracuy), and the Venezuelan Guayana (Bolívar; Map 70). In the park, found in wet areas on both slopes of Guaramacal; 1,700–2,800 m.

Eleocharis stenocarpa Svenson, Rhodora 31: 205, fig. 35. 1929; Briceño, in Morillo et al., Bot. Ecol. Monocot. Páramos Venez. 2: 467. 2010.

Rhizomatous perennial, 6–50 cm tall; rhizomes horizontally creeping, scaly, 1–2 mm thick. Culms borne in small clumps along rhizome, erect to ascending, subrigid, finely ribbed and channeled, green; sheaths elongate, green distally, dark brown or purple-brown basally, remotely transversely septate, membranous distally, oblique at orifice, dorsally oblong-acuminate with a slender green midcosta ending short of the narrowly obtuse to acute apex. Spikelets narrowly ovoid-ellipsoid, 5–9 × 1.4–2.3 mm, acute, 4–16-flowered, florets spirally imbricate, scales spreading to divergent with developing achenes; scales narrowly ovate-lanceolate to lanceolate or oblong-lanceolate, acuminate, 3–4.5 × 0.9–1.5 mm, subscarious and translucent on sides, midcostal region green, 3–5-nerved, ending short of the blunt apex. Stamens 3; anthers 0.8–1.2 mm long.

MAP 70. *Eleocharis montana* occurrence in Venezuela.

MAP 71. *Eleocharis stenocarpa* occurrence in Venezuela.

Styles 3-branched. Achenes narrowly obovoid, 1.4–1.8 × 0.5–0.7 mm, longitudinally costate, very finely and closely trabeculate; style base linear-lanceolate, often falcate, often subabruptly expanded at base, 0.7–1.2 × 0.2–0.3 mm at base; bristles 2–4, coarse, whitish, retrorsely barbed, overtopping the achene.

Found in South America (Colombia, Venezuela, Ecuador, Bolivia, and Brazil). Venezuelan material is from the Andes (Mérida, Táchira, and Trujillo; Map 71). In the park, found in wet open areas in montane forest and páramo on both slopes of Guaramacal and in the Páramo de Guaramacal; 1,600–3,100 m.

COMMON NAME. Junco.

USE. This species is used to treat kidney and liver ailments (R. Caracas, pers. comm.).

Fimbristylis Vahl

Fimbristylis Vahl, Enum. Pl. 2: 285. 1806, nom. cons.

Perennial or annual herbs, rhizomatous or tufted with fibrous roots. Culms cylindric or subcompressed to flattened, finely to coarsely ribbed, smooth, glabrous. Leaves basal; sheaths glabrous or pubescent, ventrally splitting with age, apex entire; ligule absent or present; blades flattened or inrolled, sometimes folded, narrowly linear to filiform, glabrous or pubescent, margins smooth or scabrous. Inflorescence an open, simple or compound anthela with ascending rays or sometimes a head-like cluster with congested spikelets; involucral bracts leaflike, usually smaller than the leaves, rarely overtopping the inflorescence; primary and secondary rays (when present) unequal, cylindric to subflattened, smooth or scabrous; spikelets many-flowered, ovoid, oblong-ovoid, subglobose or lanceoloid, borne singly at ray tips or sometimes clustered; scales spirally imbricate, occasionally somewhat distichous, all fertile except for the lowermost one, ovate to oblong-ovate, obtuse to acute, glabrous or pubescent, 1–5-nerved on sides, dorsally with an often 3-nerved midcosta, nerves converging apically and forming a mucro. Flowers bisexual; hypogynous squamellae or bristles absent. Stamens 1–3; anthers oblong or linear, sometimes apiculate. Styles 2- or 3-branched, unbranched portion flattened and fimbriate on margins (2-branched style) or slender, 3-angled basally, and glabrous (3-branched style), disarticulating from the summit of the achene. Achenes biconvex, lenticular or trigonous, obovate, elliptic-obovate or oblong, smooth, cancellate, reticulate, verrucose or warty.

A genus of ~300 species found in warm temperate and tropical climates worldwide, with the center of species diversity in southeastern Asia; ~15 species found in Venezuela.

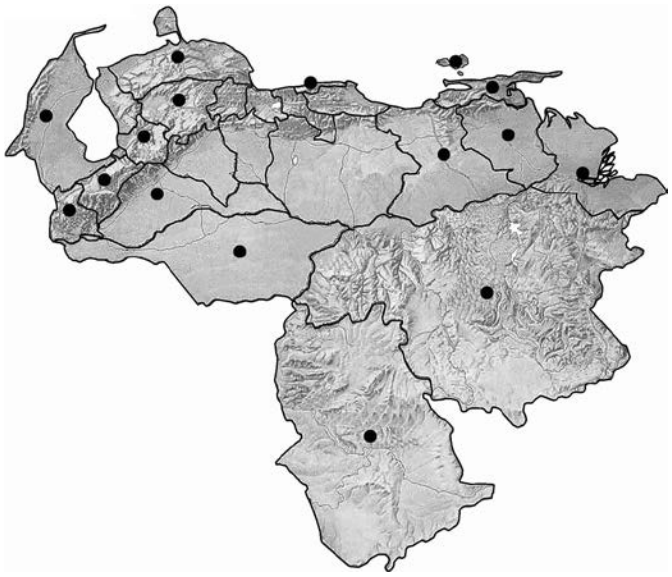
REFERENCE. Kral (1971).

Fimbristylis complanata (Retz.) Link, Hort. Berol. 1: 292. 1827; Kral, in Berry et al., Fl. Venez. Guayana 4: 572, fig. 453. 1998. *Scirpus complanatus* Retz., Observ. Bot. 5: 14. 1791 [1789]. *Fimbristylis autumnalis* var. *complanata* (Retz.) Kük., Bot. Jahrb. Syst. 59: 50. 1924.

FIGURE 8

Caespitose or rhizomatous perennial, 20–60(–100) cm tall; rhizomes short, ascending. Culms erect, compressed-trigonous proximally, flattened distally, firm, flexuous, sometimes twisted, antrorsely scabrid on margins (at least distally), 0.7–2 mm wide. Leaves numerous, subdistichous, ascending to spreading; sheaths short, uppermost dorsally keeled, brown to stramineous; ligule a horizontal band of dense hairs, 0.3–0.5 mm wide; blades linear, flattened, 5–70 cm × (1–)1.3–4 mm, adaxially antrorsely scabrous at base, smooth otherwise, margins finely and closely scabrous, abruptly narrowed to a flattened, slightly curved, acute tip. Inflorescence a terminal, compound, open or contracted anthela with ascending rays, 1.5–9 cm in diameter; involucral bracts 4–6, lowermost one leaflike, often exceeding the inflorescence, uppermost linear-setaceous; primary rays 4–12, unequal; spikelets 15–100 or more, ovoid-lanceoloid to lanceoloid, 4–7(–9) × 1–1.5(–2) mm, acute, obtuse at base, solitary at ray tips; scales ovate to ovate-lanceolate, 1.4–2.5 × 1–1.5 mm, dorsally acute, brown, reddish-lineolate, midcosta 3-nerved, green, prolonged beyond the acute apex as a short, slightly excurved mucro. Stamens 2 or 3; anthers 0.7–1 mm long, apiculate. Styles 3-branched, unbranched portion smooth, trigonous-dilated at base. Achenes trigonous with shallowly convex faces, obovoid, 0.7–1 × 0.5–0.7 mm, apiculate, obtuse at base, tricostate, finely striolate-reticulate, tuberculate to nearly smooth, chalk-white when immature, gray-white or pale brown at maturity.

An often weedy species found in tropical and subtropical regions worldwide. In the Americas, known from Mexico, Central America, the West Indies, and South America (Colombia, Venezuela, the Guianas, Ecuador, Peru, Bolivia, Brazil, Paraguay, Argentina, and Uruguay). Widespread in Venezuela (Amazonas, Anzoátegui, Apure, Barinas, Bolívar, Delta Amacuro, Distrito Federal, Falcón, Lara, Mérida, Monagas, Nueva Esparta, Sucre, Táchira, Trujillo, and Zulia; Map 72). In the park, known from wet areas in montane forest on the south slope of Guaramacal; 1,800–2,000 m.



MAP 72. *Fimbristylis complanata* occurrence in Venezuela.

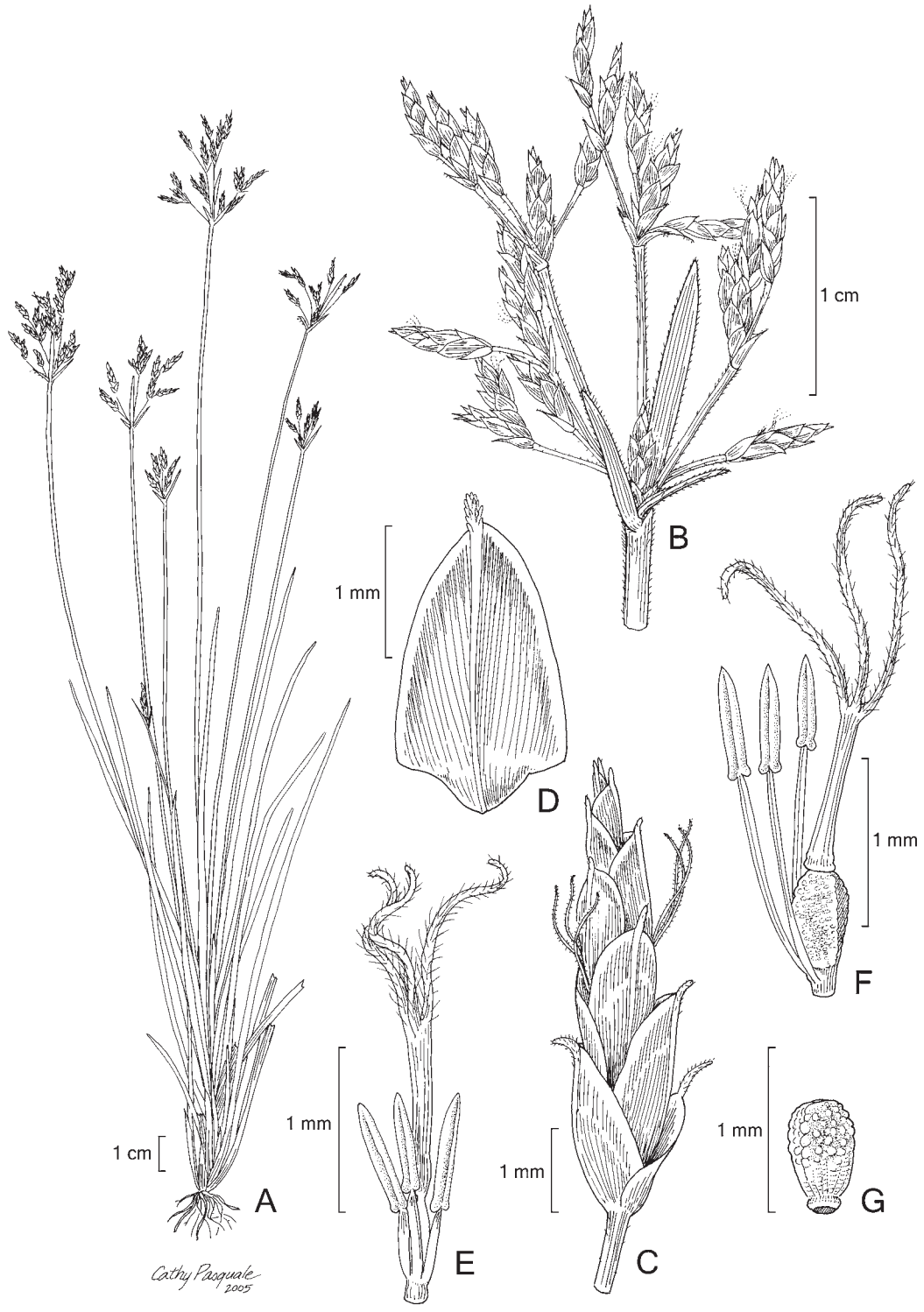


FIGURE 8. Cyperaceae, *Fimbristylis complanata* (Retz.) Link. **A.** Habit. **B.** Inflorescence. **C.** Spikelet. **D.** Spikelet scale. **E.** Flower. **F.** Mature flower with developing achene. **G.** Achene. (A–G, *Stergios et al. 20715*).

Oreobolus R. Br.

Oreobolus R. Br., Prodr. 235. 1810.
Schoenoides Seberg, Willdenowia 16: 181. 1986.

Perennial herbs, cushion- or mat-forming; rhizomes ascending to erect. Culms short, firm and rigid, obtusely angled or crescentform in cross section. Leaves primarily basal, distichous or indistinctly so, equitant; sheaths eligulate, open, strongly dilated, pale brown to purplish-brown, chartaceous; pseudopetioles linear-oblong, ± canaliculate adaxially; blades short, linear or trigonous, stiff and somewhat cartilaginous. Inflorescence terminal, racemose with several lateral spikelets or reduced to a single spikelet, short, generally hidden among the leaves and involucral bracts; involucral bracts leaflike; spikelets with 3 or 4 obscurely distichous scales, 1-flowered, terminal scale fertile, those below empty; scales deciduous from the rachilla, subcartilaginous, innermost one submembranous. Flowers bisexual, with 2 alternating whorls of scalelike tepals at base that are often persistent, rarely with bristles. Stamens 3. Styles 3-branched. Achenes obtusely trigonous, obovoid, ellipsoid or pyriform, surface smooth, glossy.

Found in Central America, South America (Colombia, Venezuela, Ecuador, Peru, Bolivia, Chile, including the Juan Fernandez Islands, and Argentina), the Falkland Islands, Malesia to southeastern Australia, Tasmania, New Zealand, Tahiti, and Hawaii; ~16 species, 3 of which are found in Venezuela.

References. Chacón et al. (2006); Seberg (1988).

Oreobolus is confined to high elevations in the tropics, and its disjunct distribution reflects a Gondwanian origin (Chacón et al., 2006).

Oreobolus venezuelensis Steyerm., Bol. Soc. Venez. Ci. Nat. 11: 308, fig. 1. 1950.

FIGURE 9

Densely caespitose, 5–16 cm tall, often elevated on a simple or branching, slender woody caudex surrounded by fibrous roots and shrouded by old leaf sheath bases. Culms often hidden among the leaves, crescentform, scabrous on margins apically, often spirally twisted, glossy green, subtended by a large 2-keeled prophyll at uppermost node. Leaves spirodistichous; sheaths 5–7-veined, reddish-brown; pseudopetiole 11–18 mm long; blades linear, crescentform, 20–46 × 0.8–1.4 mm, with (1–)2(–3) inconspicuous veins abaxially, often 2-veined medially adaxially, acute apically. Inflorescence a small racemose panicle of 2–5 spikelets from the upper leaflike bracts or sometimes reduced to a single spikelet; spikelets 3–6 × 1.1–1.5 mm; scales ovate-lanceolate, 3–5 × 1–1.5 mm, green-glaucescent, redlineolate, often tinged with purple, midcosta of the lowermost 1 or 2 scales with prolonged foliar-like awns 3–14 mm long, innermost scale 2.7–3.5 × 0.9–1.4 mm, midcosta not prolonged beyond the acuminate apex or only shortly so as a sharp tip; tepals narrowly deltate, ovate or oblong-ovate, 0.9–1.3 × 0.3–0.4 mm, ochroleucous. Anthers 1–2 mm long. Achenes obpyriform, 1.2–1.7 × 0.9–1.1(–1.3) mm, 3-sulcate and longitudinally wrinkled, truncate apically and bearing the blackened nub of the base of the style centrally, smooth, brown to reddish-brown, pale basally.

MAP 73. *Oreobolus venezuelensis* occurrence in Venezuela.

Found in Central America (Costa Rica and Panama) and South America (Colombia, Venezuela, Ecuador, Peru, and Bolivia). In Venezuela, found only in the Andes (Táchira and Trujillo; Map 73). Páramo de Guaramacal; 2,950 m.

Rhynchospora Vahl

Rhynchospora Vahl, Enum. Pl. 2: 229. 1805, nom. cons.

Perennial or sometimes annual herbs, vegetatively diverse; roots fibrous. Culms caespitose or borne singly, trigonous or obscurely so, occasionally cylindric, shallowly to deeply channeled along 1 side or margins (at least distally) with channel edges often antrorsely scabrous, essentially smooth, sometimes scabrous distally, glabrous or sometimes hirsute. Leaves basal or basal and cauline, rarely strictly cauline; sheaths green, light brown or reddish-brown, sometimes whitened at base, inner band membranous on basal sheaths, often purple-dotted, splitting with age, often membranous only at orifice on cauline sheaths, orifice truncate or concave, sometimes U-shaped, rarely convex; ligule absent or sometimes present, often a narrow band of thickened tissue or trichomes at adaxial junction of sheath and leaf blade; blades flattened, V-shaped or folded, occasionally involute or crescentform-capillary, linear, filiform or sometimes capillary, herbaceous or occasionally stiff, glabrous, hirsute, or occasionally scabrous or scabridulous distally, rarely papillose or transversely rugulose, margins and abaxial midvein usually antrorsely scabrous, ciliate or with setose hairs. Inflorescence terminal or both terminal and with a series of lateral partial panicles

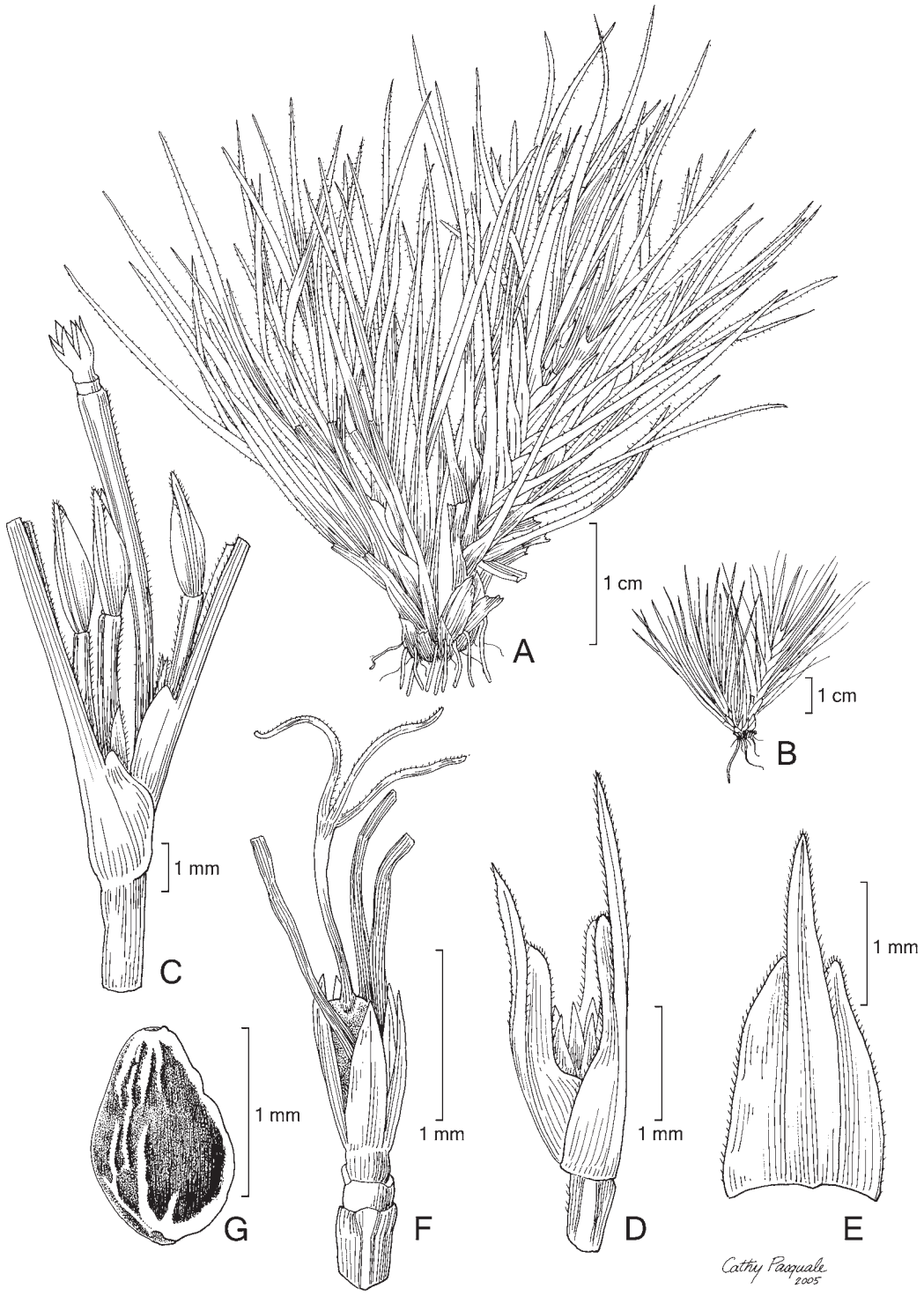


FIGURE 9. Cyperaceae, *Oreobolus venezuelensis* Steyerm. **A, B.** Habit. **C.** Inflorescence (detail). **D.** Spikelet. **E.** Spikelet scale. **F.** Flower. **G.** Achene. (A–G, *Niño et al. 1379*.)

from the upper leaflike bracts, paniculate, corymbose, racemose or congested and head-like; involucral bracts in capitate species sometimes whitened at base; branches cylindric, 3-angled, crescentform or subcompressed, finely ribbed, scabrous, ciliate or smooth on margins, spikelets solitary or in fascicles at branch tips; spikelets ovoid, ellipsoid, lanceoloid or fusiform, cylindric or subcompressed, primarily 1- to several-flowered, scales spreading with maturing achenes; scales spirally imbricate, ovate to lanceolate, shallowly to deeply cymbiform, often inrolled around flower, finely and indistinctly nerved on sides, with a single distinct or sometimes indistinct wirelike midcosta, light to dark brown, or castaneous or ferrugineous, sometimes whitish. Flowers bisexual above the (1–)2–5(–9) empty basal scales of spikelet, terminal often staminate with a rudimentary ovary or reduced and empty; bristles (1–)6(–20), rudimentary or absent, when present antrorsely or retrorsely barbed, sometimes smooth or plumose. Stamens 1–3(–12); anthers linear, narrowly elliptic or oblong, often with minute crystalline papillae or lobes at base. Styles subulate, 2-branched or undivided, often long-exserted beyond apex of subtending scale. Achenes biconvex to subcylindric, sometimes inrolled with winged or wavy margins, obovate, oblong-obovate or oblong-elliptic, deeply pitted, transversely rugulose or sometimes smooth, expanded, usually triangular, or sometimes discoid, style base persistent at summit.

A subcosmopolitan genus of 250–300 species with its greatest species diversity in the Americas, especially warm temperate North America and in the neotropics. In the Americas, the genus is found in North America, Mexico, Central America, the West Indies, and South America (all country-level political units except Chile). Approximately 110 species are found in Venezuela.

References. Kükenthal (1949); Thomas et al. (2009).

KEY TO THE SPECIES OF *RHYNCHOSPORA*

1a. Inflorescence a terminal globose head of spikelets without lateral branching; involucral bracts scalelike, indurate, imbricately arranged, and forming an involucre around spikelets; achenes antrorsely scabrous at apex; bristles plumose . . . . . ***R. globosa***

1b. Inflorescence a single spikelet or series of fascicles or panicles of spikelets, at least some branching evident; involucral bracts subtending each panicle or partial panicle 1(–2), leaflike, herbaceous; achenes smooth at apex; bristles antrorsely spinulose or wanting 2

2a. Spikelet scales light-colored, pale, stramineous or light brown on sides 3

3a. Leaf blades filiform, wiry, obtusely triangular-channeled or subcrescentform, 0.3–0.6 mm wide, often spirally twisted . . . . . ***R. gollmeri***

3b. Leaf blades flattened or plicate, 1.3–30 mm wide, not spirally twisted 4

4a. Leaves 5–7 in number, spaced at relatively long intervals, basal and cauline, usually all with well-developed blades; ligule or ligular line absent; blades 11–30 mm wide; spikelets 3–5(–5.5) mm long . . . . . ***R. locuples***

4b. Leaves >10 in number, spaced at relatively short intervals (at least at midculm), primarily cauline, basal leaves often with short blades or represented by sheaths only; sheaths ligulate with a thin band or line of tissue at adaxial junction of sheath and blade; blades 1.7–10.5 mm wide; spikelets 3.8–8 mm long 5

5a. Style base triangular, 0.4–1 mm long; achenes obovate or rounded-obovate, 0.8–1.2 × 0.6–0.8 mm, with 7–10 rows of horizontally oriented rectangular cells . . . . . ***R. polyphylla***

5b. Style base lanceolate, 1–2.3 mm long; achenes squarish-obovate, 1.1–1.6 × 0.8–1.2 mm, with 14–18 rows of horizontally oriented rectangular cells . . . . . ***R. tuerckheimii***

2b. Spikelet scales dark-colored, brown to dark brown or reddish-brown 6

6a. Achene surface transversely rugulose (wrinkled) with vertically oriented linear cells . . . . . ***R. rugosa***

6b. Achene surface cancellate or faintly so, with horizontally oriented rectangular cells in vertical rows 7

7a. Achene margins shallowly sulcate (channeled); sheaths and leaf blades often pilose . . . . . ***R. lechleri***

7b. Achene margins rounded; sheaths and leaf blades glabrous or at most with some appressed pubescence 8

8a. Basal and lower leaf blades on culm 9–23 mm wide 9

9a. Panicles open and very diffuse, terminal panicle 11–23 × 8–28 cm; scales light brown to brown; achenes with 15–19 vertical rows of horizontally oriented rectangular cells . . . . . ***R. immensa***

9b. Panicles dense, terminal panicle 3–13 × 3–8 cm; scales dark brown or reddish-brown; achenes with 11–16 vertical rows of horizontally oriented rectangular cells . . . . . ***R. ruiziana***

8b. Basal and lower leaf blades on culm 2–8 mm wide 10

10a. Leaves >10 in number, spaced at relatively short intervals (at least at midculm), primarily cauline, basal leaves often with short blades or represented by sheaths only; sheaths ligulate with a band or thin line of tissue at adaxial junction of sheath and blade . . . . . ***R. tuerckheimii***

10b. Leaves 6–11 in number, spaced at relatively long intervals, basal and cauline, usually all bearing well-developed blades; sheaths eligulate 11

11a. Inflorescence partial panicles open, diffusely branched, pyramidal . . . . . ***R.* sp. A**
11b. Inflorescence partial panicles contracted, densely branched, narrowly ovoid or trullate 12
12a. Spikelets 4–7 mm long; achenes obovate, 0.7–1.1 mm wide, obtuse to subtruncate at apex; style base sessile with achene apex, ends of base not upturned . . . . . ***R. macrochaeta***
12b. Spikelets 6.5–9 mm long; achenes shortly oblong-obovate, 1.1–1.3 mm wide, truncate at apex with often slightly upturned shoulders; style base articulate with achene body, flaring basally, ends slightly upturned . . . . . ***R. guaramacalensis***

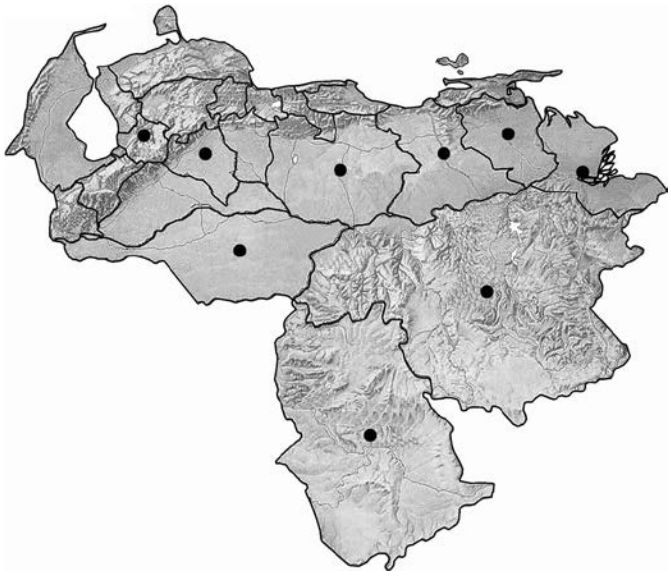
Rhynchospora globosa (Kunth) Roem. & Schult., Syst. Veg. 2: 89. 1817. *Chaetospora globosa* Kunth, in H. B. K., Nov. Gen. Sp. [fol.] 1: 185. 1815 [1816]; ibid. [qu.] 1: 230. 1815 [1816].

Our material is referred to the nominate variety of the species.

Rhynchospora globosa var. ***globosa***

Rhizomatous perennial, 30–115 cm tall; rhizomes short; culms solitary or borne tightly together in a row along rhizome or sometimes caespitose; roots coarse, 1–3 mm thick; sheathing base of culm 7–22 mm wide. Culms ascending, 0.7–2.3 mm wide, trigonous to obtusely trigonous, hardened, coarsely ribbed, green, glabrous, clavate at apex just below inflorescence head. Leaves 6–30 per culm, primarily basal, often 1–3 cauline just above base, stiffly erect to ascending, 8.5–70 cm long; sheaths eligulate, short, stiff, coriaceous, indistinctly finely veined with indistinct cross partitions between veins, shiny, subsmooth and coriaceous abaxially, smooth with soft and spongy epidermis that is often cross-puckered adaxially, brown to brown-black or black, glabrous, inner band membranous, deeply U-shaped on upper sheaths, concave to truncate on lower sheaths; blades linear, 1–4 mm wide (flattened), with indistinct cross partitions between veins, V-shaped in cross section, subtrigonous distally, stiff, smooth, indistinctly finely veined, green, glabrous, margins remotely scabrous to smooth on older well-developed leaves, antrorsely scabrous to ciliate-scabrous on young leaves, ciliate-scabrous near base on cauline leaves. Inflorescence a single hemispherical to subglobose congested head of spikelets at summit of culm, 9–20 × 8.5–22 mm; involucral bracts 5–9 (immediately surrounding spikelets, often more interspersed among spikelets), scalelike, 6–8 × 2.8–6.5 mm, indurate, stiff and cartilaginous, broadly ovate to broadly rectangular or broadly obovate, apex obtuse to truncate or emarginate, light brown to yellow-brown, ciliate to glabrate along margins, lowest often leaflike with a blade 0.7–20 cm long, exceeding the spikelets; spikelets numerous, ovate-lanceolate to narrowly elliptic-lanceolate, often curvate, acuminate at apex, short-cuneate basally, 7–9 × 1.2–2 mm, densely aggregated; scales 7–12 per spikelet, herbaceous to thickened and subcartilaginous, acute to narrowly obtuse in cross section, indistinctly very finely veined, uniformly light brown to brown or whitish stramineous, glabrous, margins scarious, acute to obtusely or acutely rounded at apex on lower fertile and sterile scales, acuminate at apex on upper fertile scales, midcosta pale green, indistinct, prolonged beyond apex as a short mucro on proximal scales, glabrous to ciliate-scabrous distally; fertile scales 4–6, ovate-elliptic to ovate-lanceolate, upper fertile scales narrowly ovate-lanceolate, (4.9–)5–8 × 1.5–4 mm; sterile scales 3–6 (excluding 2-keeled prophyll at base), ovate-lanceolate to ovate-elliptic, 2–4.5 × 0.8–3.4 mm. Stamens 2 or 3; anthers 2.3–3.5 mm long, long-apiculate at apex, truncate and papillate basally. Styles entire to shortly bifid at tip, reddish. Achenes biconvex to subplano-convex, oblong-obovate to narrowly oblong-obovate or obovate, (2–)2.1–2.8(–3) × 1.1–1.5 mm, minutely indistinctly cellular-reticulate (appearing smooth), light brown, cuneate to base, obtuse to subtruncate at apex, margins and sides at apex often with crystalline prickles; epidermal cells isodiametric to somewhat vertically elongated, no central nodules evident; style base triangular with 2 rounded basal lobes that overlap on either side of achene body, 0.6–1 × 0.5–0.7 mm basally, pale brown, apex truncate with 2 teeth on each margin, sometimes with 2 medial smaller teeth as well; bristles 5–6, 3–5 mm long, equaling to overtopping style base (longer than achene body), plumose, with ascending hairs, reddish, apex antrorsely barbed.

Found in Mexico, Central America, the Greater Antilles (Cuba), and South America (Colombia, Venezuela, Trinidad and Tobago, the Guianas, Peru, Bolivia, Brazil, Paraguay, Argentina, and Uruguay). In Venezuela, found in Amazonas, Anzoátegui,



MAP 74. *Rhynchospora globosa* var. *globosa* occurrence in Venezuela.

Apure, Bolívar, Delta Amacuro, Guárico, Monagas, Portuguesa, and Trujillo (Map 74). In the park, collected on the south slope in an abandoned field near El Campamento below Cerro El Diablo; 1,800–2,000 m.

Rhynchospora gollmeri Boeckeler, Linnaea 37: 556. 1873.

Caespitose, glabrous perennial, 6–50(–65) cm tall, with fibrous remnants of old leaf sheath bases clothing base; rhizomes short, ascending. Culms erect, wirelike, often spirally twisted, subterete or obtusely trigonous, 0.4–0.8 mm wide, pale green. Leaves primarily basal, 1 or 2 lower cauline, 4–30 cm long; sheaths eligulate, short, lowermost often bladeless, brown, inner band submembranous, truncate or slightly concave at orifice, minutely red-dotted or short-lineolate (at least distally); blades filiform, wiry, obtusely triangular-channeled or subcrescentform, 0.3–0.6 mm wide, often spirally twisted, abaxially finely veined, adaxially smooth, finely cellular-reticulate, green, margins (edges of channel) antrorsely scabrous, attenuate. Inflorescence a terminal corymb and 1 or 2 remote, lateral, small corymbs, each with (1–)2–8 short-pediceled spikelets, subtended by a leaflike, linear-setaceous involucral bract; spikelets ovoid-ellipsoid, 3.5–4.5 × 1.1–1.5 mm, narrowly acute to short-acuminate; fertile scales 4 or 5, ovate-elliptic to ovate-lanceolate, 2.5–4.2 × 1.4–2.3 mm, brown, blackish-lineolate, glabrous, margins narrowly scarious, mucronate at apex. Stamens 2 or 3; anthers 1.1–1.5 mm long. Styles 2-branched. Achenes biconvex, obovate or squarish-obovate, 1.5–2 × 1–1.2 mm, subtruncate and shallowly constricted with thickened edges at apex, short-cuneate basally, finely and shallowly transversely rugulose, brown to red-brown; style base deltate to deltate-lanceolate, 0.6–0.7 × 0.5–0.8 mm basally, finely scabrous on edges proximally, pale brown; bristles 5–6, very finely antrorsely barbed with short translucent hairs basally, shorter than to equaling apex of achene.

Found in South America (Venezuela and possibly Brazil). In Venezuela, found in Anzoátegui, Bolívar, Distrito Federal, Sucre, Táchira, and Trujillo (Map 75). In the park, known only from the area just below the Páramo de Guaramacal; 2,950 m.

Our collection differs from typical material in having short culms that are hidden among the leaves. However, characteristics of the leaves, inflorescence, flowers, and fruits do not otherwise significantly differ from typical material, and our collection probably represents only an ecological extreme of this species.

♦ ***Rhynchospora guaramacalensis*** M. T. Strong, Acta Bot. Venez. 29: 208, fig. 1. 2006; Briceño, in Morillo et al., Bot. Ecol. Monocot. Páramos Venez. 2: 471. 2010.

FIGURE 10

Rhizomatous perennial, 45–110 cm tall; rhizomes short, horizontal to ascending, woody. Culms triquetrous or shallowly so, with blunt angles, flexuous, green to dark green with pale ribs, smooth on angles. Leaves 3–7, basal and cauline, 16–70 cm long; sheaths eligulate, elongate, green or pale brown proximally, inner band membranous, reddish-brown, sparsely and finely appressed-pubescent to glabrous, orifice concave or subtruncate; blades narrowly linear, 2–4.5 mm wide, subplicate with obtuse or subrounded pleats, smooth on margins proximally, scabrous on abaxial midvein and margins distally, often sparsely setose adaxially on midvein, long-attenuate to triquetrous setiform tip. Inflorescence a terminal panicle and series of 2 or 3 lateral, remote, narrowly trullate, partial panicles from the upper leaflike bracts; terminal panicle 4–8 × 1–2 cm, lateral ones successively smaller toward the base, terminating elongate, very slender,

MAP 75. *Rhynchospora gollmeri* occurrence in Venezuela.

MAP 76. *Rhynchospora guaramacalensis* occurrence in Venezuela.

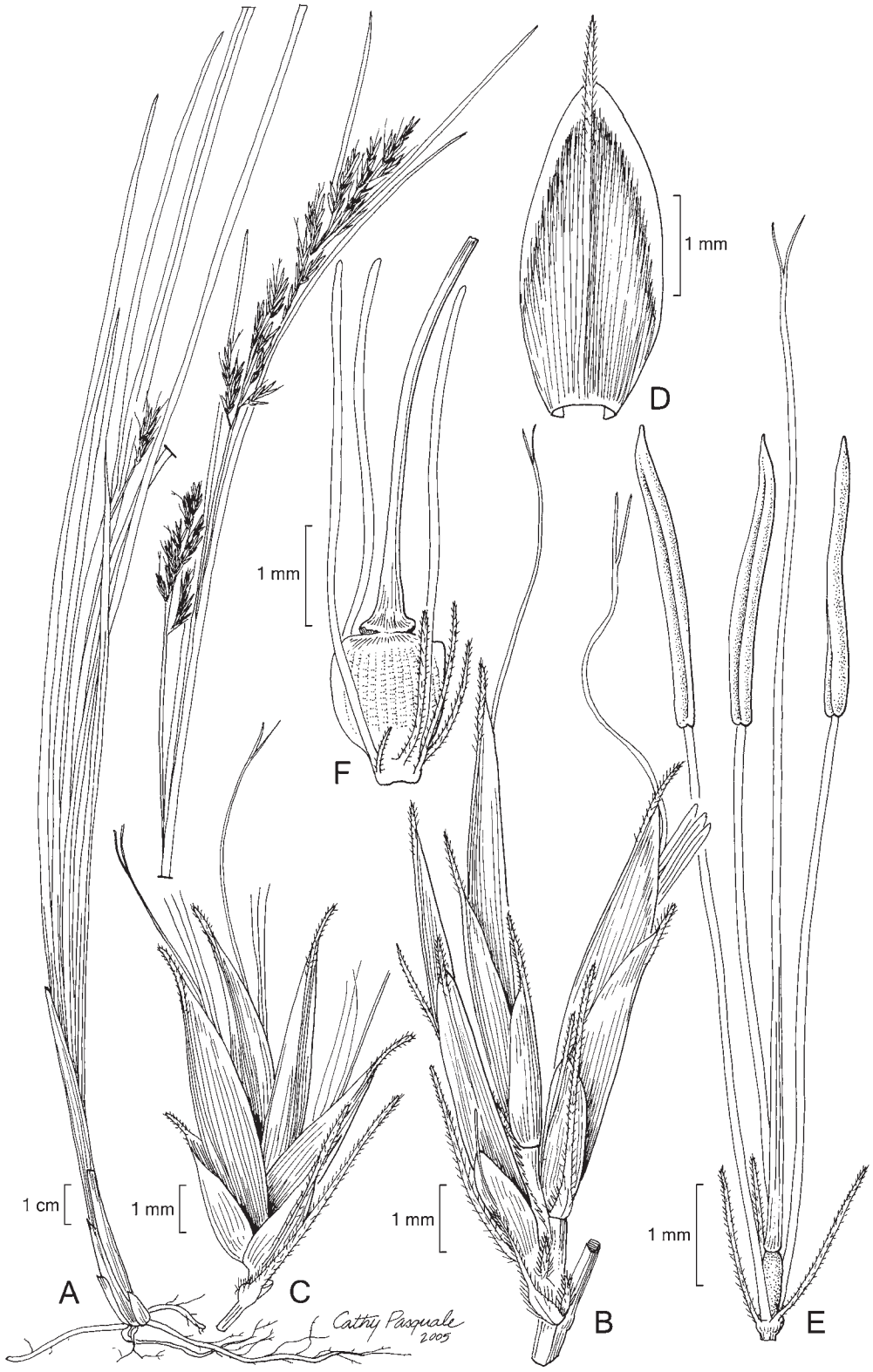


FIGURE 10. Cyperaceae, *Rhynchospora guaramacalensis* M. T. Strong. **A.** Habit. **B.** Inflorescence branch (detail). **C.** Spikelet. **D.** Spikelet scale. **E.** Flower. **F.** Achene. (A, B, D, E, *Stergios & Caracas 19742*; C, F, *Stergios & Caracas 19837*.)

erect to ascending, flexuous peduncles; branches narrowly wing-angled, pale green medially on sides, sparsely ascending-setose or smooth on angles; spikelets lanceoloid, 6.5–9 × 1–1.5 mm, 3- or 4-flowered, acuminate at apex, cuneate basally; fertile scales lanceolate, 3.5–7 × 1.7–3 mm, dorsally obtuse to subrounded, submembranous, dark brown or dark reddish-brown, midcosta wirelike, greenish, prolonged beyond the acute to acuminate apex as a 0.5–2 mm long slightly recurved awn. Stamens 3; anthers 2.3–3 mm long. Styles shortly 2-branched at apex, long-exserted. Achenes thickly biconvex, shortly oblong-obovate, 1.6–1.9 × 1.1–1.3 mm, truncate at apex with often slightly upturned shoulders, cancellate with 14–19 vertical rows of horizontally oriented rectangular cells, often semiglossy, pale brown to brown; style base narrowly triangular, articulate with achene body, attenuate, 1.3–1.7 × 0.6–0.8 mm, flaring basally, ends slightly upturned; bristles 3–5, equaling or slightly exceeding the achene body but not surpassing the tip of the style base, antrorsely scabrous, reddish.

Endemic to the Andes of Venezuela (Trujillo; Map 76). This species is, at present, known only from the park, where it has been collected on the south slope in Qda. Jirajara and in the Páramo de Guaramacal; (2,200–)2,800–3,100 m.

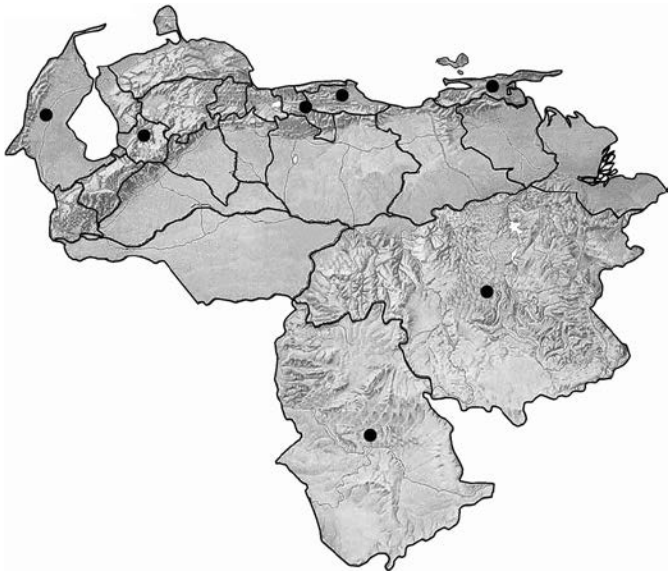
This species differs from *Rhynchospora macrochaeta* in having longer spikelets, broader achenes with upturned shoulders, and a style base that is flared.

Rhynchospora immensa Kük., Bot. Jahrb. Syst. 56(Beibl. 125): 17. 1921. *Rhynchospora aristata* var. *immensa* (Kük.) Kük., Bot. Jahrb. Syst. 74: 401. 1949.

Rhynchospora aristata auct., non Boeckler; Bono, Cat. Fl. Vert. Occid. Cordillera Mérida 92. 2010.

Rhynchospora hieronymi Boeckeler subsp. *hieronymi* auct., non Boeckeler; Dorr et al., Contr. U.S. Natl. Herb. 40: 45. 2000 [2001].

Robust, rhizomatous perennial, 115–220 cm tall; rhizomes short, stout, hardened; sheathing base of culm 1–3 cm wide. Culms ascending, 3.8–8 mm wide, narrowing to 2 mm distally, triquetrous, stiff and hardened, smooth, green to pale green distally, often golden brown proximally, glabrous or sometimes sparsely pubescent at nodes. Leaves 9–15, basal and cauline, 40–110 cm long; sheaths eligulate, loose, light brown and semiglossy abaxially, golden-brown and highly glossy adaxially, glabrous, inner band herbaceous to thinly herbaceous on proximal sheaths with a deeply U-shaped orifice at apex; blades linear-lanceolate, 9–23 mm wide, flattened to subplicate distally, green with the midvein often golden brown, closely and often indistinctly septate-nodulose, essentially glabrous, margins finely antrorsely scabrous, long-acuminate. Inflorescence a series of 4–6, open and very diffuse partial panicles from the upper leaflike bracts, terminal panicle 11–23 × 8–28 cm; involucral bracts leaflike, lowermost elongate, distal ones becoming successively shorter; primary inflorescence branches often finely antrorsely spinulose on margins; spikelets range from 30 (on lowermost panicles) to 140 or more (on terminal panicles), ovoid-lanceoloid, obtuse to cuneate basally, acuminate apically, 7–9 × (0.9–)1.1–1.7 mm; fertile scales 3–7, ovate-lanceolate, 4.7–6.5 × 2.7–3.7 mm, obtuse to acute, light brown to brown, glabrous to very minutely puberulent at apex on distal scales of spikelet, short-awned or mucronate on distal scales of spikelet. Stamens 3; anthers 2.5–3 mm long. Styles entire to shortly bifid. Achenes biconvex, subrounded-obovate or widely oblong-obovate, 1.5–1.8 × 1–1.3 mm, cellular-cancellate, broadly rounded to subtruncate at apex, abruptly contracted at base to short stipe, with 15–19 rows of horizontally oriented rectangular cells, pale brown to brown; style base triangular-lanceolate, 1.7–2.5 × 0.6–0.8 mm basally, flattened, brown; bristles 2–4, several often rudimentary, overtopping achene, shorter than to equaling tip of style base, antrorsely barbed, reddish.

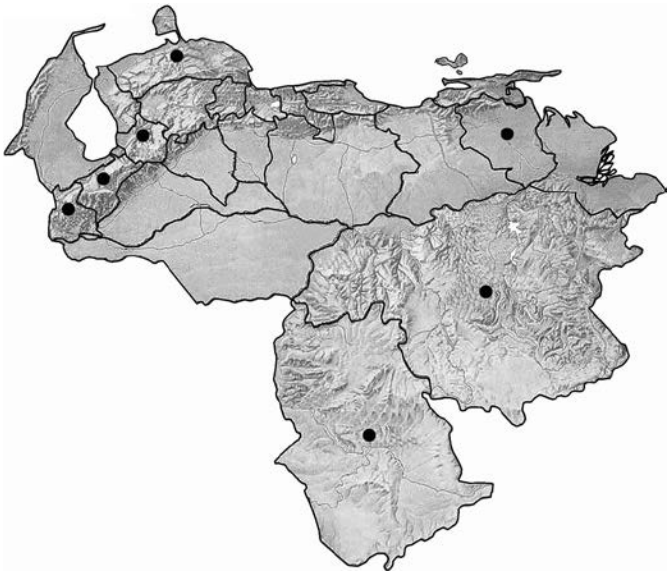


MAP 77. *Rhynchospora immensa* occurrence in Venezuela.

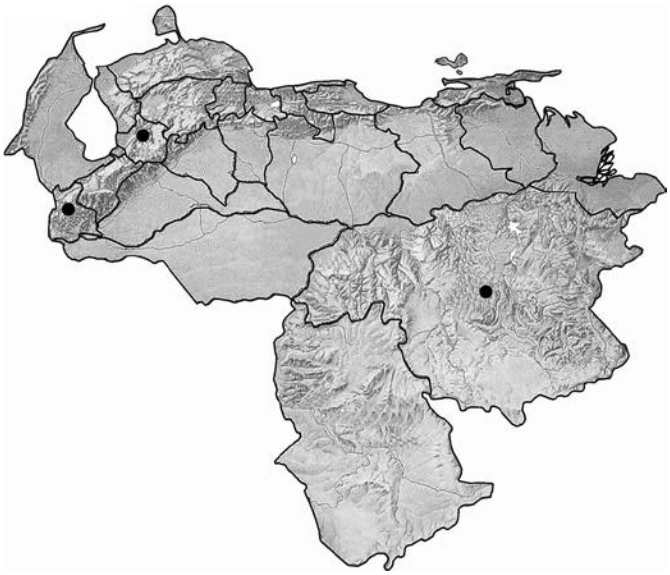
Found in Central America and South America (Colombia, Venezuela, Trinidad and Tobago, Guyana, and Brazil). In Venezuela, known from Amazonas, Aragua, Bolívar, Miranda, Sucre, Trujillo, and Zulia (Map 77). In the park, found on both slopes of Guaramacal; 2,000–2,750 m.

Rhynchospora lechleri Steud. ex Boeckeler, Linnaea 37: 633. 1873; Thomas, in Berry et al., Fl. Venez. Guayana 4: 623–624. 1998.

Caespitose perennial, 18–40 cm tall; rhizomes short, knotty. Culms erect, trigonous or obtusely so, channeled along 1 side distally, flexuous, pilose or sparsely so. Leaves primarily basal, 1–3 cauline, 5–30 cm long; sheaths short, eligulate, pilose, light brown, with a membranous inner band that is concave at orifice, orifice with a glabrous reddish-brown rim; blades linear, 1.3–3.2 mm wide, plicate, pilose at least proximally, dull green abaxially, semiglossy adaxially, attenuate to a triquetrous apex. Inflorescence a terminal panicle and series of 2 or 3 lateral,



MAP 78. *Rhynchospora lechleri* occurrence in Venezuela.



MAP 79. *Rhynchospora locuples* occurrence in Venezuela.

sublax, pyramidal or narrowly pyramidal partial panicles from the upper leaflike bracts; terminal panicle 2–4 × 1.5–3 cm, with 9–60 spikelets, lateral ones successively smaller toward the base, terminating elongate, ascending peduncles; branches ascending to divergent; spikelets ovoid-ellipsoid, 3.6–5.3 × 1.2–2 mm, 3–4-flowered; fertile scales ovate-lanceolate, brown, often with castaneous sides, glabrous, with broad scarious margins, midcosta wirelike, prolonged beyond the obtuse apex as a bristly mucro. Stamens 3; anthers 1–1.5 mm long. Styles shortly 2-branched, long-exserted. Achenes biconvex, squarish-obovate, 1–1.3(–1.5) × 0.7–1.2 mm, truncate at apex, obtusely narrowed to base, margins shallowly sulcate with the edges of channel often red, cancellate, with 11–16 vertical rows of horizontally oriented rectangular cells, often glossy, reddish-brown or dark brown; style base narrowly triangular, flattened, attenuate, 0.7–1.1 × 0.5–0.9 mm basally; bristles 2–4(–6), often caducous, several sometimes equaling or slightly exceeding the achene body, but not surpassing the tip of the style base, antrorsely scabrous, reddish.

Found in South America (Colombia, Venezuela Ecuador, Bolivia, and Peru). In Venezuela, known from Amazonas, Bolívar, Falcón, Mérida, Monagas, Táchira, and Trujillo (Map 78). In the park, known from a single collection from the Laguna de los Cedros; 2,000 m.

Rhynchospora locuples C. B. Clarke, Bot. Jahrb. Syst. 34(Beibl. 78): 5. 1904; Thomas, in Berry et al., Fl. Venez. Guayana 4: 624. 1998.

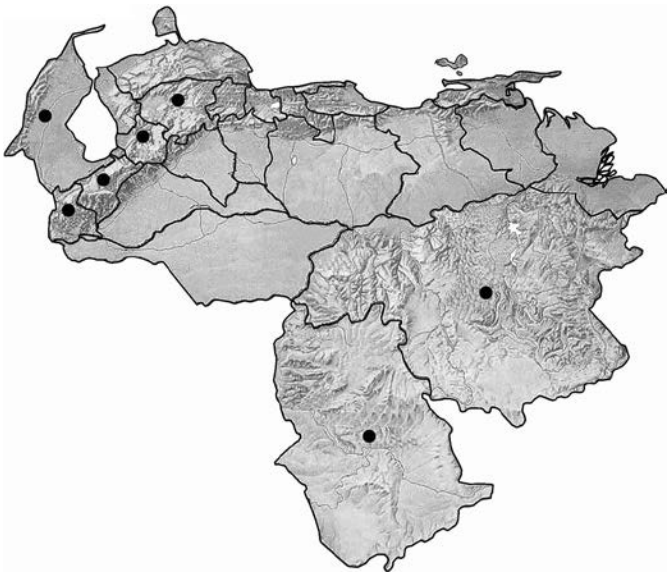
Coarse, rhizomatous perennial, 110–200 cm tall; rhizomes short, stout; roots very coarse; sheathing base of the culm 1.5–3 cm wide. Culms solitary, triquetrous, 4–11 mm wide, very finely antrorsely appressed-setose or scabridulous. Leaves 5–7, basal and cauline, 70–100 cm long; sheaths eligulate, elongate, loose, sparsely pubescent like the culms, inner band herbaceous, thinly so on proximal bands, orifice U-shaped; blades flattened to subplicate, 11–30 mm wide, green on both sides, glabrous adaxially, scabrid apically, abaxial surface glabrous or the veins sometimes scabrid. Inflorescence a terminal panicle and series of (3–)4–8 remote or distally subcontiguous, dense, pyramidal partial panicles from the upper leaflike bracts; terminal panicle 10–20 × 6–10(–20) cm, lateral panicles successively smaller below; panicle branches pilose with crystalline trichomes; spikelets narrowly ellipsoid-lanceoloid, 3–5(–5.5) × 0.7–1.3 mm, 1-flowered, solitary at branch tips or in fascicles of 2 or 3; fertile scale ovate-lanceolate, 2.5–4.5 × 1.3–2.2 mm, stramineous to light brown, dull, glabrous, mucronate at the acute apex. Stamens 3; anthers 1.5–2.2 mm long. Styles shortly 2-branched. Achenes biconvex, obovate or oblong-obovate, 1–1.7 × 0.8–1.1 mm, truncate apically, faintly cancellate with 12–15 vertical rows of horizontally oriented rectangular cells, smooth and lustrous, pale; style base narrowly triangular, lanceolate or ligulate, slightly flared basally, 1–2 × 0.5–0.6 mm basally, longitudinally wrinkled, whitish or stramineous; bristles 1–5, variable in length, several often rudimentary, 1 or 2 sometimes exceeding length of achene body, rarely exceeding tip of style base, antrorsely barbed, reddish.

Found in Central America and South America (Colombia, Venezuela, Ecuador, Peru, and Bolivia). In Venezuela, this species has a disjunct distribution and is found in the Andes (Táchira and Trujillo) and in the Venezuelan Guayana (Bolívar; Map 79). In the park, found on the south slope of Guaramacal; 1,900–2,900 m.

This coarse *Rhynchospora* species can be distinguished readily by its broad leaf blades and large, dense panicles of small, pale spikelets.

Rhynchospora macrochaeta Steud. ex Boeckeler, Linnaea 37: 632. 1873; Thomas, in Berry et al., Fl. Venez. Guayana 4: 624. 1998; Briceño, in Morillo et al., Bot. Ecol. Monocot. Páramos Venez. 2: 472, fig. 18. 2010.

Rhizomatous perennial, 25–75(–100) cm tall; rhizomes short, woody, knotty. Culms trigonous or subtriquetrous with blunt angles, rigid and hardened, smooth, sometimes scabrid just below terminal panicle. Leaves 7–11, basal and cauline, 20–60 cm long; sheaths eligulate, elongate, pale brown to brown, essentially glabrous, inner band membranous on proximal sheaths, herbaceous except at orifice on cauline sheaths, reddish-brown to dark brown, orifice truncate to concave or U-shaped, sparsely appressed-pubescent; blades linear, 3–7 mm wide, flattened to plicate distally with obtuse or rounded pleats, green on both sides, glabrous, attenuate. Inflorescence a terminal panicle and series of 2–4 lateral narrowly ovoid partial panicles from the upper leaflike bracts; terminal panicle sometimes broadly ovoid or subpyramidal, 3.5–6 × 1–7 cm, lateral ones successively smaller toward the base, terminating ascending to arching peduncles; branches short, ascending; spikelets narrowly ovoid-ellipsoid, 4–7 × 1–1.3(–1.5) mm, 2- or 3-flowered; fertile scales narrowly ovate-elliptic to ovate-lanceolate or lanceolate, acute, 2.8–6.3(–6.8) × 1.3–2.3 mm, dark brown or dark reddish-brown with blackish lineations, apex with a short antrorsely scabrous awn. Stamens 3; anthers 2.3–3.5 mm long. Styles shortly 2-branched. Achenes biconvex, obovate, narrowly obovate or narrowly elliptic-obovate, 1.2–1.7 × 0.7–1.1 mm, obtuse to subtruncate apically, cancellate with 12–19 vertical rows of horizontally oriented rectangular cells, often glossy, reddish-brown; style base narrowly triangular, attenuate, 0.9–2 × 0.5–0.7 mm basally; bristles 2–5(–6), shorter to longer than the achene body, several sometimes equaling or sometimes surpassing the tip of the style base, antrorsely scabrous, reddish.



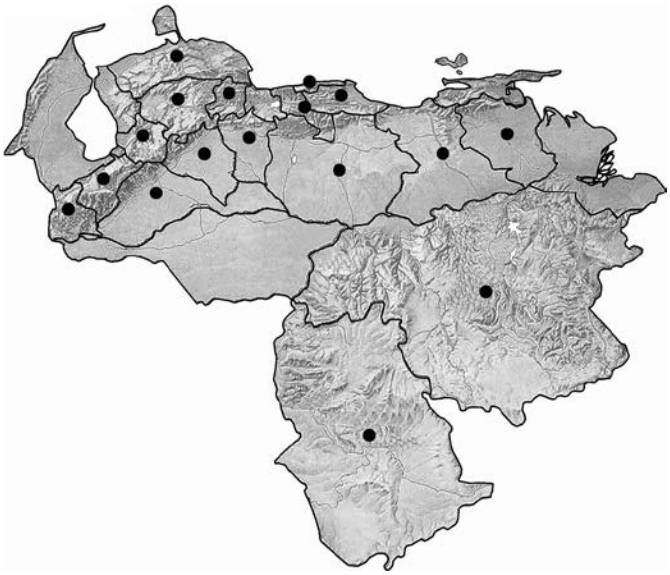
MAP 80. *Rhynchospora macrochaeta* occurrence in Venezuela.

Found in Mexico, Central America (Costa Rica), and South America (Colombia, Venezuela, Ecuador, Peru, and Bolivia). Venezuelan material is from the Andes (Lara, Mérida, Táchira, and Trujillo), the Sierra de Perijá (Zulia), and the Venezuelan Guayana (Amazonas and Bolívar; Map 80). Subpáramo and páramo near the Laguna del Pumar and in the Páramo de Guaramacal; (2,600–)2,800–3,100 m.

Jørgensen and León-Yánez (1999: 433) consider this name to be a synonym of *Rhynchospora ruiziana* Boeckeler. The two names were published simultaneously, and if the two species are combined, *R. ruiziana* is the name that must be adopted. However, study of type material of *R. macrochaeta* shows that our species differs significantly from *R. ruiziana* in vegetative, inflorescence, and floral characteristics, and the two are treated here as distinct species.

Rhynchospora polyphylla (Vahl) Vahl, Enum. Pl. 2: 230. 1805; Thomas, in Berry et al., Fl. Venez. Guayana 4: 626. 1998. *Schoenus polyphyllus* Vahl, Eclog. Amer. 2: 5. 1798.

Rhizomatous perennial, (45–)85–135 cm tall; rhizomes short, knotty, sometimes ascending; sheathing base of culm 2.5–8 mm wide. Culms ascending or clambering over other vegetation, 2.3–5.3 mm wide, obtusely trigonous, stiff, and hardened, light brown proximally, green distally, essentially glabrous. Leaves ascending to spreading, numerous, primarily cauline, internodes short midculm and distally (leaves closely spaced), 4–38(–58) cm long, lower cauline blades shorter than mid to upper cauline ones; sheaths somewhat loose, short midculm, elongate proximally, herbaceous, green distally, light brown proximally, short-pilose to glabrous, inner band membranous, red-brown and finely appressed-pubescent on proximal sheaths, membranous only at orifice on distal sheaths, orifice truncate, often tomentose; ligule a thin line or band of tissue at adaxial junction of sheath and blade; blades linear, 3.7–10.5 mm wide, flattened-plicate, herbaceous, green on both sides, sparsely pilose to glabrous abaxially, scabridulous adaxially (at least distally), attenuate. Inflorescence a series of 2–7, open to subcontracted, partial pyramidal panicles from the upper leaflike bracts; terminal panicle largest, 3–8 × 2–6 cm, with 48–310 spikelets, lower panicles successively smaller; inflorescence branches sharply angled, angles pilose; spikelets narrowly ovoid-ellipsoid to ovoid-lanceoloid, 3.8–5.5 × 0.7–1.4 mm, narrowly acute to acuminate apically, short-cuneate basally; fertile scales 6–11, ovate-elliptic to widely ovate-lanceolate, acute to short-acuminate, 2.5–4 × 1.3–3.2 mm, dull, uniformly whitened-stramineous to pale brown, reddish-lineolate (often faintly so), glabrous, margins narrowly scarious, mucronate apically. Stamens 3; anthers 1–2.3 mm long. Styles entire. Achenes biconvex, obovate or rounded-obovate, 0.8–1.2 × 0.6–0.8 mm, rounded apically, cancellate



MAP 81. *Rhynchospora polyphylla* occurrence in Venezuela.

with 7–10 rows of horizontally oriented rectangular cells, red-brown; style base triangular, attenuate to apex, slightly sagittate (shallowly 2-lobed) basally, 0.4–1 × 0.5–0.7 mm basally, light brown, dotted or flecked with dark brown; bristles 0–6, several often rudimentary, shorter than to equaling middle of achene body, antrorsely barbed, reddish.

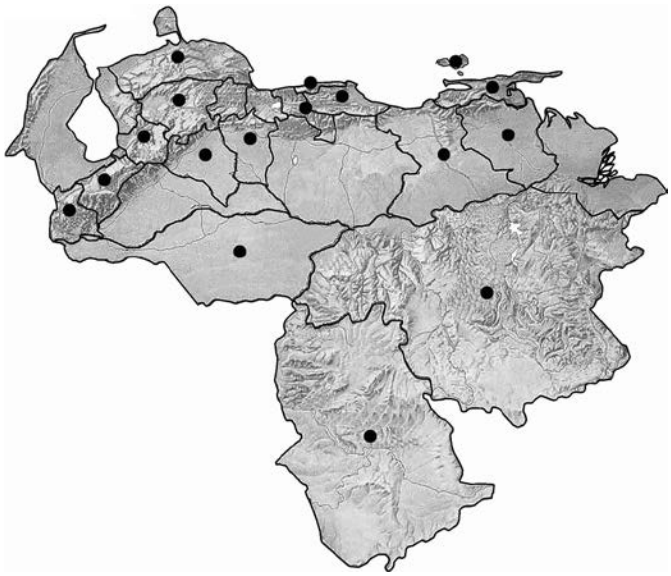
Found in Mexico, Central America, the West Indies, and South America (Colombia, Venezuela, Trinidad and Tobago, the Guianas, Ecuador, Peru, and Bolivia). Widespread in Venezuela (Amazonas, Anzoátegui, Aragua, Barinas, Bolívar, Cojedes, Distrito Federal, Falcón, Guárico, Lara, Mérida, Miranda, Monagas, Portuguesa, Táchira, Trujillo, and Yaracuy; Map 81). In the park, collected at several localities on the south slope of Guaramacal; (1,300–)1,800–2,000 m.

This species can be separated from *Rhynchospora tuerckheimii*, which has a similar habit, by its smaller obovate or rounded-obovate achenes, 0.8–1.2 × 0.6–0.8 mm, with 7–10 rows of horizontally oriented rectangular cells, and triangular style base. *Rhynchospora tuerckheimii* has squarish-obovate achenes, 1.1–1.6 × 0.8–1.2 mm, with 14–18 rows of horizontally oriented rectangular cells, and a lanceolate style base.

Rhynchospora rugosa (Vahl) Gale, Rhodora 46: 275. 1944; Thomas, in Berry et al., Fl. Venez. Guayana 4: 627. 1998; Briceño, in Morillo et al., Bot. Ecol. Monocot. Páramos Venez. 2: 474–475, fig. 21. 2010. *Schoenus rugosus* Vahl, Eclog. Amer. 2: 5. 1798.

Caespitose perennial, 27–135(–140) cm tall; rhizomes short, knotty. Culms erect, (0.8–)1.2–2.5(–3) mm wide, trigonous to obtusely trigonous, very firm, smooth, glabrous. Leaves 5–15, primarily basal, 2–5 cauline, 9–55 cm long; sheaths eligulate, short, smooth, green, glabrous, inner band membranous on basal blades, minutely red-speckled, with truncate orifice, upper and cauline sheaths membranous only distally and bearing a truncate to concave orifice; blades (1.3–)1.7–4.5(–5) mm wide, flattened to subplicate or folded, smooth, green, glabrous, long-acuminate. Inflorescence a terminal panicle and series of 1 or 2 lateral, remote cymose-paniculate partial panicles from the upper leaflike bracts; partial panicles 1–8(–11) × 0.8–2.7(–3.5) cm, lower on flexuous peduncles, 1–6 cm long; spikelets in fascicles at branch tips, ovoid-ellipsoid, acute, short-cuneate basally, 3.5–4.7(–5) × 1.1–1.7 mm; fertile scales 3–5, ovate to oblong-ovate, acuminate, (2.3–)2.5–3.5 × 1.8–2.8 mm, brown to dark brown or brownish-black, glabrous, margins broadly scarious, often erose, apex with a 0.1–0.5 mm long mucro. Stamens 3; anthers 0.6–1.7 mm long. Styles 2-branched, branches twice as long as unbranched portion, exceeding the scales and curling. Achenes biconvex, obovate to elliptic-obovate, 1.6–1.9 × 1–1.3 mm, truncate apically, transversely rugulose, light brown or yellowish-brown; style base triangular, 0.6–1 × 0.6–0.8(–1) mm basally, minutely antrorsely scabrous along margins, pale brown to dark brown; bristles 6, antrorsely barbed, equaling to exceeding apex of style base, often setose basally.

Found in Mexico, Central America, the Greater Antilles, and South America (Colombia, Venezuela, Trinidad and Tobago, the Guianas, Ecuador, including the Galapagos Islands, Peru, Bolivia, Brazil, Paraguay, Argentina, and Uruguay); adventive in Europe, Africa, Madagascar, Asia, Malesia, and the Pacific region. Widespread in Venezuela (Amazonas, Anzoátegui, Apure, Aragua, Bolívar, Cojedes, Distrito Federal, Falcón, Lara, Mérida, Miranda, Monagas, Nueva Esparta, Portuguesa, Sucre, Táchira, and Trujillo; Map 82). Collected near La Cueva below Cerro El Diablo; 1,800 m.



MAP 82. *Rhynchospora rugosa* occurrence in Venezuela.

Rhynchospora ruiziana Boeckeler, Linnaea 37: 641. 1873; Thomas, in Berry et al., Fl. Venez. Guayana 4: 626. 1998; Briceño, in Morillo et al., Bot. Ecol. Monocot. Páramos Venez. 2: 475–476, fig. 22. 2010.

Rhynchospora macrochaeta auct., non Steud.; Ortega et al., BioLlania 5: 40. 1987.

Coarse, rhizomatous perennials, 55–165 cm tall; rhizomes short, woody. Culms trigonous or obtusely so, rigid and hardened. Leaves basal and cauline, 45–110 cm long; sheaths eligulate, elongate, brown, inner band thinly herbaceous, orifice concave on basal sheaths, often convex or broadly rounded on cauline sheaths and tomentulose; blades linear, flattened or subplicate, 12–22 mm wide, glabrous, attenuate. Inflorescence a terminal panicle and series of 4–9 lateral, densely branched, pyramidal partial panicles from the upper leaflike bracts; terminal panicle 3–13 × 3–8 cm, lateral panicles successively smaller toward the base, terminating elongate, erect to ascending peduncles; branches short, ascending-setose on angles; spikelets narrowly ovoid to lanceoloid, 4–8 × 1–1.5 mm, 3–4-flowered, acute to acuminate apically; fertile scales ovate-lanceolate, acute to acuminate, 2.6–7 × 1.6–2.8 mm, dorsally obtuse, submembranous, often dark brown or reddish-brown, with a 0.5–1 mm long slightly recurved awn apically. Stamens 3; anthers 1.2–2.8 mm long. Styles shortly 2-branched. Achenes lenticular, obovate to elliptic-obovate, 1.4–1.9 × 0.9–1.4 mm, broadly rounded to subtruncate apically, cancellate with 11–16 vertical rows of horizontally oriented rectangular cells, often glossy, pale brown to brown; style base narrowly triangular, attenuate, 0.8–2(–2.5) × 0.4–0.7 mm basally; bristles 1–5, often exceeding the achene body but not surpassing the tip of the style base, antrorsely scabrous, reddish.

Found in Mexico, Central America, and South America (Colombia, Venezuela, Ecuador, Peru, and Bolivia). Venezuelan collections are from Bolívar, Distrito Federal, Táchira, and Trujillo (Map 83). In the park, collected in the Páramo de Guaramacal; 2,800–3,000 m.

Rhynchospora tuerckheimii C. B. Clarke ex Kük., Bot. Jahrb. Syst. 74: 402. 1949.

Rhizomatous perennial, (50–)94–210 cm tall; rhizomes short, knotty, sometimes ascending; sheathing base of culm 3–5 mm wide. Culms ascending, 1.4–3.3 mm wide, obtusely trigonous to trigonous distally, stiff and hardened, tan proximally, green distally, thinly pilose-puberulent to glabrous proximally. Leaves ascending to spreading, numerous, primarily cauline, internodes short midculm and distally (leaves closely spaced), 18–35 cm long, lower cauline blades shorter than the mid to upper cauline ones; sheaths somewhat loose, short midculm, elongate proximally, green distally, tan proximally, thinly pilose-puberulent or densely so on inner band, inner band narrowly membranous on basal sheaths, herbaceous and membranous only at orifice on distal sheaths, often reddish-brown and cross-puckered, orifice truncate to convex, minutely black- or red-dotted; ligule a thin line or band of tissue at adaxial junction of sheath and blade; blades narrowly linear, 1.7–5.7(–6.5) mm wide, subflattened-plicate, green on both sides, adaxial midvein pilose, abaxial surface sparsely pilose to glabrous, adaxially smooth, attenuate. Inflorescence a series of 3–7, open to subcontracted, partial pyramidal panicles from the upper leaflike bracts; terminal panicle largest, 3–7 × 2.3–5 cm, with 30–70 spikelets, lower successively smaller; branches pilose on angles; spikelets narrowly ovoid-ellipsoid, (4–)4.5–7.5(–8) ×

MAP 83. *Rhynchospora ruiziana* occurrence in Venezuela.

MAP 84. *Rhynchospora tuerckheimii* occurrence in Venezuela.

1.3–2.2 mm, acuminate apically, cuneate basally; fertile scales 5–7, ovate-elliptic to widely ovate-lanceolate, 3–7 × 2–3.2 mm, acute to narrowly acute, dull, uniformly pale or stramineous, sometimes with sides washed in brown, glabrous, margins narrowly scarious, mucronate apically. Stamens 2; anthers 1.5–2.6 mm long. Styles entire, exserted. Achenes biconvex, squarish-obovate, 1.1–1.6 × 0.8–1.2 mm, obtuse to subtruncate apically, cancellate with 14–18 rows of horizontally oriented rectangular cells, pale brown to light brown; style base lanceolate, sagittate (2-lobed) basally, 1–2.3 × 0.5–0.8 mm basally, thin, brittle, pale brown, dotted or flecked with brown; bristles 1–3, several often rudimentary, shorter than to equaling apex of achene body, antrorsely barbed, reddish.

Found in Mexico, Central America, and South America (Venezuela and Guyana). In Venezuela, known only from the Cordillera de Mérida (Trujillo; Map 84). Found in montane or cloud forest in various localities in the park, including Casa Vicuyal, the Laguna de los Cedros, Páramo del Pumar, Páramo de Guaramacal, Qda. Honda, and El Campamento below Cerro El Diablo; 1,800–2,600(–3,000) m.

Spikelet scale color of this species is typically pale or stramineous. However, in some material from Guaramacal, the sides of the scales are washed in brown. This material does not differ otherwise from the material with pale or stramineous spikelet scales and can be readily separated from other Guaramacal species of *Rhynchospora* with brown scales by the numerous leaves with short internodes. See the discussion under *R. polyphylla* above for differences between it and this species.

***Rhynchospora* sp. A**

Rhizomatous perennial, 100–200 cm tall; rhizomes short, knotty, sometimes ascending; sheathing base of culm 8–15 mm wide. Culms solitary or 2 or 3 together, ascending, 1.8–4 mm wide, triquetrous with blunt angles or flattened-trigonous distally, stiff and hardened, scabridulous to smooth, pale brown or tan proximally, green distally. Leaves 6–9, basal and cauline, 55–85 cm long; sheaths eligulate, elongate, somewhat loose, glossy and somewhat spongy-thickened proximally, often with some cross walls (partitions) between the veins, green distally, tan proximally, glabrous, inner band membranous on basal sheaths, herbaceous and membranous only at orifice on distal sheaths, often reddish-brown, orifice concave, rimmed with brown; blades linear, 3.8–8 mm wide, subflattened-plicate proximally, plicate distally, herbaceous, green on both sides, semiglossy, abaxial surface glabrous, adaxial surface smooth or scabridulous distally, adaxial midvein smooth, very finely and closely antrorsely scabrous on margins and abaxial midvein (at least distally), attenuate. Inflorescence a terminal panicle and series of 3 or 4, open, remote, pyramidal, partial panicles on elongate ascending peduncles from the upper leaflike bracts; terminal panicle largest, 6–13 × 5–10 cm, with 20–100 spikelets, lower successively smaller; branches 2–6 per panicle, subterete and glabrous proximally, sharply angled distally, angles antrorsely scabrous; spikelets narrowly lanceoloid, 5–8 × 1–1.5 mm, acuminate apically, cuneate basally; fertile scales 3–4, ovate-elliptic to ovate-lanceolate, 3.7–6 × 1.4–2.3 mm, dorsally rounded to broadly rounded, acute to narrowly acute or obtuse, submembranous, semiglossy, brown to reddish-brown, glabrous, margins narrowly scarious, mucronate or short-awned apically. Stamens 3; anthers 1.3–1.8 mm long. Styles shortly bifid apically, exserted. Achenes biconvex, narrowly oblong-obovate, 1.7–2.2 × 0.8–1.2 mm, obtuse to broadly rounded or subtruncate apically, glossy, cancellate with 14–18 rows of horizontally oriented rectangular cells, pale brown to light brown; style base lanceolate, 1.4–2.5 × 0.6–1 mm at the shallowly sagittate base, thickened, pale brown; bristles 1–4, several often rudimentary, extending to ½ the length of achene body to equaling or exceeding its apex, not exceeding tip of style base, antrorsely barbed, reddish.

MAP 85. *Rhynchospora* sp. A occurrence in Venezuela.

Evidently endemic to Venezuela and at present known only from a suite of collections made in Guaramacal (Trujillo state; Map 85). Fila de Agua Fría; 2,700–2,800 m.

This undescribed species belongs in *Rhynchospora* sect. *Paniculatae* Boeckler.

Scleria P. J. Bergius

Scleria P. J. Bergius, Kongl. Vetensk. Acad. Handl. 26: 142. 1765.

Perennial or sometimes annual herbs; rhizomes, when present, horizontal or short and nodose, hardened and knotty, sometimes tuberous. Culms erect, elongating and sprawling, or scandent, trigonous or triquetrous, harshly scabrous to smooth, glabrous or pubescent, green. Leaves well developed at the middle and upper nodes, basal ones essentially bladeless; sheaths 3-angled, closed at summit, distinctly veined, apex of

the inner band with a rounded, obtuse or triangular contraligule with distinct, straight or anastomosing veins, margins thickened or cartilaginous, sometimes with a short to elongate scarious appendage; ligule absent or sometimes present; blades linear-elongate or sometimes lanceolate, flattened-plicate to plicate or somewhat inrolled along margins, 3-costate, herbaceous, weakly to harshly scabrous on margins and costae, glabrous or sometimes pubescent. Inflorescence paniculate or spike-like, terminal or terminal and a series of axillary partial panicles from the upper leaflike bracts; panicle branches 3-angled, sometimes narrowly winged, scabrous or smooth, pubescent or glabrous; panicle bractlets linear-lanceolate or setaceous, often ciliate or scabrous on margins; spikelets unisexual or bisexual and androgynous, sessile or on pedicels to 1 cm long; staminate spikelets lanceolate or narrowly oblong-ovate, cylindric or subcompressed, many-flowered; staminate scales numerous, basal 2 or 3 often 2-ranked and sterile, like the sterile pistillate spikelet scales, upper fertile ones spirally imbricate, narrowly ovate to lanceolate, membranous; pistillate spikelets ovoid to ovoid-lanceoloid or ellipsoid, subcompressed, often becoming obovoid after expanding to the width of the mature achene, cylindric to subcompressed, with a single terminal flower that is usually subtended by a much reduced, lanceolate fertile scale, hidden by the uppermost well-developed sterile scale; pistillate spikelet scales 2-ranked, uppermost 2 broadly naviculiform or cupuliform and spreading widely with the developing achene, carina 1–3-nerved, lateral nerves indistinct. Flowers unisexual; hypogynium (when present) borne at base of achene, sessile or stipitate, smooth or crustaceous, entire or 3-lobed, sometimes 3–9-tuberculate near base, lobes entire or dissected, sometimes reflexed; cupula supporting the hypogynium and ovary shallow and dish-like, 3-lobed or obtusely trigonous with smooth margins, or deep and cuplike, enveloping the hypogynium and often ciliate on margin. Stamens 1–3; anthers often prickly appendaged apically. Styles capillary, 3-branched, unbranched portion glabrous. Achene body globose or ovoid to ellipsoid, rounded or obtusely trigonous, rarely trigonous or triquetrous, sometimes subconic, with straight to recurved apex, apiculate, bony or crustaceous, white or sometimes variegated with purple, glabrous or pilose, surface smooth, rugose, reticulate, trabeculate, papillate, verrucose or warty.

A genus of 200–225 species found primarily in warm temperate and tropical regions worldwide. In the Americas, found in North America, Mexico, Central America, the West Indies, and South America (all country-level political units except Chile). Approximately 42 species occur in Venezuela.

REFERENCES. Camelbeke and Goetghebeur (2002); Core (1936, 1948).

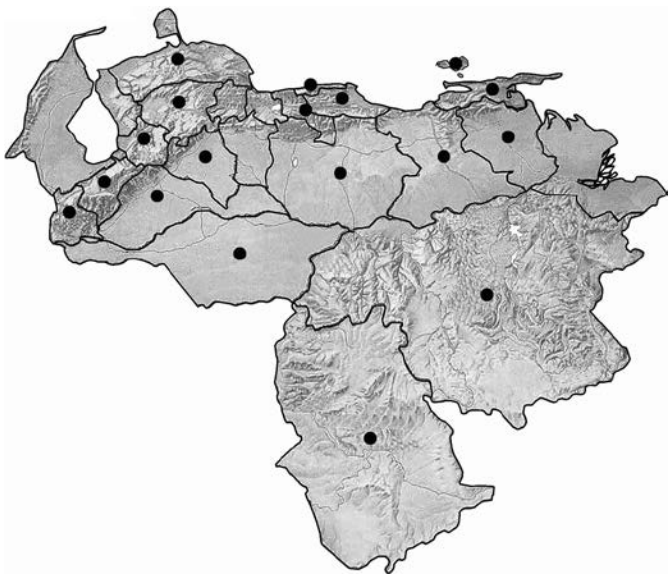
KEY TO THE SPECIES OF *SCLERIA*

1a. Slender perennial, 0.5–0.6 m tall; inflorescence interruptedly fasciculate-spicate; spikelets in nodding fascicles; spikelet scales coarsely setose . . . . . ***S. distans***

1b. Coarse perennial, 2–3 m tall; inflorescence paniculate; spikelets separate on lateral branches; spikelet scales glabrous . . . . . ***S. tropicalis***

Scleria distans Poir., in Lamarck, Encycl. 7: 4. 1806; Camelbeke and Goetghebeur, in Berry et al., Fl. Venez. Guayana 4: 644–645, fig. 508. 1998.

Slender perennial, 15–60 cm tall; rhizomes scaly, horizontally creeping, 2–4 mm thick. Culm erect, triquetrous, 0.8–2.7(–3) mm wide, glabrous, angles smooth, wirelike. Leaves 2–8; sheaths subinflated apically, unwinged, hirsute to glabrescent, angles smooth or hirsute; ligule absent; contraligule obtuse or slightly concave, with hirsute margins, inner band often hirsute in a longitudinal line medially; blades flattened to subplicate, 1–20 cm × 1.7–4(–5) mm, abaxial and adaxial surface glabrous, margins, midvein, and lateral veins often hirsute or sparsely so, subabruptly narrowed to an acute or acuminate, subflattened apex. Inflorescence terminal, interruptedly glomerate-spicate with no lateral branching, 8–22 cm × 7–10 mm, composed of 4–10 sessile fascicles of spikelets; fascicles 4–8 mm in diameter, with 3–7(–9) spikelets, reflexed at maturity; bractlets ciliate basally, margins with dark hairs; spikelets bisexual (androgynous), ovoid-ellipsoid, 3.5–5 × 0.8–1.3 mm; staminate scales lanceolate, membranous; pistillate scale ovate to ovate-lanceolate, 2–2.5(–3) × 1–1.5 mm (excluding awn), sparsely setose on sides, pale green to dark purplish-brown, carina 1-nerved, setose, prolonged



MAP 86. *Scleria distans* occurrence in Venezuela.

beyond the acute apex as a setose awn. Staminate flowers with 2 stamens; anthers 1.7–2.2 mm long, with a lanceolate, bristly appendage at apex. Achene body subglobose to broadly obtusely trigonous in cross section, 1.4–1.8 × 1–1.3 mm, broadly obtuse to rounded apically, apiculate, with a brownish or blackish apiculum, porose, smooth, white or grayish, with a stipe-like, trigonous base; style base deciduous; hypogynium inconspicuous, 3-lobed, with setaceous awl-shaped lobes, these often impressed into margins of base.

Found in North America (USA), Mexico, Central America, the West Indies, South America (Colombia, Venezuela, Trinidad and Tobago, the Guianas, Ecuador, Bolivia, Brazil, Paraguay, Argentina, and Uruguay), Africa, and Madagascar. Widely distributed in Venezuela (Amazonas, Anzoátegui, Apure, Aragua, Barinas, Bolívar, Distrito Federal, Falcón, Guárico, Lara, Mérida, Miranda, Monagas, Nueva Esparta, Portuguesa, Sucre, Táchira, and Trujillo; Map 86). In the park, known from wet areas on the south slope of Guaramacal near El Campamento below Cerro El Diablo; 1,800–2,000 m.

♦ ***Scleria tropicalis*** M. T. Strong, Harvard Pap. Bot. 11: 199, fig. 1. 2007.

Rhizomatous perennial, 2–3 m tall. Culms ascending, triquetrous, 2.5–7 mm wide, stiff and hardened, scabrid on angles, smooth proximally to scabrid on sides distally, finely ribbed, green proximally, often red or tinged with red on angles and ribs and at nodes distally. Leaves cauline, spaced at 5–15 cm intervals; sheaths eligulate, 5–10 cm long, broadly winged from the decurrent margins of the blade bases, wing margins finely and closely retrorsely spinulose, essentially smooth on sides, finely veined, often red-tinged; blades ascending, 30–70 × 13–26 mm, plicate, 3-costate, margins and abaxial midcosta finely and closely retrorsely spinulose, decurrent on margins of sheath, long-attenuate to a subulate tip, green and often tinged with red; contraligule convex to rounded, with thickened, dark reddish or blackish hispid margins, veins of the inner band running straight to the margins, not anastomosing. Inflorescence a terminal rhombic panicle and a series of 0–3 lateral narrower and successively smaller partial panicles at intervals of 5–10 cm from the upper leaflike bracts; terminal panicle 2–3 × 2–2.5 cm; panicle branches stiff, triquetrous to wing-angled, often red or red-tinged medially, mostly very finely antrorsely spinulose with some retrorse barbs intermixed on margins; bracts subtending each partial panicle leaflike, becoming successively smaller distally; bracts subtending branches linear-setaceous, 2–7 cm long; pistillate spikelets generally lowest on each secondary or tertiary branch with 1–3 staminate ones above, 4–5.5 × 1.5–2 mm, narrowly ellipsoid-lanceoloid, cuneate basally, acuminate apically with a single terminal floret subtended by a linear reduced scale, sterile scales 3 or 4 proximally; staminate spikelets lanceoloid, short-cuneate basally, obtuse apically, 3–4 × 1.2 mm, with 3 sterile scales proximally and 2 to several linear membranous fertile scales distally, each subtending 3 stamens; sterile pistillate scales ovate to broadly so, thinly herbaceous, dark reddish-brown,

MAP 87. *Scleria tropicalis* occurrence in Venezuela.

midcosta slender, prolonged as a mucro beyond the cusp-like acute apex, lateral nerves indistinct; sterile staminate scales like the pistillate except somewhat narrower and shorter. Flowers unisexual. Stamens 3; anthers 1.5–2.3 mm long (including the black subulate appendage at apex). Styles 3-branched. Hypogynium indistinct, shallowly 3-lobed, connate with achene body, minutely dotted along edges. Achenes ovoid, obtusely trigonous to broadly so, 3.5–4.3 × 3–3.3 mm, abruptly narrowed to an apiculus apically, truncate basally, smooth, uniformly white or tinged with green.

Found in South America (Colombia and Venezuela). In Venezuela, known only from the Andes (Trujillo; Map 87). In the park, found in wet pasture and disturbed areas bordering montane forest on the south slope in El Campamento below Cerro El Diablo; 1,800–2,000 m.

Uncinia Pers.

Uncinia Pers., Syn. Pl. 2: 534. 1807.

Tufted, rhizomatous or rarely stoloniferous, monoecious, perennial herbs. Culms central, erect or ascending, sharply trigonous to subterete, striate, smooth proximally, often scabrid below inflorescence, base often surrounded by bladeless sheaths. Leaves basal, tristichous; sheaths ligulate; blades narrowly linear, flattened or involute, scabrous on margins and abaxial midvein. Inflorescence a terminal, simple, linear-cylindric, contiguous spike, androgynous with pistillate spikelets proximally and a short staminate spikelet distally; involucral bracts mostly small and scalelike or a few lower ones leaflike, deciduous or persistent; spikelets with spirally arranged scales; scales ovate to oblong; staminate spikelet with few to many densely arranged

scales, each axillating a flower; stamens (1) 2 or 3; pistillate spikelets 1-flowered; rachilla vestigial, elongated beyond the beak of the perigynia and bearing a hooked rudimentary spikelet apically; ovary enclosed in an obtusely trigonous, bottle-shaped, herbaceous sac (perigynium); style 3-branched, incrassate basally, exserted from the apex of the perigynia; bristles absent; style 3-branched, base not distinct, often thickened and persistent. Fruit a trigonous, oblong to ovate, beaked achene, surface smooth.

As presently construed, a genus of ~60 species found in Mexico, Central America, the Greater Antilles, South America (Colombia, Venezuela, Ecuador, Peru, Bolivia, Brazil, Chile, including the Juan Fernandez Islands, and Argentina), Malesia, Australia, New Zealand, and the Pacific Islands (including Hawaii). Three species occur in Venezuela.

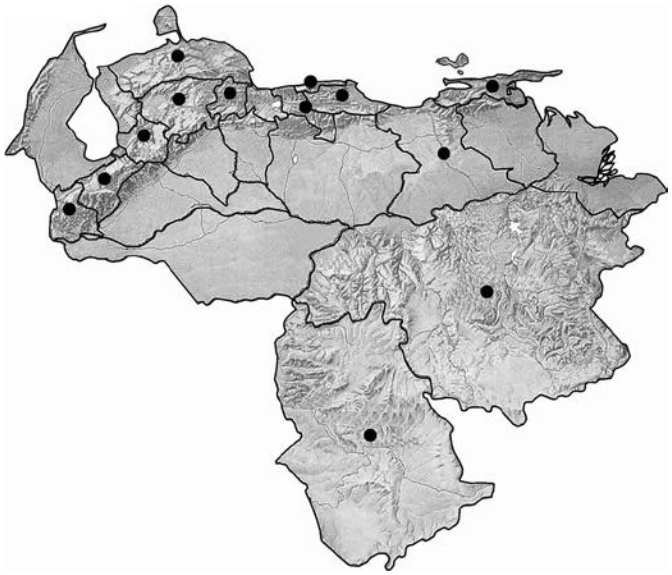
References. Gehrke et al. (2010); Hamelin (1958); Starr and Ford (2009); Starr et al. (2004, 2008); Waterway and Starr (2007); Waterway et al. (2009).

Although molecular data (Starr et al., 2004, 2008; Waterway et al., 2009; Gehrke et al., 2010) resolve *Uncinia* as monophyletic, it is embedded in the very large genus *Carex* and is a major element in a core unispicate clade (Waterway and Starr, 2007; Starr and Ford, 2009) that also includes *Cymophyllus* and unispiculate species of *Kobresia* and *Carex*. Sister to this core unispicate clade is the *Schoenoxiphium* clade composed of *Schoenoxiphium* Nees and species of *Carex*. These two clades together compose one of the four major clades identified in *Carex*, contain representatives of all five genera recognized in the Cariceae, and include ~230 species found in temperate and montane habitats of the Northern and Southern Hemispheres.

Uncinia hamata (Sw.) Urb., Symb. Antill. 2: 169. 1900; Kearns and Goetghebeur, in Berry et al., Fl. Venez. Guayana 4: 661. 1998; Briceño, in Morillo et al., Bot. Ecol. Monocot. Páramos Venez. 2: 478, fig. 24. 2010. *Carex hamata* Sw., Prodr. 18. 1788.

FIGURE 11

Caespitose, 20–70 cm tall; rhizomes short, ascending or horizontal. Culms erect, subtriquetrous to obtusely trigonous with blunt angles, 0.6–1.5 mm wide, smooth, glabrous. Leaves 6–12 per culm, narrowly linear, primarily basal, 2 or 3 lower cauline, 8–50 cm long; sheaths elongate, glabrous, inner band membranous with a U-shaped finely ciliate orifice; ligule a thickened, finely ciliate, narrow band of tissue, ~0.3 mm wide, at adaxial junction of sheath and blade, merging from margins in an obtuse to acuminate configuration; blades 1.7–4 mm wide, flattened or subplicate, adaxially coarsely scabrous along mid and lateral veins (at least distally), abaxially smooth, finely veined with coarser pale green mid and lateral veins, dark green otherwise, long-attenuate to triquetrous apex. Inflorescence spike 6–18 cm × 2.5–3.5 mm, staminate tip 1–3 cm long; spikelet rachilla exserted for 3–6 mm, strongly uncinate apically; pistillate scales oblong-obovate, 4–6 × 1.7–2.2 mm, obtusely to acutely narrowed to apex, widest above the middle, gradually narrowed to base, submembranous, greenish, glabrous or scabridulous apically dorsally, midcosta indistinct, sides finely and closely pale-nerved, these often merging proximally, ending short of the apex. Stamens 3; anthers ~1 mm long. Perigynia plano-convex or compressed-trigonous, 2-margined, oblanceolate, obtuse, gradually to subabruptly narrowed to a finely black-nerved stipitate base, 4.5–6.5 × 0.7–1.6 mm, tightly enveloping achene, finely nerved, often faintly so, scabridulous distally, smooth proximally, margins bristly ciliate; achenes plano-convex, oblong, 2.7–4 mm long, obtuse apically, truncate basally, brown, with 3 very fine, pale, marginal nerves, puncticulate.



MAP 88. *Uncinia hamata* occurrence in Venezuela.

Found in Mexico, Central America, the Greater Antilles, and South America (Colombia, Venezuela, Ecuador, Peru, Bolivia, Brazil, and Argentina). In Venezuela, found in Amazonas, Anzoátegui, Aragua, Bolívar, Distrito Federal, Falcón, Lara, Mérida, Miranda, Sucre, Táchira, Trujillo, and Yaracuy (Map 88). In the park, found in open areas on both slopes of Guaramacal; 1,900–2,600 m.

Dioscoreaceae

L. J. DORR AND B. STERGIOS

Perennial geophytes, twining-climbing vines (our species), herbs or rarely shrubs; rhizomes short and often subtending 1 to several tubers; aerial shoots often long. Leaves alternate (our species), opposite or whorled; leaf blades simple (our species) or digitately compound, usually cordate; margins entire, sometimes palmately lobed; principal veins arcuate, ascending from base to

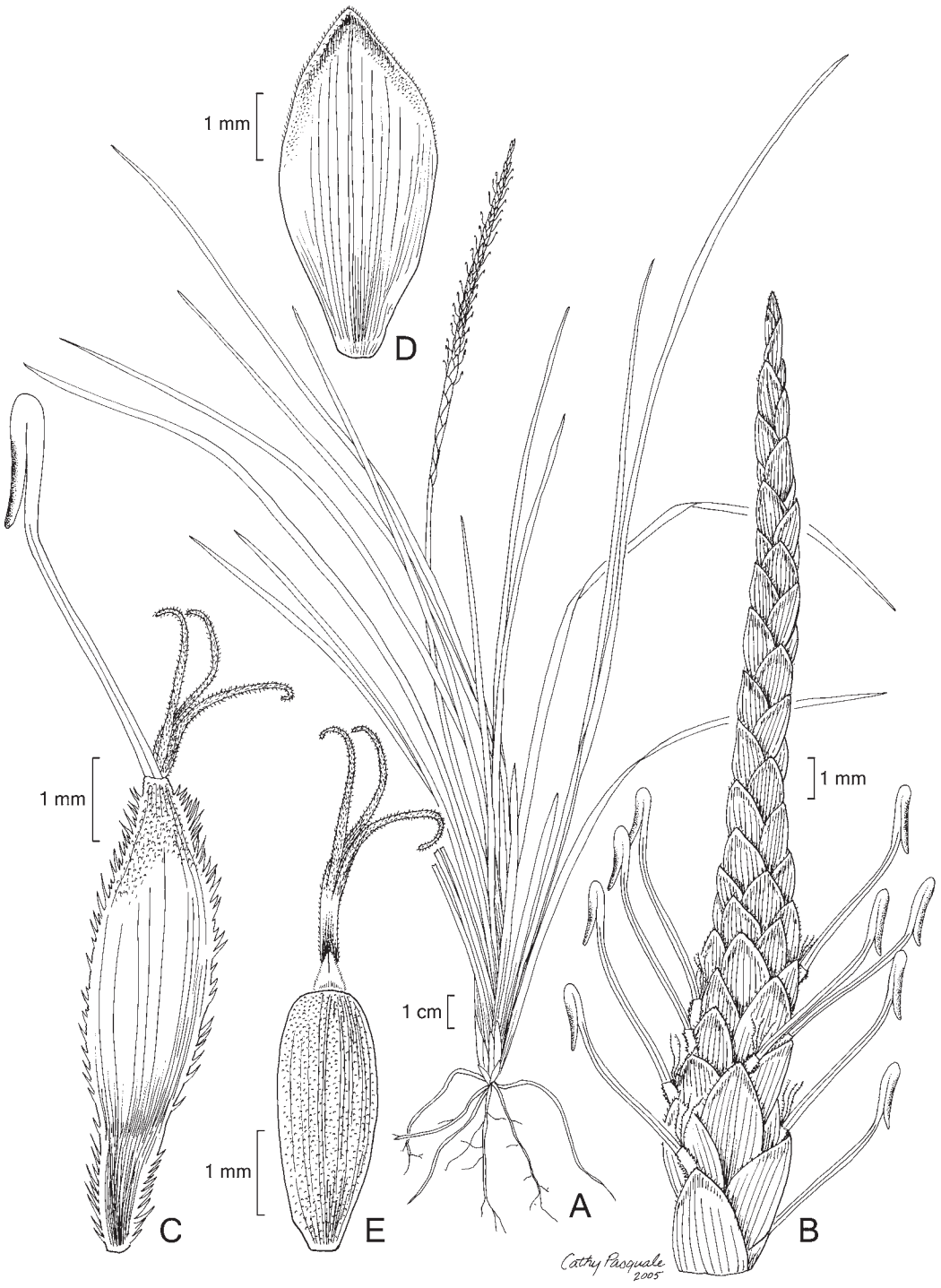


FIGURE 11. Cyperaceae, *Uncinia hamata* (Sw.) Urb. **A.** Habit. **B.** Inflorescence (detail). **C.** Flower. **D.** Spikelet scale. **E.** Achene. (A, *Stergios et al. 19320*; B–E, *Stergios et al.* 20634.)

apex, secondary veins reticulate; tendrils absent; petioles usually pulvinate at the base and apex; lateral nodal flanges ("stipules") sometimes present at base. Inflorescences usually axillary, in panicles, cymes, spikes or racemes. Flowers 3-merous, epigynous, actinomorphic, unisexual or bisexual (plants dioecious, rarely monoecious). Tepals 6 in 2 whorls, ± free or connate at the base. Stamens (or staminodes) 6 in 2 whorls, the inner whorl sometimes sterile or absent; filaments free, rarely short-connate at the base; anthers 2-thecate, 4-sporangiate, longitudinally dehiscent. Gynoecium syncarpous, 3-carpellate; septal nectaries sometimes present; ovary (1–)3-locular, inferior; ovules anatropous, 2 to many per locule; placentation axile or parietal; nectaries septal or at the base of tepals; styles 3-branched or -lobed. Fruit a capsule (our species), rarely a samara or berry; seeds flattened and winged or globose and unwinged.

A principally tropical family of 2 genera and ~800(or 350–400?) species found in North America (USA), Mexico, Central America, the West Indies, South America (all country-level political units), Europe, Africa, Madagascar, Asia, Australia, and the Pacific Islands. *Dioscorea* L. is the only genus of Dioscoreaceae found in Venezuela.

References. Al-Shehbaz and Schubert (1989); Caddick et al. (2002a, 2002b); Huber (1998); Knuth (1924); Merckx et al. (2010); Wilkin et al. (2005).

In Guaramacal, Dioscoreaceae and Burmanniaceae are the only families included in the Dioscoreales, and as discussed under Burmanniaceae, their circumscription has been problematic, with respect to which genera to include in each family and the limits of these genera. Caddick et al. (2002b), utilizing molecular data, argue that a monophyletic Dioscoreaceae can be defined by including four genera: *Dioscorea* s.l. (including *Tamus* L. and *Rajania* L.), *Stenomeris* Planch., *Tacca* J. R. Forst. & G. Forst., and *Trichopus* Gaertn. (synonym: *Avetra* H. Perrier). *Stenomeris* and *Tacca* often are placed in their own monogeneric families, Stenomeridaceae and Taccaceae, respectively, whereas *Trichopus* and *Avetra* are segregated as Trichopodaceae. Merckx et al. (2010), however, argue that Dioscoreaceae sensu Caddick et al. (2002b) is not monophyletic, and they found strong support for Taccaceae and Trichopodaceae. We have chosen to adopt the circumscription of Merckx et al. (2010) and restrict Dioscoreaceae to *Dioscorea* and *Stenomeris*.

Dioscoreaceae have economic value as they are the source of edible yams, notably *Dioscorea alata* L., and medicinal (corticosteroid) and contraceptive compounds.

Dioscorea L.

Dioscorea L., Sp. Pl. 1032. 1753, nom. cons.

Lianas, herbaceous or suffruticose; aerial stems annual, creeping or climbing, twisting clockwise (dextrorse) or counterclockwise (sinistrorse; direction species specific); some species producing bulbils (aerial tubers) in the leaf axils; glabrous or pubescent with simple to stellate or T-shaped hairs. Leaves alternate (our species), opposite or whorled, simple (our species) or compound, entire (our species) or palmately lobed. Plants dioecious, rarely monoecious or with vestigial staminate or pistillate flowers. Inflorescences simple or compound, partial inflorescences usually pendent, spicate or racemose; staminate flowers solitary or paired, sometimes in cymules; pistillate flowers usually solitary or paired. Spicate inflorescences lax to dense, flowers usually with 2 floral bracteoles, usually unequal; tepals 6, in 2 whorls, equal or unequal, free to basally connate, inserted on a disk of variable size and shape. Staminate flowers: stamens 3 or 6, inner or outer whorl sometimes staminodial; pistillode present or not. Pistillate flowers: staminodes 3 or 6 or wanting; ovary inferior, 3-locular; ovules 2 per locule; styles 3, variously fused at base and free toward the apical stigmatic surfaces. Fruit a capsule (our species), 3-winged, loculicidally dehiscent, rarely baccate or a 1-winged samara. Seeds usually 6, 2 per locule, sometimes fewer; usually winged (our species) or sometimes wingless.

A pantropical genus of 350–400(or ~800?) species; some species also found in temperate parts of North America, Europe, and Asia. Approximately 40 species occur in Venezuela.

Knuth (1924) and Huber (1998), both relying on morphological characters, proposed scores of subgeneric groupings of *Dioscorea*, but whether or not these should be maintained is the subject of ongoing molecular and morphological research (Caddick et al., 2002b).

KEY TO THE SPECIES OF *DIOSCOREA*

1a. Staminate flowers sessile to short-pedicellate, solitary or in minute cymules; leaf bases cordate to ± hippocrepiform, sinuses broad; hairs, where present, simple and multicellular; stems twisting counterclockwise (sinistrorse) . . . . . ***D. meridensis***

1b. Staminate flowers pedicellate, always solitary, never in cymules; leaf bases truncate to cordate, not hippocrepiform or with broad sinuses; glabrous or pubescent (hairs not multicellular); stems twisting clockwise (dextrorse) 2

2a. Leaf blades 9–11-nerved, glabrous above, pubescent (rarely glabrous) below on nerves; petioles >4 cm long . . . . . ***D. lehmannii***

2b. Leaf blades 5–7(–9)-nerved, glabrous above and below; petioles <3 cm long 3

3a. Stems terete; leaf blades 6–11 × 2.5–5 cm, 5–7-nerved; staminate flowers: pedicels 5–8 mm long; filaments <0.5 mm long, separate at anthesis; staminal disk conspicuous . . . . . ***D. lisae***

3b. Stems angular to slightly winged; leaf blades 11–18 × 5–10.5 cm, 7–9-nerved; staminate flowers: pedicels 2–4 mm long; filaments ~1 mm long, connate below, free above; staminal disk inconspicuous . . . . . ***D. coriacea***

Dioscorea coriacea Humb. & Bonpl. ex Willd., Sp. Pl. 4(2): 794. 1806.

Helmia moritziana Kunth, Enum. Pl. 5: 422. 1850. *Dioscorea moritziana* (Kunth) R. Knuth, Notizbl. Bot. Gart. Berlin-Dahlem 7: 197. 1917.

Dioscorea sp. B; Dorr et al., Contr. U.S. Natl. Herb. 40: 46. 2000 [2001].

Suffruticose twining vines; stems to 3 mm in diameter, angular to slightly winged (at least when dry), twisting clockwise (dextrorse), minutely papillate. Leaf blades ovate-lanceolate, 11–18 × 5–10.5 cm, base subcordate to truncate, apex acute to acuminate, 7(–9)-nerved, glabrous above and below, coriaceous; petioles 2.5–3.5 cm long, minutely papillate. Staminate inflorescences racemose, 1–4 racemes per node, to 15 cm long; rachis minutely pubescent to glabrescent; flowers solitary, short-pedicellate; pedicels 1.5–4 mm long. Staminate flowers: green, infundibuliform, tepals ± equal, reflexed at anthesis; stamens 3; staminal disk inconspicuous; filaments to 1 mm long, connate below, free above; staminodes 0; stamens concealing a pistillode. Pistillate inflorescences spicate, to 15 cm long (to 40 cm long in fruit); flowers solitary. Pistillate flowers: tepals ± equal, free, reflexed at anthesis; style fused below, separate above, stigmas ± digitate; staminodes 0. Capsules oblong, 1.5–2 × 0.6–1.2 cm, base rounded to truncate, apex acute, glabrous.

Found in South America (Colombia, Venezuela, Ecuador, and Peru). In Venezuela, reported from Apure, Aragua, Barinas, Distrito Federal, Lara, Mérida, Portuguesa, Táchira, Trujillo, Yaracuy, and Zulia (Map 89). In the park, found in montane forest on both slopes of Guaramacal; 1,800–2,100 m.

COMMON NAME. Ñame de monte.

Staminate inflorescences in the few Guaramacal collections we have of *Dioscorea coriacea* all have a single raceme per node, whereas outside the range of our flora staminate inflorescences have up to four racemes per node.

Dioscorea lehmannii Uline, Bot. Jahrb. Syst. 22: 430. 1897; Morillo, in Morillo et al., Bot. Ecol. Monocot. Páramos Venez. 2: 487. 2010.

Suffruticose twining vines; stems to 4 mm in diameter, somewhat angled to very slightly winged (at least when dry), twisting clockwise (dextrorse), minutely pubescent. Leaf blades ovate to broadly ovate, 4–16 × 6–14 cm, base cordate, apex acuminate to cuspidate, 9–11-nerved, glabrous above, pubescent below on nerves (rarely glabrous), coriaceous; petioles 4.5–6.5 cm long, minutely pubescent to glabrescent. Staminate inflorescences paniculate, 1–8 racemes per node, 8–25 cm long; rachis minutely pubescent; flowers solitary, short-pedicellate; pedicels 2–4 mm long. Staminate flowers: green (or pink), campanulate to subrotate at anthesis, tepals equal; stamens 3; staminal disk prominent, annular; filaments short, erect, aggregated in the center of the disk, connivent; staminodes 0. Pistillate inflorescences spicate, to 12 cm long (to 30 cm long in fruit); flowers solitary. Pistillate flowers: tepals equal, free, spreading; style fused below, diverging toward apex, stigmas digitate; staminodes 0. Capsules ovate to narrowly ovate, 2–2.2 × 0.7–1 cm, base rounded, apex acute to acuminate, glabrous.

Found in South America (Colombia, Venezuela, and Ecuador). In Venezuela, known only from the Cordillera de Mérida

MAP 89. *Dioscorea coriacea* occurrence in Venezuela.

MAP 90. *Dioscorea lehmannii* occurrence in Venezuela.

(Portuguesa and Trujillo; Map 90). In the park, found on both slopes of Guaramacal; 1,900–3,100 m.

Knuth (1924) allied *Dioscorea lehmannii* with *D. coriacea*; the former is recognized by the presence of a staminal disk and the latter by its absence. He also placed these two species and *D. moritziana* (=*D. coriacea*) in *D.* sect. *Cylcadenium* Uline.

♦ ***Dioscorea lisae*** Dorr & Stergios, Sida 20: 1007, figs. 1, 2. 2003; Morillo, in Morillo et al., Bot. Ecol. Monocot. Páramos Venez. 2: 487–488, fig. 1. 2010.

FIGURE 12

Dioscorea sp. A; Dorr et al., Contr. U.S. Natl. Herb. 40: 46. 2000 [2001].

Herbaceous twining vines; stems delicate, ~1 mm in diameter, terete, twisting clockwise (dextrorse), glabrous. Leaf blades ovate-lanceolate, 6–11 × 2.5–5 cm, base cordate to truncate, apex acuminate to long-acuminate, 5–7-nerved, glabrous above and below, membranous; petioles 1.5–3.5 cm long, glabrous. Staminate inflorescences paniculate, with 1–4 racemose branches, 8–13 cm long; rachis minutely papillate; flowers solitary, pedicellate; pedicels 5–8 mm long. Staminate flowers: greenish-red to purple, rotate at anthesis, tepals equal, free, slightly reflexed at anthesis; stamens 3; staminal disk conspicuous flattened, annular; filaments very short to ~0.25 mm long; staminodes 0. Pistillate inflorescences spicate, to 14 cm long; flowers solitary. Pistillate flowers: tepals equal; styles connate below, free above toward stigmatic surface; staminodes 0. Capsules elliptic, 2–3 × 1.2–1.5 cm, apex and base rounded, glabrous.

Endemic to the Andes of Venezuela (Trujillo; Map 91). In the park, known only from montane forest on the north slope of Guaramacal; 1,800–3,000 m.

Several specimens of *Dioscorea lisae* have both infructescences and staminate inflorescences, indicating that this species is not strictly dioecious.

Dioscorea meridensis Kunth, Enum. Pl. 5: 334. 1850.

Suffruticose twining vines; stems to 5 mm in diameter, ± terete, grooved, twisting counterclockwise (sinistrorse), sparingly pubescent with simple, multicellular hairs, becoming glabrescent. Leaf blades orbicular to broadly ovate, 12–19 × 8.5–16.5 cm, base cordate to ± hippocrepiform, sinus broad, 3–4 × 2 cm, apex acute to cuspidate, 9–11(–13)-nerved, glabrous above, sparingly pubescent below with simple, multicellular hairs especially along nerves, membranous; petioles 8–12 cm long, sparingly pubescent with simple, multicellular hairs. Staminate inflorescences paniculate, with 4–6(or more) branches, to 30 cm long; rachis pubescent with simple, multicellular hairs; flowers in minute cymules or solitary, sessile to short-pedicellate; pedicels ~1 mm long. Staminate flowers: green, short-campanulate at anthesis, tepals ± equal; stamens 3; staminal disk inconspicuous; filaments short, distinct; staminodes 3; stamens and staminodes surrounding a pistillode. Pistillate inflorescences spicate, to 20(–40) cm long; flowers solitary. Pistillate flowers: not seen. Capsules ovate to ovate-oblong, 1.8–2.2 × 1.3–1.5 cm, base cuneate, apex truncate, glabrous.

Found in South America (Colombia, Venezuela, Ecuador, and Peru). In Venezuela, known from the Andes (Mérida, Táchira, and Trujillo) and the Sierra de Perijá (Zulia; Map 92). Understory of montane forest on the north slope of the park; 1,800–2,500 m.

MAP 91. *Dioscorea lisae* occurrence in Venezuela.

MAP 92. *Dioscorea meridensis* occurrence in Venezuela.

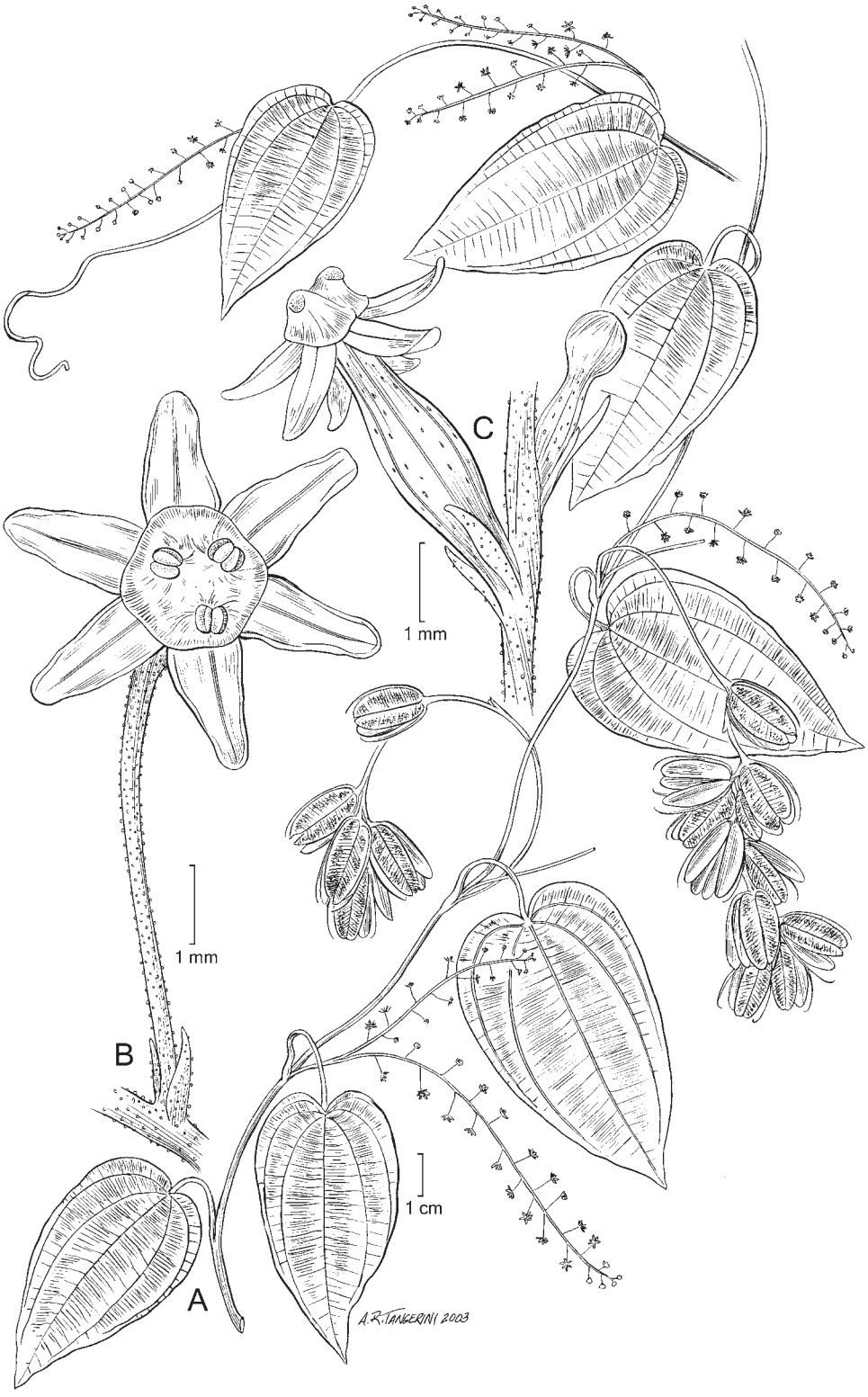


FIGURE 12. Dioscoreaceae, *Dioscorea lisae* Dorr & Stergios. **A.** Habit (of a plant with mixed inflorescences, either male inflorescences or male inflorescences arising from the axils of infructescences). **B.** Staminate flower. **C.** Pistillate flower. (A, *Dorr et al. 8921*; B, C, *Dorr & Barnett* 8057.)

Eriocaulaceae

L. J. DORR AND S. MIGUEL NIÑO

Perennial or rarely annual herbs, terrestrial (favoring very wet sites) or aquatic, rosulate, acaulescent or rarely caulescent. Rhizomes present or absent. Leaves alternate, spiral, rarely distichous or whorled, almost always basal, lanceolate to linear, flat or fleshy. Inflorescences in terminal heads, solitary or in umbels; involucral bracts usually present; peduncles long or short, enclosed at base by a tubular sheath. Flowers small, actinomorphic or zygomorphic, sessile or very short-pedicellate, numerous (10–1,000 per head), unisexual or very rarely bisexual (*Rondonanthus* Herzog), some species with flowers of both sexes on the same head or in separate heads, rarely dioecious; hypogynous. Sepals 2 or 3, free or connate basally, sometimes completely connate. Petals 2 or 3 or absent, free or connate, eglandular or with a gland (*Eriocaulon* L.). Staminate flowers: stamens usually 3 or 2, or 6 or 4 in 2 whorls; filaments free or adnate to the corolla tube, sometimes with an androphore; anthers dorsifixed or basifixed, 1- or 2-thecate, 2- or 4-sporangiate; pistillodes present. Pistillate flowers: ovary superior, 2- or more commonly 3-locular; ovules 1 per locule, pendulous, orthotropous; styles 2 or 3 fused, stigmatic portions fused or not, style-like appendages nectariferous or not; staminodes present or absent. Fruit a capsule, generally loculicidally dehiscent, rarely an indehiscent achene. Seeds 1 per locule, rarely reduced to 1 per fruit; seed coat reticulate, striate, rough or smooth; endosperm copious.

A cosmopolitan family of 7 or 8 genera and ~1,200 species, with its greatest diversity in subtropical and tropical America, but also found in Europe, Africa, Madagascar, Asia, Australia, and the Pacific Islands. The majority of genera and species of Eriocaulaceae occur in mountainous areas of the Venezuelan Guayana and in west central and southeastern Brazil. In Venezuela as a whole, 6 or 7 genera and ~100 species occur.

References. Andrade et al. (2010); Costa and Sano (2013); Giulietti et al. (2012); Kral (1989); Parra et al. (2010); Stützel (1998); Unwin (2004).

Paepalanthus Mart.

Paepalanthus Mart., Ann. Sci. Nat., Bot., sér. 2, 2: 28. 1834, nom. cons.

Tonina Aubl., Hist. Pl. Guiane 2: 856. 1775.

Lachnocaulon Kunth, Enum. Pl. 3: 497. 1841.

Paepalanthus subgen. *Actinocephalus* **Körn., in Martius, Fl. Bras. 3(1): 321. 1863.** *Actinocephalus* (Körn.) Sano, Taxon 53: 99. 2004.

Blastocaulon Ruhland, in Engler, Pflanzenr. 4, 30 (Heft 13): 223. 1903.

Rosulate herbs, acaulescent to caulescent, erect or creeping; usually vegetative parts pubescent, trichomes simple or malpighiaceous ("T"-shaped). Leaves linear, membranous or coriaceous. Inflorescences a single head (pedunculate or sessile) or a group of heads terminating a rosette, heads in umbels or not (our species); involucral bracts present. Flowers unisexual and bisexual (plants polygamous), 2- or 3-merous, subtended by a single bract, usually resembling the sepals, perianth biseriate and involute. Staminate flowers: sepals free or connate basally, forming a membranous tube, glabrous or pilose; petals fused; stamens 2-thecate (rarely 1-thecate), 4-sporangiate (rarely 2-sporangiate); filaments free; gynoecium reduced to glands. Pistillate flowers: sepals free or connate basally, usually pubescent; petals free (or absent), inserted ± at the same height as the stigmas and opposite to them, apex papillate; gynoecium with simple or bifid stigmas and appendages (glands).

A predominately neotropical genus of ~450 species found in North America (USA), Mexico, Central America, the West Indies, South America (Colombia, Venezuela, the Guianas, Ecuador, Peru, Bolivia, Brazil, and Paraguay), Africa, and Madagascar. Approximately 50 species occur in Venezuela, the majority in the Venezuelan Guayana.

References. Rosa and Scatena (2007); Ruhland (1903); Trovó et al. (2013).

Stützel (1998) argues that circumscription of *Paepalanthus* is problematic as he interprets the genus as "a conglomerate of several, probably not closely related groups of species." Andrade et al. (2010), however, identify a monophyletic *Paepalanthus* s.l. if *Actinocephalus* (Körn.) Sano, *Blastocaulon* Ruhland, *Lachnocaulon* Kunth, and *Tonina* Aubl. are considered synonyms (as is done here, but see below). Trovó et al. (2013) resolve the Paepalanthoideae as monophyletic but hint at a dismemberment of *Paepalanthus* s.l., which Costa and Sano (2013) have initiated by recognizing *Actinocephalus* as a genus endemic to Brazil. The subgeneric groupings of *Paepalanthus* s.l. proposed by Ruhland (1903) based on morphology are clearly artificial and do not agree with the relationships that now are being revealed by analyses of molecular data.

The generic synonymy proposed above creates a nomenclatural problem in that *Tonina* is a much older name than *Paepalanthus*, which is conserved against *Dupatya* Vell. and not *Tonina*. The ICN (McNeill et al., 2012: Art. 11) requires us to adopt the older of the two generic names, but adopting the Aublet name for the ~450 species of *Paepalanthus* would be destabilizing nomenclaturally. Fortunately, the ICN (McNeill et al., 2012: Art. 56.1) also permits names to be rejected, and we expect that once the status of *Paepalanthus* is fully resolved a proposal to reject the monotypic *Tonina* will be made.

Paepalanthus pilosus (Kunth) Kunth, Enum. Pl. 3: 518. 1841; Briceño, in Morillo et al., Bot. Ecol. Monocot. Páramos Venez. 2: 498–499, foto 8. 2010. *Eriocaulon pilosum* Kunth, in H. B. K., Nov. Gen. Sp. [fol.] 1: 200. 1815 [1816]; ibid. [qu.] 1: 251. 1815 [1816].

FIGURES 13, 25D

Paepalanthus karstenii Ruhland, in Engler, Pflanzenr. IV, 30 (Heft 13): 155. 1903; Briceño, in Morillo et al., Bot. Ecol. Monocot. Páramos Venez. 2: 494–495, fig. 2, foto 5. 2010.

Paepalanthus karstenii var. *corei* Moldenke, Phytologia 29: 386. 1975.

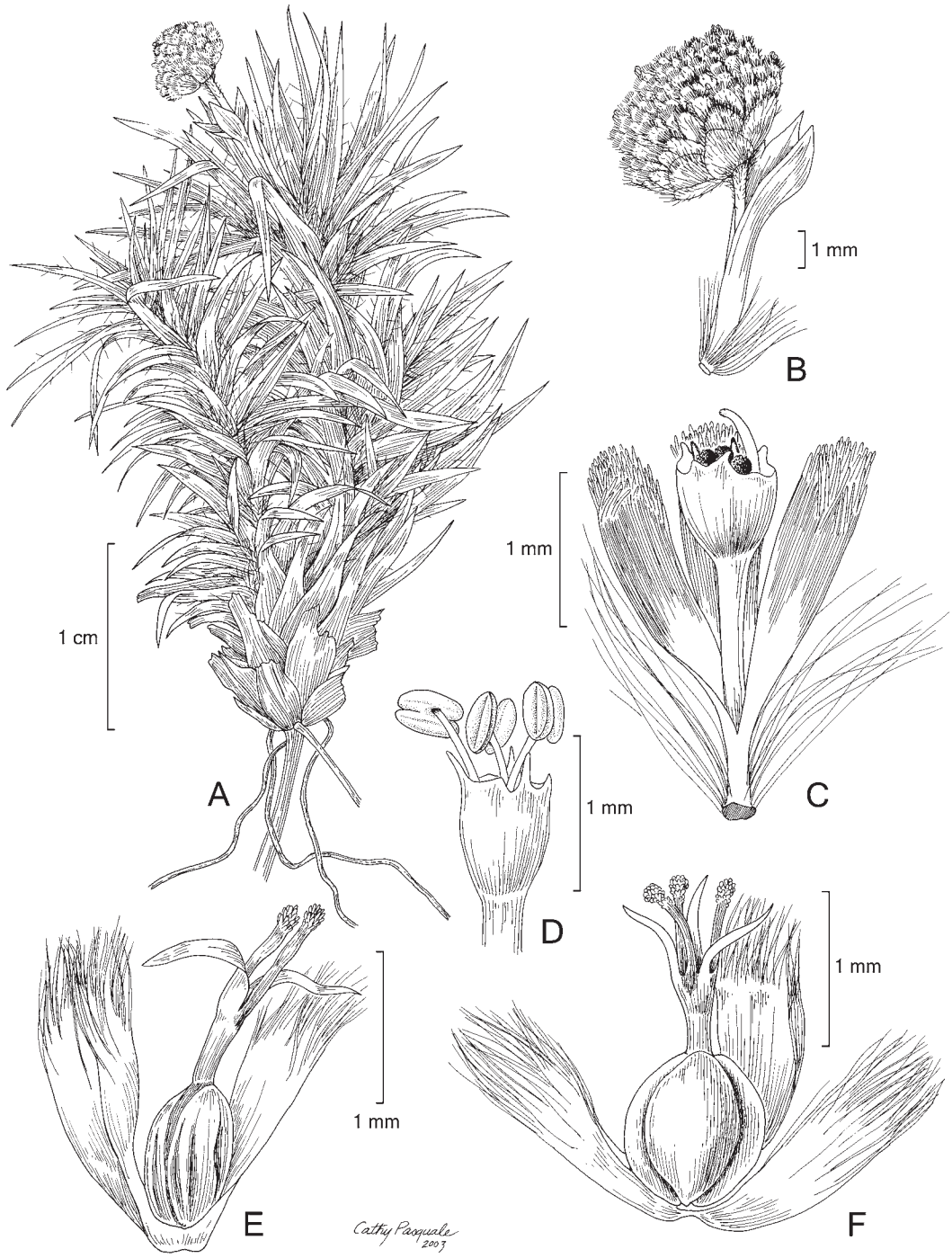


FIGURE 13. Eriocaulaceae, *Paepalanthus pilosus* (Kunth) Kunth. **A.** Habit. **B.** Inflorescence with peduncle and involucral bracts. **C, D.** Staminate flowers. **C.** Staminate flower with pistillodes barely equaling petal tube in length (anthers mostly removed, one filament visible). **D.** Staminate flower with three anthers exceeding petal tube in length. **E, F.** Pistillate flowers. **E.** Flower with two-locular ovary. **F.** Flower with three-locular ovary. (A–C, E, F, *Dorr et al. 7324*; D, *Stergios et al. 18726*.)

Rosulate herbs, 1.5–2.5 cm tall, cushion-like or forming small colonies. Leaves recurved, 10–14(–20) × 1–2 mm, apex sharply acute, margins with scattered long cilia (or with scars where these hairs have fallen), otherwise glabrous. Inflorescences several, arising from lower nodes; peduncles 0.5–4(–9) cm long, apex pubescent, subtended by a 3-lobed, glabrous, sheathing bract; heads 2–5 mm in diameter. Involucral bracts light brown, apex pubescent, sometimes margins and abaxial surface also pubescent. Sepals black. Petals of the pistillate flowers oblanceolate, pilose on both surfaces but surfaces not completely covered by hairs.

Found in Central America (Costa Rica and Panama) and South America (Colombia, Venezuela, Ecuador, Peru, and Bolivia). In Venezuela, found only in the Andes (Lara, Mérida, Táchira, and Trujillo; Map 93). In the park, found in waterlogged soils, often with *Sphagnum* L. and other mosses, in the Páramo de Guaramacal and near the Laguna del Pumar; ~2,600–3,100 m.

A critical revision of the species of *Paepalanthus* that occur in the northern Andes is needed. The last comprehensive treatment to deal with these species was that of Ruhland (1903), but a number of northern Andean species have been described since then without consideration as to where they would fall in Ruhland's scheme. In addition, interpretations of several species treated by Ruhland have changed. Ruhland (1903) distinguished *P. karstenii* from *P. pilosus* by involucral bract pubescence (glabrous vs. pilose), but this is a weak distinction as the bracts of *P. pilosus* are sometimes almost completely glabrous except for the very apex. Similarly, Hensold in Hammel et al. (2003a) resurrected *P. dendroides* (Kunth) Kunth, which Ruhland (1903) had considered to be a synonym of *P. pilosus*.

MAP 93. *Paepalanthus pilosus* occurrence in Venezuela.

The ranges of these two species are similar (Costa Rica south to Peru), but there are no records yet of *P. dendroides* occurring in Venezuela. Hensold in Hammel et al. (2003a) distinguished *P. dendroides* from *P. pilosus* by its larger leaves and peduncles and by its glabrous (except for the base) leaves. The leaf margins of Guaramacal material of *P. pilosus* have long cilia (or their scars), but leaf length and peduncle length overlap with measurements cited by Hensold in Hammel et al. (2003a) for Costa Rican material of *P. dendroides*. Her brief descriptions in that Central American flora do not appear to cover the full range of variation in either species.

Heliconiaceae

L. J. DORR AND S. MIGUEL NIÑO

Perennial herbs, terrestrial, solitary or forming dense colonies. Rhizomatous. Aerial stems either very short (leaf sheaths forming a pseudostem) or elongate with distinct internodes, enclosed by leaf sheaths. Leaves distichous; composed of sheath, blade, and petiole (sometimes inconspicuous or absent); without a distinct ligule; leaf blade entire with a prominent midrib, venation generally pinnate-parallel, slightly arcing toward the margins. Inflorescences terminal, usually on leafy shoots, sometimes on specialized shoots bearing only bladeless sheaths, with few-flowered cymes clustered in axils of cincinnal (or spathaceous) bracts; bracts generally showy (red, yellow, orange or a combination of these colors), alternately arranged along the rachis, distichous or spiral, persistent or deciduous. Flowers bisexual, perfect, 3-merous, heterochlamydeous, strongly zygomorphic. Tepals 6, in 2 series, all petaloid, the median adaxial tepal of outer series distinct, the remaining 5 connate and forming a basal tube. Stamens 5, fertile; staminodes 1; filaments adnate to the tubular part of perianth; anthers basifixed, 2-thecate, 4-sporangiate. Ovary inferior, 3-locular; placentation axile; ovules anatropous, subbasal, 1 per locule; style 1, filiform; stigma capitate or 3-lobed. Fruit a drupe; seeds (1–)3, not arillate.

A predominately neotropical family composed of a single genus and 100–200 species found in Mexico, Central America, the West Indies, and South America (all country-level political units except Chile and Uruguay); also on the Pacific Islands, including New Guinea. Twenty-three species occur in Venezuela.

Reference. Andersson (1998a).

The majority of *Heliconia* species found in the Venezuelan Andes are known by the common name "platanillo," which reflects the similarity of their leaves to those of the cultivated banana or plantain. Some also are known as "ave de paraíso," although less commonly, and this presumably reflects a transfer of the common name of the superficially similar *Strelitzia* Aiton (Strelitziaceae), native to Africa and now cultivated throughout the tropics.

Many species of *Heliconia* are cultivated.

Heliconia L.

Heliconia L., Mant. Pl. 2: 147, 211. 1771, nom. cons.

The characters of the genus are those of the family.

REFERENCES. Andersson (1981b, 1985); Aristeguieta (1961); Berry and Kress (1991); Kress (1997); Kress et al. (1999); Rodríguez (1954).

KEY TO THE SPECIES OF *HELICONIA*

1a. Cincinnal bracts spiral; drupes large, 17–22 mm in diameter . . . . . ***H. meridensis***
1b. Cincinnal bracts distichous; drupes small, 4–10 mm in diameter 2
  2a. Petioles <1 cm long; flowers resupinate, yellow or orange, always with green eyespots near apex . . . . . ***H. hirsuta***
  2b. Petioles 30–80 cm long; flowers not resupinate, white with a green apex that lacks eyespots . . . . . ***H. stricta***

Heliconia hirsuta L. f., Suppl. Pl. 158. 1781 [1782]; Andersson, in Berry et al., Fl. Venez. Guayana 5: 585, fig. 504. 1999.

FIGURE 14A–F

Heliconia costanensis Aristeg., Bol. Soc. Venez. Ci. Nat. 25(107): 206, t. 1964.

Herbs with *Zingiber*-like habit (i.e., leaves horizontally arranged with short petioles), (0.5–)1.5–3(–4) m tall. Leaves 9–25 per stem; leaf blades 25–40 × 10–15 cm, glabrous above and below, sometimes waxy below; petioles 0.5–1 cm long. Inflorescences erect, to 15(–20) cm long; cincinnal bracts distichous, 5–10 per inflorescence, basal ones 5–15(–20) × 0.5–1 cm, medial ones 4–10 × 0.5–1 cm, usually orange at base, becoming red at apex, sometimes greenish-yellow or yellow. Flowers resupinate, 2.5–5 cm long, yellow to orange or red, with dark green eyespots near apex. Ovary 3–6 × 2–4 mm, glabrous to ± hirsute, yellow or green with an orange or red apex. Drupes 7–10 × 6–10 mm, dark blue.

Found in Central America and South America (Colombia, Venezuela, Trinidad and Tobago, the Guianas, Ecuador, Peru, Bolivia, Brazil, Paraguay, and Argentina); introduced in the West Indies. Widely distributed in Venezuela (Amazonas, Anzoátegui, Apure, Aragua, Barinas, Bolívar, Carabobo, Cojedes, Delta Amacuro, Distrito Federal, Falcón, Guárico, Lara, Mérida, Miranda, Monagas, Portuguesa, Sucre, Táchira, Trujillo, Yaracuy, and Zulia; Map 94). In the park, in open areas and in forest where the canopy is not completely closed; (1,500–)1,600–1,800 (–2,700) m.

This is a highly polymorphic species.

Heliconia meridensis Klotzsch, Linnaea 20: 462. 1847.

FIGURES 14G–K, 25E

Heliconia schneeana Steyerm., Fieldiana, Bot. 28: 161. 1951.

Heliconia falcata Barreiros, Rodriguésia 28(41): 130. 1976.

Herbs with *Musa*-like habit (i.e., leaves vertically arranged with long petioles) to *Canna*-like habit (i.e., leaves obliquely arranged with medium-sized petioles), 2–4.5 m tall. Leaves 4–5 per stem; leaf blades 100–150 × 25–40 cm, glabrous above, ± arachnoid-pilose below on midrib (indumentum often

MAP 94. *Heliconia hirsuta* occurrence in Venezuela.

MAP 95. *Heliconia meridensis* occurrence in Venezuela.

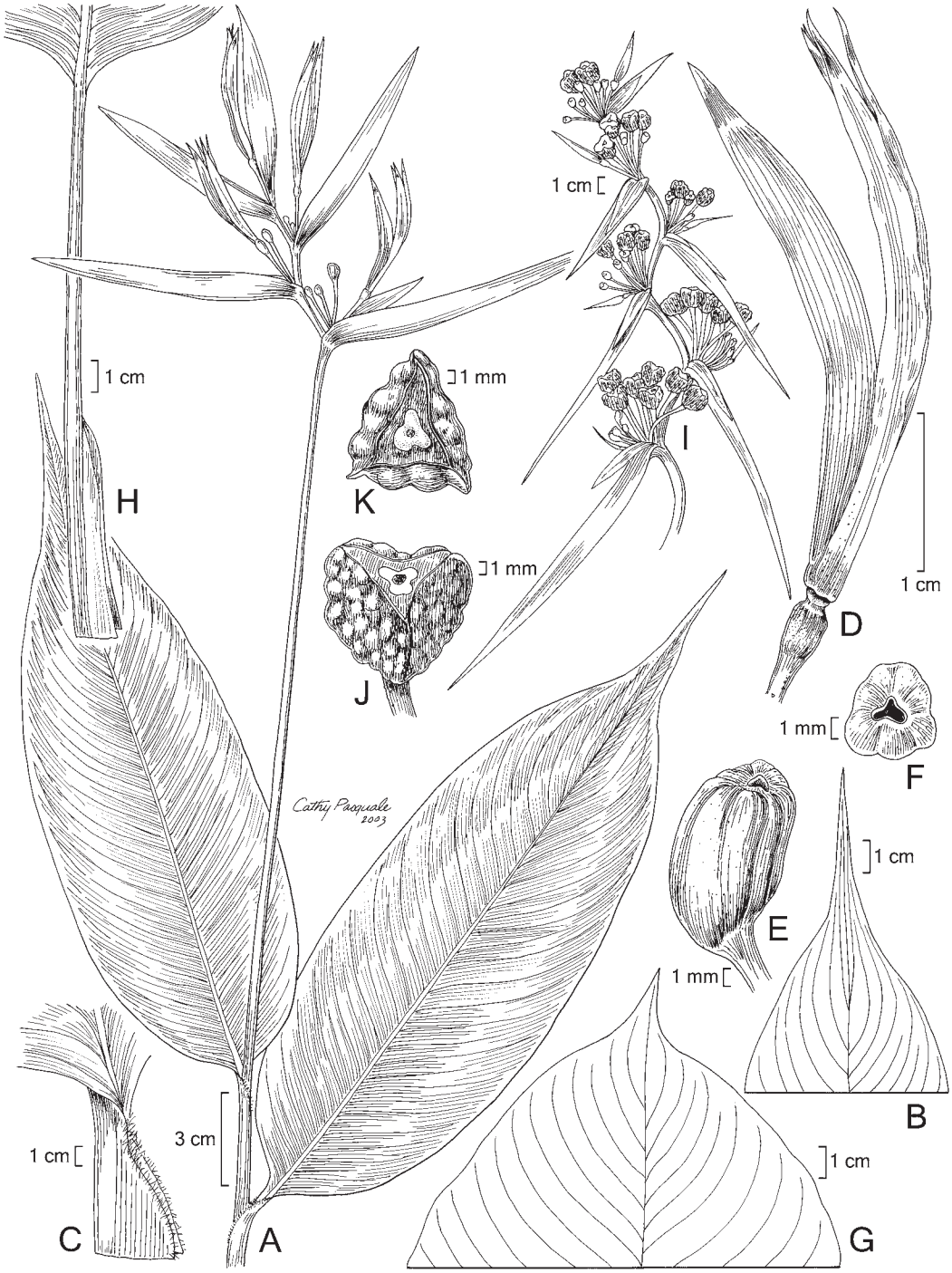


FIGURE 14. Heliconiaceae. **A–F.** *Heliconia hirsuta* L. f. **A.** Habit. **B.** Leaf apex. **C.** Sheath (detail). **D.** Flower. **E.** Lateral view of the ovary. **F.** Apical view of the ovary. **G–K.** *H. meridensis* Klotzsch. **G.** Leaf apex. **H.** Base of leaf (detail). **I.** Infructescence. **J.** Lateral view of fruit. **K.** Apical view of fruit. (A, D, *van der Werff et al. 7649*; B, C, *Cuello et al. 1747*; E, F, *Dorr et al. 5685*; G, *Dorr et al. 8341*; H, *Stergios 17372*; I–K, *R. M. King et al. 10561*.)

inconspicuous); petioles 15–35(–45) cm long. Inflorescences erect, to 33 cm long; cincinnal bracts spiral, 7–9 per inflorescence, 13–15 × 4 cm, generally red, but occasionally displaying gradations of pink to dark red. Flowers resupinate, 3–5 cm long, yellow or yellowish-green. Ovary 5–6 × 9–10 mm, glabrous, yellow to bright green. Drupes 14–15 × 17–22 mm, dark blue.

Found in South America (Colombia and Venezuela). In Venezuela, found in the Andes (Barinas, Lara, Mérida, Portuguesa, Táchira, and Trujillo), the Sierra de Perijá (Zulia), and the Cordillera de la Costa (Yaracuy; Map 95). Common throughout the park; (1,500–)1,600–2,000 m.

Heliconia meridensis is sometimes placed in synonymy under *H. latispatha* Benth., but the two species are only superficially similar. The flowers of the former are resupinate (vs. not resupinate in the latter), and the perianth is not hidden by cincinnal bracts (vs. partially hidden by cincinnal bracts in the latter).

Heliconia stricta Huber, Bol. Mus. Paraense Emilio Goeldi 4: 543. 1906.

Herbs with *Musa*-like habit, 1.5–4 m tall. Leaves 3–5 per stem; leaf blades 80–160 × 15–30 cm, glabrous above and puberulous to villose along midrib margin below; petioles 30–80 cm long. Inflorescences erect, 20–35 cm long; cincinnal bracts distichous, 4–8(–10) per inflorescence, basal ones 12–18 cm long, apical ones shorter, 8–12 cm long, red or orange on the sides, yellowish on keel and margin, green on the edge, rarely entirely dingy yellowish. Flowers not resupinate, 5–9 cm long, white basally, dark green distally with white apex. Ovary 5–8 × 3–5 mm, glabrous, white. Drupes 11–12 × 4–5 mm, blue.

Found in South America (Colombia, Venezuela, the Guianas, Ecuador, Peru, Bolivia, and Brazil); cultivated in the Greater Antilles. In Venezuela, found in Apure, Barinas, Bolívar, Mérida, Portuguesa, Táchira, and Trujillo (Map 96). In the park, found on the edge of coffee plantations in the karst area above the Río Amarillo; ~1,200 m.

MAP 96. *Heliconia stricta* occurrence in Venezuela.

Heliconia stricta occurs only near the lower elevational limits of the park. It can be confused easily with *H. bihai* (L.) L., which also occurs in the Venezuelan Andes. The former species is less robust and smaller than *H. bihai*. Also, *H. stricta* has a perianth that is white basally and dark green distally, with a white apex (vs. white basally with distal third pale green), and the staminodes are inserted (8–)10 mm or usually much more above the base of the perianth (vs. 1.5–7 mm above the base of the perianth).

Heliconia stricta is widely cultivated and can be seen in tropical and subtropical gardens worldwide.

Hypoxidaceae

L. J. DORR

Perennial herbs from ± tuberous rhizomes or corms, the apical portion usually covered by a membranous to fibrous coat formed by overlapping leaf bases. Leaves simple, entire, rosulate, usually tristichous; blades linear to lanceolate, often plicate (best seen in fresh material), pubescent with simple and compound hairs, or glabrous, prominently parallel-veined, sessile (our species) or with a petiole-like constriction, persistent. Inflorescences several per plant, axillary, borne on leafless scapes arising from the tuberous rhizomes or corms, appearing corymbose or racemose, or sometimes reduced to a single flower. Flowers from the axils of small or larger and leafy bracts, perfect (our species), rarely staminate; tepals usually 6, in 2 whorls, ± petaloid, subequal, free (our species) or fused to form a tube, usually yellow. Stamens usually 6, in 1 or less commonly 2 whorls; filaments distinct, adnate to base of tepals; anthers 2-loculed, basifixed. Ovary inferior, 3-locular; ovules few to many in each locule; placentation axile (our species) or parietal; style simple with 3 stigmas as free lobes or grooves. Nectaries absent. Fruit a capsule with circumscissile or loculicidal dehiscence or sometimes indehiscent and berrylike. Seeds small, globose to ellipsoid; testa black or brown, smooth to variously textured; embryo small; endosperm copious.

A family of 8 genera and 150–175 species widely distributed in tropical and subtropical regions of the world, especially in the Southern Hemisphere, but also occurring in the Northern Hemisphere, most notably in the Americas. In Venezuela, 2 genera (*Curculigo* Gaertn. and *Hypoxis* L.) and 3 species are native or naturalized. A fourth species, *C. capitulata* (Lour.) Kuntze, is occasionally seen in cultivation, but it is not known to escape in Venezuela.

References. Judd (2000); Kocyan et al. (2011); Nordal (1998); Rudall et al. (1998).

Morphological and molecular data consistently support Hypoxidaceae as a monophyletic clade (Rudall et al., 1998; Judd,

2000; Kocyan et al., 2011), which can be subdivided into three well-supported major clades (Kocyan et al., 2011). Genera and species belonging to two of these three major clades, the *Curculigo* clade and the *Hypoxis* clade, are found in the Venezuelan flora.

Hypoxis L.

Hypoxis L., Syst. Nat., ed. 10, 972, 986, 1366. 1759.
Rhodohypoxis Nel, Bot. Jahrb. Syst. 51: 239, 257, 300. 1914.

Acaulescent herbs; rhizomes often relatively large and ± tuberous. Leaves grasslike, linear-lanceolate to almost filiform, usually pubescent, even if only sparingly so. Inflorescences reduced cymes of 2 to several flowers, but often appearing racemose, sometimes reduced to a solitary, axillary flower, borne on a slender, erect to decumbent scape that is usually shorter than the subtending leaves. Flowers sessile to long-pedicellate and of 2 kinds: chasmogamous flowers showy, with spreading tepals, cleistogamous ones inconspicuous, with perianth parts forming a conical point. Tepals ± petaloid, 3 outer tepals spreading, narrower than inner, green below and yellow above, inner tepals spreading, yellow above and below (white to green in cleistogamous flowers). Stamens exserted, the filaments short subulate to filiform. Fruit a capsule dehiscing by a circumscissile slit below the marcescent perianth and often then splitting longitudinally into 3 segments; seeds spherical-ellipsoid.

A genus of 50–100 species widely distributed in America, Africa, Madagascar, Asia, and Australia, with an important center of diversity in Africa. Species number is problematic since the genus is apomictic. Two species occur in Venezuela.

Reference. Brackett (1923).

Problems with circumscribing a monophyletic *Hypoxis* were noted by Judd (2000). Molecular data (Kocyan et al., 2011) suggest that such a circumscription can be achieved by placing the African genus *Rhodohypoxis* Nel in synonymy (as is done here) and by excluding several Australian species of *Hypoxis* that show affinities to the one major clade of Hypoxidaceae not found in Venezuela and otherwise restricted to southern Africa.

Mature seeds are needed to identify specimens as the color and ornamentation of the testa are important diagnostic characters.

Hypoxis decumbens L., Syst. Nat., ed. 10, 986. 1759; Morillo, in Morillo et al., Bot. Ecol. Monocot. Páramos Venez. 2: 510–511, foto 1. 2010.

FIGURE 15

Hypoxis decumbens var. *major* Seub., in Martius, Fl. Bras. 3(1): 52, t. 7, fig. 1. 1847.

Herbs 10–30(–45) cm tall. Leaves linear to linear-lanceolate, 5–30(–45) × 0.2–0.8 cm, sparingly pubescent with long, simple hairs, especially along the margin; leaf sheaths disintegrating completely, not fibrous. Inflorescences 3–5 per plant, each scape with 1–4(–6) flowers, scapes filiform, (5–)10–20(–30) cm long, shorter than the leaves, sparingly pubescent to glabrous. Tepals ovate-lanceolate, 4–6 × 1.5–3 mm, glabrous adaxially, pubescent abaxially. Capsules subcylindric to fusiform, 10–15(–20) × 2–3 mm, densely pubescent to glabrate. Mature seed black, ellipsoid, ~1 mm in diameter; testa tuberculate.

MAP 97. *Hypoxis decumbens* occurrence in Venezuela.

Found in Mexico, Central America, the West Indies, and South America (Colombia, Venezuela, Ecuador, including the Galapagos Islands, Peru, Bolivia, Brazil, Paraguay, Argentina, and Uruguay). In Venezuela, found in the Andes (Lara, Mérida, Miranda, Portuguesa, Táchira, and Trujillo) and in the Cordillera de la Costa (Aragua, Distrito Federal, and Yaracuy; Map 97). We have a few collections from below Páramo del Pumar and in El Campamento on the south slope (Qda. Jirajara), but we suspect that this species has a wider distribution in the park in disturbed areas and pastures; 1,900–2,800 m.

Use. A glue is obtained from the rhizomes (R. Caracas, pers. comm.).

Hypoxis decumbens can be distinguished from *H. humilis* Kunth, which also occurs in Venezuela, by seed color (black vs. dull brown) and texture (rounded tubercles vs. sharp-pointed murications). We do not agree with Campbell in Hokche et al. (2008: 744), who synonymized these two species, and we have not incorporated her distributional data into ours. Undoubtedly, *H. decumbens* occurs in more Venezuelan states than we have indicated here.

Iridaceae

L. J. DORR AND B. STERGIOS

Perennial or rarely annual herbs, woody shrubs (Africa only) or achlorophyllous saprophytes (Madagascar only); sometimes

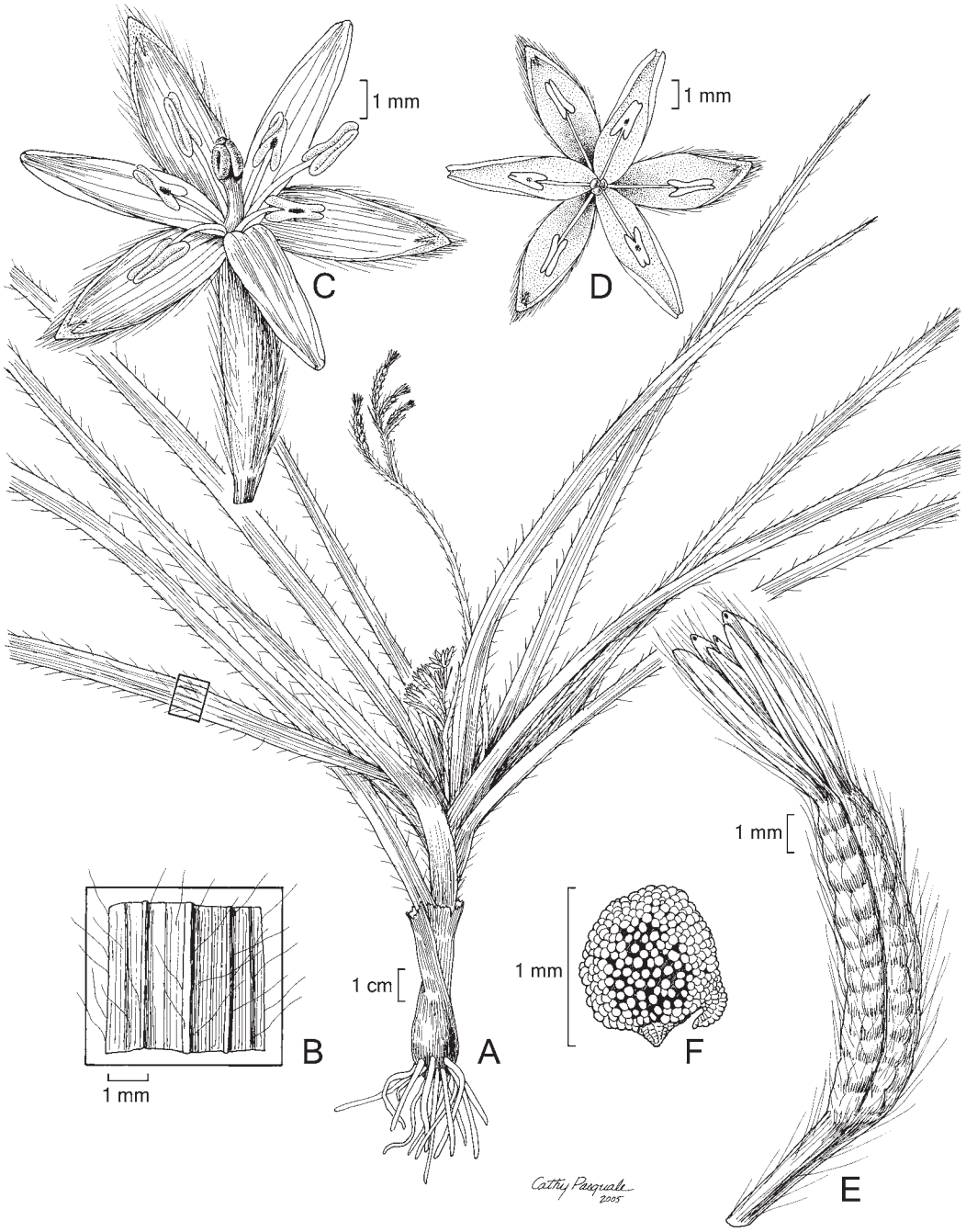


FIGURE 15. Hypoxidaceae, *Hypoxis decumbens* L. **A.** Habit. **B.** Leaf (detail of abaxial surface). **C.** Flower. **D.** Flower, pistil removed. **E.** Mature fruit. **F.** Seed. (A–F, *Dorr et al. 8556*.)

caespitose; underground stems rhizomes, corms or bulbs. Leaves basal and cauline, sometimes cataphylls present, distichous, sheaths of the foliage leaves open or closed; leaf blades unifacial, but bifacial proximally (equitant) or occasionally terete, plane or plicate, venation parallel. Flowering stems simple or branched, terete or compressed and then angled or winged. Inflorescences 1 to many umbellate monochasial cymes (rhipidia), panicles, spikes or flowers solitary; rhipidia enclosed in 2, opposed, large, leafy bracts (spathes). Flowers usually pedicellate (or subsessile), bisexual, actinomorphic to slightly zygomorphic; perianth petaloid

with 2 equal or unequal whorls of 3 tepals each; tepals showy, distinct or connate below to form a tube. Stamens 3(rarely 2), opposite the outer tepals; filaments distinct or connate below to form a tube; anthers 2-thecate, 4-sporangiate, extrorse or latrorse, usually dehiscing by longitudinal slits. Ovary inferior (rarely superior), 3-locular; placentation axile; ovules many to few (occasionally 1 or 2), anatropous; style single below, filiform (at least proximally), 3-branched or 3-lobed, branches either filiform or distally expanded or branches thickened or flattened, petaloid. Fruits capsular, loculicidal, rarely indehiscent. Seeds globose to angular or discoid; seed coat reticulate to smooth, generally dry, rarely fleshy or arillate.

A cosmopolitan family of 65–75 genera and 2,000–2,050 species, with southern Africa the most important center of diversity. The family is found throughout the Americas. In Venezuela, 12 genera and ~20 species of native or naturalized taxa have been recorded.

References. Goldblatt and Manning (2008); Goldblatt et al. (1998, 2008); Reeves et al. (2001a, 2001b).

Iridaceae are popular garden plants, and additional genera and species are likely to become naturalized in Venezuela.

KEY TO THE GENERA OF IRIDACEAE

1a. Flowering stalks terete; flowers ± sessile, included within the spathes; capsules pubescent; seeds angular, whitish-brown to brown . . . . . ***Orthrosanthus***

1b. Flowering stalks compressed, usually angular or winged; flowers long-pedicellate, exserted from the spathes; capsules glabrous; seeds globose or compressed-globose, dark brown to blackish . . . . . ***Sisyrinchium***

Orthrosanthus Sweet

Orthrosanthus Sweet, Fl. Australas. t. 11. 1827.

Perennial, evergreen herbs; caespitose and forming large tufts; rhizomes short, persistent, creeping. Leaves mostly basal, narrowly ensiform, equitant, linear to linear-lanceolate, coriaceous, without a prominent midrib. Flowering stems erect, branched or semibranched, branches long or short, ascending, terminating in a single rhipidium or branches with various rhipidia; rhipidia ± short; spathes (bracts) unequal. Flowers bisexual, actinomorphic, subsessile or short-pedicellate, fugacious. Tepals free (our species) or connate in a short tube (Australian species), subequal, spreading horizontally from the base, blue or white. Anthers erect; filaments free or partially connate below. Ovary subsessile, included within the spathes (our species), rarely exserted; style short, 3-branched, branches relatively long, extending between the stamens, and stigmatic apically. Capsule ellipsoid to cylindric, pubescent (our species) or not. Seeds angular to fusiform.

A genus of 9 species with an unusual disjunct distribution; 5 species found in Mexico, Central America, and South America (Colombia, Venezuela, Ecuador, Peru, Bolivia, and Argentina) and 4 in southwestern Australia. The American species are restricted to higher elevations but are absent from high elevations in the Venezuelan Guayana. Two species occur in Venezuela.

References. Henrich and Goldblatt (1987); Steyermark (1948).

Orthrosanthus is superficially similar to *Eccremis* Willd. ex Baker (Xanthorrhoeaceae). Characters to distinguish the two genera in Guaramacal are listed following the description of *Eccremis*.

Orthrosanthus acorifolius (Kunth) Ravenna, Not. Mens. Mus. Nac. Hist. Nat. 21(249): 9. 1977; Morillo, in Morillo et al., Bot. Ecol. Monocot. Páramos Venez. 2: 515–516, fig. 1. 2010. *Moraea acorifolia* Kunth, in H. B. K., Nov. Gen. Sp. [fol.] 1: 259. 1815 [1816]; ibid. [qu.] 1: 322. 1815 [1816]. *Orthrosanthus chimboracensis* var. *acorifolius* (Kunth) Steyerm., Lloydia 11: 19. 1948.

FIGURE 16D–G

Orthrosanthus chimboracensis auct., non (Kunth) Baker; Ortega et al., BioLlania 5: 43. 1987.

Robust herbs, 0.8–1 m tall. Basal leaves 40–50 × 1.5–2 cm, broadly linear, gradually acuminate, sometimes plicate, cauline leaves 10–20 cm long, linear-acuminate. Flowering stems erect, rigid, branched with internodes, ± equal in length to basal leaves, 0.5 cm wide. Rhipidia several-flowered, flowers ~3 cm in diameter,

MAP 98. *Orthrosanthus acorifolius* occurrence in Venezuela.

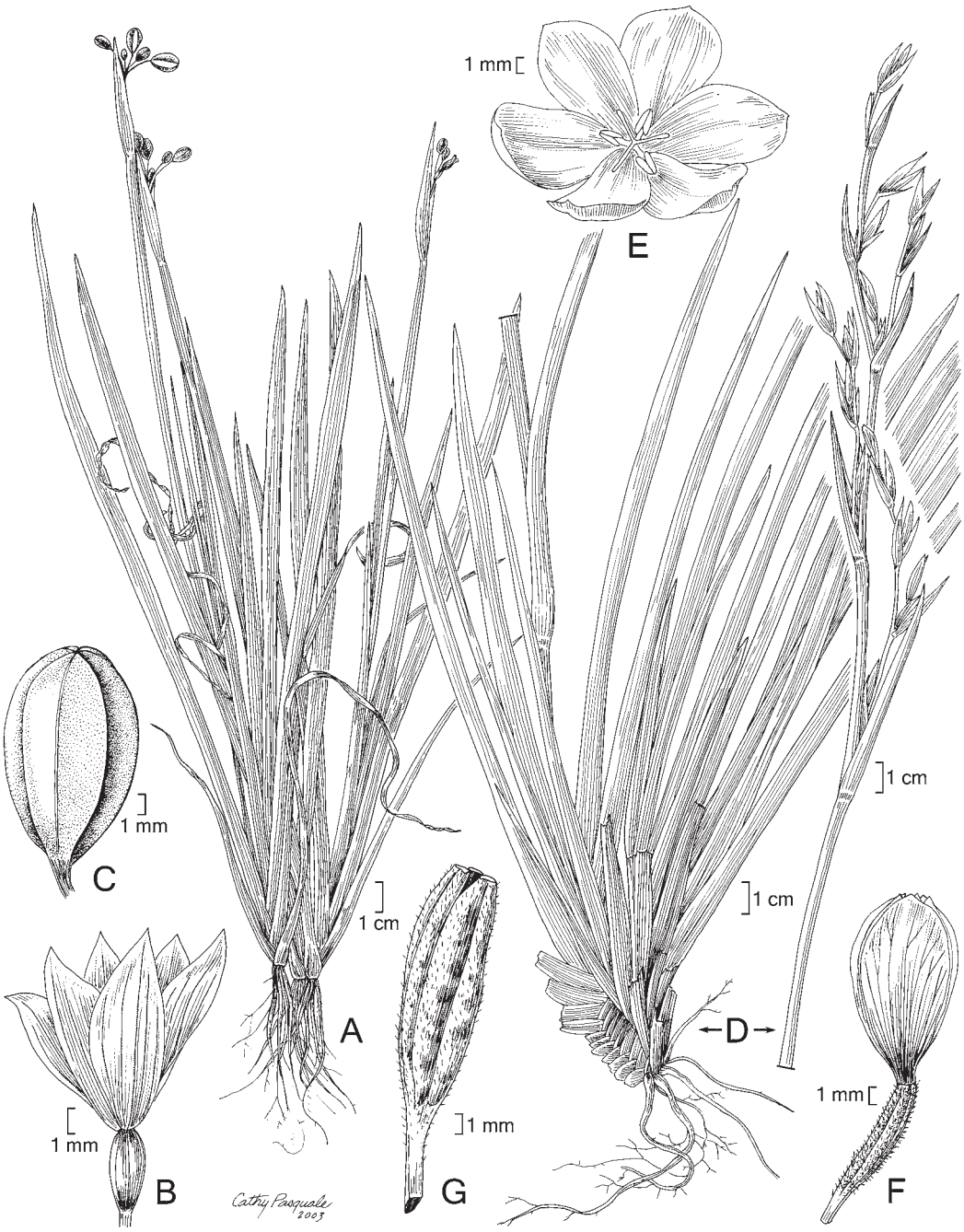


FIGURE 16. Iridaceae. **A–C.** *Sisyrinchium tinctorium* Kunth. **A.** Habit. **B.** Flower showing ovary. **C.** Capsule. **D–G.** *Orthrosanthus acorifolius* (Kunth) Ravenna. **D.** Habit. **E.** Open flower. **F.** Flower showing ovary. **G.** Pubescent capsule. (A, *Aymard et al. 4409*; B, C, *Aymard et al. 5180*; D, *Stergios 17469*; E, F, *Stergios 18723*; G, *Cuello 1387*.)

showy, blue or bluish-white. Capsules 8–11 mm long, sessile or short-pedicellate, pubescent. Seeds rounded-angular or fusiform.

Found in South America (Colombia and Venezuela). In Venezuela, found in the Andes (Lara, Mérida, and Trujillo) and in the Cordillera de la Costa (Anzoátegui, Distrito Federal, Miranda, and Sucre; Map 98). Collected in páramo and subpáramo in the park, including the Fila de Agua Fría, the Páramo de Guaramacal, and the Páramo de Vicuyal and between El Campamento and El Santuario; (1,900–)2,100–3,100 m.

COMMON NAMES. Espadilla and palmiche.

Orthrosanthus acorifolius is distinguished from *O. chimboracensis* (Kunth) Baker, the only other species found in the Venezuelan Andes, by its sessile or shortly pedicellate (pedicels <5 mm long) and pubescent fruit, by its smaller stature, and by the fact that its flowering stalks scarcely exceed the leaves in length.

The label of one collection from Guaramacal (*Cuello 1387*) states that the flowers are yellow, which is without doubt an error.

Sisyrinchium L.

Sisyrinchium L., Sp. Pl. 954. 1753.

Perennial or rarely annual herbs; often caespitose; rhizomatous or rootstock indistinct, roots thick and fleshy or tuberous or fibrous (annual species). Leaves basal or basal and cauline, basally equitant; leaf blades ensiform, lanceolate to linear, flat (our species) or sometimes terete, usually glabrous. Flowering stems scape-like or branched, compressed and angled or winged, sometimes comprising a single extended terminal internode; spathes equal or subequal. Flowers actinomorphic; tepals ± distinct, ± equal, rotate or campanulate, yellow, white or blue with a yellow center, sometimes with darker-colored veins. Stamens symmetrically arranged; filaments distinct, connate basally (our species) or united in a tube, often puberulent or glandular-pubescent. Ovary globose, included or exserted; style 3-branched, suberect, connate below, filiform, branches extending between stamens. Capsule globose to cylindric or pyriform, glabrous (our species) or papillose. Seeds globose and slightly flattened or 3-angled, frequently foveolate or deeply pitted.

An almost exclusively American genus of 100–150 species with a wide distribution, including North America (Greenland, Canada, and USA), Mexico, Central America, the West Indies, and South America (Colombia, Venezuela, Guyana, Ecuador, Peru, Bolivia, Brazil, Chile, Paraguay, Argentina, and Uruguay); also, 1 species is native to Hawaii. Species of *Sisyrinchium* are naturalized in the Galapagos Islands, Europe (western Ireland), the Mascarene Islands, Malaysia, and a number of the Pacific Islands, including Hawaii and New Zealand. Four species occur in Venezuela.

References. Chauveau et al. (2011); Goldblatt et al. (1990); Karst and Wilson (2012); Tacuatiá et al. (2012).

Sisyrinchium is the largest genus of Iridaceae in the Americas.

KEY TO THE SPECIES OF *SISYRINCHIUM*

1a. Flowering stem branched, or at least with 1 or more cauline leaves and several internodes, not or minutely winged, 1 mm wide; flowers white or lilac-pink, with dark maroon veins; rhipidium sometimes repeated in second-order branches . . . . . ***S. micranthum***

1b. Flowering stem unbranched, a single long, leafless internode, narrowly to broadly winged, 3 mm wide; flowers pale yellow, without dark maroon veins; rhipidium solitary and terminal . . . . . ***S. tinctorium***

Sisyrinchium micranthum Cav., Diss. 6: 345, t. 191, fig. 2. 1788; Morillo, in Morillo et al., Bot. Ecol. Monocot. Páramos Venez. 2: 517–518, fig. 2. 2010.

Sisyrinchium iridifolium Kunth, in H. B. K., Nov. Gen. Sp. [fol.] 1: 260. 1815 [1816]; ibid. [qu.] 1: 324. 1815 [1816].

Delicate, annual herbs, 6–25 cm tall; roots fibrous. Leaves linear, acuminate, basal leaves 5–9 cm × 2–4 mm, cauline leaves smaller, 1.5–6 cm × 1–2 mm. Flowering stems branched, 4–20 cm tall, 0.8–1 mm wide, not or minutely winged, with several internodes with cauline leaves; spathes 1.5–2(–4) cm long. Flowers campanulate, white or lilac-pink and with dark maroon veins (our material), blue with a yellow center or yellow; tepals 6–7.5 mm long. Capsules globose, ~3 mm long. Seeds minute, <1 mm in diameter, 3-angled, pitted, blackish.

Native to Mexico, Central America, the Greater Antilles (Hispaniola), and South America (Colombia, Venezuela, Ecuador, Peru, Bolivia, Brazil, Paraguay, and Argentina); adventive in the Galapagos Islands, the Mascarene Islands, and several Pacific Islands, including New Zealand. In Venezuela, found in the Andes (Mérida, Táchira, and Trujillo) and in the Cordillera de la Costa (Aragua, Distrito Federal, and Miranda; Map 99). In the park, found in open and rocky areas at the edge of forest on both slopes of Guaramacal; (1,700–)2,000–2,500 m.

This is a morphologically and cytologically complex species (Tacuatiá et al., 2012) with an extensive range and a tendency to be invasive.

MAP 99. *Sisyrinchium micranthum* occurrence in Venezuela.

Sisyrinchium tinctorium Kunth, in H. B. K., Nov. Gen. Sp. [fol.] 1: 260. 1815 [1816]; ibid. [qu.] 1: 324. 1815 [1816]; Goldblatt and Henrich, in Berry et al., Fl. Venez. Guayana 5:

MAP 100. *Sisyrinchium tinctorium* occurrence in Venezuela.

662. 1999; Morillo, in Morillo et al., Bot. Ecol. Monocot. Páramos Venez. 2: 518–519. 2010.

FIGURES 16A–C, 25G

Sisyrinchium bogotense Kunth, in H. B. K., Nov. Gen. Sp. [fol.] 1: 259. 1815 [1816]; ibid. [qu.] 1: 323. 1815 [1816].

Perennial herbs, (15–)22–32 cm tall; roots mostly fibrous, some thickened and tuberous, but always thin. Leaves all basal, linear-lanceolate, 18–25 cm × 5–7(–12) mm, acuminate. Flowering stems unbranched, equal to or scarcely surpassing the leaves in length, 12–24 cm tall, 3 mm wide, narrowly to broadly winged; spathes 3–4 cm long. Flowers stellate, pale yellow, without dark maroon veins; tepals 7–10 mm long. Capsules pyriform, 10–15 mm long, pendulous. Seeds ~1.5 mm in diameter, globose, foveolate, blackish.

Found in Mexico, Central America, and South America (Colombia, Venezuela, Ecuador, Peru, Bolivia, and Argentina). In Venezuela, found in the Andes (Lara, Mérida, Táchira, and Trujillo), the Cordillera de la Costa (Aragua, Miranda, Monagas, and Sucre), and possibly Amazonas (Map 100). Open areas in montane forest, cloud forest, and especially páramo in the park; 1,800–2,800 m.

COMMON NAME. Espadilla.

The record from Amazonas state (Goldblatt and Henrich in Berry et al., 1999: 662) is anomalous as it is outside the expected range of this species. The specimen upon which the record is based has not been examined by us.

JUNCACEAE

L. J. DORR AND S. MIGUEL NIÑO

Perennial or rarely annual herbs; terrestrial or sometimes rooted aquatics; usually rhizomatous or caespitose. Flowering stems erect, ascending or rarely procumbent, terete or laterally compressed; leafless or leaf-bearing. Leaves simple, spirally arranged, tristichous or rarely distichous, basal or on lower part of stem, blades linear to filiform, flat or terete, when terete hollow and sometimes septate, margins glabrous or pilose (*Luzula* DC.); leaf sheaths open or closed (*Luzula*), auriculate or not; blades of basal leaves sometimes reduced (cataphylls). Inflorescences terminal or pseudolateral, compound, cymose or racemose, paniclelike or anthelate (i.e., a panicle in which the lower branches overtop the upper ones), many-flowered, flowers in 1 to many terminal heads or spikelike clusters, or flowers sometimes solitary and terminal or lateral; lower inflorescence bracts usually herbaceous; flower bracteoles 1 or 2 or absent. Flowers perfect, rarely dioecious or monoecious, actinomorphic, hypogynous. Tepals 6 in 2 whorls, free, equal or subequal, glumaceous or herbaceous. Stamens (2–)3–6, in 2 whorls, alternate to the tepals; anthers basifixed, 2-locular, oblong or linear. Ovary superior, 1-locular or 3-septate to 3-locular; ovules 3 to many, central, basal or ± parietal, anatropous; style 1-, 2-, or 3-branched (stigmas). Fruit a dry capsule, loculicidal or rarely circumscissile. Seeds 3 to many, globose, angled or flattened, sometimes with tail-like appendages.

A cosmopolitan family of 7 genera and 400–450 species generally found in cool and temperate regions. The family is found throughout the Americas but is absent from the Guianas. Two genera and 14 species occur in Venezuela.

REFERENCES. Balslev (1996, 1998); Drábková et al. (2003); Kirschner (2002a, 2002b, 2002c); Záveská Drábková (2010); Záveská Drábková and Vlček (2009).

The circumscription of most of the genera of this family is likely to change as additional molecular evidence is gathered. Although *Luzula* appears to be monophyletic, *Juncus* L., the largest genus, is clearly paraphyletic (Drábková and Vlček, 2009; Záveská Drábková, 2010); the small South American genera *Distichia* Nees & Meyen, *Marsippospermum* Desv., *Oxychloe* Phil., *Patosia* Buchenau, and *Rostkovia* Desv. (*Marsippospermum* and *Rostkovia* are also found in New Zealand and subantarctic islands) are embedded in a clade that includes species of *Juncus*.

Prionium E. Mey., a small genus endemic to southern Africa, often has been included in the Juncaceae, but molecular data indicate that it is sister to Juncaceae and Cyperaceae (Munro and Linder, 1998; Davis et al., 2004) and is better placed in the closely related Thurniaceae (synonym Prioniaceae), a family of two genera with an unusual southern African–South American disjunction.

KEY TO THE GENERA OF JUNCACEAE

1a. Leaf margins glabrous; leaf sheaths open (rarely closed); capsules 1- or 3-locular; seeds many . . . . . ***Juncus***
1b. Leaf margins (at least when young) pilose; leaf sheaths closed; capsules 1-locular; seeds 3 . . . . . ***Luzula***

Juncus L.

Juncus L., Sp. Pl. 325. 1753.

Perennial or rarely annual herbs; rhizomatous or caespitose, glabrous. Stems usually erect, sometimes prostrate or ascending. Basal leaves lacking blades or blades reduced (cataphylls); fully developed leaves basal and/or cauline, spiraled, flat and not septate or terete and with or without septa; leaf sheaths open, usually conspicuously auriculate or without auricles. Bracts leaflike or reduced, decreasing in size from base to apex. Inflorescences compound, cymose or racemose, often anthelate, with few to many flowers, sometimes clustered in heads. Flowers bisexual (rarely unisexual), with or without a pair of bracteoles. Tepals lanceolate, equal or nearly equal, entire, persistent. Stamens (2–)3–6; filaments filiform or flattened; anthers linear to oblong. Ovary sessile; style almost absent to long; stigmas (2)3, filiform, twining, sticky papillose. Capsules 1- or more commonly 3-locular. Seeds numerous, ellipsoid to ovoid, appendaged or not.

As presently construed a cosmopolitan genus of ~300 species, ~50 of which are tropical and confined to higher (>1,500 m) elevations. *Juncus* occurs in all major political units in the Americas with the exception of the Guianas. Twelve species occur in Venezuela.

References. Kirschner (2002b, 2002c).

Molecular evidence suggests that *Juncus* is paraphyletic (Záveská Drábková and Vlček, 2009; Záveská Drábková, 2010); the majority of taxa demonstrate affinity to two main groups on the basis of the presence or absence of bracteoles and cymose or racemose inflorescences, respectively. However, many species lie outside this scheme, and there are also species where bracteoles may be present or not.

KEY TO THE SPECIES OF *JUNCUS*

1a. Annuals; stems scapose; leaf blades flat, never septate; leaf sheaths without auricles; inflorescences open or pseudolateral; flowers mainly solitary, each flower with 2 clasping bracteoles . . . . . ***J. bufonius***

1b. Perennials; stems ± leafy; leaf blades cylindric, septate; leaf sheaths with auricles; inflorescences capitate; flowers clustered, without clasping bracteoles . . . . . ***J. microcephalus***

Juncus bufonius L., Sp. Pl. 328. 1753; Briceño, in Morillo et al., Bot. Ecol. Monocot. Páramos Venez. 2: 523–524, fig. 2. 2010.

Annual herbs, 5–35 cm tall; caespitose; without rhizomes. Stems erect, procumbent or ascending, terete, smooth. Basal leaves often cataphylls; cauline leaves linear, plane or involute (edges incurved toward the top of the leaf) with raised margins, slightly channeled, to 20 cm × 0.5–1 mm; sheaths 1–3 cm long, auricles absent. Inflorescences compound, lax, cymose; lowermost inflorescence bracts always the longest, 10–15 cm long; uppermost bracts to 5 mm long; cymes with solitary flowers, sometimes with 2–4 flowers, each flower subtended by a pair of bracteoles. Tepals unequal, lanceolate, acuminate, green. Capsules ellipsoid, truncate, 3.5–5 × 2 mm.

MAP 101. *Juncus bufonius* occurrence in Venezuela.

A cosmopolitan weed found only in high elevations in the tropics, typically in open and wet sites. Its American distribution is extensive and includes North America, Mexico, Central America, the West Indies, and South America (Colombia, Venezuela, Ecuador, Peru, Bolivia, Brazil, Chile, Argentina, and Uruguay). In Venezuela, known from the Andes (Mérida, Táchira, and Trujillo) and the Cordillera de la Costa (Aragua, Distrito Federal, and Monagas; Map 101). In the park, known from the Páramo de Guaramacal and elsewhere along the Boconó–Guaramacal road; 1,600–3,100 m.

This species is part of "an intricate complex of very similar and closely related taxa" (Kirschner, 2002c: 9).

Juncus microcephalus Kunth, in H. B. K., Nov. Gen. Sp. [fol.] 1: 190. 1815 [1816]; ibid. [qu.] 1: 237. 1815 [1816]; Briceño, in Morillo et al., Bot. Ecol. Monocot. Páramos Venez. 2: 527, fig. 6. 2010.

FIGURE 17C–H

Juncus densiflorus auct., non Kunth; Dorr et al., Contr. U.S. Natl. Herb. 40: 47. 2000 [2001].

Perennial herbs, 20–75(–100) cm tall; caespitose; rhizomes short, densely branched. Stems erect, terete, smooth or striate. Leaf blades linear, terete, hollow, striate and transversely septate,

FIGURE 17. Juncaceae. **A, B.** *Luzula gigantea* Desv. **A, A1.** Habit. **B.** Inflorescence (detail). **C–H.** *Juncus microcephalus* Kunth. **C.** Habit. **D.** Head. **E.** Flower with ovary removed showing stamens and tepals. **F.** Flower with three tepals and ovary removed showing three stamens. **G.** Flower with tepals removed showing stamens, ovary, and styles. **H.** Cross section through leaf blade. (A, B, *Stergios et al. 20549*; C, *Stergios & Zambrano 17686*; D–H, *Cuello et al. 1266*.)

MAP 102. *Juncus microcephalus* occurrence in Venezuela.

10–40 cm × 2–3 mm; sheaths 4–12 cm long, auriculate. Inflorescences anthelate, decompound, composed of conical to globose heads, heads 2–6-flowered; the lowermost bracts (of the peduncle) usually sheath-like, 5–10 cm long, generally shorter than the inflorescence. Tepals unequal, lanceolate, acute, clear-green to pale coffee. Capsules ellipsoid to obovoid, truncate, 2–3 × 1.5 mm.

Found in Mexico, Central America, and South America (Colombia, Venezuela, Ecuador, Peru, Bolivia, Brazil, Chile, Paraguay, Argentina, and Uruguay); introduced in Australia. In Venezuela, found in the Andes (Lara, Mérida, Portuguesa, Táchira, and Trujillo), the Sierra de Perijá (Zulia), and the Cordillera de la Costa (Distrito Federal and Sucre; Map 102). In the park, found on both slopes of Guaramacal, including near the summit of the Fila de Agua Fría; (1,500–)1,600–3,100 m.

COMMON NAME. Paja grama.

This species evidently is absent from the Venezuelan Guayana despite a record for Amazonas state (Schnee in Pittier et al., 1945: 172), which should be treated with skepticism.

Luzula DC.

Luzula DC., in Lamarck and A. P. de Candolle, Fl. Franç., 3rd ed., 3: 158. 1805, nom. cons.

Perennial or rarely annual herbs; usually caespitose; rhizomatous. Stems erect. Leaves alternate, scalelike on stolons and rhizomes, leafy and grasslike at the base of the stem, and bract-like below the inflorescence. Leaf blades linear to narrowly lanceolate, plane, margins pilose (at least when young); sheaths closed, auricles absent. Inflorescences diverse, usually many-flowered, either cymose with flowers borne singly or in few-flowered clusters in much-branched panicles or decompound anthelate inflorescences, or in spikelike clusters, either pedunculate or clustered in many-flowered dense heads. Flowers perfect, each flower subtended by a small bract at pedicel base, and 1 or 2 bracteoles just below flower; bracts decreasing in size from the base to the apex and changing in color from green to chestnut or bright brown. Tepals 6, equal to ± unequal, lanceolate, margin entire (our species) or ciliate. Stamens 3–6; anthers oblong to linear; filaments filiform, rarely linear or flattened. Ovary sessile; style short, filiform; stigmas 3, filiform, twining, sticky papillose. Capsules 1-locular, ± ovoid-trigonous, occasionally 3-lobed basally. Seeds 3, with or without appendages.

A cosmopolitan genus of ~115 species found principally in temperate regions. Approximately 12 species occur in tropical regions of the world, generally at higher (>2,500 m) elevations. The genus is present throughout the Americas, with the exception of parts of Central America, the West Indies, and the Guianas, Paraguay, and Uruguay in South America. Only 2 species have been collected in Venezuela, both in the Andes.

REFERENCE. Kirschner (2002a).

Luzula as traditionally circumscribed appears to be monophyletic (Drábková and Vlček, 2009; Záveská Drábková, 2010).

Luzula gigantea Desv., J. Bot. (Desvaux) 1: 145. 1808; Briceño, in Morillo et al., Bot. Ecol. Monocot. Páramos Venez. 2: 529–530, fig. 8. 2010.

FIGURE 17A,B

Perennial herbs, 15–90 cm tall; rhizomatous. Stems erect, terete, 2–4 mm in diameter, ± rosulate. Basal leaves 10–30 ×1–2 cm, linear to narrowly lanceolate, plane, margins pilose (at least when young); sheaths short; cauline leaves similar to basal ones,

MAP 103. *Luzula gigantea* occurrence in Venezuela.

but sheaths to 6 cm long. Inflorescences lax, compound panicles, storied and subdivided into 4–5 subequal anthelate parts; flowers solitary on elongate and distinct pedicels; bracteoles ovate to ovate-lanceolate. Tepals ± unequal. Stamens 6. Capsules widely ellipsoid, apiculate, ~2 × 1.5 mm. Seeds ~1 × 0.5 mm, appendages scarcely visible.

Found in South America (Colombia, Venezuela, Ecuador, Peru, Bolivia, and Argentina). In Venezuela, known only from the Andes (Mérida, Táchira, and Trujillo; Map 103). In the park, found in páramo near the Laguna del Pumar; 2,900–3,100 m.

Luzula racemosa Desv., the only other species of the genus found in Venezuela, can be distinguished by its spiciform raceme.

MARANTACEAE

L. J. DORR AND S. MIGUEL NIÑO

Perennial herbs, terrestrial (our species) or semiaquatic; rhizomatous; stems soft to suffruticose, usually branched, sometimes giving the plant a shrubby appearance. Leaves in a basal cluster, both basal and cauline or solely cauline, alternate, distichous, consisting of an open sheath, petiole (occasionally absent), and blade; ligule absent; blade with a prominent midrib and parallel veins, lateral veins ± sigmoid and united near the margin of the blade; petiole modified at apex as a pulvinus. Inflorescences 1 to several per shoot (synflorescence), varying in level of complexity; each inflorescence terminal (or terminal and lateral), usually a spicate thyrse with bracteate spathes subtending groups of 1 to several cymules of 2 flowers each; the spathes distichous or spirally arranged, usually showy and colored; bracteoles present or absent. Flowers bisexual, epigynous, asymmetrical (the pair of flowers of each cymule appearing as mirror images). Sepals 3, distinct, not petaloid. Petals 3, 1 often cucullate and larger than the other 2. Corolla, staminodes, and style fused and forming a tube; fertile stamen 1, sometimes the filament petaloid; anthers 1-thecate; staminodes (2–)3–4, outer staminodes (0) 1 or 2, petaloid, inner staminodes 2, 1 hooded (staminodium cucullatum) and 1 firm and fleshy (staminodium callosum), appendaged. Ovary inferior, 3-locular or 1-locular by abortion; placentation basal; septal nectaries well-developed. Ovule 1 per locule, anatropous. Style 1, terminal portion and stigma enclosed in the hooded staminode (staminodium cucullatum) and held under tension until explosively released by a pollinator; stigma cup-shaped. Fruit a capsule, berry or achene, dehiscent or rarely indehiscent, fleshy or dry; sepals often persistent in fruit. Seeds 1–3 with a basal aril or aril absent.

A family of 31 genera and ~550 species distributed in the tropics and subtropics of the Americas, Africa, Madagascar, and Asia. In Venezuela there are 9 genera and 62 species.

REFERENCES. Andersson (1976, 1998b); Andersson and Chase (2001); Prince and Kress (2006); Rogers (1984).

Andersson (1976) provides a detailed discussion of the complicated inflorescence structure of Marantaceae.

The majority of Venezuelan species of Marantaceae are known by the common name "platanillo," which is derived from the similarity of their leaves to those of the cultivated banana or plantain.

A number of species of Marantaceae are cultivated as ornamental plants, especially for their foliage. Also, the tubers of at least one species found in Venezuela, *Maranta arundinacea* L., are the source of an edible starch.

Stromanthe Sond.

Stromanthe Sond., Neue Allg. Deutsche Garten-Blumenzeitung 5: 225. 1849.

Shrub-like herbs, generally caulescent. Leaves clustered at the nodes, petiolate, with pulvinus or not. Inflorescences terminal, usually well branched, floral units composed of 1–5 two-flowered cymules; bracteate spathes green or bright colors (orange, yellow or red), deciduous or not; bracteoles present or absent. Sepals fibrous. Tube formed by fusion of petals, stamens, staminodes, and discrete style shorter than wide. Petals blue-violet (lavender), white or greenish. Ovary with 2 sterile locules and 1 fertile one. Capsules with a thick pericarp, sepals persistent or not. Seed 1, arillate.

Found in Mexico, Central America, the West Indies, and South America (Colombia, Venezuela, Trinidad and Tobago, the Guianas, Ecuador, Peru, Bolivia, Brazil, and Argentina); ~15 species. In Venezuela, only the 2 species treated here are found.

REFERENCE. Andersson (1981a).

KEY TO THE SPECIES OF *STROMANTHE*

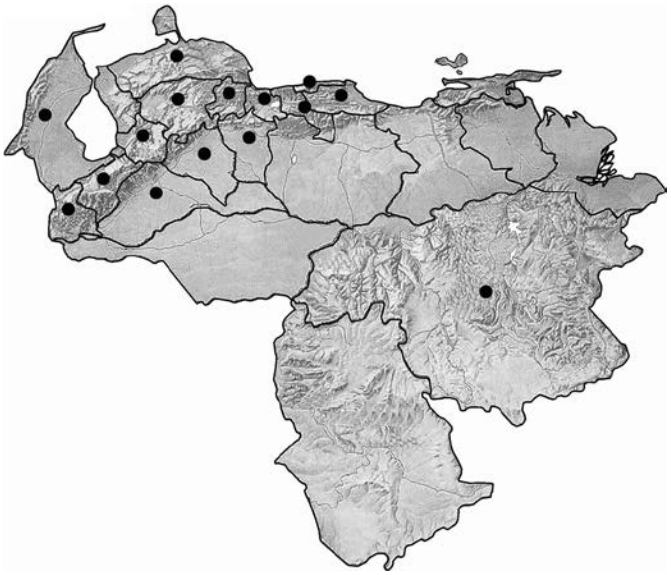
1a. Leaves 20–40 × 4.5–16 cm, pulvinus 1.5–2.5(–3) cm long; spathes showy, orange or bright yellow; petals white to greenish; ovary glabrous or slightly pubescent, fruit yellowish . . . . . ***S. jacquinii***

1b. Leaves 5–20 × 2.5–5 cm, pulvinus 0.4–1 cm long; spathes not showy, light green; petals white to lavender; ovary densely pubescent; fruit orange to reddish . . . . . ***S. tonckat***

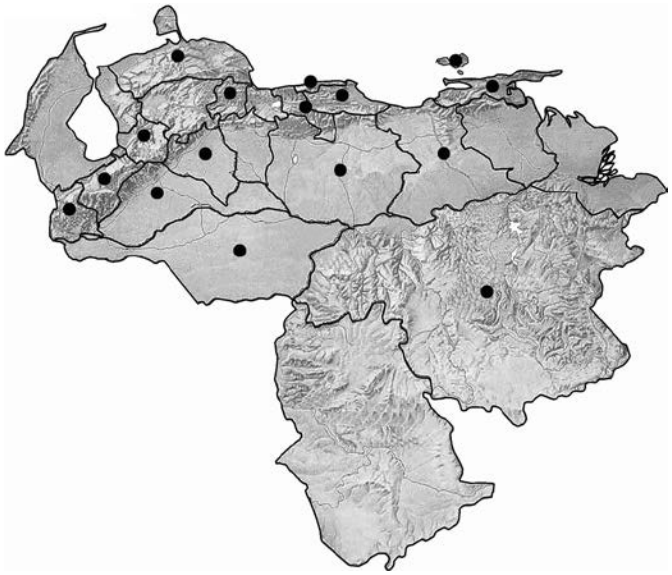
Stromanthe jacquinii (Roem. & Schult.) H. Kenn. & Nicolson, Ann. Missouri Bot. Gard. 62: 501. 1975; Andersson, in Berry et al., Fl. Venez. Guayana 6: 247. 2001. *Maranta jacquinii* Roem. & Schult., Syst. Veg. 1: 558. 1817 ("*jacquini*").

Maranta lutea Jacq., Ic. Pl. Rar. 2: 1, t. 201. 1788, non Aubl., 1775.

Shrub-like herbs, to ~2 m tall. Leaf blades 20–45 × 4.5–16 cm, with hairs along the midrib above and below; pulvinus well developed, 1.5–2.5(–3) cm long, slightly tomentose basally. Inflorescences monosymmetric; spathes bract-like, showy, orange or bright yellow. Petals white to greenish. Ovary glabrous or slightly pubescent. Fruit yellowish.



MAP 104. *Stromanthe jacquinii* occurrence in Venezuela.



MAP 105. *Stromanthe tonckat* occurrence in Venezuela.

Found in Central America (Panama) and South America (Colombia, Venezuela, and Ecuador); adventive in Hawaii. In Venezuela, found in the Andes (Barinas, Lara, Mérida, Portuguesa, Táchira, and Trujillo), the Sierra de Perijá (Zulia), the Cordillera de la Costa (Aragua, Carabobo, Distrito Federal, Falcón, Miranda, and Yaracuy), and the Venezuelan Guayana (Bolívar; Map 104). Collected in forest understory near the lower limits of the southern boundary of the park in the karst area above the Río Amarillo; ~1,200–1,400 m.

Stromanthe tonckat (Aubl.) Eichler, Abh. Königl. Akad. Wiss. Berlin 1883: 80. 1884; Andersson, in Berry et al., Fl. Venez. Guayana 6: 247. 2001. *Maranta tonckat* Aubl., Hist. Pl. Guiane 1: 3. 1775.

FIGURE 18

Shrub-like herbs, to 3 m tall. Leaf blades 5–20 × 2.5–5 cm, glabrous below and with hairs along the midrib above; pulvinus short, 0.4–1 cm long, tomentose basally. Inflorescences bisymmetric, greatly reduced; spathes bract-like, greenish. Petals lavender, gradually changing to white. Ovary densely pubescent. Fruit orange to reddish.

Found in Mexico, Central America, the Lesser Antilles, and South America (Colombia, Venezuela, Trinidad and Tobago, the Guianas, Bolivia, and Brazil). In Venezuela, recorded from Anzoátegui, Apure, Aragua, Barinas, Bolívar, Distrito Federal, Falcón, Guárico, Mérida, Miranda, Nueva Esparta, Portuguesa, Sucre, Táchira, Trujillo, and Yaracuy (Map 105). In the park, found only at lower elevations on the south slope in localities such as La Divisoria de la Concepción and the karst area above the Río Amarillo; ~1,200–1,500 m.

Orchidaceae

G. CARNEVALI FERNÁNDEZ-CONCHA AND L. J. DORR

Terrestrial, lithophytic or epiphytic, rarely subaquatic or subterraneous herbs, or rarely vines; chlorophyllous (our species) or rarely achlorophyllous; strongly mycotrophic. Rhizomes delicate to stout, sometimes creeping, simple or branched. Roots fibrous or fleshy to tuberous, in epiphytic taxa frequently sheathed by 1 or several layers of velamen (i.e., water-absorbing layer of dead cells) originating from the rhizome or from the bases or sides of stems. Stems elongate to almost absent, primarily with a sympodial branching pattern, less commonly monopodial; stems in sympodial systems frequently thickened into corms or pseudobulbs. Leaves with parallel venation, simple (rarely lobed), articulate or not with their sheaths, distichous or spiraled, membranous to fleshy; vernation convolute to conduplicate. Inflorescences terminal or lateral, 1-flowered or racemose to paniculate, rarely subumbellate. Flowers small and inconspicuous to large and showy, primarily zygomorphic, bisexual (rarely plants monoecious), 3-merous. Sepals 3, free to variously connate, frequently 1 sepal (dorsal sepal) different from the other 2 (lateral sepals), lateral sepals often producing at their bases a spur or mentum (i.e., chin-like extension at the base of the flower composed of column foot, base of labellum, and lateral sepals). Petals 3, 1 petal (opposed to the dorsal sepal) modified into a labellum that functions as a landing platform for insect visitors, commonly of different shape and color than the other 2 petals, often lobed and frequently provided with calli, hairs, keels or other ornaments, in some cases basally produced into a spur, the other 2 petals similar

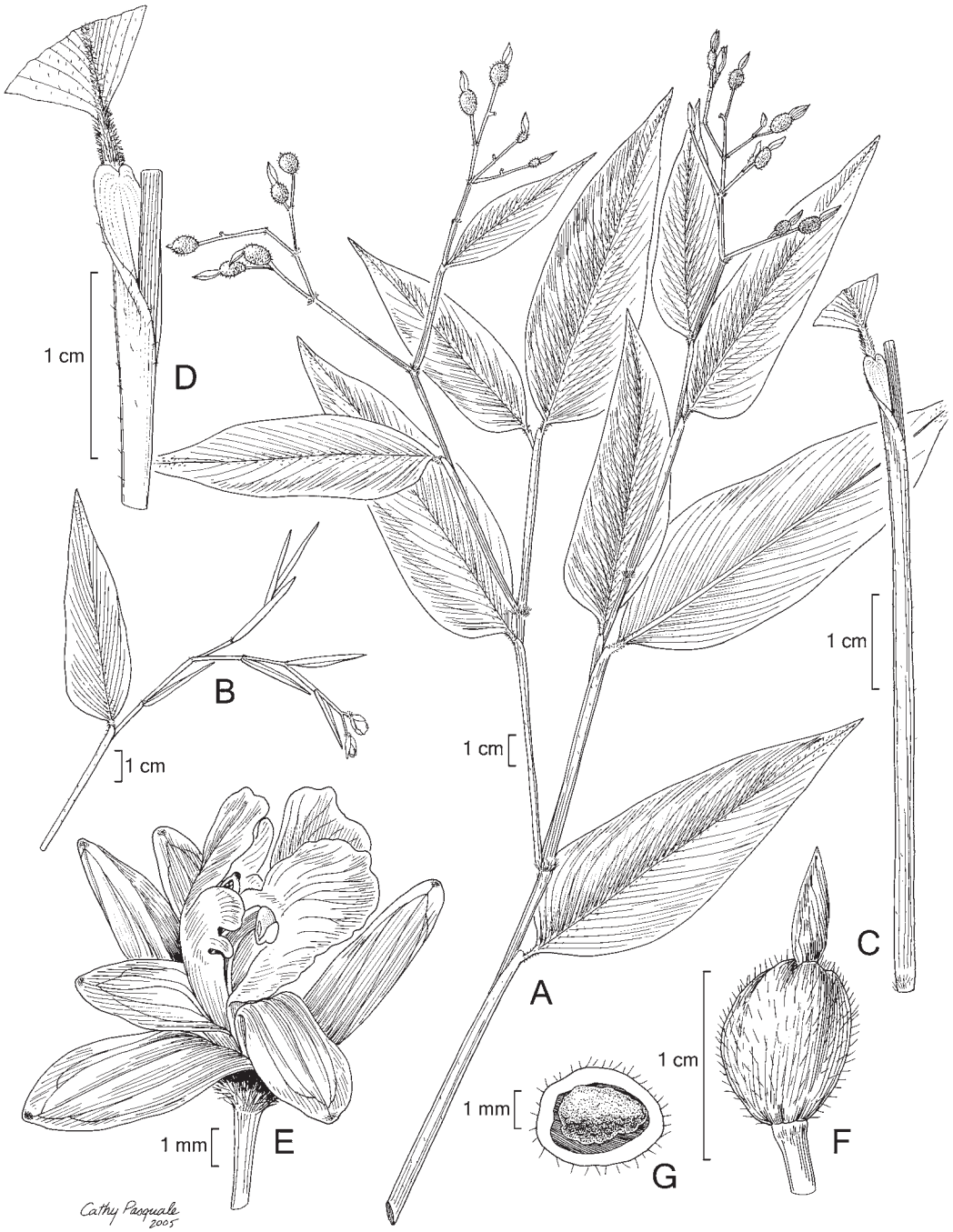


FIGURE 18. Marantaceae, *Stromanthe tonckat* (Aubl.) Eichler. **A.** Habit (plant in fruit). **B.** Habit (plant in flower). **C, D.** Leaf (details showing open sheath, petiole, and pulvinus). **E.** Flower. **F.** Fruit with persistent sepals. **G.** Cross section of fruit showing a seed. (A–D, F, G, *Dorr & Stergios 8824*; E, *van der Werff et al. 7487*.)

in shape and color and alternate with the sepals. Stamens and styles fused into a complex organ (the column), which is placed in the center of the flower. Column with 1 or more, rarely 2 or 3, fertile stamens located near the apex of the column or on the sides; stigmatic surfaces confluent on the ventral face of the column or ± separated, the apex of the medial stigma lobe modified to form an organ (the rostellum) that keeps pollen from contacting the stigmatic surface and provides a sticky matter for pollen to be attached to pollinators. Anther, when present, placed above the rostellum, 2- or 4-locular, located on an apical cavity of the column (the clinandrium); pollen in tetrads or more commonly in masses (pollinia); pollinia 2, 4, 6 or 8, soft and mealy or hard and cartilaginous; pollinia associated with structures that aid in transport and placement over pollinators, the whole complex called the pollinarium; pollinarium consisting of the pollinia, a structure called viscidium that originates from the rostellum (and hence of stigmatic ontogeny) and attaches to the pollinator, caudicles that are made of pollinic material (hence originating from the anther), and frequently provided with 1 or 2 stipes, which are made of anther material and link the pollinia to the viscidium. Ovary inferior, 1–3-locular. Fruit a capsule, dry or rarely fleshy; seeds many, very small, dry, wind-dispersed; acotyledonous.

A cosmopolitan, but mainly tropical, family with ~800 genera and 22,000–35,000 species. Approximately 215 genera and 1,500 species occur in Venezuela.

References. Dunsterville and Garay (1959, 1961, 1965, 1966, 1972, 1976, 1979a, 1979b, 1979c); Fernández (2003); Foldats (1969, 1970a, 1970b, 1970c, 1970d); Pridgeon et al. (2001a, 2003, 2005, 2009); Romero-González and Carnevali Fernández-Concha (2000).

The following keys are artificial and do not reflect the relationships of the genera found in Guaramacal. However, subfamily, tribe, and subtribe (if available) are indicated in square brackets following each generic description, and these will permit one to discern higher-level relationships. Three subfamilies are found in the park: Epidendroideae, Orchidoideae, and Vanilloideae. The vast majority of the genera are placed in the Epidendroideae.

KEY TO MAJOR GROUPS OF ORCHIDACEAE

1a. Leaves plicate with (3–)5–9(–15) equally conspicuous nerves or herbaceous (i.e., without conspicuous nerves and grassy or herbaceous texture); prefoliation convolute (i.e., leaves rolled during development) 2
  2a. Inflorescences emerging from the (lateral) base of pseudobulbs . . . . . **Subkey I**
  2b. Inflorescences emerging from apices of elongate or less commonly short stems and in some terrestrial plants emerging from pseudobulbs . . . . . **Subkey II**
1b. Leaves conduplicate or terete with midrib more conspicuous than other veins; prefoliation conduplicate (i.e., leaves folded along the midrib in development) 3
  3a. Pseudobulbs present 4
    4a. Inflorescences terminal . . . . . **Subkey III**
    4b. Inflorescences lateral . . . . . **Subkey IV**
  3b. Pseudobulbs absent 5
    5a. Inflorescences terminal . . . . . **Subkey V**
    5b. Inflorescences lateral . . . . . **Subkey VI**

SUBKEY I: LEAVES PLICATE; INFLORESCENCES LATERAL

1a. Pseudobulbs absent; plants terrestrial; leaves distichous; inflorescences terminal and/or lateral . . . . . ***Corymborkis***
1b. Pseudobulbs present; plants epiphytic or terrestrial; leaves at apices of pseudobulbs or a few leaves on sides of pseudobulbs 2
  2a. Plants terrestrial with homoblastic pseudobulbs (i.e., with 2–5 ± equally developed internodes); inflorescences erect; flowers blue or violet . . . . . ***Warreella***
  2b. Plants epiphytic with heteroblastic pseudobulbs (i.e., with 1 well developed internode); inflorescences pendulous; flowers white, yellow or orange or white-spotted with dark purple, never completely violet or blue 3
    3a. Leaves 2–4 at the apex of a pseudobulb; inflorescences (3–)6–10(–20)-flowered; flowers resupinate; labellum not enclosed by lateral sepals and these not forming a sac . . . . . ***Acineta***
    3b. Leaf 1 at the apex of a pseudobulb; inflorescences 1–5-flowered; flowers not resupinate; labellum hidden in the sepaline sac . . . . . ***Schlimmia***

SUBKEY II: LEAVES PLICATE OR HERBACEOUS; INFLORESCENCES TERMINAL

1a. Stems elongate, conspicuous, erect or rarely prostrate; leaves distichous or partially spiral, distributed along the stem 2

2a. Leaves plicate 3
3a. Inflorescences branched, terminal and lateral; flowers yellow or creamy yellow; anther much longer than wide, located on the back of the column . . . . . ***Corymborkis***
3b. Inflorescences simple or (seemingly) 1-flowered; flowers white, lilac, purple to orange, never yellow; anther shorter than wide, located at the apex of the column 4
4a. Inflorescences greatly abbreviated; rachis completely covered by 1 or more spathes forming a conical or ellipsoid structure, flowering successive and the inflorescence appearing 1-flowered; flowers large and showy, purple or white; petals and sepals >5 cm long . . . . . ***Sobralia***
4b. Inflorescences elongated or abbreviated, clearly multiflowered; rachis naked or partially covered by bracts or spathes; flowers small, showy or not, white, lilac, purple to orange; petals and sepals <2.5 cm long . . . . . ***Elleanthus***
2b. Leaves not plicate, herbaceous 5
5a. Inflorescences racemes of 5 or more flowers; flowering ± simultaneous; flowers, usually white or greenish 6
6a. Stems completely erect; 1 or 2 irregularly shaped tubers and fibrous roots emerging from the stem base; nectary of the labellum longer than the central lobe of the labellum; petals 2-lobed (split longitudinally into 2 segments of unequal length); floral segments widely spreading . . . . . ***Habenaria***
6b. Stems prostrate or decumbent, erect only in the upper ⅔–½ of their length; fleshy-fibrous roots arising from internodes lying on the substrate; nectary of the labellum shorter than the central lobe of the labellum; petals entire; floral segments parallel to the column and creating a tubular flower . . . . . ***Microchilus***
5b. Flowers solitary or in short racemes of 1–3 flowers; flowering ± successive; flowers green with purple areas on the labellum or entirely lilac 7
7a. Understory plants, trailing basally; leaves (in living material) dark green, drying dark brown, almost black, short but conspicuously petiolate; flowers green with purple spots on the labellum; floral segments 2–2.5 cm long . . . . . ***Psilochilus***
7b. Plants of exposed locations, fully erect; leaves (in living material) light green to glaucous, drying brown, completely sessile and conspicuously sheathed; flowers lilac or purple; floral segments >3 cm long . . . . . ***Cleistes***
1b. Stems short, inconspicuous or completely to partially underground; leaves in basal rosettes, erect to prostrate 8
8a. Plants with pseudobulbs completely enclosed within a pseudostem (formed by erect petioles and sheathing leaves) from which the inflorescence emerges; leaf blades ovate at the apex of the pseudostem and appearing to be sessile, seemingly opposite or subopposite; inflorescences umbels . . . . . ***Malaxis***
8b. Plants without pseudobulbs or pseudostems; leaf blades elliptic to ovate, rosulate or subdistichous; inflorescences spikes or racemes 9
9a. Petals and labellum adnate to column in their basal parts . . . . . ***Ponthieva***
9b. Petals and labellum free from column 10
10a. Inflorescences lateral; leaves often withered and absent at anthesis (i.e., plants hysteranthous) . . . . ***Pterichis***
10b. Inflorescences terminal; leaves present at anthesis 11
11a. Pedicels conspicuous (longer than floral segments); floral bracts much shorter than the flowers and not exceeding the pedicels in length at anthesis . . . . . ***Cranichis***
11b. Pedicels inconspicuous (shorter than floral segments); floral bracts exceeding the flowers in length at anthesis 12
12a. Dorsal sepal connate at base with lateral sepals to form a tube or a cup . . . . . ***Prescottia***
12b. Dorsal sepal completely free from lateral sepals 13
13a. Column sigmoid, usually pubescent or papillose; leaves basal and cauline, but mostly grouped together near base . . . . . ***Gomphichis***
13b. Column erect, glabrous; leaves rosulate . . . . . ***Aa***

SUBKEY III: LEAVES CONDUPLICATE; PSEUDOBULBS PRESENT; INFLORESCENCES TERMINAL

1a. Plants vegetatively reduced with leaves <5 cm long; pseudobulbs usually partially hidden by the leaf sheaths; peduncles laterally flattened; column very short, partially covered with warts or rigid black hairs; rostellum elongated into a hook; pollinarium of 4 pollinia superimposed on a long, narrowly obtriangular stipe; viscidium linear, hook-shaped . . . . . ***Telipogon***
1b. Plants vegetatively variable, but leaves usually >5 cm long; pseudobulbs always conspicuous and never completely covered by the leaf sheaths; peduncles terete or angled, but not laterally flattened; column elongate (at least ½ the length

of the labellum), not covered with hairs or warts; rostellum transverse in the column, inconspicuous, not hook-shaped; pollinarium of 4 pollinia with caudicles, without a stipe or hook-shaped viscidium 2
2a. Pseudobulbs cylindrical, 8–20× longer than wide, in groups superimposed on top of each other originating from the apex of the oldest pseudobulb (when old pseudobulbs flower, flowers can appear lateral); inflorescences with greatly reduced rachises and peduncles and flowers solitary or in small, 1–3-flowered fascicles; column with a well-developed foot and labellum articulate at the apex of the columnar foot . . . . . ***Scaphyglottis***
2b. Pseudobulbs fusiform (sometimes appearing subcylindric in the herbarium), <6× longer than wide, not superimposed on top of each other; inflorescences with well-developed rachises and peduncles (but peduncles abbreviated in *Epidendrum jajense*); column without a foot and labellum completely or partially joined to the column 3
3a. Labellum free from the column or fused only in its basal ¼; petals wider than sepals; plants and flowers precipitating glycoside crystals in all tissues preserved in alcohol . . . . . ***Prosthechea***
3b. Labellum completely fused to the apex of the column; petals conspicuously narrower than the sepals; plants and flowers not precipitating glycoside crystals in all tissues preserved in alcohol . . . . . ***Epidendrum***

SUBKEY IV: LEAVES CONDUPLICATE; PSEUDOBULBS PRESENT; INFLORESCENCES LATERAL

1a. Inflorescences 1-flowered, solitary or fascicled 2
2a. Flowers with a conspicuous spur (nectary projecting toward the back of the flower); pseudobulbs very small and almost completely hidden by the sheaths subtending them . . . . . ***Trichocentrum***
2b. Flowers spurless; pseudobulbs conspicuous 3
3a. Labellum always articulate at the foot of the column and mobile; petals and sepals >2.5 cm long; petals at least 4× longer than wide . . . . . ***Maxillaria***
3b. Labellum fused rigidly to the column at its base; petals and sepals <2 cm long; petals <3× as long as wide 4
4a. Flowers red or bright yellow (rarely white with a red dot on the labellum), medium-sized; labellum sac-shaped or very concave, very fleshy; sepals ~1 cm long; most recent pseudobulbs, at least, with 1 or 2 sheaths with foliar blades . . . . . ***Ornithidium***
4b. Flowers white, very small; labellum lobed, never deeply concave or extremely fleshy; sepals >0.6 cm long; sheaths covering pseudobulbs lacking foliar blades . . . . . ***Camaridium***
1b. Inflorescences few- or many-flowered, but appearing 1-flowered when flowering is successive (persistent pedicels or floral bracts provide evidence of the actual few- or many-flowered inflorescence condition) 5
5a. Pseudobulbs inconspicuous, <1 cm long, often completely or partially covered by sheaths, usually 1-foliolate 6
6a. Plants tiny; leaf blades 2.5–4 × >1 cm; peduncles laterally flattened; flowers without a spur; column very short, partially covered with warts; rostellum elongated, hook-shaped; pollinarium with a linear, hook-shaped viscidium . . . . . ***Telipogon***
6b. Plants larger; leaf blades at least 5 × 1.5 cm; peduncles terete (cylindrical); flowers with a ± conspicuous spur; column longer (at least ⅕ the length of the labellar blade) and if verruculose, only in the anther; pollinarium with a variable but never elongated, hook-shaped viscidium 7
7a. Leaves very fleshy, mottled with purple; spur very conspicuous, significantly longer than blade of the labellum, fully formed by base of the labellum; anther verruculose; flowers showy and fleshy, white or pink with red or purple stripes or spots . . . . . ***Trichocentrum***
7b. Leaves coriaceous, less fleshy, uniformly green; spur not very conspicuous, shorter to slightly longer than blade of the labellum, created by a basal extension of the lateral lobes within which is inserted basal projections of the labellum; anther smooth; flowers ± showy, membranous to subcoriaceous, red or yellow . . . . . ***Comparettia***
5b. Pseudobulbs conspicuous, ≥2 cm long, often completely or partially uncovered (even though they may be covered by conspicuous sheaths), usually 2- or 3-foliate apically 8
8a. Pseudobulbs 1-foliate apically; sheaths covering pseudobulbs without foliar blades (or foliar blades much reduced and very different from the leaves at the apex of the pseudobulbs); inflorescences racemes 9
9a. Inflorescences pendulous or arching; peduncles ± slender; leaves coriaceous; petals and sepals linear, acute, white, creamy or pale pink; labellum blade oblong-subquadrate; labellum base parallel to the column; clinandrium fimbriate . . . . . ***Trichopilia***
9b. Inflorescences stiffly erect; peduncles robust (at least 3–4 mm thick); leaves chartaceous-coriaceous; petals and sepals broadly elliptic or oblong-elliptic, rounded or truncate, yellowish-brown with darker brown areas; labellum blade pandurate (i.e., guitar-shaped); labellum base at an 180° angle to the column; clinandrium smooth or at most erose . . . . . ***Otoglossum***

8b. Pseudobulbs 1- or 2-foliate apically; sheaths covering pseudobulbs with foliar blades very similar (albeit smaller at times) to the leaves at the apex of the pseudobulbs; inflorescences panicles or racemes 10
10a. Inflorescences short racemes, shorter to somewhat longer than the leaves at the apex of the pseudobulb; floral bracts glumaceous (chartaceous), exceeding the flowers in length; sepals 9–13 mm long; flowers tubular, yellow or orange; labellum rigidly fused to the base of the column and forming a saccate nectary that is inserted into the receptacle of the flower . . . . . ***Brassia***
10b. Inflorescences panicles or racemes, usually longer than the leaves at the apex of the pseudobulb; floral bracts never glumaceous (chartaceous) or exceeding the flowers in length; sepals usually >15 mm long (~10 mm in *Cyrtochilum megalophium*); flowers with widely opening parts, variously colored; labellum completely free of the column (but not articulate with it), not forming a nectary with the column . . . 11
11a. Pseudobulbs rounded or ovate, surface dull, often hidden by large, foliaceous, distichous bracts; roots relatively thick; pollinia with relatively broad stipe and large caudicles . . . . . ***Cyrtochilum***
11b. Pseudobulbs compressed, ancipitous (i.e., distinctly edged), surface glossy; roots relatively thin; pollinia with large stipe and short caudicles 12
12a. Basal portion of labellum parallel (and often adnate) to the basal portion of the column for >½ the length of the column . . . . . ***Odontoglossum***
12b. Basal portion of labellum spreading from the base of the column, parallel for <¼ the length of the column . . . . . ***Oncidium***

SUBKEY V: LEAVES CONDUPLICATE OR TERETE; PSEUDOBULBS ABSENT; INFLORESCENCES TERMINAL

1a. Leaves arranged along the stem or when there is a single stem 2 or more leaves at the apex of the stem; pedicels not articulate with the ovary 2
2a. Leaves terete . . . . . ***Jacquiniella***
2b. Leaves dorsoventrally compressed 3
3a. Epiphytic plants; vegetatively reduced with leaf blades usually <5 cm long; peduncles flattened laterally; column very short, partially covered with warts or stiff black hairs; rostellum elongated in the shape of a hook; pollinarium with 4 pollinia superimposed on a long, narrowly obtriangular stipe, viscidium linear, hook-shaped . . . . . ***Telipogon***
3b. Epiphytic or terrestrial plants; vegetatively variable but leaf blades usually >5 cm long; peduncles terete or angled but not flattened laterally; column elongated (at least ½ the labellar length), not covered with warts or hairs; rostellum transverse in the column, inconspicuous, not hooked; pollinarium with 4 pollinia with caudicles, without stipe or hook-shaped viscidium 4
4a. Stems 10–20× longer than wide with 2 or 3 leaves at the apex of a stem; stems superimposed each on top of the other; flowers with labellum articulate with the column foot; column foot well developed . . . . ***Scaphyglottis***
4b. Stems with leaves distributed along length of stem or when leaves rarely concentrated at the apex of the stem, the stem much shorter (no more than 5× longer than wide); stems not superimposed each on top of the other; flowers with column rigidly fused to labellum its entire length; column foot lacking . . . . . ***Epidendrum***
1b. Leaves solitary at the apex of the stem (or stems); pedicels articulate with the ovary (Pleurothallidinae) 5
5a. Stems filiform; sheaths lepanthiform (i.e., sheaths inflated and cupuliform, open and spreading apically with ciliate margins, the nerves prominent) 6
6a. Petals wider than long, clearly 2-lobed; labellum with a ± conspicuous, deeply 2-lobed basal claw, lobes attenuate basally where they unite to form a labellar claw, sinus of the apical junction of the 2 lobes with a small "appendage" (ontogenetically homologous with the apical lobe) of various shapes, usually pubescent; column ± elongate, apically embraced by the lateral lobes of the labellum, ventral faces of the labellum in the same plane as the back of the column; anther apical . . . . . ***Lepanthes***
6b. Petals longer than wide, not lobed; labellum without a claw or claw inconspicuous, simple or 3-lobed, without an appendage; column short or ± elongate, not closely embraced by the lateral lobes of the labellum (or labellum simple); anther apical or subventral 7
7a. Anther subapical on a short column (<⅓ the length of the labellum); inflorescences 1-flowered (our species) . . . . . ***Lepanthopsis***
7b. Anther ventral or apical on a column that is at least ½ the length of the labellum; inflorescences 2–6-flowered . . . . . ***Trichosalpinx***
5b. Stems filiform or more commonly more robust, without lepanthiform sheaths, sheaths tubular, margins entire, not ribbed 8

8a. Sheaths covering stems hispid (covered with black hairs); inflorescences 1-flowered; petal apices thickened in black globules (osmophores) . . . . . ***Myoxanthus***

8b. Sheaths covering stems not hispid; inflorescences 1- to many-flowered; petal apices not thickened in black globules 9

9a. Stems inconspicuous, much shorter than the leaves (1/5 the length of the leaf blade), attenuate in a conspicuous pseudopetiole that can be mistaken for a stem 10

10a. Sepals completely fused in a tube, apically free and attenuate in conspicuous tails 1.5–4 cm long; petals and labellum much smaller than the sepals and completely enclosed in the sepaline tube; petals with a retrorse tooth on the inner margin (opposite the column) . . . . . ***Masdevallia***

10b. Sepals completely free or, if fused in a basal tube, then the tails <1 cm and the tube <5 mm long; petals and sepals variable, usually not completely enclosed within the sepaline tube; petals without teeth on the inner margin 11

11a. Column wider than long; stigma 2-lobed, the lobes subapical; flowers pink or translucent pink with a darker labellum . . . . . ***Platystele***

11b. Column conspicuously longer than wide; stigma simple; flowers yellow or greenish translucent . . . . . ***Specklinia***

9b. Stems conspicuous, at least ½ the length of the leaf blade, attenuate in a pseudopetiole or not 12

12a. Inflorescences 1-flowered, solitary or fascicled 13

13a. Leaf bases cordate; leaf blades broadly ovate to linear; lateral sepals completely fused; pollinia 2 . . . . . ***Acronia***

13b. Leaf bases not cordate; leaf blades linear to elliptic; lateral sepals free or fused in the basal ¼; pollinia 8 . . . . . ***Pleurothallopsis***

12b. Inflorescences 2- to many-flowered, simultaneous or successive (in which case inflorescences may appear 1-flowered but a careful examination of the rachis will reveal scars left by earlier flowers), solitary or multiple 14

14a. Inflorescences associated with an annulus (i.e., an articulation on the stem just to the side of the base of the inflorescence below the articulation with the leaf blade), subtended by a ± conspicuous spathe emerging from 1 side of the stems 15

15a. Sepals broadly triangular, very shortly fused at the base and widely spreading (in most species) making the flower resemble a triangle; petals transverse and very fleshy, calli often in the apical margin; labellum very fleshy and resembling ⅛ of a sphere (in 3 dimensions); stigma 2-lobed . . . . . ***Stelis***

15b. Sepals oblong or ovate, not broadly triangular, the flower not resembling a triangle; petals longer than wide, without calli in the apical margin (or calli inconspicuous); labellum longer than wide, membranous, oblong, elliptical or ovate in general outline; stigma 1-lobed 16

16a. Flowers relatively large and showy; dorsal sepal 3–6.7 cm long; perianth segments translucent yellow with conspicuous wine-red nerves; labellum >10 mm long, with hooked and porrect (i.e., extended horizontally) lateral lobes . . . . . ***Lindleyalis***

16b. Flowers small or medium-sized; dorsal sepal ≤2 cm long; perianth segments variously colored; labellum <8 mm long, with various lateral lobes but not hooked and porrect 17

17a. Labellum articulate at its base with the globular apex of the columnar foot (forming a ball-shaped joint); labellum 3-lobed; sepals fused in their basal ½ . . . . . ***Crocodeilanthe***

17b. Labellum articulate with the column on a transverse strip at the base of the labellum and apex of the column; labellum simple or inconspicuously 3-lobed and its basal margins erect or not; sepals free or lateral sepals connate for a variable length (often fully connate) as a synsepal . . . . . ***Anathallis***

14b. Inflorescences not associated with an annulus; spathes, if present, emerging from leaf bases 18

18a. Stems triangular in cross section, winged; flowers very fleshy; inflorescences reclining or resting on the leaves; clinandrium laciniate or toothed; anther subventral; stigma ventral . . . . . ***Acianthera***

18b. Stems terete in cross section, not winged; flowers membranous; inflorescences various, often pendulous, rarely resting on the leaves; clinandrium entire; anther apical or dorsal; stigma apical . . . . . ***Pleurothallis***

SUBKEY VI: LEAVES CONDUPLICATE; PSEUDOBULBS ABSENT; INFLORESCENCES LATERAL

1a. Leaf blades laterally compressed, not articulate with leaf sheaths, densely imbricate basally (stem completely covered with leaves except for the bases of old stems); inflorescences of several successive flowers (sometimes >1 flower present when the inflorescence branches) . . . . . ***Lockhartia***

1b. Leaf blades dorsoventrally compressed, articulate or not with leaf sheaths, loosely or subdensely arranged on the stem; inflorescences composed of 1 flower or with 2 flowers in a subumbel of ± simultaneous flowers 2

2a. Large terrestrial (or possibly and less commonly epiphytic) plants; leaf blades ≥10 cm long; stems ≥60 cm long; column completely fused with the labellum . . . . . ***Epidendrum***

2b. Small epiphytic or humicolous plants; leaf blades <3 cm long; stems ≤30 cm long; column free from the labellum 3

3a. Inflorescences 1-flowered 4

4a. Plants pendulous; fruits muricate, suborbicular in cross section; leaves marcescent; labellum attenuate at base and anchor-shaped at apex (i.e., apex 2-lobed with retrorse lobes) . . . . . ***Dichaea***

4b. Plants erect; fruit not muricate; leaves not marcescent; labellum not anchor-shaped at apex . . . . ***Brachionidium***

3b. Inflorescences 1–5-flowered, in a small umbel of ± simultaneous flowers . . . . . ***Fernandezia***

Aa Rchb. f.

Aa Rchb. f., Xenia Orch. 1: 18. 1854.

Terrestrial herbs. Roots fleshy, linear-fusiform, fascicled at the base of the rosette. Leaves rosulate, 3 or 4 leaves per rosette, present (our species) or absent at anthesis (i.e., plants hysteranthous); leaf blades elliptic or linear-elliptic, bases very short pseudopetiolate. Inflorescences terminal, originating from the remnants of the rosette of the previous growing season and thus appearing to be lateral, racemose and appearing spiciform because of short pedicels, racemes relatively short compared to peduncles, entirely covered by floral bracts; peduncles robust, completely surrounded by tubular, ± appressed, imbricate, hyaline sheaths; rachises with flowers densely packed, many-flowered; floral bracts hyaline to diaphanous, usually longer than flowers, erect, reflexed after anthesis. Flowers not resupinate, small, inconspicuous, glabrous; perianth segments membranous. Sepals free or sometimes shortly connate at base, ± similar or lateral sepals much larger than dorsal sepal, often recurved. Petals free, narrower than sepals, glabrous. Labellum calceolate (i.e., slipper-shaped), margins involute, fimbriate or denticulate, with a pair of subglobose calli basally; column erect, short, somewhat dilated apically, glabrous; clinandrium relatively small, without lobes, never tubulose; rostellum transverse, truncate, reniform, relatively large; anther dorsal, erect, relatively small; pollinia 4, linear-oblong, sessile. Ovary glabrous to glandular-pubescent. [Orchidoideae: Cranichideae: Cranichidinae.]

A genus of 25–30 species found at high elevations in South America (Colombia, Venezuela, Ecuador, Peru, Bolivia, Brazil, and Argentina). Two species are known from Venezuela.

References. Álvarez-Molina and Cameron (2009); Pridgeon et al. (2003); Salazar Chávez et al. (2009).

The species of *Aa* are heliophilous and often found in light gaps in forest.

Salazar Chávez et al. (2009) determined *Aa* to be monophyletic and closely related to *Porphyrostachys* Rchb. f., the two genera forming a clade sister to *Gomphichis* Lindl., which also occurs in Guaramacal. Álvarez-Molina and Cameron (2009), however, recovered a slightly different topology. These same three genera and two or three others formed a highly supported clade (*Altensteinia* clade) of predominantly Andean genera. A relationship between *Aa* and *Myrosmodes* Rchb. f. was not completely resolved, and Álvarez-Molina and Cameron (2009) suggested that with more taxon sampling *Myrosmodes* ultimately might prove to be better accommodated in *Aa*. Álvarez-Molina and Cameron (2009) also recovered a relationship between *Aa*/*Myrosmodes*, *Porphyrostachys*, and *Gomphichis* similar to that of Salazar Chávez et al. (2009), who did not sample *Myrosmodes*.

Aa hartwegii Garay, Fl. Ecuador 9: 161, fig. 49. 1978; Romero and Carnevali, Orchids Venez., 2nd ed., 1: 1. 2000; Morillo, in Morillo et al., Bot. Ecol. Monocot. Páramos Venez. 1: 92–93, fig. 23. 2011.

Altensteinia paleacea auct., non (Kunth) Kunth; Foldats, Fl. Venez. 15(1): 403, fig. 151. 1969, pro parte.

MAP 106. *Aa hartwegii* occurrence in Venezuela.

Terrestrial herbs. Leaf blades 15–18 × 1.6–1.8 cm; pseudopetioles 2–4 cm long. Inflorescences 7–9 cm long; peduncles 45–48 cm long. Floral bracts ovate-lanceolate, 11–13 × 5 mm, acute. Flowers white. Dorsal sepal 2.5 × ~1 mm.

Found in South America (Colombia, Venezuela, and Ecuador). In Venezuela, known only from the Andes (Táchira and Trujillo; Map 106). In the park, known from the Laguna del Pumar and vicinity; 3,000 m.

Acianthera Scheidw.

Acianthera Scheidw., Allg. Gartenzeitung 10: 292. 1842. *Pleurothallis* subgen. *Acianthera* (Scheidw.) Luer, Monogr. Syst. Bot. Missouri Bot. Gard. 20: 12. 1986.

Epiphytic, lithophytic or rarely subterrestrial herbs; caespitose or repent, rarely pendent. Rhizomes reduced or creeping. Stems terete, laterally compressed or triangular in cross section and apparently winged, reduced to much longer than the leaves, frequently covered by 1 to several tubular and appressed sheaths. Leaves erect, perpendicular or deflexed on the stem; leaf blades commonly ovate or ovate-elliptic, more rarely linear, suborbicular to obovate or subcylindrical, bases attenuate, cordate or decurrent on stem, apices slightly 3-toothed, coriaceous or fleshy, sessile of petiolate. Inflorescences terminal, not associated with an annulus, emerging from the apex of the stem or appearing to originate directly from the leaf when leaf margins are decurrent on triquetrous stems, solitary or less commonly fasciculate, racemose or 1-flowered by abortion, usually shorter than subtending leaves and frequently appressed to the ventral face of same, rarely pendulous, flowers opening successively or more commonly ± simultaneously; floral bracts usually tubular, fleshy, less commonly large and conspicuous. Flowers commonly resupinate, small or medium-sized, variously colored, often malodorous, fleshy (compared to other Pleurothallidinae). Sepals almost free or, more commonly, the lateral sepals connate for a variable length (often their full length) in a synsepal that supports the labellum, externally smooth or verruculose; dorsal sepal often narrower and differently shaped than synsepal. Petals less fleshy and conspicuously smaller than sepals, generally parallel to the column, margins smooth or frequently dentate to fimbriate or laciniate. Labellum very fleshy, attached to the column foot, simple to deeply 3-lobed, lateral lobes relatively small, erect, and clasping the column, apical lobe usually verruculose, margins smooth, more commonly erose to laciniate; disk usually with 2 longitudinal calli in the basal or medial portion; column elongate, semicylindrical, straight or ± arcuate, with a well-developed foot, frequently glandular or verruculose; clinandrium usually erose or dentate to fimbriate; anther operculate, subventral; pollinia 2; stigma and rostellum ventral. Ovary terete or subtriangular, glabrous or pubescent, attached to pedicel. Capsules ellipsoid to pyriform. [Epidendroideae: Epidendreae: Pleurothallidinae.]

A neotropical genus of over 250 species found in Mexico, Central America, the West Indies, and South America (Colombia, Venezuela, Ecuador, Peru, Bolivia, Brazil, Argentina, and Uruguay). One center of diversity is in southeastern Brazil. Twenty-four species are reported from Venezuela.

References. Luer (1986d, 2002b, 2004); Pridgeon and Chase (2001); Pridgeon et al. (2001b, 2005).

Although Luer (1986d, 2002b, 2004) treated *Acianthera* as a subgenus in a broadly defined *Pleurothallis* R. Br., there is strong molecular support (Pridgeon et al., 2001b) for recognizing *Acianthera* as a distinct genus.

KEY TO THE SPECIES OF *ACIANTHERA*

1a. Leaf blades ovate or ovate-elliptic, 3–5(–8) × 1.5–2.5(–4) cm; stem wings not decurrent on the leaf base; flowers opening widely, without side windows (i.e., openings created by the way the concave dorsal sepal rests on the erect apex of the synsepal); dorsal sepal oblong–obovate; margins of lateral sepals entire, apices acute or obtuse, inconspicuously apiculate; petals entire or margins slightly erose or serrate . . . . . ***A. casapensis***

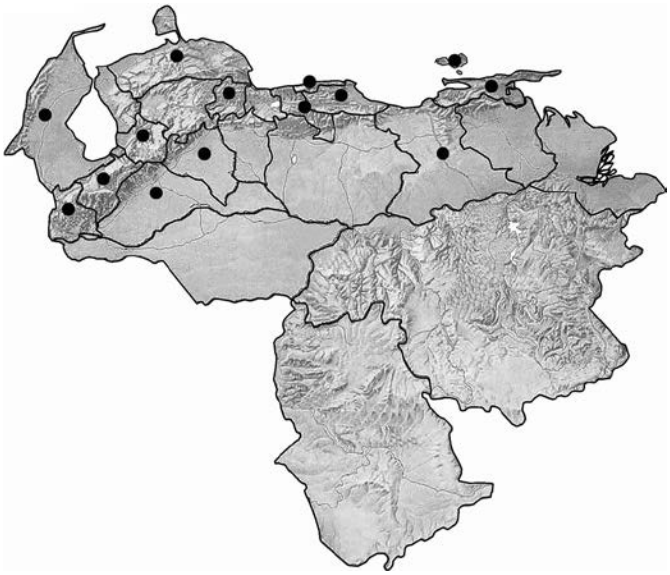
1b. Leaf blades elliptic, 6–10 × 2–3 cm; stem wings conspicuously decurrent on the leaf base; flowers globular with side windows (see above); dorsal sepal obovate; margins of lateral sepals erose-fimbriate, apices truncate and conspicuously apiculate; petals strongly laciniate . . . . . ***A. prognatha***

Acianthera casapensis (Lindl.) Pridgeon & M. W. Chase, Lindleyana 16: 242. 2001. *Pleurothallis casapensis* Lindl., Edwards's Bot. Reg. 28: Misc. 76. 1842; Dorr et al., Contr. U.S. Natl. Herb. 40: 52. 2000 [2001].

Pleurothallis chamensis Lindl., Orchid. Linden. 2. 1846; Dunsterville and Garay, Venez. Orchids Ill. 1: 314–315. 1959; Foldats, Fl. Venez. 15(2): 235–238, fig. 269. 1970; Romero and Carnevali, Orchids Venez., 2nd ed., 3: 764. 2000; Fernández, Orquídeas Nat. Táchira 176. 2003. *Acianthera chamensis* (Lindl.) Pridgeon & M. W. Chase, Lindleyana 16: 242. 2001.

Epiphytic or lithophytic herbs, shortly creeping; stems 3–15 cm long. Inflorescences 3–10-flowered. Flowers yellowish-green to yellow (becoming orange in age). Dorsal sepal 5–9 mm long. Labellum simple, 2.4–5.6 mm long.

Found in South America (Colombia, Venezuela, Ecuador, Peru, Bolivia, and Brazil). In Venezuela, found in the Andes (Barinas, Mérida, Portuguesa, Táchira, and Trujillo), the Sierra de Perijá (Zulia), the Cordillera de la Costa (Anzoátegui, Aragua, Distrito Federal, Falcón, Miranda, Sucre, and Yaracuy), and Nueva Esparta (Map 107). In the park, known from La



MAP 107. *Acianthera casapensis* occurrence in Venezuela.

Divisoria de la Concepción and other localities on the south slope of Guaramacal; 1,600 m.

Acianthera prognatha (Luer & R. Escobar) Pridgeon & M. W. Chase, Lindleyana 16: 245. 2001. *Pleurothallis prognatha* Luer & R. Escobar, Orquideología 16: 30, t. p. 29. 1983; Dorr et al., Contr. U.S. Natl. Herb. 40: 53. 2000 [2001]; Fernández, Orquídeas Nat. Táchira 189. 2003.

MAP 108. *Acianthera prognatha* occurrence in Venezuela.

Epiphytic herbs, ± caespitose or shortly creeping. Inflorescences 3–6-flowered. Flowers green (our specimens) or dull-orange flowers (or only becoming orange in age?). Dorsal sepal 8.5–9.5 mm long. Labellum obovate, subacute, 7 mm long.

Found in South America (Colombia and Venezuela). In Venezuela, found only in the Andes (Portuguesa and Táchira; Map 108). In the park, known only from La Divisoria de la Concepción; 1,700 m.

Acineta Lindl.

Acineta Lindl., Edwards's Bot. Reg. 29: Misc. 67. 1843.

Epiphytic or rarely terrestrial herbs; robust, caespitose. Stem modified into ovoid to subcylindrical pseudobulbs arising from 1 internode, often compressed and/or sulcate. Leaves (1–)2–4, articulate; leaf sheaths withering in age; leaf blades narrowly ovate, acute, plicate, coriaceous, subpetiolate (petioles indistinct). Inflorescences 1 to several, lateral, many-flowered pendent racemes arising from the base of the pseudobulbs. Flowers resupinate, globose, fleshy, waxy, showy; floral bracts concave, ovate, shorter than the pedicellate ovary. Sepals widely elliptic to very broadly ovate, concave, spreading, fleshy; lateral sepals partially connate or not, asymmetrical. Petals spathulate, generally smaller than sepals. Labellum fleshy, rigid, subsessile to conspicuously clawed, 3-lobed, claw concave to subsacciform, lateral lobes large, erect, hatchet-shaped, triangular, transversely elliptic or subreniform, midlobe subrhombic, flat or apically shallowly concave; disk with fleshy calli; column short, erect, semiterete, glabrous or slightly pubescent toward the base, apically winged to subauriculate, rarely produced into a short, broad foot; anther terminal, operculate, incumbent, 1- or imperfectly 2-locular; pollinarium with 2 yellow pollinia, narrowly obovate, cleft, cartilaginous, and dorsoventrally flattened, tegula (i.e., covering) long, oblong-linear; viscidium subtriangular or bifurcate; rostellum ligulate. [Epidendroideae: Cymbidieae: Stanhopeinae.]

Found in Mexico, Central America, and South America (Colombia, Venezuela, Guyana, Suriname, Ecuador, Peru, and Brazil). *Acineta* comprises 10–15 species, 3 of which are found in mountainous parts of Venezuela.

References. Christenson (2006); Gerlach (1999b); Pridgeon et al. (2009); Whitten et al. (2000).

Whitten et al. (2000) identified the monotypic Bolivian *Vasqueziella* Dodson as sister to *Acineta* and speculated that it might, in fact, be synonymous.

Acineta cryptodonta Rchb. f., Bonplandia (Hannover) 2: 92. 1854; Fernández, Orquídeas Nat. Táchira 31. 2003; Llamozas et al., Libro Rojo Fl. Venez. 380. 2003.

Acineta erythroxantha auct., non Rchb. f.; Foldats, Fl. Venez. 15(4): 185–187, fig. 638. 1970.

Acineta sella-turcica auct., non Rchb. f.; Foldats, Orquideophilo 3(1): 14. 1995.

MAP 109. *Acineta cryptodonta* occurrence in Venezuela.

Epiphytic herbs, 30–50 cm tall; pseudobulbs 8–10 cm tall, fusiform to pyriform, apically 2- or 3-foliate. Leaf blades 25–60 cm long, pendulous. Flowers yellow. Sepals 3.5–7 cm long.

Found in South America (Colombia and Venezuela). In Venezuela, found only in the Andes (Barinas, Lara, Táchira, and Trujillo; Map 109). The presence of this species in the park is not vouchered by an herbarium specimen; we include it on the basis of a sight record by G. Gerlach (pers. comm.). Gerlach did not indicate the elevation in the park where he encountered this species, but other Venezuelan collections have been made at 1,800 m.

Acronia C. Presl

Acronia C. Presl, Rel. Haenk. 1: 103. 1827.

Zosterophyllanthos Szlach. & Marg., Polish Bot. J. 46: 118. 2001.

Epiphytic, lithophytic or subterrestrial herbs; caespitose to repent, erect to pendent. Rhizomes very short to elongate. Roots few to many, slender to coarse and fleshy. Stems consisting of modules with a short basal part and an aerial part of 2 or 3 internodes, with 1 apical leaf, internodes covered by tubular, appressed sheaths, sheaths shorter than internodes, aerial modules simple or, more rarely, proliferous (becoming scandent), usually longer than the leaves, terete or rarely laterally compressed. Leaves attached at apex of stem; leaf blades usually ovate and bases cordate or subcordate (leaf blades deflexed in some species with cordate bases), less commonly elliptic, linear or lanceolate and bases cuneate to pseudopetiolate, apices obtuse, acute to abruptly short-acuminate with a small mucro in the center of the apical sinus, membranous to coriaceous. Inflorescences solitary (rarely fasciculate), 1- or few-flowered racemes, almost always shorter than leaves; peduncles thin or thick, always emerging from a small to large and subfoliaceous spathe; floral bracts tubular, usually shorter than floral pedicels. Flowers resupinate or not, arising from leaf bases, usually small, sometimes relatively large and conspicuous, color variable but most often green, yellow or deep burgundy. Sepals with or without keels, glabrous or more rarely verruculose or even somewhat pubescent, membranous or fleshy; dorsal sepal free; lateral sepals completely connate to form a ± concave synsepal that rests on the labellum, synsepal usually ovate or ovate-elliptic, obtuse, acute or acuminate, base sometimes with a mentum. Petals free, usually narrower than the sepals, margins entire, papillose or denticulate, straight or recurved, narrowly ovate, broadly ovate, lanceolate to obovate, obtuse, acute or acuminate, membranous or fleshy. Labellum membranous or fleshy, entire, usually ovate or lanceolate, subquadrate or obovate, flat, concave or convex, usually with a well-developed glenion (i.e., small area with a shiny surface that appears wet, which is on the upper plane of the labellum, where it rests beneath the column) at the base, margins and surfaces smooth, calli papillose or margins fimbriate, articulate to rigidly joined to columnar base; column semiterete or conical, short, thick, sometimes with a small foot, without wings; anther apical; pollinia 2, narrowly pyriform with small caudicles; stigma apical, transverse or 2-lobed. Ovary 3-valved, pedicellate, smooth or (more rarely) verruculose, deciduous. [Epidendroideae: Epidendreae: Pleurothallidinae.]

A neotropical genus of ~220 species found in Central America and South America (Colombia, Venezuela, Ecuador, Peru, Bolivia, Brazil, and Paraguay). Approximately 35 species occur in Venezuela.

References. Luer (2005); Wilson et al. (2011).

Acronia, a segregate of *Pleurothallis*, consists of two sections, sect. *Acronia*, with inflorescences composed of various numbers of flowers, and sect. *Macrophyllae-fasciculatae* (Lindl.) Luer, with 1-flowered inflorescences. Our species belong to this latter section.

The generic concept presented here is strictly morphological. There is a suggestion (Wilson et al., 2011) based on unpublished and preliminary molecular data that if *Acronia* and *Zosterophyllanthos* Szlach. & Marg. are shown to be monophyletic, then the group would be relegated to subgeneric status in an expanded concept of *Pleurothallis*.

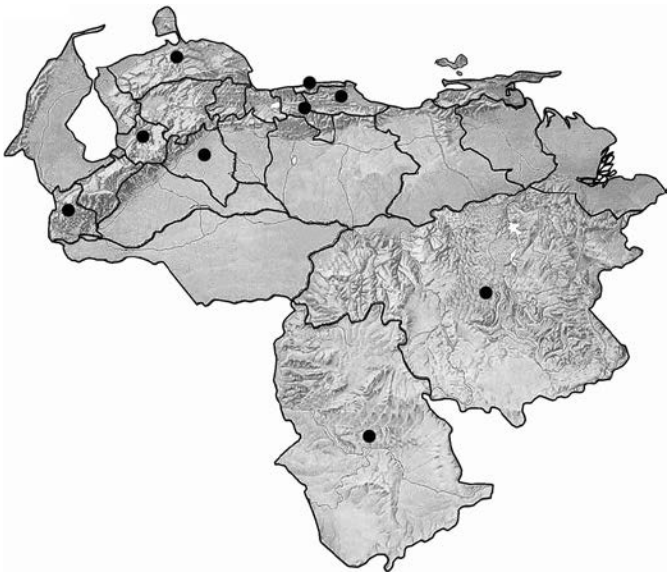
KEY TO THE SPECIES OF *ACRONIA*

1a. Leaf blades linear, >15× longer than wide ..... ***A. calamifolia***
1b. Leaf blades elliptic to broadly ovate, never more than 8× longer than wide 2
  2a. Floral pedicels >4 cm long; flowers pendulous or obscured beneath the leaf blade ..... ***A. ruberrima***
  2b. Floral pedicels <2 cm long (usually <1 cm long); flowers borne on the upper surface of the leaf blade 3

3a. Adult leaf blades <6.5 cm long, usually <2.5 cm wide; adult stems 5–8(–9) cm long 4
4a. Dorsal sepal and synsepal ± the same width; labellum rounded and thickened apically; flowers greenish-salmon . . . . . ***A.*** sp. A
4b. Synsepal conspicuously wider than dorsal sepal; labellum acute apically; flowers yellow or yellowish-brown . . . . . ***A. phyllocardioides***
3b. Adult leaf blades >8 cm long (if somewhat shorter, then no more than 2.5× longer than wide), usually >3 cm wide; adult stems 9–20 cm long 5
5a. Petals obovate or oblong-obovate, 3-nerved; flowers completely yellow; leaf blades oblong-elliptic to ovate-elliptic, always 3–4× longer than wide, bases rounded to deeply cordate; labellum broadly oblong . . . . . ***A. semiscabra***
5b. Petals at most narrowly oblong, 1-nerved; flowers usually purplish or brownish-purple, sepals sometimes translucent yellow or the flower completely yellow but then leaf blades 1.3–2× longer than wide; leaf blades ovate or ovate-elliptic, bases cordate to deeply cordate; labellum ovate or ovate-triangular to elliptic . . . 6
6a. Dorsal sepal (when hydrated) at least 20 mm long (15–17 mm long in herbarium material), 3–5-nerved 7
7a. Labellum elliptic in general outline, margins in the apical ½ plane; upper ½ of petals glabrous . . . . . ***A. bivalvis***
7b. Labellum ovate in general outline, margins in the apical ½ incurved, rolled down so that the labellum apex is conical-cylindric; upper ½ of petals pubescent . . . . . ***A. siphoglossa***
6b. Dorsal sepal (when hydrated) 8–12 mm long, 3-nerved 8
8a. Flowers purplish-brown; dorsal sepal and synsepal 1.2–1.8× longer than wide; petals oblong, obtuse, 4–5× longer than wide, margins erose; labellum ovate, apex obtuse or rounded; glenion (see generic description) conspicuous, ovate, covering at least ⅓ of the total area of the labellum . . . . ***A. archidiaconi***
8b. Flowers greenish-yellow translucent, yellowish or pink; dorsal sepal and synsepal at least 3× longer than wide; petals linear-triangular, acute, at least 7× longer than wide, margins entire; labellum narrowly triangular, apex acute; glenion (see generic description) inconspicuous . . . . . ***A. coriacardia***

Acronia archidiaconi (Ames) Carnevali & G. A. Romero, **comb. nov.** *Pleurothallis archidiaconi* Ames, Sched. Orchid. 9: 29. 1925; Romero and Carnevali, Orchids Venez., 2nd ed., 3: 751. 2000; Dorr et al., Contr. U.S. Natl. Herb. 40: 52. 2000 [2001]; Carnevali and Ramírez-Morillo, in Berry et al., Fl. Venez. Guayana 7: 512. 2003.

Pleurothallis monocardia auct., non Rchb. f.; Dunsterville and Garay, Venez. Orchids Ill. 1: 336–337. 1959; Foldats, Fl. Venez. 15(2): 345–347, fig. 312. 1970.



MAP 110. *Acronia archidiaconi* occurrence in Venezuela.

Epiphytic herbs, to 25 cm tall, usually shorter. Leaf blades 7–10 × 3.5–5 cm, bases cordate, apices shortly acuminate, minutely 3-toothed. Flowers purple-brown. Dorsal sepal 5–7 mm long. Labellum reddish-purple with a yellow center.

Found in South America (Venezuela, Trinidad and Tobago, the Guianas, and Ecuador). Venezuelan collections are from the Andes (Portuguesa, Táchira, and Trujillo), the Cordillera de la Costa (Aragua, Distrito Federal, Falcón, and Miranda), and the Venezuelan Guayana (Amazonas and Bolívar; Map 110). We have a single record of this species from the south slope of Guaramacal that consists of a photograph taken by B. Stergios (see Carnevali and Ramírez in Cuello A., 1999: 93).

Luer (2005: 93–96) includes this species in his concept of *Acronia bivalvis* (Lindl.) Luer but acknowledges the latter is "the greatest catch all or waste basket of the genus."

Pleurothallis omoglossa Luer, described from Ecuador, might be conspecific with *Acronia archidiaconi*. If so, the latter name has priority.

Acronia bivalvis (Lindl.) Luer, Monogr. Syst. Bot. Missouri Bot. Gard. 103: 93. 2005. *Pleurothallis bivalvis* Lindl., Orchid. Linden. 2. 1846; Dunsterville and Garay, Venez. Orchids

MAP 111. *Acronia bivalvis* occurrence in Venezuela.

MAP 112. *Acronia calamifolia* occurrence in Venezuela.

Ill. 4: 206–207. 1966; Foldats, Fl. Venez. 15(2): 215–217, fig. 259. 1970; Romero and Carnevali, Orchids Venez., 2nd ed., 3: 758–759. 2000; Dorr et al., Contr. U.S. Natl. Herb. 40: 52. 2000 [2001]; Fernández, Orquídeas Nat. Táchira 175. 2003.

Pleurothallis coriacardia auct., non Rchb. f.; Carnevali and Ramírez, in Cuello, Parque Nac. Guaramacal 91, fig. 1999 ("Foto: A. Licata").

Epiphytic herbs, to 40 cm tall. Adult leaf blades 7–13 × 3–5(–7) cm, bases cordate to deeply cordate, apices acute to subacute. Flowers relatively large for the complex of species with cordate leaves. Dorsal sepal 15–22 cm long, pale pink (at base) or yellow with purple nerves; synsepal pale purple with darker nerves; petals and labellum dark purple; column pale yellow.

Found in Central America (Costa Rica and Panama) and South America (Colombia, Venezuela, Ecuador, Peru, and Bolivia). In Venezuela, recorded from the Andes (Lara, Mérida, Portuguesa, Táchira, and Trujillo), the Sierra de Perijá (Zulia), and the Cordillera de la Costa (Distrito Federal and Miranda; Map 111). In the park, found in cloud forest on both slopes of Guaramacal; 1,800–2,750 m.

Acronia calamifolia (Luer & R. Escobar) Luer, Monogr. Syst. Bot. Missouri Bot. Gard. 103: 99. 2005. *Pleurothallis calamifolia* Luer & R. Escobar, Orquideología 20: 40. 1996.

Pleurothallis subtilis auct., non C. Schweinf.; Foldats, Fl. Venez. 15(2): 422–426, fig. 347. 1970, pro parte; Ortega et al., BioLlania 5: 49. 1987; Dorr et al., Contr. U.S. Natl. Herb. 40: 53. 2000 [2001].

Epiphytic herbs, 25–45 cm tall. Leaves erect or becoming deflexed on the stem; leaf blades linear, 12–16 × 0.7–0.9 cm, bases rounded or subcordate, apices acute. Flowers yellowish. Dorsal sepal 2.6–2.8 mm long. Labellum darker yellow.

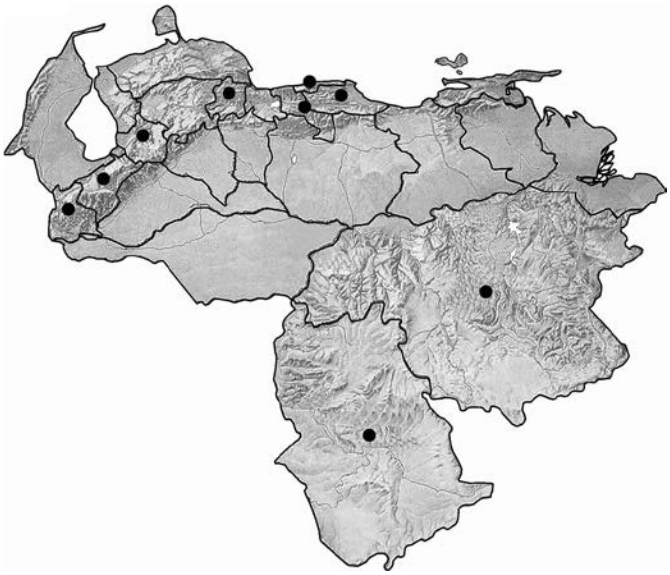
Found in South America (Colombia and Venezuela). In Venezuela, found only in the Cordillera de Mérida (Portuguesa and Trujillo; Map 112). In the park, known from La Divisoria de la Concepción, Casa Vicuyal, and along the Boconó–Guaramacal road; 1,700–2,300 m.

This is the first report of *Acronia calamifolia* occurring in Venezuela. It is a distinctive species closely related to *A. subtilis* (C. Schweinf.) Luer, with which it has been confused in the past. The latter species has a proportionately smaller convex labellum and longer and narrower petals. Material collected by G. C. K. Dunsterville in La Carbonera (Mérida state) and illustrated by him under the name *Pleurothallis subtilis* C. Schweinf. (see Dunsterville and Garay, 1966: 244–245; Romero-González and Carnevali Fernández-Concha, 2000: 853) has a relatively small, strongly convex labellum with a strongly corrugated surface that is reddish maroon. This material probably represents a distinct species that has yet to be described.

Acronia coriacardia (Rchb. f.) Luer, Monogr. Syst. Bot. Missouri Bot. Gard. 103: 117. 2005. *Pleurothallis coriacardia* Rchb. f., Bonplandia (Hannover) 2: 26. 1854; Romero and Carnevali, Orchids Venez., 2nd ed., 3: 767. 2000; Dorr et al., Contr. U.S. Natl. Herb. 40: 52. 2000 [2001]; Carnevali and Ramírez-Morillo, in Berry et al., Fl. Venez. Guayana 7: 513–514. 2003; Fernández, Orquídeas Nat. Táchira 177. 2003; Morillo, in Morillo et al., Bot. Ecol. Monocot. Páramos Venez. 1: 246–247, fig. 92. 2011.

Pleurothallis linguifera auct., non Lindl.; Foldats, Fl. Venez. 15(2): 329, 331–332, fig. 305. 1970.

Pleurothallis lansbergii auct., non Regel; Dunsterville and Garay, Orchids Venez., ed. 1, 3: 783. 1979.



MAP 113. *Acronia coriacardia* occurrence in Venezuela.

MAP 114. *Acronia phyllocardioides* occurrence in Venezuela.

Epiphytic or sometimes lithophytic herbs, erect, to 35 cm tall. Leaves erect or deflexed on the stem; leaf blades ovate to broadly ovate, 8–12 × 0.3–0.5 cm, bases cordate, apices acuminate. Flowers greenish-yellow translucent, yellowish or pinkish-green. Dorsal sepal 9–12 mm long.

Found in South America (Colombia, Venezuela, Ecuador, Peru, and Bolivia). In Venezuela, recorded from Amazonas, Aragua, Bolívar, Distrito Federal, Mérida, Miranda, Táchira, Trujillo, and Yaracuy (Map 113). Montane forest below Páramo del Pumar and along the southwestern border of the park; 1,900–2,200(–2,600) m.

Material from the Venezuelan Guayana identified as *Acronia coriacardia* shows differences in flower color and size and may represent a distinct species.

Acronia phyllocardioides (Schltr.) Luer, Monogr. Syst. Bot. Missouri Bot. Gard. 103: 174. 2005. *Pleurothallis phyllocardioides* Schltr., Repert. Spec. Nov. Regni Veg. Beih. 19: 193. 1923; Romero and Carnevali, Orchids Venez., 2nd ed., 3: 826. 2000; Fernández, Orquídeas Nat. Táchira 188. 2003. *Zosterophyllanthos phyllocardioides* (Schltr.) Szlach. & Marg., Polish Bot. J. 46: 120. 2001. *Zosterophyllanthos phyllocardioides* (Schltr.) Szlach. & Kulak, Richardiana 6(4): 192. 2006, isonym.

Epiphytic herbs, 12–15 cm tall when mature. Leaf blades 4.5–6 × 1.8–2.5 cm, bases deeply cordate, apices acute. Flowers yellow. Dorsal sepal 4.8–5.5 mm long.

Found in Central America and South America (Colombia, Venezuela, Ecuador, Peru, and Bolivia). In Venezuela, known only from the Andes (Táchira and Trujillo; Map 114). Collected near the village of Guaramacal; ~1,500 m.

Acronia ruberrima (Lindl.) Luer, Monogr. Syst. Bot. Missouri Bot. Gard. 103: 184. 2005. *Pleurothallis ruberrima* Lindl., Orchid. Linden. 1. 1846; Dunsterville and Garay, Venez. Orchids Ill. 1: 344–345. 1959; Foldats, Fl. Venez. 15(2): 389–391, fig. 332. 1970; Romero and Carnevali, Orchids Venez., 2nd ed., 3: 836. 2000; Fernández, Orquídeas Nat. Táchira 191. 2003.

MAP 115. *Acronia ruberrima* occurrence in Venezuela.

Epiphytic herbs, 35–60 cm tall. Leaf blades narrowly oblong-elliptic, 14–16 × 2.5–3 cm, bases shallowly cordate, apices acuminate. Flowers greenish-pink. Dorsal sepal 17–28 mm long. Labellum pink or dark purple with darker nerves.

Found in South America (Colombia, Venezuela, Ecuador, Peru, and Bolivia). In Venezuela, known from Apure, Aragua, Distrito Federal, Mérida, Miranda, Táchira, Trujillo, and Zulia (Map 115). In the park, collected at La Punta in sector El Santuario; ~1,850 m.

Acronia semiscabra (Lindl.) Luer, Monogr. Syst. Bot. Missouri Bot. Gard. 103: 190. 2005. *Pleurothallis semiscabra* Lindl., Orchid. Linden. 2. 1846; Dunsterville and Garay, Venez. Orchids Ill. 3: 258–259. 1965; Foldats, Fl. Venez. 15(2): 409–411, fig. 341. 1970; Ortega et al., BioLlania 5: 49. 1987; Romero and Carnevali, Orchids Venez., 2nd ed., 3: 844. 2000. *Maxillaria semiscabra* (Lindl.) P. Ortiz, Orquideología 18: 101. 1991; Dorr et al., Contr. U.S. Natl. Herb. 40: 51. 2000 [2001].

Epiphytic herbs, 20–35 cm tall. Leaf blades narrowly ovate-elliptic to elliptic, (5.5–)7–10 × (2–)2.5–3.5(–4) cm, bases rounded to deeply cordate, apices acuminate. Flowers completely yellow. Dorsal sepal 5–9 mm long.

Endemic to Venezuela, where it is found in the Andes (Lara, Mérida, and Trujillo) and in the Cordillera de la Costa (Miranda; Map 116). In the park, found in montane forest and cloud forest on both slopes of Guaramacal; 1,800–2,600 m.

Acronia siphoglossa (Luer & R. Escobar) Luer, Monogr. Syst. Bot. Missouri Bot. Gard. 103: 192. 2005. *Pleurothallis siphoglossa* Luer & R. Escobar, Orquideología 20: 82, tt. pp. 83, 89. 1996; Romero and Carnevali, Orchids Venez., 2nd ed., 3: 848. 2000; Dorr et al., Contr. U.S. Natl. Herb. 40: 53. 2000 [2001].

Pleurothallis grandiflora auct., non Lindl.; Dunsterville and Garay, Venez. Orchids Ill. 4: 218–219. 1966.

Epiphytic herbs, 25–30 cm tall. Leaf blades ovate, 7–10 × 3.5–5 cm, bases cordate to deeply cordate, apices acuminate. Flowers yellowish or translucent; labellum and petals purple. Dorsal sepal 18–23 mm long.

Found in South America (Colombia, Venezuela, and Ecuador). In Venezuela, known only from the Cordillera de Mérida (Mérida and Trujillo; Map 117). In the park, we have a single record of this species growing on the south slope of Guaramacal that consists of a photograph taken by A. Licata (Carnevali and Ramírez in Cuello A., 1999: 90).

MAP 116. *Acronia semiscabra* occurrence in Venezuela.

MAP 117. *Acronia siphoglossa* occurrence in Venezuela.

***Acronia* sp. A**

Epiphytic herbs, 10–14 cm tall. Leaf blades ovate-elliptic, 4–4.5 × 1.6–1.8 cm, bases cordate, apices shortly acuminate. Flowers spreading, salmon-orange (in sched.). Dorsal sepal 5.2 × 3 mm.

Endemic to Venezuela (Trujillo; Map 118). In the park, collected on the north slope of Guaramacal along the trail from the Laguna de Aguas Negras to Qda. Salvaje; 1,850–2,100 m.

This undescribed species is similar to the widely distributed *Acronia phyllocardioides*, but it has a wider dorsal sepal and a rounded and apically thickened labellum. Vegetatively, the new species seems to belong to the *A. tridentata* (Klotzsch) Luer complex, but in this species complex the species have a labellum that is strongly geniculate basally and proportionally wider.

MAP 118. *Acronia* sp. A occurrence in Venezuela.

Anathallis Barb. Rodr.

Anathallis Barb. Rodr., Gen. Spec. Orchid. 1: 23. 1877.

Pleurothallis subgen. *Acuminatia* Luer, Monogr. Syst. Bot. Missouri Bot. Gard. 76: 98. 1999.

Epiphytic, lithophytic or rarely subterrestrial herbs; erect or pendulous. Rhizomes short or creeping. Stems terete or ventrally canaliculate, greatly abbreviated to much longer than the leaves but more commonly subsimilar in length, frequently covered by 1 to several appressed, tubular sheaths. Leaves erect to perpendicular to the stem; leaf blades commonly elliptic to linear or suborbicular to obovate, rarely subcylindrical, bases usually attenuate, apices minutely 3-toothed, coriaceous or fleshy. Inflorescences terminal, associated with an annulus and emerging just above it and below the foliar attachment, solitary or fascicled, racemose or 1-flowered by abortion, with successive or ± simultaneous flowers; floral bracts usually reduced, less commonly large and conspicuous, membranous. Flowers commonly resupinate, small or medium, variously colored, membranous or subfleshy (compared to other Pleurothallidinae). Sepals almost free or lateral sepals connate for a variable length (often fully connate) as a synsepal on which the labellum rests, externally smooth or verruculose; dorsal sepal frequently narrower and differently shaped than synsepal. Petals less fleshy than the sepals and conspicuously smaller, variable in shape, usually parallel to the column, margins entire or often dentate to fimbriate or laciniate. Labellum attached to column foot and often with a pair of minute lobes or retrorse teeth at the base on each side of the attachment, lamina deeply 3-lobed to more commonly simple, lateral lobes relatively small, erect, apical lobe smooth, verruculose or pubescent, margins smooth to more commonly erose to laciniate; disk usually with 2 longitudinal calli basally or medially; column elongate, hemicylindrical and concave ventrally, straight or ± curved, often membranous and easily pliable, with a well-developed foot; clinandrium usually erose or dentate to fimbriate; anther operculate, subventral; pollinia 2; stigma and rostellum ventral. Ovary attached to pedicel, terete or subtriangular, glabrous or papillose; pedicel usually fleshy, scarcely differentiated from the ovary. Capsules ellipsoid to obovoid. [Epidendroideae: Epidendreae: Pleurothallidinae.]

A neotropical genus of 300–400 species found in Mexico, Central America, the Greater Antilles, and South America (Colombia, Venezuela, Trinidad and Tobago, the Guianas, Ecuador, Peru, Bolivia, Brazil, and Argentina). The genus is most diverse in the Andes; 35–40 species are recorded from Venezuela.

References. Chiron et al. (2012); Karremans et al. (2013); Luer (1986d, 1999, 2002b); Pridgeon and Chase (2001); Pridgeon et al. (2005).

Morphologically, *Anathallis* is difficult to circumscribe because it has no obvious synapomorphies. It is easily confused with *Specklinia* Lindl.; both genera have an annulus subtending the inflorescence, which is usually many-flowered with ± membranous flowers. Also, both genera are highly variable vegetatively and florally. Nonetheless, species of *Anathallis* usually have stems longer than those of *Specklinia*, which typically has stems shorter that the leaf blades. Also, species of *Specklinia* typically have pedicels that are conspicuously thinner and longer than the ovary.

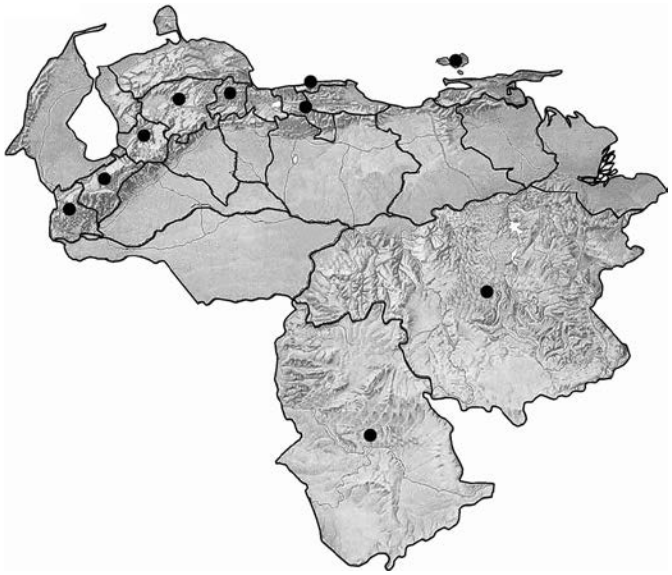
Karremans et al. (2013) provided molecular evidence that suggests *Anathallis* as defined by Pridgeon and Chase (2001) is not monophyletic. They found that *A. anderssonii* (Luer) Pridgeon & M. W. Chase, *A. dolichopus* (Schltr.) Pridgeon & M. W. Chase, *A. rubens* (Lindl.) Pridgeon & M. W. Chase, and *A. sclerophylla* (Lindl.) Pridgeon & M. W. Chase, which they considered to be close relatives, did not group together into a monophyletic clade and appeared to be interrelated with species of *Physothallis* Garay and *Crocodeilanthe* Rchb. f. & Warsz. Chiron et al. (2012) examined two of these four species of *Anathallis* and found somewhat different relationships; *A. sclerophylla* was embedded within a well-supported *Anathallis* clade, whereas *A. rubens* was part of a *Stelis* clade, and the species was transferred to *Stelis* Sw. as *S. neorubens* Chiron, nom. nov.

KEY TO THE SPECIES OF *ANATHALLIS*

1a. Leaf blades 8–25 mm wide, at least 4× longer than wide, ± as long as the stems they subtend or longer; sepals completely free, lanceolate or linear-lanceolate, apices long-acuminate; petal apices acute or rounded; labellum obovate . . . . . ***A. acuminata***

1b. Leaf blades 15–30 mm wide, ~3× longer than wide, much shorter than the stems they subtend; sepals briefly connate basally, linear to oblong, apices acute; petal apices rounded and somewhat apiculate; labellum oblong . . . . . ***A. sclerophylla***

MAP 119. *Anathallis acuminata* occurrence in Venezuela.



MAP 120. *Anathallis sclerophylla* occurrence in Venezuela.

Anathallis acuminata (Kunth) Pridgeon & M. W. Chase, Lindleyana 16: 247. 2001. *Dendrobium acuminatum* Kunth, in H. B. K., Nov. Gen. Sp. [fol.] 1: 286. 1815 [1816]; ibid. [qu.] 1: 357. 1815 [1816]. *Pleurothallis acuminata* (Kunth) Lindl., Edwards's Bot. Reg. 28: Misc. 70. 1842; Dunsterville and Garay, Venez. Orchids Ill. 4: 200–201. 1966; Foldats, Fl. Venez. 15(2): 197–200, fig. 252. 1970; Romero and Carnevali, Orchids Venez., 2nd ed., 3: 747. 2000; Dorr et al., Contr. U.S. Natl. Herb. 40: 52. 2000 [2001]; Fernández, Orquídeas Nat. Táchira 173. 2003.

Epiphytic herbs, to 25 cm tall (including the inflorescences). Leaf blades 4–7.5(–11) cm long. Inflorescences 10–20 cm long. Flowers greenish-yellow. Sepals 15–25 mm long.

Found in South America (Colombia, Venezuela, Ecuador, Peru, and Bolivia). Venezuelan material is from the Andes (Lara, Mérida, Táchira, and Trujillo) and the Cordillera de la Costa (Distrito Federal and Miranda; Map 119). Collected in montane forest on the north slope of the park; 1,800–2,550 m.

Anathallis sclerophylla (Lindl.) Pridgeon & M. W. Chase, Lindleyana 16: 250. 2001. *Pleurothallis sclerophylla* Lindl., Edwards's Bot. Reg. 21: t. 1797. 1836 [1835]; Dunsterville and Garay, Venez. Orchids Ill. 2: 300–301. 1961; Foldats, Fl. Venez. 15(2): 403–406, fig. 339. 1970; Ortega et al., BioLlania 5: 49. 1987; Romero and Carnevali, Orchids Venez., 2nd ed., 3: 843. 2000; Dorr et al., Contr. U.S. Natl. Herb. 40: 53. 2000 [2001]; Carnevali and Ramírez-Morillo, in Berry et al., Fl. Venez. Guayana 7: 521, fig. 473. 2003; Fernández, Orquídeas Nat. Táchira 192. 2003.

FIGURE 25H

Epiphytic herbs, to 35 cm tall (including the inflorescences). Leaf blades (5–)9–12 cm long. Inflorescences 15–27 cm long. Flowers yellow; sepals 7.5–21 mm long.

Found in South America (Colombia, Venezuela, Guyana, French Guiana, Ecuador, Peru, Bolivia, and Brazil). Venezuelan records are from the Andes (Lara, Mérida, Táchira, and Trujillo), the Cordillera de la Costa (Aragua, Distrito Federal, and Yaracuy), the Venezuelan Guayana (Amazonas and Bolívar), and Nueva Esparta (Map 120). In the park, collected in forest on the north slope of Guaramacal; 1,800–2,350 m.

The generic placement of this species needs to be reevaluated since molecular studies have produced two different, contradictory hypotheses; either this species is embedded in an *Anathallis* clade (Chiron et al., 2012), or it belongs in a *Stelis* clade (Karremans et al., 2013).

Brachionidium Lindl.

Brachionidium Lindl., Fol. Orchid. 8: Brachionidium 1. 1859.

Yolanda Hoehne, Arq. Mus. Nac. Rio de Janeiro 22: 72. 1919. *Brachionidium* sect. *Yolanda* (Hoehne) Pabst, Bradea 1: 269. 1972.

Epiphytic, humicolous or subterrestrial herbs; caespitose to long-creeping; erect or prostrate to climbing or sometimes pendulous, occasionally tuft forming. Rhizomes erect or creeping, simple or branched; internodes often abbreviated or more commonly elongated between the stems, covered with a few tubular sheaths, glabrous or verruculose, sheaths usually mucronate. Roots few to many originating at the base of rhizomes (in many of the erect species) or along the internodes in trailing plants and in some of the erect ones (where these are decurrent from the rhizome to the substrate), thin and somewhat fibrous to thick and subfleshy. Stems ascending to erect, always shorter than subtending leaves, 1-foliate, usually covered by 2 sheaths similar to those of the rhizomes. Inflorescences 1-flowered, not associated with an annulus originating semilaterally near

the apex of the stem (i.e., the point of abscission between leaf and stem). Leaves erect on the stem; leaf blades narrowly to broadly elliptic or obovate to broadly spathulate, bases cuneate to narrowly cuneate, apices acute to obtuse, with a slit in the apex and mucro in the sinus, smooth to rough or verruculose, various shades of green, sometimes tinged with purple, 1–3-veined on each side of midrib, submembranous to thickly coriaceous, shortly pseudopetiolate. Flowers usually not resupinate, solitary, large and relatively showy compared to the size of the plant, usually opening widely, usually ephemeral (lasting 1 day); peduncles variable in length, much shorter than (our species) to much longer than subtending leaves; floral bracts cucullate, inflated, acuminate, clasping the abbreviated pedicel and often most of the ovary; pedicels robust; perianth segments green or yellow suffused with red or purple, or completely brown, red or purple (our species), often margins ciliate, membranous to subfleshy. Dorsal sepal free, usually elliptic, rarely obovate, apices often acuminate and terminating in a slender tail; lateral sepals free, connate in a flat or concave synsepal, usually ± similar to dorsal sepal, acute or obtuse, apices often acuminate and terminating in a thin tail, often bifid. Petals ± similar to dorsal sepal (giving the appearance of a flower with 4 segments), often slightly oblique, margins often minutely ciliate, apices often acuminate and terminating in a slender tail. Labellum articulate at the apex of the column foot, conspicuously smaller than other perianth segments, very fleshy, usually transverse, apex acute, obtuse to rounded, margins smooth to fimbriate, sometimes bimarginate (because of the thick and fleshy labellum), with or without an apiculus, disk ± carinate or embedded into the anterior portion, with an elevated or ± flat callus, oblong or ovoid, ± pubescent; callus situated in the center of the labellum just above the base and fitting just below the column in natural position; column relatively short, robust, anterior margin 2-dentate or entire, base of the column forming a strong foot at the apex of the ovary; anther apical; pollinia 6 or 8, unequal in size and in 2 groups or packages, clavate, free or attached to a small viscidium; rostellum transverse; stigma apical, transverse, 2-lobed, sometimes appearing to be 2 stigmas but actually continuous below the rostellum with receptive surfaces protruding on each side. Ovary smooth, 3-valved. Capsules oblong to oblong-obovoid, obtuse, trigonal. [Epidendroideae: Epidendreae: Pleurothallidinae.]

A neotropical genus of 65–70 species found in Central America, the West Indies, and South America (Colombia, Venezuela, Guyana, Ecuador, Peru, Bolivia, and Brazil). Nine species have been found in Venezuela.

References. Luer (1986d, 1995); Pridgeon et al. (2001b, 2005).

Brachionidium tuberculatum Lindl., Fol. Orchid. 8: Brachionidium 1. 1859; Foldats, Fl. Venez. 15(2): 11–13, fig. 189. 1970; Fernández, Orquídeas Nat. Táchira 37. 2003; Romero and Carnevali, Orchids Venez., 2nd ed., 1: 36. 2000; Morillo, in Morillo et al., Bot. Ecol. Monocot. Páramos Venez. 1: 97–98, fig. 4. 2011.

MAP 121. *Brachionidium tuberculatum* occurrence in Venezuela.

Brachionidium steyermarkii Foldats, Acta Bot. Venez. 3: 306, fig. 1. 1968; Foldats, Fl. Venez. 15(2): 10–11. 1970.

Epiphytic or humicolous herbs, erect, to 22 cm tall. Rhizomes robust, rigid, ± erect. Roots at the base. Leaf blades elliptic to broadly elliptic, 10–15 × 7–10 mm. Flowers purple (our material) or yellow. Dorsal sepal 7–8 × 5 mm; lateral sepals 6–7 × 5 mm. Petals 6–7.5 × 3.5–5 mm. Labellum 2.4–2.6 × 3.4–3.6 mm.

Restricted to South America (Colombia, Venezuela, Ecuador, Bolivia, and Brazil). In Venezuela, known only from the Andes (Mérida, Táchira, and Trujillo; Map 121). Park records are from the Páramo de Guaramacal in dwarf forest and on shrubs in areas dominated by bamboo; 2,900–3,000 m.

Brassia R. Br.

Brassia R. Br., in W. T. Aiton, Hort. Kew., 2nd ed., 5: 215. 1813.
Brachtia Rchb. f., Linnaea 22: 853. 1849, nom. cons.
Mesospinidium Rchb. f., Bot. Zeitung (Berlin) 10: 929. 1852.
Oncodia Lindl., Fol. Orchid. 4: Oncodia 1. 1853.
Ada Lindl., Fol. Orchid. 5: Ada 1. 1854.
Brassiopsis Szlach. & Górniak, Biodivers. Res. Conservation 1–2: 12. 2006.

Epiphytic herbs; caespitose or with shortly creeping, ascending rhizomes. Roots dense, thick. Pseudobulbs conspicuous, laterally compressed, apically 1- or 2-leaved, subtended by 1–4 leaf-bearing sheaths. Leaves articulate; leaf blades conduplicate, usually elliptic or oblong-elliptic, apices acute or obtuse, coriaceous or chartaceous, epetiolate. Inflorescences 1 or 2, lateral, from the base of pseudobulbs and emerging among sheaths that subtend them or from the newly forming shoots, ± as long or longer than the leaves that subtend them, erect or arcuate, racemose with the flowers in the upper ⅓; peduncles remotely

few-sheathed; rachises abbreviated; floral bracts glumaceous, stiff, distichous or unilateral, as long or longer than the pedicellate ovary, often covering the base of the flower. Flowers usually resupinate, secund on the inflorescence, cream, yellow, orange-yellow or greenish-yellow, often with a white labellum; perianth segments free, fleshy, ringent or campanulate. Sepals equal or dorsal sepal somewhat broader and lateral sepals slightly oblique, elliptic, ovate-elliptic or oblong-elliptic. Petals broader than the sepals, often triangular-elliptic. Labellum very fleshy, simple, concave, apical portion sigmoid or reflexed, basal portion calceolate, firmly adnate and confluent with the canaliculate ovary, disk provided with a pair of fleshy callus-like ridges below which there is a pad-like, pubescent or pilose callus at the entrance to the canaliculate nectary; column short, stout, parallel to the labellum, apically produced into a pair of short, thick wings, footless; stigmatic surface subreniform; rostellum bidentate; clinandrium smooth; anther smooth; pollinia 2, pyriform, stipes broad, subquadrate, viscidium suborbicular, relatively small. Ovary pedicellate, glabrous. Capsules 3-nerved. [Epidendroideae: Cymbidieae: Oncidiinae.]

A subtropical and tropical American genus of ~75 species found in North America (USA), Mexico, Central America, the West Indies, and South America (Colombia, Venezuela, Trinidad and Tobago, the Guianas, Ecuador, Peru, Bolivia, and Brazil). Fifteen species are found in Venezuela.

References. Chase and Whitten (2011); Pridgeon et al. (2009); Senghas (1999); Sweet (1974).

Brassia sulphurea (Rchb. f.) M. W. Chase, Phytotaxa 20: 28. 2011. *Brachtia sulphurea* Rchb. f., Bonplandia (Hannover) 2: 14. 1854; Foldats, Fl. Venez. 15(5): 57–59, fig. 786. 1970; Ortega et al., BioLlania 5: 46. 1987.

MAP 122. *Brassia sulphurea* occurrence in Venezuela.

Brachtia glumacea Rchb. f., Linnaea 22: 854. 1849; Dunsterville and Garay, Venez. Orchids Ill. 3: 44–45. 1965; Foldats, Fl. Venez. 15(5): 55–57, fig. 785. 1970; Romero and Carnevali, Orchids Venez., 2nd ed., 1: 37. 2000; Dorr et al., Contr. U.S. Natl. Herb. 40: 48. 2000 [2001]; non *Brassia glumacea* Lindl., Orchid Linden. 17. 1846. *Oncodia glumacea* (Rchb. f.) Lindl., Fol. Orchid. 4: Oncodia 1. 1853. *Brassiopsis glumacea* (Rchb. f.) Szlach. & Górniak, Biodivers. Res. Conservation 1–2: 12. 2006. *Brassia glumaceoides* M. W. Chase, Phytotaxa 20: 28. 2011, nom. nov.

Epiphytic herbs, 15–25 cm tall; pseudobulbs apically 1- or rarely 2-leaved, 2–3.5 cm long. Leaf blades 10–22 × 2 cm. Floral bracts ~2 cm long. Flowers fleshy and thick, bright yellow. Dorsal sepal 6–7.5 mm long.

Found in South America (Colombia and Venezuela). Venezuelan records are from the Cordillera de Mérida (Mérida and Trujillo) and the Cordillera de la Costa (Aragua; Map 122). Found in cloud forest and at forest margins along the Boconó–Guaramacal road; 2,550–2,800 m.

Camaridium Lindl.

Camaridium Lindl., Bot. Reg. 10: t. 844. 1824. *Maxillaria* sect. *Camaridium* (Lindl.) Christenson, Proc. 16th World Orchid Conf. 282. 2002.

Psittacoglossum La Llave & Lex., Nov. Veg. Descr. 2 (Orch. Opusc.): 29. 1825.

Sepalosaccus Schltr., Repert. Spec. Nov. Regni Veg. Beih. 19: 244. 1923.

Maxillaria sect. *Cucullatae* Christenson, Proc. 16th World Orchid Conf. 283. 2002.

Pseudomaxillaria Hoehne, Arq. Bot. Estado São Paulo, ser. 2, 2: 71. 1947. *Maxillaria* sect. *Pseudomaxillaria* Christenson, Proc. 16th World Orchid Conf. 285. 2002.

Adamanthus Szlach., in Szlachetko and Śmiszek, Richardiana 7(1): 30. 2007.

Chaseopsis Szlach. & Sitko, in Szlachetko et al., Biodivers. Res. Conservation 25: 25. 2012.

Chelyella Szlach. & Sitko, in Szlachetko et al., Biodivers. Res. Conservation 25: 25. 2012.

Viracocha Szlach. & Sitko, in Szlachetko et al., Biodivers. Res. Conservation 25: 36. 2012.

Epiphytic, rarely lithophytic or subterrestrial herbs; erect, creeping or pendulous; sympodial or pseudomonopodial; caespitose or rhizomatous. Vegetative architecture quite variable; in some species sympodia consist of a few short internodes, one of which is thickened into a ± conspicuous pseudobulb; in other species the sympodia consist of several extended erect, creeping or subpendulous internodes with at least 1 of the terminal internodes thickened into a pseudobulb; in other species pseudobulbs are absent, and the plant is essentially monopodial; in many species the juvenile plant is sympodial with aggregated pseudobulbs, and the mature plant produces new sympodia with long internodes; the long internodes generally covered with imbricate sheaths, with or without foliar blades. Pseudobulbs heteroblastic, 1- or 2-foliate apically, subtended by several sheaths, of which the innermost 1 or 2 usually have leaf blades. Leaves conduplicate, articulate; leaf blades usually oblong or linear-oblong to

elliptic, symmetrical to irregularly oblique, sessile or sometimes pseudopetiolate. Inflorescences 1-flowered, solitary or fasciculate at the base of pseudobulbs or sheaths that cover the stems; peduncles relatively short, thin. Flowers usually resupinate, conspicuous and showy or inconspicuous and tiny, subcampanulate to spreading, usually short-lived, rarely flowers long-lasting, usually white or whitish-green, with or without nerves or spots of other colors, or rarely flowers of other colors entirely; perianth segments usually free, lacking conspicuous fibers, membranous, often minutely papillose with a sparkling texture, usually nectarless. Sepals subequal; lateral sepals often larger, oblique, adnate to the column foot, forming a mentum. Petals similar to sepals, but smaller. Labellum somewhat fleshier than other perianth parts, variable, entire or 3-lobed, wider than long or as wide as long, articulate to ± fused at the apex of the column foot; labellar disk lacking pseudopollen, wax or oil, provided with a single callus; column hemicylindrical or cylindrical, straight or curved with a short or almost absent foot; anther terminal, operculate, incumbent, often crested, glabrous; pollinia 4, in 2 unequal, superimposed pairs, stipe usually lunate, sometimes ligulate to seemingly absent; viscidium well-developed, broadly lunate or ovoid, rostellum transverse; stigma ventral, ovoid or transverse. Ovary smooth, round in cross section, pedicellate. Capsules ellipsoid to subspherical; valves separating apically, reflexing at dehiscence. [Epidendroideae: Cymbidieae: Maxillariinae.]

A neotropical genus of 80–85 species found in North America (USA), Mexico, Central America, the Greater Antilles, and South America (Colombia, Venezuela, Trinidad and Tobago, Ecuador, Peru, Bolivia, and Brazil). *Camaridium* has a center of diversity in Central America. Five or 6 species occur in Venezuela.

References. Blanco et al. (2007); Christenson (2002b); Pridgeon et al. (2009); Whitten et al. (2007).

Maxillaria s.l. is grossly polyphyletic (Blanco et al., 2007; Whitten et al., 2007) and *Camaridium* has been resurrected for members of the "core Maxillariinae" that have membranous, short-lived flowers that are basically white but often have red or purple nerves or spots. The flowers of *Camaridium* are subtended by conspicuous floral bracts, and the plants tend to have elongate stems and rhizomes. The pseudobulbs of *Camaridium* are 1- or 2-foliate, whereas those of most species of *Maxillaria* s. str. are 1-foliate.

We disagree with the taxonomy of Szlachetko et al. (2012), who split *Camaridium* into seven genera, and we have adopted a more conservative circumscription of the genus (see Blanco et al., 2007; Whitten et al., 2007; Pridgeon et al., 2009).

Camaridium vestitum (Sw.) Lindl., Ann. Mag. Nat. Hist., ser. 3, 1: 333. 1858. *Epidendrum vestitum* Sw., Prodr. 124. 1788. *Camaridium purpureum* Spreng., Syst. Veg. 3: 735. 1826, nom. illeg. *Ornithidium vestitum* (Sw.) Rchb. f., Ann. Bot. Syst. 6: 491. 1863. *Ornithidium confertum* Griseb., Fl. Br. W. I. 626. 1864. *Maxillaria purpurea* (Spreng.) Ames & Correll, Bot. Mus. Leafl. 11: 16. 1943; Dunsterville and Garay, Venez. Orchids Ill. 1: 234–235. 1959; Foldats, Fl. Venez. 15(4): 511–514, fig. 751. 1970. *Maxillaria conferta* (Griseb.) C. Schweinf. ex León, Contr. Ocas. Mus. Hist. Nat. Colegio "De La Salle" 8: 395. 1946 [1947]; Romero and Carnevali, Orchids Venez., 2nd ed., 2: 532. 2000; Carnevali and Ramírez-Morillo, in Berry et al., Fl. Venez. Guayana 7: 436. 2003; Fernández, Orquídeas Nat. Táchira 142. 2003. *Pseudomaxillaria vestita* (Sw.) Brieger, Bot. Jahrb. Syst. 97: 553. 1977.

Scaphyglottis parviflora Poepp. & Endl., Nov. Gen. Sp. Pl. 1: 58, t. 97. 1835 [1836], non *Camaridium parviflorum* Fawc., in Urban, Symb. Antill. 1: 472. 1910. *Ornithidium parviflorum* (Poepp. & Endl.) Rchb. f., Bonplandia (Hannover) 2: 19. 1854. *Maxillaria parviflora* (Poepp. & Endl.) Garay, Bot. Mus. Leafl. 21: 258. 1967; Dorr et al., Contr. U.S. Natl. Herb. 40: 51. 2000 [2001]. *Pseudomaxillaria parviflora* (Poepp. & Endl.) Brieger, Bot. Jahrb. Syst. 97: 555. 1977. *Camaridium micranthum* M. A. Blanco, Lankesteriana 7: 520. 2007, nom. nov.

Epiphytic herbs, suberect or ascending to subpendulous; sympodia consisting of several internodes covered by scarious sheaths lacking leaf blades and terminating in a 1-foliate pseudobulb. Leaf blades elliptic, 6–19 × 0.6–1.5 cm, apices acute. Flowers white, campanulate. Perianth segments 4–6 mm long.

Found in North America (USA), Central America, the Greater Antilles, and South America (Colombia, Venezuela, Trinidad and Tobago, the Guianas, Ecuador, including the Galapagos Islands, Peru, Bolivia, Brazil, and Argentina). In Venezuela, known from the Andes (Portuguesa and Táchira), the Cordillera de la Costa (Aragua, Distrito Federal, Miranda, Monagas, and Yaracuy), and the Venezuelan Guayana (Amazonas, Bolívar, and Delta Amacuro; Map 123). Near La Divisoria de la Concepción; (1,300–)1,500–1,700 m.

A great deal of nomenclatural confusion surrounds this species. Venezuelan floras and checklists, with the exception of

MAP 123. *Camaridium vestitum* occurrence in Venezuela.

Knuth (1928: 267), generally have failed to appreciate either that *Camaridium purpureum* Spreng. is an illegitimate renaming of *Epidendrum vestitum* Lindl. or that *Ornithidium confertum* Griseb. was proposed as a new name for *E. vestitum* Lindl. and that these names all share the same type and are therefore obligate synonyms.

Cleistes Rich. ex Lindl.

Cleistes Rich. ex Lindl., Gen. Sp. Orchid. Pl. 409. 1840.

Terrestrial or humicolous herbs; erect. Roots elongate, fibrous, fleshy or tuberous. Stems unbranched or rarely branching, terete or subcylindrical. Leaves convolute, not articulate, distichous to ± spiraled; leaf sheaths clasping; leaf blades 1 to several per stem or blades sometimes reduced and bract-like or totally absent, leaves or entire plant frequently glaucous, subfleshy to rarely subcoriaceous. Inflorescences terminal, racemose, few-flowered or 1-flowered and axillary at base of leaflike bracts. Flowers resupinate, short-lived, usually showy, greenish, yellow, white, purple, pink or red; floral bracts similar to leaf blades but smaller; perianth segments free, mostly campanulate, membranous to subfleshy. Sepals usually narrowly elliptic or narrowly oblong-elliptic, lateral sepals somewhat oblique, sometimes widely spreading. Petals similar to sepals, often wider and shorter or differently colored, parallel to column. Labellum free from column and parallel to it, basally with 2–4 pedunculate calli, entire or 3-lobed, flat or more frequently concave, inner surface generally with well-developed longitudinal calli or lamellae, frequently tuberculate; column relatively long, erect or forming an angle with respect to ovary, apically lobed or unlobed, usually tapering basally, footless; anther terminal, incumbent; clinandrium mostly 3-lobed or otherwise lobed or lacerate; pollinia 2, pollen soft and mealy, coherent in tetrads, without viscidium; rostellum transverse; stigma entire, ventral. Ovary relatively long, subterete, pedicellate, glabrous. Capsules ellipsoid, erect. [Vanilloideae: Pogonieae.]

A neotropical genus of ~30 species found in Central America (Costa Rica and Panama) and South America (Colombia, Venezuela, the Guianas, Ecuador, Peru, Brazil, Paraguay, and Argentina); Brazil is the center of species diversity. Ten species occur in Venezuela.

References. Pansarin and Barros (2008); Pansarin et al. (2008); Pridgeon et al. (2003).

Species of *Cleistes* are mostly sun loving and often found in boggy or marshy areas.

Authorship of the generic name has been attributed incorrectly to L. C. Richard. The confusion apparently stems from Lindley's citation of "*Cleistes*. Rich. Annot. p. 9" in his protologue. However, the Richard (1817) publication that he cited does not contain a validating description, and none was supplied until Lindley adopted Richard's generic name.

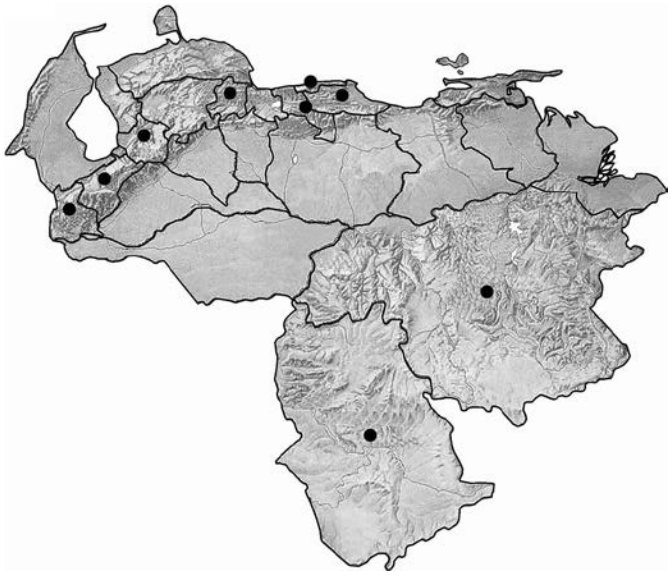
Molecular evidence (Pansarin et al., 2008) indicates that the genus *Cleistes* s.l. is paraphyletic and that the two (one?) North American species are more closely related to *Isotria* Raf. and *Pogonia* Juss. than they are to their Central American and South American congeners, which form a monophyletic group that includes the type of the genus. Pansarin and Barros (2008), citing molecular and morphological evidence, segregated the North American species as *Cleistesiopsis* Pansarin & F. Barros; the neotropical elements retain the name *Cleistes*.

Cleistes rosea Lindl., Gen. Sp. Orchid. Pl. 410. 1840; Dunsterville and Garay, Venez. Orchids Ill. 1: 82. 1959; Romero and Carnevali, Orchids Venez., 2nd ed., 1: 113. 2000; Carnevali and Ramírez-Morillo, in Berry et al., Fl. Venez. Guayana 7: 279. 2003; Fernández, Orquídeas Nat. Táchira 45. 2003. *Pogonia rosea* (Lindl.) Rchb. f., Xenia Orchid. 2: 89. 1865; Foldats, Fl. Venez. 15(1): 137–139, fig. 46. 1969.

Terrestrial herbs, (30–)50–100 cm tall. Leaf blades 5–15 cm long. Flowers large and showy, ephemeral (lasting only 1 day), pink to purple, darker on the margins of the apical lobe. Dorsal sepal 6–8 cm long.

Found in Central America (Panama) and South America (Colombia, Venezuela, Trinidad and Tobago, the Guianas, Ecuador, Peru, Bolivia, and Brazil). In Venezuela, found in the Andes (Mérida, Táchira, and Trujillo), the Cordillera de la Costa (Aragua, Distrito Federal, Miranda, and Yaracuy), and the Venezuelan Guayana (Amazonas and Bolívar; Map 124). Park records are from the north slope of Guaramacal; 1,900–2,100 m.

This is the most widespread species of the genus. Although several of our references include Costa Rica in its distribution, Costa Rican material of *Cleistes rosea* has been segregated as *C. costaricensis* Christenson. Similarly, although two color forms



MAP 124. *Cleistes rosea* occurrence in Venezuela.

of *C. rosea* once were recognized in Venezuela, *C. rosea* f. *pallida* Carnevali & I. Ramírez has been described as a distinct species, *C. abdita* G. A. Romero & Carnevali, that is restricted to savannas in the Venezuelan Guayana. *Cleistes abdita* differs from our species in having white or pale pink (vs. pink, purple or deep purple) flowers and a narrower, denticulate (vs. entire) labellum.

Comparettia Poepp. & Endl.

Comparettia Poepp. & Endl., Nov. Gen. Sp. Pl. 1: 42. 1835 [1836].
Diadenium Poepp. & Endl., Nov. Gen. Sp. Pl. 1: 41. 1835 [1836].
Chaenanthe Lindl., Edwards's Bot. Reg. 24: Misc. 38. 1838 ("*Chænanthe*").
Scelochilus Klotzsch, Allg. Gartenzeitung. 9: 261. 1841.
Neokoehleria Schltr., Repert. Spec. Nov. Regni Veg. 10: 390. 1912.
Scelochiloides Dodson & M. W. Chase, Icon. Pl. Trop., ser. 2, 3: t. 293. 1989.
Stigmatorthos M. W. Chase & D. E. Benn., Lindleyana 8: 4. 1993.
Pfitzeria Senghas, J. Orchideenfreund 5(1): 20. 1998.
Scelochilopsis Dodson & M. W. Chase, Orquideología 21: 61. 1998.

Epiphytic herbs; erect or pendulous; caespitose; sometimes partially psygmoid (i.e., with laterally compressed leaves that are arranged fanlike); sympodial. Rhizomes short or absent; pseudobulbs inconspicuous to almost absent, usually cylindrical to suborbicular, apically 1-leaved, enclosed by 1 or 2(3 or more) overlapping sheaths, of which the innermost 1 or 2 have leaf blades (sometimes absent). Leaves conduplicate or less commonly laterally compressed, articulate, usually oblong or oblong-elliptic, acute or obtuse, often tinged with red, sessile or short-petiolate. Inflorescences arising from the base of pseudobulbs, erect, arching or pendulous, shorter to longer than the leaves, usually in lax, few-flowered racemes, sometimes a lateral branch arises from the base of the rachis or from the older internodes of the peduncle; peduncles glabrous, with remote tubular sheaths; floral bracts inconspicuous, tubular to concave. Flowers resupinate or not, small or medium, long-pedicellate, usually relatively short-lived, yellow, yellow with reddish nerves, red, orange or pinkish with darker purple nerves; perianth segments parallel to column at base, apical ½ straight or spreading, membranous to subfleshy. Dorsal sepal free, usually concave; lateral sepals free apically or not, connate basally and forming a spur of various shapes, apically 1- or 2-lobed. Petals usually broader than the sepals, free. Labellum more conspicuous than other perianth segments, hastate basally and enclosed in the sepaline spur, lamina simple, variable in shape, usually 2-lobed or apically emarginate; disk with callus consisting of 2 parallel longitudinal keels; column erect, straight; anther terminal with a basal horn or pair of horns that secrete nectar into a cavity formed by fused lateral sepals, not auriculate or with very small wings, almost footless; pollinarium with a flat, spathulate stipe longer than the pollinia; caudicles very small; pollinia 2, yellow, orbicular, pyriform to flattened and disciform; viscidium circular, entire, ventral; rostellum beak-shaped; stigmatic surface immediately below the rostellum, circular or in the form of a small slit. Ovary glabrous. Capsules ellipsoid, triangular. [Epidendroideae: Cymbidieae: Oncidiinae.]

A neotropical genus of ~60 species found in Mexico, Central America, the Greater Antilles, and South America (Colombia, Venezuela, the Guianas, Ecuador, Peru, Bolivia, and Brazil); most diverse in the western Andes. Six species occur in Venezuela. Several species, especially species of *Comparettia* s. str., also are cultivated in Venezuela.

References. Bock (1986); Bockemühl and Senghas (1985); Neubig et al. (2012); Pridgeon et al. (2009); Senghas (1987, 1995d, 1995e, 2001); Tuskes and Tuskes (1999).

Comparettia species are usually sun-loving twig epiphytes, and many of them are quite inconspicuous, infrequently collected, and, as a consequence, poorly known.

We have adopted an expanded circumscription of this genus based on molecular evidence (Pridgeon et al., 2009; Neubig et al., 2012). *Comparettia* s.l. now includes all species with sepalar nectar spur(s) furnished by a horn or pair of horns on the column base that secrete nectar. These species previously were scattered among the genera listed in synonymy.

KEY TO THE SPECIES OF *COMPARETTIA*

1a. Inflorescences usually longer than the leaves; flowers lilac or reddish; pedicels longer than dorsal sepal; labellum conspicuously larger than other perianth segments, widely diverging, apical lobe wider than long; nectary >1 cm long . . . . . ***C. falcata***

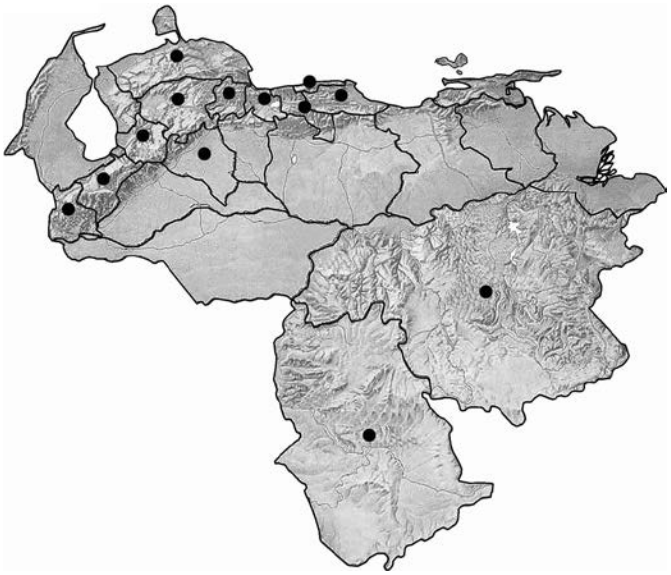
1b. Inflorescences usually shorter or equal in length to the leaves; flowers yellow with reddish nerves; pedicels shorter than dorsal sepal; labellum ± the same length as petals and sepals and enclosed in a tubular flower, apical lobe longer than wide; nectary 0.3–0.4 mm long . . . . . ***C. ottonis***

Comparettia falcata Poepp. & Endl., Nov. Gen. Sp. Pl. 1: 42, t. 73. 1835 [1836]; Dunsterville and Garay, Venez. Orchids Ill. 1: 86–87. 1959; Foldats, Fl. Venez. 15(5): 89–92, fig. 795. 1970; Romero and Carnevali, Orchids Venez., 2nd ed., 1: 123. 2000; Carnevali and Ramírez-Morillo, in Berry et al., Fl. Venez. Guayana 7: 284. 2003; Fernández, Orquídeas Nat. Táchira 47. 2003.

The nominate variety is the only one found in Guaramacal and in Venezuela.

Comparettia falcata var. ***falcata***

Twig epiphytes. Leaf blades 5–20 cm long. Inflorescences (5–)10–20(–30) cm long. Flowers lilac or reddish. Labellum 1–2 cm wide.



MAP 125. *Comparettia falcata* var. *falcata* occurrence in Venezuela.

MAP 126. *Comparettia ottonis* occurrence in Venezuela.

Found in Mexico, Central America, the Greater Antilles, and tropical South America (Colombia, Venezuela, French Guiana, Ecuador, Peru, Bolivia, and Brazil). Widely distributed in Venezuela (Amazonas, Aragua, Bolívar, Carabobo, Distrito Federal, Falcón, Lara, Mérida, Miranda, Portuguesa, Táchira, Trujillo, and Yaracuy; Map 125). Park records are from near the Laguna de Aguas Negras and in the Qda. Chandá; (1,350–) 1,800–1,850 m.

A collection of this species made near the lower elevational boundary of the park was described as having white flowers (*Angulo & Infante* 2, PORT), but this is probably an observational error made in the field. Flower color in this species suggests hummingbird pollination, which is what has been observed in plants growing in Puerto Rico (Rodríguez-Robles et al., 1992).

Brazilian material of this species is segregated as *Comparettia falcata* var. *paulensis* (Cogn.) I. Bock.

Comparettia ottonis (Klotzsch) M. W. Chase & N. H. Williams, in Chase et al., Lindleyana 21: 29. 2008. *Scelochilus ottonis* Klotzsch, Allg. Gartenzeitung. 9: 261. 1841; Foldats, Fl. Venez. 15(5): 79–81, fig. 792. 1970; Romero and Carnevali, Orchids Venez., 2nd ed., 3: 964. 2000; Dorr et al., Contr. U.S. Natl. Herb. 40: 54. 2000 [2001]; Carnevali and Ramírez-Morillo, in Berry et al., Fl. Venez. Guayana 7: 561. 2003; Fernández, Orquídeas Nat. Táchira 215. 2003.

Rodriguezia stenochila Lindl., Orchid. Linden. 23. 1846. *Scelochilus stenochilus* (Lindl.) Rchb. f., Ann. Bot. Syst. 6: 689. 1861 [1863]; Foldats, Fl. Venez. 15(5): 82. 1970. *Comparettia stenochila* (Lindl.) M. W. Chase & N. H. Williams, in Chase et al., Lindleyana 21: 30. 2008.

Twig epiphytes. Leaf blades 8–14 cm long. Inflorescences ± the same length as the leaves. Flowers golden-yellow, red striped or brown. Labellum golden-yellow with red-purple areas, 1.2–1.7 cm long.

Restricted to Venezuela, although perhaps also present in the Brazilian portion of the Sierra de la Neblina. In Venezuela, collected in the Andes (Mérida, Táchira, and Trujillo), the Cordillera de la Costa (Aragua, Carabobo, Distrito Federal, Miranda, and Yaracuy), and the Venezuelan Guayana (Sierra de la Neblina, Amazonas state; Map 126). Locally common in montane forest on the north slope of the park and between Boconó and Batatal; 1,950–2,600 m.

Rodriguezia stenochila Lindl., described from nearby Mérida state and only known from the type, was thought to differ from *Comparettia ottonis* by a narrower, apically hastate labellum. Examination of an image of the type of *R. stenochila* suggests that this species was most likely based on an artifact created by the poor preservation of its flowers, which is not surprising as flowers of *Comparettia* are membranous and difficult to reconstruct after being pressed and dried.

Corymborkis Thouars

Corymborkis Thouars, Nouv. Bull. Sci. Soc. Philom. Paris, sér. 2, 1: 318. 1809.

Terrestrial herbs; erect; caespitose; sympodial. Roots few, fibrous, fascicled. Rhizomes short, subterranean. Stem cane-like, somewhat woody basally, usually unbranched, to several meters long, covered by leaf sheaths. Leaves distichous or sometimes spiral, few to many, plicate, with several prominent nerves, not

articulate; leaf sheaths tubular and almost completely covering the stem, often brown furfuraceous basally; leaf blades elliptic, acuminate. Inflorescences lateral or (more rarely) subterminal, erect or patent, much shorter than the subtending leaves, solitary in each leaf axil (the plant often with several inflorescences simultaneously), racemes or more commonly panicles that are 1- or 2-pinnate with 3–10-flowered branches; peduncles terete or flattened, ± naked; rachises relatively short with subfoliaceous sheaths. Flowers distichous, resupinate or not; pedicels relatively short, sometimes ± showy and fragrant, campanulate; perianth segments subequal, linear-elliptic to linear-obovate, connivent or connate basally, sometimes clawed. Labellum with 2 conspicuous keels that completely encircle the column, leaving only the labellar apex free, which is somewhat reflexed, without a callus; column erect, nearly as long as the labellum; anther terminal, erect, pollinia 2, thin, sectile, bipartite, attached to a linear-ovate viscidium via an elongated hamulus (i.e., pollinium stalk derived from the apex of the rostellum), flat or semiterete; rostellum prominent, bifid when viscidium removed. Ovary cylindrical, glabrous. Capsules fusiform, 6-ribbed, crowned by the persistent perianth and the remnants of the column. [Epidendroideae: Tropidieae.]

A pantropical genus of 5 species, 3 of which occur in the neotropics. The American species are found in Mexico, Central America, the West Indies, and South America (Colombia, Venezuela, Ecuador, Peru, Bolivia, Brazil, Paraguay, and Argentina). Two species, one of them endemic, are known from Venezuela.

References. Pridgeon et al. (2005); Rasmussen (1977).

Species of *Corymborkis* are shade loving.

The leaves on specimens of *Corymborkis* that have been prepared for the herbarium are typically dark reddish brown when dry.

Corymborkis flava (Sw.) Kuntze, Revis. Gen. Pl. 2: 658. 1891 ("*Corymborchis*"); Foldats, Fl. Venez. 15(1): 237–239, fig. 88. 1969; Dunsterville and Garay, Venez. Orchids Ill. 6: 94–96. 1976; Romero and Carnevali, Orchids Venez., 2nd ed., 1: 129. 2000 ("*Corymborchis*"). *Serapias flava* Sw., Prodr. 119. 1788.

Terrestrial herbs, erect, 1–3 m tall. Leaf blades 20–30 × 5–7 cm. Flowers campanulate, yellow, relatively attractive. Sepals 1.4–1.7 cm long.

Found in Central America, the West Indies, and South America (Colombia, Venezuela, Ecuador, Peru, Bolivia, Brazil, Paraguay, and Argentina). In Venezuela, known from the Andes (Lara and Trujillo) and the Cordillera de la Costa (Aragua, Distrito Federal, and Miranda; Map 127). In the park, found in Qda. Honda; ~1,900 m.

Corymborkis galipanensis (Rchb. f.) Foldats, which is endemic to the Cordillera de la Costa, can be distinguished from *C. flava* by its much longer (30 vs. 15 mm long) perianth segments.

MAP 127. *Corymborkis flava* occurrence in Venezuela.

Cranichis Sw.

Cranichis Sw., Prodr. 8, 120. 1788.

Terrestrial, humicolous or rarely subepiphytic herbs; caespitose. Roots fascicled, fleshy, villous. Leaves usually basal, often in a rosette, rarely cauline and gradually intergrading into peduncular sheaths, usually present at anthesis, often with white spots, herbaceous to subfleshy, sessile or petiolate. Inflorescences terminal, racemose or pseudospicate, usually lax; peduncles terete, with few tubular sheaths. Flowers not resupinate, small; perianth segments usually green or white, membranous, labellum often with conspicuous, prominent, reticulate greenish or purplish veins. Sepals free. Petals free, much narrower than sepals. Labellum fleshier than other perianth segments, usually concave or cochleariform, sometimes lobed; column fleshy, short; clinandrium cyathiform, acute, erect; stigma relatively large, terminal; anther dorsal, erect; pollinia 4, ovoid-clavate, with a small, brittle hamulus; rostellum apical, viscidium small, globose. Ovary long-pedicellate, pubescent. Capsules erect. [Orchidoideae: Cranichideae: Cranichidinae.]

A subtropical and tropical American genus of ~60 species found in North America (USA), Mexico, Central America, the West Indies, and South America (Colombia, Venezuela, Suriname, French Guiana, Ecuador, Peru, Bolivia, Brazil, and Argentina). Approximately a dozen species occur in Venezuela, the majority in the Andes.

References. Álvarez-Molina and Cameron (2009); Pridgeon et al. (2003); Salazar Chávez et al. (2009).

Cranichis appears to be monophyletic (Álvarez-Molina and Cameron, 2009; Salazar Chávez et al., 2009) and is part of a larger, well-supported clade comprising the Cranichidinae s. str.

KEY TO THE SPECIES OF *CRANICHIS*

1a. Leaves long-petiolate, petioles longer than or ± equal to leaf blades, >5 cm long; labellum suborbicular or obovate, with thick, elevated, green or purple longitudinal ribs; petal margins ciliate . . . . . ***C. antioquiensis***

1b. Leaves short-petiolate, petioles shorter than leaf blades, ≤5 cm long; labellum ovate, without thick, longitudinal ribs but with a large, 2-lobed, ± verruculose callus; petal margins not ciliate . . . . . ***C. diphylla***

Cranichis antioquiensis Schltr., Repert. Spec. Nov. Regni Veg. Beih. 7: 57. 1920; Romero and Carnevali, Orchids Venez., 2nd ed., 1: 130. 2000; Fernández, Orquídeas Nat. Táchira 47. 2003; Morillo, in Morillo et al., Bot. Ecol. Monocot. Páramos Venez. 1: 103, fig. 6. 2011.

Cranichis ciliata auct., non (Kunth) Kunth; Dunsterville and Garay, Venez. Orchids Ill. 3: 66–67. 1965, pro parte; Foldats, Fl. Venez. 15(1): 410–411, fig. 153. 1969, pro parte; Dorr et al., Contr. U.S. Natl. Herb. 40: 49. 2000 [2001].

Terrestrial herbs, to 45 cm tall. Leaf blades 3–15 × 2–7(–8) cm. Inflorescences to 20 cm tall. Flowers green or white tinged with dark green or brown. Dorsal sepal 4.5–6 mm long. Labellum white with raised, deep green or brown ribs.

Found in South America (Colombia, Venezuela, and Ecuador). In Venezuela, restricted to the Andes (Lara, Mérida, Táchira, and Trujillo; Map 128). In the park, found near the Laguna de Aguas Negras and along the Boconó–Guaramacal road; 1,850–2,150 m.

This species has been confused with *Cranichis ciliata* (Kunth) Kunth (described from the Silla de Caracas in the Distrito Federal), but it has larger flowers, a narrower labellum, and inflorescences with more flowers. It may be, however, that these two species are not distinct, but that question requires further study.

Cranichis diphylla Sw., Prodr. 120. 1788; Foldats, Fl. Venez. 15(1): 411–413, fig. 154. 1969; Romero and Carnevali, Orchids Venez., 2nd ed., 1: 131. 2000; Morillo, in Morillo et al., Monocot. Páramos Venez. 1: 104–105, fig. 7. 2011.

Cranichis monophylla Lindl., Orchid. Linden. 27. 1846; Dunsterville and Garay, Venez. Orchids Ill. 4: 58–59. 1966; Carnevali and Ramírez-Morillo, in Berry et al., Fl. Venez. Guayana 7: 257, fig. 250. 2003.

Cranichis tenuis auct., non Rchb. f.; Dunsterville, Lindleyana 1: 234–235. 1986; Ortega et al., BioLlania 5: 46. 1987; Romero and Carnevali, Orchids Venez., 2nd ed., 1: 133. 2000; Dorr et al., Contr. U.S. Natl. Herb. 40: 49. 2000 [2001]; Fernández, Orquídeas Nat. Táchira 48. 2003.

Habenaria parviflora auct., non Lindl.; Dorr et al., Contr. U.S. Natl. Herb. 40: 49. 2000 [2001] (as to *Stergios & Palacios 18703*).

Terrestrial herbs, 15–25(–30) cm tall. Leaf blades 3–6 × 2–5(–8) cm, often variegated. Inflorescences to 20–27 cm tall. Flowers white with green veins. Dorsal sepal 1.5–3.5 mm long. Labellum white with some bright green spots.

Found in Mexico, Central America, the Greater Antilles, and South America (Colombia, Venezuela, Suriname, Ecuador, and Peru). Venezuelan records are from the Andes (Mérida, Táchira, and Trujillo), the Cordillera de la Costa (Aragua, Distrito Federal, and Miranda), and the Venezuelan Guayana (Bolívar; Map 129). In the park, found in Qda. Segovia along the Boconó–Guaramacal road; 2,000–2,400 m.

MAP 128. *Cranichis antioquiensis* occurrence in Venezuela.

MAP 129. *Cranichis diphylla* occurrence in Venezuela.

Crocodeilanthe Rchb. f. & Warsz.

Crocodeilanthe Rchb. f. & Warsz., Xenia Orchid. 1: 10. [1 Apr] 1854; ibid., Bonplandia (Hannover) 2: 113. [1 Mai] 1854. *Pleurothallis* subgen. *Crocodeilanthe* (Rchb. f. & Warsz.) Luer, Monogr. Syst. Bot. Missouri Bot. Gard. 20: 34. 1986.

Stelis auct., non Sw.; Pridgeon and M. W. Chase, Lindleyana 16: 235–271. 2001, pro parte, excluding type.

Epiphytic or lithophytic herbs; erect, large and robust (in comparison to other Pleurothallidinae). Rhizomes often abbreviated, less commonly creeping. Stems robust (in comparison to other Pleurothallidinae), elongate, conspicuously longer than the leaves to ± similar in length, terete, often partially covered by 1 to several appressed, imbricate tubular sheaths, basally covered in several coarse, papery sheaths, these often covering >1 stem at a time, stems in several species prolific (i.e., 1 or more stems originating from the apex of another). Leaves rarely erect with respect to the stem; leaf blades usually elliptic or obovate, bases petiolate or sessile, apices minutely 3-toothed, coriaceous, fleshy or fleshy-coriaceous. Inflorescences terminal or emerging below the stem apex, solitary or often fasciculate, erect, subtended by a conspicuous foliaceous spathe associated with an annulus and emerging just above the annulus and below the leaf articulation, racemose, usually many-flowered, flowers simultaneous or rarely ± successive, shorter than subtending leaves to several times as long; floral bracts usually reduced or rarely very conspicuous, membranous; pedicels thick and shorter than or equal to the ovary. Flowers commonly resupinate, small or medium in size, erect, patent or nutant, variously colored but typically translucent, white, greenish or yellowish, with or without purple or brown veins, rarely entirely reddish-brown, membranous. Sepals almost free, fused basally or lateral for variable lengths (rarely completely fused) in a flat synsepal, bases concave, apices convex, never caudate, smooth, pubescent or verruculose internally, smooth externally; dorsal sepal often a different width than synsepal, apices acute to rounded. Petals conspicuously smaller and less fleshy than sepals, 1- or 3-nerved, variable in shape but usually oblong to elliptic or obovate, at least the basal ½ parallel to the column, margins smooth. Labellum supported by or contained within the concavity of the synsepal, articulate with the foot of the hinge-shaped column (the basal part of the labellar blade is adaxially concave, and the concavity is freely articulated on the bulbous columnar foot), sometimes the hinged articulation is vestigial, and the labellum is merely articulate with the column base via an area of membranous tissue, without lobes or retrorse teeth basally, with a linear, transverse callus that separates the convex area that is articulated with the base of the labellar blade, the blade from almost simple to more commonly 3- or 5-lobed, the lateral lobes relatively small, erect or extended, apical lobe smooth, verruculose or pubescent, margins smooth, less commonly erose, disk usually with 2 calli, globose in the middle or on the side lobes; column relatively short, cylindrical, nearly straight or ± curved, with a well-developed, bulbous foot, smooth or verruculose; clinandrium usually entire; anther apical or subapical, operculate; stigma and rostellum ventral; pollinia 2. Ovary articulate with pedicel, terete or subangular. Capsules often ellipsoid or obclavate. [Epidendroideae: Epidendreae: Pleurothallidinae.]

A neotropical genus of 75–80 species found in Mexico, Central America, the West Indies, and South America (Colombia, Venezuela, Ecuador, Peru, and Brazil). The majority of species are found in the northern Andes at higher elevations (above 1,500 m); only 1 species occurs in the West Indies. Approximately 10–12 species are reported from Venezuela.

References. Karremans et al. (2013); Luer (1986d, 1998); Pridgeon and Chase (2001).

In Venezuela, *Crocodeilanthe* traditionally has been treated as part of *Pleurothallis* (see e.g., Foldats, 1970a; Dunsterville and Garay, 1979c; Romero-González and Carnevali Fernández-Concha, 2000). Molecular phylogenetic studies, however, have provided a basis for reclassifying the Pleurothallidinae and contributed to a dismemberment of *Pleurothallis* s.l. (Pridgeon and Chase, 2001; Pridgeon et al., 2005). One result of these studies is the realization that *Crocodeilanthe* belongs to a clade that includes *Stelis* and several other groups previously included in *Pleurothallis* as subgenera or sections (see, e.g., Pridgeon and Chase, 2001; Pridgeon et al., 2005; Karremans et al., 2013). Pridgeon and Chase (2001) decided to treat this entire clade within a broadly circumscribed *Stelis*. Luer (2004, 2006, 2007, 2011) rejected this broad circumscription of *Stelis* and instead recognized *Stelis* in a narrow sense, resurrecting older generic concepts such as *Crocodeilanthe* and creating a number of new genera to accommodate species that were excluded from *Stelis* s. str. More recently, Karremans et al. (2013) identified a highly supported clade that includes both *Stelis* and *Crocodeilanthe* but one that also had four major subclades, including a subclade that corresponds to *Stelis* s. str. and another to *Crocodeilanthe*.

We have chosen to accept *Crocodeilanthe* because there is molecular support for a monophyletic lineage, and the genus is also well circumscribed morphologically. Species of *Crocodeilanthe* are relatively large plants with stems usually exceeding the leaves in length; sheaths enclosing the bases of stems; inflorescences multiflowered, erect, racemose and arising from conspicuous spathes; flowers resupinate, small, and opening simultaneously; sepals similar to each other and never caudate; petals 1- or 3-veined; labellum short and simple with 2 small lateral lobes attached to the base of the column; anther apical or subapical; and pollinia "bubble-like" (see Karremans et al., 2013: fig. 8).

KEY TO THE SPECIES OF *CROCODEILANTHE*

1a. Rhizomes creeping; stems in fascicles of 2 or 3 . . . . . ***C. stergiosii***
1b. Rhizomes short, stems clustered 2

2a. Leaves <½ the length of stems; inflorescences conspicuously shorter than leaves; flowers translucent, cream, green or white 3
3a. Internodes of inflorescence rachis as long or almost as long as floral bracts; floral bracts ± inflated and as long as pedicels; sepals fused in the lower ½ of their length, synsepal geniculate; apices of petals and labellum rounded to subacute; labellum no more than 2× as long as wide . . . . . ***C. sp. A***
3b. Internodes of inflorescence rachis conspicuously longer than floral bracts; floral bracts appressed to the rachis and shorter than pedicels; sepals fused only in the lower ⅕ of their length or nearly free, synsepal not geniculate; apices of petals and labellum truncate; labellum 2.5–3× longer than wide . . . . . ***C. gelida***
2b. Leaves at least ¾ the length of stems and often longer than stems; inflorescences ± equal in length to leaves or conspicuously longer than leaves; flowers usually translucent with purple or brown veins, rarely completely reddish-brown 4
4a. Flowers (in living material) erect; peduncles very short, almost completely hidden by spathe . . . . . ***C. moritzii***
4b. Flowers (in living material) nutant or patent; peduncles short or long, but always exceeding spathe in length 5
5a. Inflorescences slightly shorter to slightly longer than leaves, usually 3 or more present simultaneously; flowers (in living material) nutant; dorsal sepal 4–5 mm long, slightly wider than synsepal, ovate to elliptic ovate, 3-ribbed, apex acute to broadly obtuse; petals spathulate or oblong-spathulate, 1-nerved; labellum elliptic in general outline, 3-lobed, with 2 subglobular calli, 1 on each side of the lateral lobe . . . . . ***C. galeata***
5b. Inflorescences usually longer than leaves, 1 or 2 present simultaneously; flowers (in living material) patent; dorsal sepal 8–10 mm long, much wider than the synsepal, broadly ovate, 5-ribbed, apex rounded; petals broadly obovate, obovate or oblong, 3-nerved; labellum suborbicular or subquadrate-suborbicular in general outline, simple, ecallose or almost ecallose . . . . . ***C. elegans***

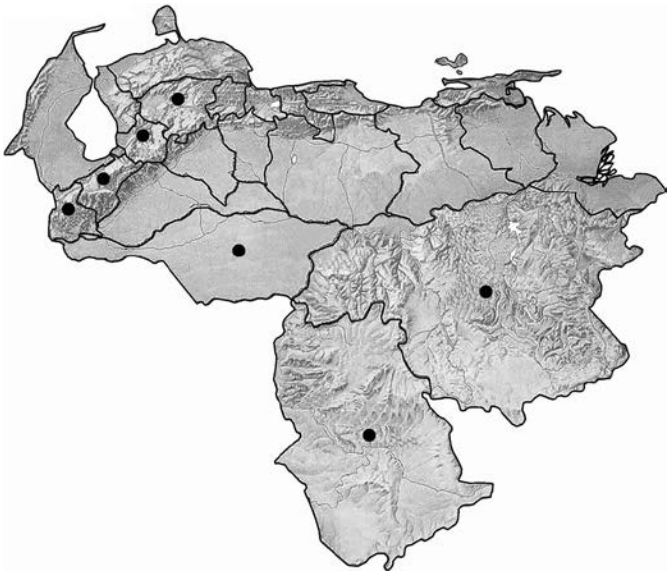
Crocodeilanthe elegans (Kunth) Luer, Monogr. Syst. Bot. Missouri Bot. Gard. 95: 256. 2004; Morillo, in Morillo et al., Bot. Ecol. Monocot. Páramos Venez. 1: 106–107, fig. 8. 2011. *Dendrobium elegans* Kunth, in H. B. K., Nov. Gen. Sp. [fol.] 1: 287. 1815 [1816]; ibid. [qu.] 1: 358. 1815 [1816]. *Pleurothallis elegans* (Kunth) Lindl., Edwards's Bot. Reg. 28: Misc. 70. 1842; Dunsterville and Garay, Venez. Orchids Ill. 4: 214–215. 1966; Foldats, Fl. Venez. 15(2): 262–264, fig. 278. 1970; Romero and Carnevali, Orchids Venez., 2nd ed., 3: 778. 2000; Fernández, Orquídeas Nat. Táchira 180. 2003. *Stelis elegans* (Kunth) Pridgeon & M. W. Chase, Lindleyana 16: 262. 2001, non Luer & R. Vásquez, 1981. *Stelis picta* Pridgeon & M. W. Chase, Lindleyana 17: 100. 2002, nom. nov.

Epiphytic herbs, 15–30 cm tall (including inflorescences). Leaf blades narrowly elliptic, elliptic or oblong-elliptic, 9–13 cm long (including pseudopetioles), 1.6–5.5 cm wide. Inflorescences 14–17 long, 12–26-flowered. Flowers pale brown with dark purple nerves. Dorsal sepal 8–10 mm long.

Found in South America (Colombia, Venezuela, Ecuador, and Peru). In Venezuela, known from the Andes (Mérida, Táchira, and Trujillo), the Cordillera de la Costa (Aragua and Distrito Federal), and the Venezuelan Guayana (Bolívar; Map 130). In the park, known from the Páramo de Guaramacal near the television antennas; 2,900–3,100 m.

MAP 130. *Crocodeilanthe elegans* occurrence in Venezuela.

Crocodeilanthe galeata (Lindl.) Luer, Monogr. Syst. Bot. Missouri Bot. Gard. 95: 256. 2004; Morillo, in Morillo et al., Bot. Ecol. Monocot. Páramos Venez. 1: 109–110, fig. 10. 2011. *Pleurothallis galeata* Lindl., Ann. Mag. Nat. Hist. 15: 107. 1845; Dunsterville and Garay, Venez. Orchids Ill. 4: 216–217. 1966; Foldats, Fl. Venez. 15(2): 282–283, fig. 285. 1970; Ortega et al., BioLlania 5: 49. 1987; Dorr et al., Contr. U.S. Natl. Herb. 40: 53. 2000 [2001]; Romero and Carnevali, Orchids Venez., 2nd ed., 3: 788. 2000; Carnevali and Ramírez-Morillo, in Berry et al., Fl. Venez. Guayana 7: 515. 2003; Fernández, Orquídeas Nat. Táchira 182. 2003. *Stelis galeata* (Lindl.) Pridgeon & M. W. Chase, Lindleyana 16: 263. 2001.



MAP 131. *Crocodeilanthe galeata* occurrence in Venezuela.

MAP 132. *Crocodeilanthe gelida* occurrence in Venezuela.

Epiphytic or subterrestrial herbs, 20–30 cm tall (including inflorescences). Leaf blades elliptic, 9–15 cm long (including pseudopetioles), 2.5–3.5 cm wide. Inflorescences 10–15 cm long, 30-flowered or more. Flowers cream-colored, pink or opaque-translucent yellow to salmon, outer nerves a darker hue. Dorsal sepal 4.5–6 mm long.

Found in South America (Colombia, Venezuela, Ecuador, and Peru). In Venezuela the distribution is disjunct, with records from the Andes (Apure, Lara, Mérida, Táchira, and Trujillo) and the Venezuelan Guayana (Amazonas and Bolívar; Map 131). In the park, collected in montane forest in various localities on both slopes of Guaramacal; 1,800–2,200(–2,600) m.

Crocodeilanthe gelida (Lindl.) Carnevali & I. Ramírez, **comb. nov.** *Pleurothallis gelida* Lindl., Edwards's Bot. Reg. 27: Misc. 91. 1841; Foldats, Fl. Venez. 15(2): 283–285, fig. 286. 1970; Ortega et al., BioLlania 5: 49. 1987; Romero and Carnevali, Orchids Venez., 2nd ed., 3: 790. 2000; Dorr et al., Contr. U.S. Natl. Herb. 40: 53. 2000 [2001]; Fernández, Orquídeas Nat. Táchira 182. 2003; Morillo, in Morillo et al., Bot. Ecol. Monocot. Páramos Venez. 1: 249–250, fig. 94. 2011. *Stelis gelida* (Lindl.) Pridgeon & M. W. Chase, Lindleyana 16: 263. 2001. *Specklinia gelida* (Lindl.) Luer, Monogr. Syst. Bot. Missouri Bot. Gard. 95: 260. 2004. *Niphantha gelida* (Lindl.) Luer, Monogr. Syst. Bot. Missouri Bot. Gard. 120: 154. 2010.

Epiphytic herbs, 25–40 cm tall (including inflorescences). Leaf blades narrowly elliptic to oblanceolate, 8–12 cm long (including pseudopetioles), 3.3–3.8 cm wide. Inflorescences 6–9 cm long, 10–15-flowered. Flowers yellowish-green. Dorsal sepal 5–8 mm long.

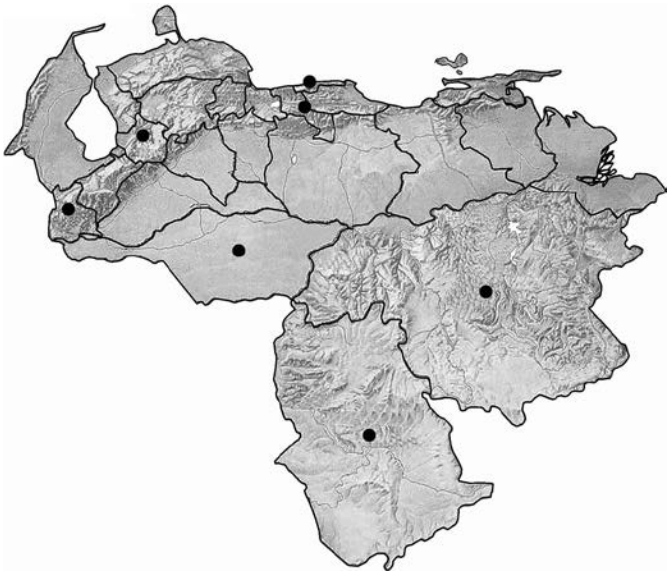
Found in North America (USA), Mexico, Central America, the Greater Antilles, and South America (Colombia, Venezuela, Ecuador, Peru, Bolivia, and Brazil). In Venezuela, collected in the Andes (Táchira and Trujillo) and the Cordillera de la Costa (Yaracuy; Map 132). In the park, known from the north slope of Guaramacal; 2,800 m.

The correct generic placement of this species is problematic, as its extensive synonymy suggests. We place it in *Crocodeilanthe* on the basis of its morphology, although it is resolved in its own clade separate from *Crocodeilanthe* and *Stelis* s. str. in the molecular study published by Karremans et al. (2013; Clade E, but mislabeled D in fig. 5). Morphologically, *C. galeata* is very similar to their definition of *Crocodeilanthe* and *Stelis* s. str., except that this species has incumbent (vs. apical) anthers and divergent "whale tail" (vs. "bubble-like") pollinaria (see Karremans et al., 2013: fig. 8). Luer (2010) made this species the type of *Niphantha* Luer, which also includes a second species from Ecuador that has not been included yet in molecular analyses.

Crocodeilanthe moritzii (Rchb. f.) Luer, Monogr. Syst. Bot. Missouri Bot. Gard. 95: 256. 2004. *Pleurothallis moritzii* Rchb. f., Linnaea 22: 824. 1849; Dorr et al., Contr. U.S. Natl. Herb. 40: 53. 2000 [2001]; Carnevali and Ramírez-Morillo, in Berry et al., Fl. Venez. Guayana 7: 518–519, fig. 459. 2003. *Stelis moritzii* (Rchb. f.) Pridgeon & M. W. Chase, Lindleyana 16: 264. 2001.

Pleurothallis elegans auct., non (Kunth) Lindl.; Foldats, Fl. Venez. 15(2): 262–264, fig. 264. 1970.

Epiphytic, lithophytic or rarely subterrestrial herbs, 15–30 cm tall (including inflorescences). Leaf blades elliptic to oblong-elliptic, 7–15 cm long (including pseudopetioles),



MAP 133. *Crocodeilanthe moritzii* occurrence in Venezuela.

MAP 134. *Crocodeilanthe stergiosii* occurrence in Venezuela.

1.6–5.5 cm wide. Inflorescences 2–7 in a fascicle, 8–18 cm long, many-flowered. Flowers cream or yellowish. Dorsal sepal 5–8 mm long.

Found in South America (Venezuela, Guyana, Ecuador, and Peru). In Venezuela, this species is reported from Amazonas, Apure, Aragua, Bolívar, Distrito Federal, Táchira, and Trujillo (Map 133). The sole park record is from subpáramo and dwarf forest below the Páramo de Guaramacal; 2,800 m.

♦ ***Crocodeilanthe stergiosii*** (Carnevali & I. Ramírez) Carnevali & I. Ramírez, in Hokche et al., Nuevo Cat. Fl. Vasc. Venez. 578. 2008. *Pleurothallis stergiosii* Carnevali & I. Ramírez, Harvard Pap. Bot. 3: 247, figs. 5, 6. 1988; Ortega et al., BioLlania 5: 49. 1987; Dorr et al., Contr. U.S. Natl. Herb. 40: 53. 2000 [2001].

Pleurothallis velaticaulis auct., non Rchb. f.; Foldats, Fl. Venez. 15(2): 440–443, fig. 355. 1970, pro parte; Ortega et al., BioLlania 5: 49. 1987.

Epiphytic herbs, to 40 cm tall (including inflorescences); creeping. Leaf blades elliptic or oblong-elliptic, leaves 8.1–11.5 cm long (including pseudopetioles), 1.5–3 cm wide. Inflorescences 2 or 3 in a fascicle, 15–24 cm long, much longer than the subtending leaves, 40–55-flowered. Flowers green or yellow. Dorsal sepal 4.5–5 mm long.

Endemic to Venezuela (Trujillo; Map 134). In the park, found on the north slope of Guaramacal; 1,800–2,700 m.

***Crocodeilanthe* sp. A**

Epiphytic herbs, 28–35 cm tall (including inflorescences). Leaf blades lanceolate or narrowly elliptic, 13–15 cm long (including pseudopetioles), 2–2.8 cm wide. Inflorescences 5–7 cm long, 13–20-flowered. Flowers very small, greenish-white. Dorsal sepal 3.2–3.5 mm long.

Known only from the Andes of Venezuela (Trujillo; Map 135). In the park, found on the north slope of Guaramacal near the Laguna de Aguas Negras and in Qda. Salvaje; 1,850–2,100 m.

This appears to be an undescribed species currently known only from material collected in Guaramacal National Park.

MAP 135. *Crocodeilanthe* sp. A occurrence in Venezuela.

Cyrtochilum Kunth

Cyrtochilum Kunth, in H. B. K., Nov. Gen. Sp. [fol.] 1: 280. 1815 [1816]; ibid. [qu.] 1: 349. 1815 [1816]. *Oncidium* sect. *Cyrtochilum* (Kunth) Lindl., Sert. Orchid. t. 48. 1842. *Oncidium* subgen. *Cyrtochilum* (Kunth) Garay, Taxon 19: 444. 1970.

Neodryas Rchb. f., Bot. Zeitung (Berlin) 10: 834. 1852.

Rusbyella Rolfe ex Rusby, Mem. Torrey Bot. Club 6: 122. 1896.

Buesiella C. Schweinf., Bot. Mus. Leafl. 15: 153. 1952.

Dasyglossum Königer & Schildh., Arcula 1: 5. 1994.

Trigonochilum Königer & Schildh., Arcula 1: 13. 1994.

Siederella Szlach. et al., Biodivers. Res. Conservation 1–2: 4. 2006.

Irenea Szlach. et al., Biodivers. Res. Conservation 1–2: 5. 2006.

Epiphytic, lithophytic or terrestrial herbs; caespitose or long-creeping; usually medium to very large in size (compared to other Oncidiinae), rarely very small. Roots thick (much thicker than those of *Oncidium* Sw. and *Odontoglossum* Kunth), long, white. Rhizomes thick, conspicuous, usually elongate with pseudobulbs well separated from each other, in other cases shorter, loosely covered with scarious, tubular sheaths. Pseudobulbs generally large, subhemispherical to ovoid, apically (1-) 2- or 3- (4)-foliate, covered by several distichous sheaths, of which the innermost 2–4 have foliar blades, surface opaque. Inflorescences 1 or 2, lateral, usually arising from sheaths of new buds or from between sheaths of mature pseudobulbs, usually paniculate, less commonly racemose, many-flowered, short and ± rigidly erect to very long (to several meters long) and creeping, twining or pendulous; peduncles terete (rarely 2- or 3-costate), relatively thick, loosely covered with tubular sheaths, sheaths subtending inflorescence branches usually conspicuous; floral bracts small or medium-sized, always much shorter than the pedicellate ovary, loosely tubular to patent or inflated, ovate, acute. Flowers resupinate, small to very large and conspicuous, spreading, lasting several days, variously colored, white, yellow to chocolate-brown or purple with lines or areas of purple, brown or red, often the petals and sepals different colors, fleshy; perianth segments often abruptly attenuate basally and with a conspicuous claw. Sepals free or lateral sepals fused below the middle, subequal. Petals free, wider or narrower than sepals or differently shaped. Labellum usually narrower and fleshier than other perianth segments, simple or somewhat 3-lobed, usually triangular in general outline or ovate-triangular and acute, less commonly pandurate and rounded to truncate apically, the upper ½ of the labellum often reflexed (in living material); disk with 1 to several calli, these simple or very complex, the labellar blade sessile at the base of the column or with a short hook; column proportionally long, subterete, making an angle of ~80°–120° with respect to the labellar blade or less commonly the basal part completely parallel to the labellum, straight or sigmoid, often attenuate basally, apically with or without a pair of small wings or teeth on each side of the stigma; stigma ventral, entire, subquadrate, cordate or transversely elliptic; rostellum small, transverse; anther apical, incumbent, operculate; pollinia 2, ellipsoid or obovoid, waxy, yellow, on a short and wide tegula; viscidium small, rounded, ventrally flattened, with relatively conspicuous caudicles. Ovary glabrous. Capsules triangular. [Epidendroideae: Cymbidieae: Oncidiinae.]

A neotropical genus of 115–130 species found in the West Indies and South America (Colombia, Venezuela, Ecuador, Peru, and Bolivia). Only 1 species appears to be native to the West Indies and 1 South American species is adventive in the Greater Antilles. The genus is most diverse in the Andes of Colombia and Ecuador; ~20 species occur in Venezuela.

References. Chase (1997, 2002); Dalström (2001); Garay (1970); Pridgeon et al. (2009); Senghas (1997b); Williams et al. (2001).

Species of *Cyrtochilum* can be found in the shade but are more commonly sun loving.

As noted by Chase in Pridgeon et al. (2009: 509), "the taxonomic history of *Cyrtochilum* is long and troubled." The species currently assigned to this genus were in the past included in several other genera, including *Oncidium* and *Odontoglossum*, with which they shared evolutionarily convergent floral characters. *Cyrtochilum*, as conceived here and circumscribed by both morphological and molecular characters, is mostly a high Andean group characterized by large, usually long-creeping plants, with thick white roots and suborbicular or ovoid pseudobulbs, which are not or slightly compressed laterally, and covered with various leaf sheaths with foliar blades. The inflorescences are usually elongate, often creeping or twining. The flowers are variable in size and include some of the largest in the subtribe and in the family (e.g., *C. macranthum* (Lindl.) Kraenzl.) and usually have relatively small and triangular labella. The angle formed by the base of the labellum and the column was used in the past to determine whether or not a species was assigned to *Oncidium* (labellum perpendicular to the column) or *Odontoglossum* (labellum basally parallel to the column). The "true" members of these two genera have, among other differences, strongly laterally compressed pseudobulbs and thin roots.

KEY TO THE SPECIES OF *CYRTOCHILUM*

1a. Dorsal sepal <1.5 cm long; pedicels at least 2× longer than the sepals 2
  2a. Rhizomes long-creeping; pseudobulbs separate on the rhizomes; flowers campanulate (in living material), secund; pedicels curved . . . . . ***C. megalophium***
  2b. Rhizomes abbreviated or shortly creeping; pseudobulbs aggregated; flowers spreading, not secund; pedicels straight (or if curved, then not secund) 3
    3a. Lateral sepals fused in their basal ½; labellum ± the same width as petals . . . . . ***C. distans***
    3b. Lateral sepals completely free; labellum conspicuously wider than petals . . . . . ***C. cimiciferum***

1b. Dorsal sepal ≥2.5 cm; pedicels up to 1.5× longer than the sepals 4
4a. Rhizomes short with pseudobulbs aggregated (sometimes only 1 pseudobulb on an herbarium specimen, but often >1); inflorescences rigidly erect, emerging from the developing pseudobulb; labellum ± as wide as sepals; callus with ridges and linear teeth; column without wings or teeth; flowers white with pink . . . . . ***C. ramosissimum***
4b. Rhizomes long-creeping with separate pseudobulbs (almost always only 1 pseudobulb on an herbarium specimen); inflorescences creeping, prostrate or twining, several meters long, emerging from mature pseudobulbs (or from young ones in *C. orgyale*); labellum always conspicuously narrower than sepals; callus with ridges and lamellar teeth; column with teeth on the sides of the stigma; flowers of various colors but if white, then with areas of dark purple or bright red 5
5a. Petals triangular, <2× as long as wide; inflorescences emerging from developing pseudobulbs (or from new buds); petals pale purple . . . . . ***C. orgyale***
5b. Petals elliptic or triangular, at least 2.5× as long as wide; inflorescences emerging from mature pseudobulbs; petals white with purple areas or brown with yellow areas 6
6a. Flowers brown or reddish-brown with yellow areas toward the apices of the perianth segments; dorsal sepal conspicuously wider than petals that are curved (in living material); labellum panduriform, ± the same width from base to apex . . . . . ***C. falcipetalum***
6b. Flowers white with dark purple or red areas; dorsal sepal the same width to slightly wider than petals; labellum triangular, conspicuously wider toward base 7
7a. Sepals ~2 cm long; callus occupying only the central area of the labellar disk . . . . . ***C. zebrinum***
7b. Sepals ~3 cm long; callus occupying the entire labellar disk . . . . . ***C. detortum***

Cyrtochilum cimiciferum (Rchb. f.) Dalström, Lindleyana 16: 61. 2001; Fernández, Orquídeas Nat. Táchira 50. 2003; Morillo, in Morillo et al., Bot. Ecol. Monocot. Páramos Venez. 1: 116–117, fig. 14. 2011. *Odontoglossum cimiciferum* Rchb. f., Linnaea 22: 849. 1849. *Oncidium cimiciferum* (Rchb. f.) Beer, Prakt. Stud. Orchid. 274. 1854; Dunsterville and Garay, Venez. Orchids Ill. 4: 186–187. 1966; Foldats, Fl. Venez. 15(5): 300–303, fig. 867, excluding A. 1970; Ortega et al., BioLlania 5: 48. 1987; Romero and Carnevali, Orchids Venez., 2nd ed., 2: 676. 2000; Dorr et al., Contr. U.S. Natl. Herb. 40: 52. 2000 [2001].

MAP 136. *Cyrtochilum cimiciferum* occurrence in Venezuela.

Cyrtochilum flexuosum Kunth, in H. B. K., Nov. Gen. Sp. [fol.] 1: 280. 1815 [1816]; ibid. [qu.] 1: 350. 1815 [1816].

Terrestrial or epiphytic herbs. Leaf blades 23–50 cm long. Flowers 1.5–2 cm in diameter. Perianth pale yellow with opaque, reddish-brown spots. Dorsal sepal 7–9 mm long. Callus bright yellow.

Found in South America (Colombia, Venezuela, Ecuador, Peru, and Bolivia). In Venezuela, known from the Andes (Mérida, Táchira, and Trujillo) and the Sierra de Perijá (Zulia; Map 136). In the park, found along the Boconó–Guaramacal road; 2,250 m.

Cyrtochilum detortum (Rchb. f.) Kraenzl., Notizbl. Bot. Gart. Berlin-Dahlem 7: 92. 1917; Fernández, Orquídeas Nat. Táchira 52. 2003. *Oncidium detortum* Rchb. f., Gard. Chron., ser. 3, 3: 392. 1888; Romero and Carnevali, Orchids Venez., 2nd ed., 2: 680. 2000; Dorr et al., Contr. U.S. Natl. Herb. 40: 52. 2000 [2001].

Large terrestrial or rarely epiphytic herbs. Leaf blades 30–60 cm long. Inflorescences creeping, pendulous or twining, 3–6 m long. Flowers 4–5 cm in diameter. Perianth white with red or reddish-purple spots. Dorsal sepal 2.5–3 cm long.

Found in South America (Venezuela, Ecuador, and Peru). In Venezuela, known only from the Andes (Táchira and Trujillo; Map 137). Near the park boundary in the Laguna de Aguas Negras; ~1,850 m.

Cyrtochilum distans (Rchb. f.) Kraenzl., Notizbl. Bot. Gart. Berlin-Dahlem 7: 99. 1917. *Odontoglossum distans* Rchb. f., Linnaea 22: 848. 1849; Dunsterville and Garay, Venez. Orchids Ill. 4: 170–171. 1966; Foldats, Fl. Venez. 15(5): 210–

MAP 137. *Cyrtochilum detortum* occurrence in Venezuela.

212, fig. 839. 1970. *Symphyglossum distans* (Rchb. f.) Garay & Dunst., in Dunsterville and Garay, Venez. Orchids Ill. 6: 40. 1976; Ortega et al., BioLlania 5: 50. 1987; Romero and Carnevali, Orchids Venez., 2nd ed., 3: 1065. 2000; Dorr et al., Contr. U.S. Natl. Herb. 40: 54. 2000 [2001]; Fernández, Orquídeas Nat. Táchira 227. 2003. *Trigonochilum distans* (Rchb. f.) Senghas, Orchideen I/C, 33–36: 2211. 1997.

Epiphytic or subterrestrial herbs; pseudobulbs 5–10 cm long. Leaf blades to 50 cm long. Inflorescences to 1 m long. Flowers 1.5–2 cm in diameter. Perianth pale yellowish-green or white with a pink labellum, white basally. Dorsal sepal 9–13 mm long. Labellum 7–10 mm long.

Found in South America (Colombia, Venezuela, and Ecuador). In Venezuela, found in the Andes (Mérida, Táchira, and Trujillo) and in the Cordillera de la Costa (Aragua and Distrito Federal; Map 138). In the park, found in cloud forest along the Boconó–Guaramacal road; 2,100–2,450 m.

Cyrtochilum falcipetalum (Lindl.) Kraenzl., Notizbl. Bot. Gart. Berlin-Dahlem 7: 92. 1917; Fernández, Orquídeas Nat. Táchira 52. 2003; Morillo, in Morillo et al., Bot. Ecol. Monocot. Páramos Venez. 1: 119–121, fig. 17. 2011. *Oncidium falcipetalum* Lindl., Orchid. Linden. 14. 1846; Dunsterville and Garay, Venez. Orchids Ill. 1: 266–267. 1959; Foldats, Fl. Venez. 15(5): 320–323, fig. 874. 1970; Ortega et al., BioLlania 5: 48. 1987; Romero and Carnevali, Orchids Venez., 2nd ed., 2: 683. 2000; Dorr et al., Contr. U.S. Natl. Herb. 40: 52. 2000 [2001].

Epiphytic or terrestrial herbs; pseudobulbs 4–15 cm long. Leaf blades 10–60 cm long. Inflorescences 2–4 m long. Flowers brown or reddish-brown. Sepals 3.5–4.5 cm long. Petals and labellum with yellow spots.

Found in South America (Colombia, Venezuela, Ecuador, Peru, and Bolivia). In Venezuela, known from the Andes (Lara, Mérida, Táchira, and Trujillo) and the Cordillera de la Costa (Aragua and Distrito Federal; Map 139). Park records are from both slopes of Guaramacal; 1,950–2,350(–3,000) m.

MAP 138. *Cyrtochilum distans* occurrence in Venezuela.

MAP 139. *Cyrtochilum falcipetalum* occurrence in Venezuela.

MAP 140. *Cyrtochilum megalophium* occurrence in Venezuela.

MAP 141. *Cyrtochilum orgyale* occurrence in Venezuela.

Cyrtochilum megalophium (Lindl.) Kraenzl., Notizbl. Bot. Gart. Berlin-Dahlem 7: 98. 1917; Fernández, Orquídeas Nat. Táchira 54. 2003; Morillo, in Morillo et al., Bot. Ecol. Monocot. Páramos Venez. 1: 122, fig. 182. 2011. *Odontoglossum megalophium* Lindl., Orchid. Linden. 15. 1846; Dunsterville and Garay, Venez. Orchids Ill. 3: 210–211. 1965; Foldats, Fl. Venez. 15(5): 221–223, fig. 844. 1970; Ortega et al., BioLlania 5: 48. 1987; Romero and Carnevali, Orchids Venez., 2nd ed., 2: 661. 2000; Dorr et al., Contr. U.S. Natl. Herb. 40: 52. 2000 [2001].

Epiphytic or terrestrial herbs; pseudobulbs 4–10 × 1.5–4 cm. Leaf blades 18–55 cm long. Inflorescences broadly paniculate, suberect to twining, to 2 m long. Flowers yellow. Dorsal sepal 4–6 mm long; lateral sepals 7–8 mm long.

Found in South America (Colombia, Venezuela, and Peru). In Venezuela, restricted to the Andes (Mérida, Táchira, and Trujillo; Map 140). In the park, found in páramo on the Fila de Los Recostaderos and in cloud forest on the north slope of Guaramacal; 2,700–3,100 m.

Cyrtochilum orgyale (Rchb. f. & Warsz.) Kraenzl., Notizbl. Bot. Gart. Berlin-Dahlem 7: 92. 1917; Fernández, Orquídeas Nat. Táchira 55. 2003. *Oncidium orgyale* Rchb. f. & Warsz., Bonplandia (Hannover) 2: 102. 1854; Foldats, Fl. Venez. 15(5): 370–373, fig. 891. 1970; Ortega et al., BioLlania 5: 48. 1987; Romero and Carnevali, Orchids Venez., 2nd ed., 2: 694. 2000; Dorr et al., Contr. U.S. Natl. Herb. 40: 52. 2000 [2001].

Cyrtochilum undulatum auct., non Kunth; Morillo, in Morillo et al., Bot. Ecol. Monocot. Páramos Venez. 1: 126–127, fig. 21, foto 11. 2011.

Large, epiphytic herbs; pseudobulbs to 15 cm long. Leaf blades 15–50 cm long. Inflorescences 3–4 m long. Sepals brownish-purple; dorsal sepal 2.4–2.7 cm long. Petals purple.

Found in South America (Colombia and Venezuela). In Venezuela, restricted to the Andes (Mérida, Táchira, and Trujillo; Map 141). In the park, found on the north slope and in the Páramo de Guaramacal; 2,250–3,000 m.

Dalström (2001: 71) speculated that *Cyrtochilum orgyale* might be synonymous with *C. undulatum* Kunth. If this proves to be true, then the latter name has priority.

Cyrtochilum ramosissimum (Lindl.) Dalström, Lindleyana 16: 72. 2001; Morillo, in Morillo et al., Bot. Ecol. Monocot. Páramos Venez. 1: 123–124, fig. 19, foto 10. 2011. *Odontoglossum ramosissimum* Lindl., Fol. Orchid. 1: Odontoglossum 16. 1852; Dunsterville and Garay, Venez. Orchids Ill. 3: 212–213. 1965; Foldats, Fl. Venez. 15(5): 229–231, fig. 847. 1970; Ortega et al., BioLlania 5: 48. 1987; Romero and Carnevali, Orchids Venez., 2nd ed., 2: 664. 2000; Dorr et al., Contr. U.S. Natl. Herb. 40: 52. 2000 [2001].

Epiphytic herbs; pseudobulbs 6.5–12 × 3–5 cm. Leaf blades 30–60 cm long. Inflorescences 60–120 cm tall, erect. Flowers white, bases of perianth segments purple. Sepals 2.5–3 cm long.

Found in South America (Colombia, Venezuela, Ecuador, and Peru). In Venezuela, restricted to the Andes (Mérida, Táchira, and Trujillo; Map 142). In the park, found in cloud forest along the Boconó–Guaramacal road; 1,850–2,150 m.

Cyrtochilum zebrinum (Rchb. f.) Kraenzl., Notizbl. Bot. Gart. Berlin-Dahlem 7: 94. 1917; Fernández, Orquídeas Nat.

MAP 142. *Cyrtochilum ramosissimum* occurrence in Venezuela.

Táchira 57. 2003; Morillo, in Morillo et al., Bot. Ecol. Monocot. Páramos Venez. 1: 127, fig. 22. 2011. *Odontoglossum zebrinum* Rchb. f., Linnaea 22: 849. 1849; Dunsterville and Garay, Venez. Orchids Ill. 2: 260–261. 1961. *Oncidium zebrinum* (Rchb. f.) Rchb. f., Bonplandia (Hannover) 2: 12. 1854; Foldats, Fl. Venez. 15(5): 404–406, fig. 901. 1970; Dorr et al., Contr. U.S. Natl. Herb. 40: 52. 2000 [2001].

MAP 143. *Cyrtochilum zebrinum* occurrence in Venezuela.

Oncidium engelii Rchb. f., Linnaea 41: 22. 1877 [1876]; Dunsterville and Garay, Venez. Orchids Ill. 4: 189–190. 1966; Foldats, Fl. Venez. 15(5): 316–317. 1970; Romero and Carnevali, Orchids Venez., 2nd ed., 2: 681. 2000.

Oncidium detortum auct., non Rchb. f.; Dunsterville and Garay, Venez. Orchids Ill. 3: 222–223. 1965.

Epiphytic or more frequently terrestrial herbs; pseudobulbs large, to 10 cm long. Leaf blades 15–60 cm long. Inflorescences 3–4 m long, creeping or twining. Perianth white with brown or red bands. Dorsal sepal ~2 cm long.

Found in South America (Venezuela, Colombia, Ecuador, and Peru). In Venezuela, found in the Andes (Lara, Mérida, Portuguesa, Táchira, and Trujillo) and in the Cordillera de la Costa (Distrito Federal and Miranda; Map 143). In the park, found on the Fila de Agua Fría and both slopes of Guaramacal; 1,800–2,800(–3,000) m.

Dichaea Lindl.

Dichaea Lindl., Gen. Sp. Orchid. Pl. 208. 1833.

Epiphytic, rarely lithophytic or subterrestrial herbs; pendent, arched, erect or prostrate; caespitose; pseudobulbs absent. Roots usually thin, sometimes very thick and fleshy, arising from the bases of stems or in prostrate plants internodes in contact with the substrate. Stems monopodial or pseudomonopodial with indeterminate growth, branching from the base (and creating caespitose plants) or less commonly from more distal internodes, completely obscured by leaf sheaths that are persistent and only disintegrate to reveal terete stems on very old plants. Leaves distichous, articulate or marcescent; sheaths imbricate; leaf blades in the same plane as sheaths or perpendicular to them, usually oblong or linear-oblong, sometimes elliptic or narrowly ovate-elliptic, rounded to acute or acuminate, often apiculate or with a subapical mucro, margins entire, ciliate to finely toothed, cilia or teeth often restricted to the upper part of the blade. Inflorescences 1-flowered, solitary, opposite the leaves; peduncles usually filiform, usually shorter than the leaves; floral bracts usually clasping more than ½ the length of the ovary, tubular, apiculate or mucronate. Flowers resupinate, campanulate or the segments ± spreading, fugacious; perianth segments oblong-elliptic to ovate (rarely obovate), rounded to acuminate, outer surface smooth to verruculose, usually white or green, rarely yellow or pink, often spotted or tinged with purple or pink, 1–5-nerved, membranous to subfleshy. Lateral sepals somewhat oblique. Petals similar to sepals or narrower. Labellum rigidly attached to the column base, usually attenuate basally into a conspicuous claw, rarely subsessile, the claws ecallose or rarely with 1 or 2 calli; labellar blade usually anchor-shaped, less commonly pandurate, margins entire or finely ciliolate, the same color as other members of the perianth but often with larger areas of color (as described above), usually ecallose; column short to somewhat elongate, subcylindric, often forming an angle with the labellum; anther terminal, operculate, incumbent, clinandrium shallow;

pollinia 4, ovoid, waxy, tegula well developed, short to elongate; viscidium small; stigma relatively large, ventral but occasionally appearing frontal because of the angle of the column, often with an imperceptibly pubescent ligule. Ovary obconical to fusiform, smooth to densely muricate, usually with a linear bracteole at the base; bracteole longer to shorter than the ovary. Capsules ellipsoid, smooth or muricate. [Epidendroideae: Cymbidieae: Zygopetalinae.]

A neotropical genus of ~100 species found in Mexico, Central America, the West Indies, and South America (Colombia, Venezuela, the Guianas, Ecuador, Peru, Bolivia, and Brazil); ~16 species occur in Venezuela.

References. Folsom (1996); Neubig et al. (2009); Pridgeon et al. (2009); Senghas (1994a).

Molecular and morphological data support the monophyly of *Dichaea*. Molecular data (Neubig et al., 2009), however, call into question the infrageneric classification that was constructed on morphology alone. In particular, Neubig et al. (2009) suggest that *D.* sect. *Dichaea* should be expanded to include *D.* sect. *Dichaeastrum*.

Dichaea has been difficult to study because pressed flowers do not rehydrate well, and as a consequence, herbarium material alone generally is inadequate for interpreting floral morphology. To make the situation even more complicated, plants usually produce flowers in succession and have only 1(2) flower open per stem. These flowers often remain attached to the paper used to press them; as a consequence most herbaria are filled with sterile specimens.

KEY TO THE SPECIES OF *DICHAEA*

1a. Leaves articulate with their sheaths, eventually deciduous and leaving a scar at the apex of the sheath 2
  2a. Mature leaf blades oblong to elliptic-oblong or elliptic, 38–63(–75) mm long, apices rounded or subacute and mucronate . . . . . ***D. robusta***
  2b. Mature leaf blades oblong-lanceolate, 22–40 mm long, apices acuminate to narrowly acute . . . . ***D. camaridioides***
1b. Leaves not articulate with their sheaths, marcescent 3
  3a. Plants small, usually <10 cm long; leaf blades 2.5–3 mm wide, margins conspicuously ciliate-denticulate . . . . . ***D. hystricina***
  3b. Plants larger, usually >15 cm long; leaf blades 3–7.5 mm wide, margins smooth or minutely denticulate only in the apical half . . . . . ***D. latifolia***

Dichaea camaridioides Schltr., Repert. Spec. Nov. Regni Veg. Beih. 7: 201. 1920; Romero and Carnevali, Orchids Venez., 2nd ed., 1: 152. 2000; Carnevali and Ramírez-Morillo, in Berry et al., Fl. Venez. Guayana 7: 301. 2003; Fernández, Orquídeas Nat. Táchira 58. 2003.

MAP 144. *Dichaea camaridioides* occurrence in Venezuela.

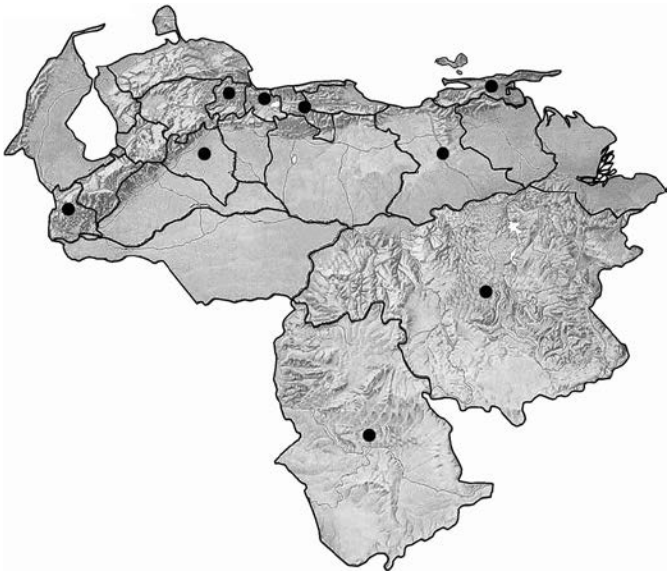
Dichaea brachypoda auct., non Rchb. f.; Foldats, Fl. Venez. 15(5): 447–449, fig. 916. 1970; Dunsterville and Garay, Venez. Orchids Ill. 3: 72–73. 1965.

Epiphytic herbs; erect or arching to pendulous; stems to 30 cm long. Leaves articulate with their sheaths; leaf blades oblong-lanceolate, 22–40 × 5–10 mm, margins smooth, microscopically pilose toward apex, apices acute to acuminate. Flowers cream-colored, purple-speckled, margins green. Sepals 7–13 mm long.

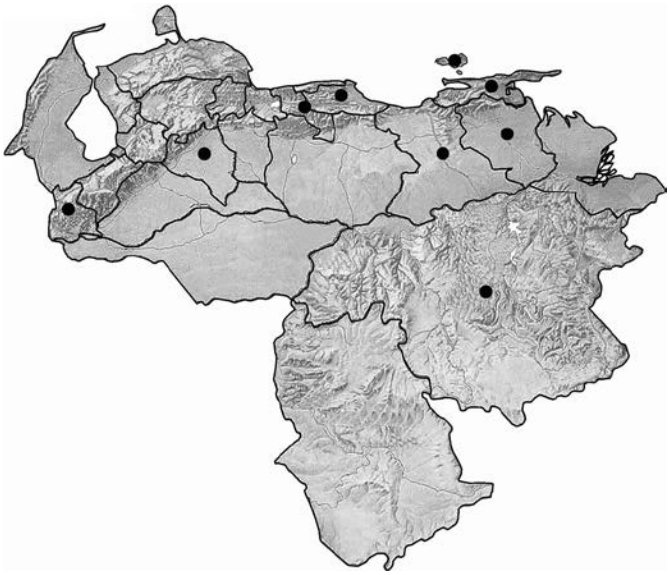
Found in South America (Colombia, Venezuela, and possibly Guyana). In Venezuela, known from the Andes (Lara, Portuguesa, and Táchira), the Cordillera de la Costa (Yaracuy), and the Venezuelan Guayana (Amazonas; Map 144). In the park, collected on the south slope of Guaramacal near El Campamento of El Santuario and on the Camino Real Paramito–Batatal; (1,550–)1,800–2,000 m.

Dichaea hystricina Rchb. f., Flora 48: 279. 1865; Dunsterville and Garay, Venez. Orchids Ill. 2: 86–87. 1961; Foldats, Fl. Venez. 15(5): 452–454, fig. 918. 1970; Romero and Carnevali, Orchids Venez., 2nd ed., 1: 155. 2000; Carnevali and Ramírez-Morillo, in Berry et al., Fl. Venez. Guayana 7: 302, fig. 290. 2003; Fernández, Orquídeas Nat. Táchira 59. 2003.

Epiphytic herbs; suberect, spreading or pendulous; stems branched or not, 3–8(–15) cm long. Leaves not articulate with their sheaths; leaf blades elliptic to elliptic-lanceolate, 4–10 × 1.5–3 mm, margins conspicuously denticulate-ciliate, apices acute to acuminate. Flowers white or greenish-white with



MAP 145. *Dichaea hystricina* occurrence in Venezuela.



MAP 146. *Dichaea latifolia* occurrence in Venezuela.

purple-pink spots. Sepals 4–6.5 mm long. Labellum occasionally completely violet.

Found in Central America, the West Indies, and South America (Colombia, Venezuela, Trinidad and Tobago, Ecuador, and Brazil). In Venezuela, found in the Andes (Portuguesa and Táchira), the Cordillera de la Costa (Anzoátegui, Aragua, Carabobo, Sucre, and Yaracuy), and the Venezuelan Guayana (Amazonas and Bolívar; Map 145). La Divisoria de la Concepción; 1,700 m.

The diminutive *Dichaea hystricina* is usually collected in shade growing among bryophytes. It is the only *Dichaea* in our flora with conspicuously denticulate-ciliate leaf margins.

Dichaea latifolia Lindl., Gen. Sp. Orchid. Pl. 208. 1833.

Dichaea longa Schltr., Repert. Spec. Nov. Regni Veg. Beih. 10: 54. 1922. *Dichaea latifolia* var. *longa* (Schltr.) Folsom, Orchid Digest 60: 154. 1996; Romero and Carnevali, Orchid Venez., 2nd ed., 1: 156. 2000; Carnevali and Ramírez-Morillo, in Berry et al., Fl. Venez. Guayana 7: 302. 2003.

Dichaea muricata auct., non (Sw.) Lindl.; Dunsterville and Garay, Venez. Orchids Ill. 2: 89. 1961; Foldats, Fl. Venez. 15(5): 460–463, fig. 921. 1970.

Epiphytic herbs; pendulous; stems unbranched or branched only in the lower ½, to 1 m long. Leaves articulate with their sheaths; leaf blades elliptic or rarely elliptic-lanceolate, 8–20 × 3–7.5 mm, margins smooth or minutely denticulate above, apices obtuse or rounded. Flowers pale greenish-brown, sometimes purple-spotted. Sepals 7–14 mm long. Labellum white with violet zones.

Found in the West Indies and South America (Colombia, Venezuela, Ecuador, Peru, and Bolivia). In Venezuela, found in the Andes (Portuguesa and Táchira), the Cordillera de la Costa (Anzoátegui, Aragua, Miranda, Monagas, and Sucre), the Venezuelan Guayana (Bolívar), and Nueva Esparta (Map 146). Cloud forest near the lower boundaries of both slopes of the park, including the Laguna de Aguas Negras, El Campamento below Cerro El Diablo, and La Divisoria de la Concepción; (1,300–)1,800–2,000 m.

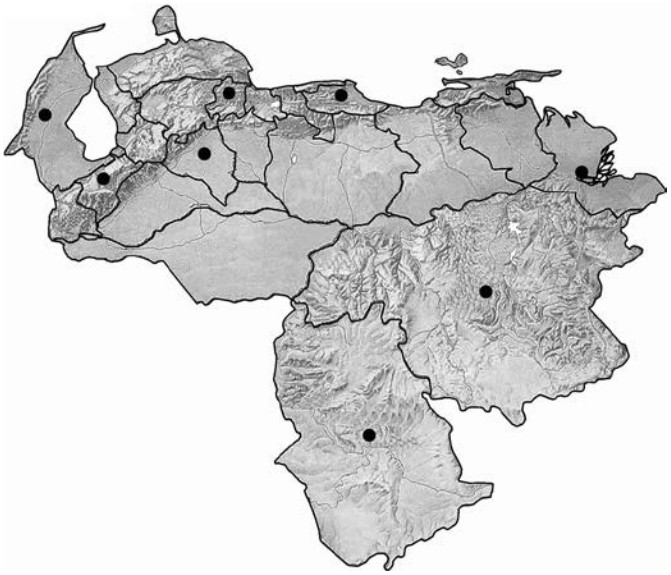
According to Folsom (1996: 152), *Dichaea latifolia* var. *longa* is distinguished from the nominate variety by having "leaf blades spreading, nearly touching" versus "leaf blades usually retrorse, spaced." We fail to see this distinction in the Venezuelan material available to us and have adopted a broader concept of *D. latifolia*.

Dichaea robusta Schltr., Repert. Spec. Nov. Regni Veg. 27: 83. 1929; Romero and Carnevali, Orchids Venez., 2nd ed., 1: 160. 2000; Carnevali and Ramírez-Morillo, in Berry et al., Fl. Venez. Guayana 7: 302. 2003.

Dichaea morrisii auct., non Fawc. & Rendle; Dunsterville and Garay, Venez. Orchids Ill. 1: 94–95. 1959, pro parte; Foldats, Fl. Venez. 15(5): 457–459, fig. 920. 1970; Dorr et al., Contr. U.S. Natl. Herb. 40: 49. 2000 [2001].

Epiphytic herbs; erect or pendulous; stems 10–55 cm long. Leaves articulate with their sheaths; leaf blades oblong to elliptic-oblong or elliptic, 38–63(–75) × 10–16 mm, margins smooth, apices rounded or subacute and mucronate. Flowers green or yellowish-green, sometimes streaked with brown or purple. Sepals 7–18 mm long. Labellum purple or (less commonly) whitish with purple or brown blotches.

Found in Central America (Costa Rica and Panama) and South America (Colombia, Venezuela, Ecuador, Peru, and Bolivia). Venezuelan collections are from the Andes (Mérida,



MAP 147. *Dichaea robusta* occurrence in Venezuela.

Portuguesa, and Táchira), the Sierra de Perijá (Zulia), the Cordillera de la Costa (Miranda and Yaracuy), and the Venezuelan Guayana (Amazonas, Bolívar, and Delta Amacuro; Map 147). Near La Divisoria de la Concepción; 1,700 m.

Dichaea robusta Schltr. is part of a complex of at least two species (R. Dressler, pers. comm.), both of which have been confused under one name. One of them, to which the name *D. robusta* applies, occurs from Costa Rica southward to at least Peru. The second entity, *D. morissii* Fawcett & Rendle, occurs in the West Indies (type locality) and Central America. They are sympatric in Costa Rica. *Dichaea robusta* features broader sepals and petals that are acute to obtuse at the apex, the claw of the labellum is thick, the lateral lobes of the labellum are long and reflexed, and the labellum apex is more or less truncate to rounded. *Dichaea morrisii,* on the other hand, displays narrower, narrowly acute to acuminate sepals and petals, short, straight lateral lobes to the labellum, and the labellum apex is acute. Flower color is also different. *Dichaea robusta* usually has greenish or green-white flowers with a few red or purple spots, whereas *D. morrisii* is characterized by white flowers with pink-purple stripes. Both species have dark purple-red labella, these somewhat darker in *D. robusta*.

Elleanthus C. Presl

Elleanthus C. Presl, Reliq. Haenk. 1: 97. 1830 [1827].

Terrestrial, epiphytic or subterrestrial herbs; erect to pendulous; caespitose, often forming dense clumps. Rhizomes short. Roots relatively thick, glabrous. Stems thin to relatively thick, ± woody, elongate, simple or branched, to 2(–3.5) m tall, often articulate, terete or ± laterally compressed, covered by sheaths, usually leafy in the apical ¾. Leaves convolute, plicate or rarely subconduplicate, articulate, distichous or rarely subdistichous, soft or rigid, sessile; leaf sheaths amplexicaul to funnel-shaped, often pubescent or verruculose; leaf blades linear to lanceolate, nerves prominent, especially in the lower surface, usually glabrous. Inflorescences terminal or (in some Andean species) originating directly from rhizomes, erect, racemose, usually with many spiraled or few distichous flowers, or capitate, always shorter than the stem, usually subtended by several foliaceous or scarious bracts; floral bracts usually conspicuous and brightly colored, rarely inconspicuous or scarious. Flowers resupinate or not, usually campanulate, mostly brightly colored, sometimes white; perianth segments membranous. Sepals free, subequal, mostly elliptic, lanceolate or narrowly ovate. Petals similar to sepals but usually narrower and apically more obtuse. Labellum free from column to base, erect, subequal or longer than the sepals, blade concave in the basal ½, funnelform and clasping the column, apically simple or inconspicuously 3-lobed, margins entire, denticulate or fimbriate; disk basally with 1 or 2 prominent calli; column erect, semiterete, sometimes winged, footless; anther terminal, operculate, ± incumbent or erect, 2-locular or imperfectly 4-locular; clinandrium small; pollinia 8, waxy or soft, ovoid, without viscidium; rostellum transverse, stigma ventral, emergent. Ovary relatively thick and short, smooth or verruculose, pedicellate. Capsules cylindrical. [Epidendroideae: Sobralieae.]

A neotropical genus of ~100 species found in Mexico, Central America, the West Indies, and South America (Colombia, Venezuela, Guyana, Suriname, Ecuador, Peru, Bolivia, and Brazil); most diverse in the Andes. Approximately 20 species occur in Venezuela.

References. Løjtnant (1977); Neubig et al. (2011); Pridgeon et al. (2005).

Molecular data support the monophyly of *Elleanthus* (Neubig et al., 2011). Most members of the genus have brightly colored bracts and flowers, and most species are assumed to be pollinated by hummingbirds.

KEY TO THE SPECIES OF *ELLEANTHUS*

1a. Plants always epiphytic; leaves linear-oblong, <7 mm wide; inflorescences laterally compressed with distichous, imbricate floral bracts; flowers white, barely emerging from the condensed inflorescence, inconspicuous; sepals 4–6 mm long . . . . . ***E. graminifolius***

1b. Plants epiphytic or terrestrial; leaves elliptic to lanceolate, >10 mm wide; inflorescences usually racemose or conical, not laterally compressed; flowers variously colored but usually not white, conspicuous; sepals >9 mm long 2

2a. Plants epiphytic; inflorescences 2–4-flowered, very lax, distichous; flowers arranged in a zigzag pattern . . . . ***E. confusus***

2b. Plants terrestrial or epiphytic; inflorescences usually multiflowered, dense or sublax; flowers usually spirally arranged, never in a zigzag pattern 3
3a. Plants terrestrial, composed of elongated stems that freely produce lateral branches, often fasciculate, 5–10 cm long each, at several distances from the base of the main stem; flowers bright orange and yellow or rarely entirely orange or yellow 4
4a. Flowers bright orange with yellow or entirely orange; lateral sepals lanceolate, acute . . . . . ***E. aurantiacus***
4b. Flowers pale yellow; lateral sepals triangular-elliptic, acuminate . . . . . ***E. flavescens***
3b. Plants terrestrial or epiphytic, composed of simple, unbranched (rarely branched in *E. furfuraceus*) stems; flowers pinkish or purplish 5
5a. Floral bracts at base of inflorescences narrowly elliptic, long-acuminate or setose-acuminate, 2.5–6.5 cm long, 2 or 3× longer than the flowers they subtend; dorsal sepal 15–18 mm long . . . . . ***E. lupulinus***
5b. Floral bracts at base of inflorescences elliptic or ovate, obtuse, acute or short-acuminate, <2.5 cm long, as long as or slightly longer than the flowers they subtend; dorsal sepal 5–13 mm long 6
6a. Inflorescences with 10 or fewer flowers; stems 1.5–4 mm in diameter, usually <50 cm long (when fertile); leaves narrowly lanceolate, 1–2.5 cm wide, with 2 or 3 nerves each side of the midnerve; floral bracts 4–12 mm wide; dorsal sepal 5–8 mm long; lateral sepals strongly keeled dorsally; basal sacciform portion of labellum accounting for about ½ of the total labellar length; ovary furfuraceous 7
7a. Petals elliptic; labellum deeply sacciform . . . . . ***E. furfuraceus***
7b. Petals oblong or oblong-spathulate; labellum shallowly sacciform . . . . . ***E. gracilis***
6b. Inflorescences with 20 or more flowers; stems 5–10 mm in diameter, usually >80 cm long (when fertile); leaves lanceolate or oblong-lanceolate, 2.5–7 cm wide, with 4–6 nerves on each side of the midnerve; floral bracts 2–6 mm wide; dorsal sepal 9.5–13 mm long; lateral sepals not keeled dorsally; basal sacciform portion of labellum accounting for ⅓ or less of total labellar length; ovary glabrous 8
8a. Calli at base of labellum discrete, free from each other; unconstricted portion of labellum about as long as wide or wider than long; floral bracts 3–6 mm wide . . . . . ***E. columnaris***
8b. Calli at base of labellum fused into a ± 2-lobed single structure; unconstricted portion of labellum longer than wide; floral bracts to 2 mm wide . . . . . ***E. wageneri***

Elleanthus aurantiacus (Lindl.) Rchb. f., Ann. Bot. Syst. 6: 482. 1861 [1863]; Dunsterville and Garay, Venez. Orchids Ill. 4: 68–69. 1966; Foldats, Fl. Venez. 15(1): 211–213, fig. 77. 1969, pro parte; Romero and Carnevali, Orchids Venez., 2nd ed., 1: 175. 2000; Morillo, in Morillo et al., Bot. Ecol. Monocot. Páramos Venez. 1: 129, fig. 23, foto 10. 2011. *Evelyna aurantiaca* Lindl., in Bentham, Pl. Hartw. 149. 1844 [1845].

MAP 148. *Elleanthus aurantiacus* occurrence in Venezuela.

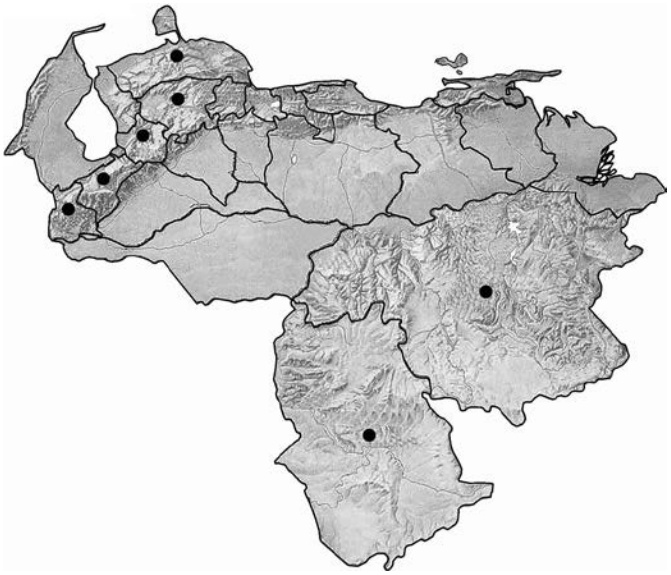
Elleanthus gracilis auct., non (Rchb. f.) Rchb. f.; Ortega et al., BioLlania 5: 47. 1987.

Terrestrial or lithophytic herbs, to 1.5 m tall. Leaf blades 2–12 × 0.5–2.4 cm. Flowers usually orange and yellow. Dorsal sepal 4.5–8.2 mm long.

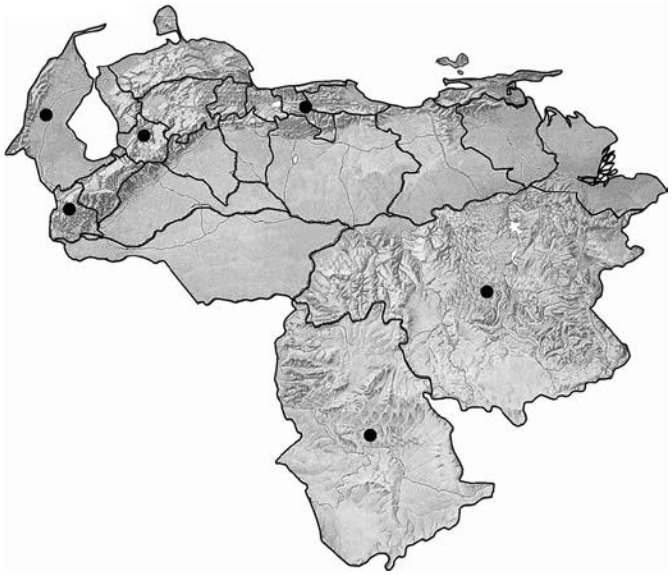
Found in Central America and South America (Colombia, Venezuela, Ecuador, Peru, and Bolivia). In Venezuela, known from the Andes (Mérida, Táchira, and Trujillo) and the Cordillera de la Costa (Aragua, Distrito Federal, Miranda, and Yaracuy; Map 148). Collected in cloud forest in the park without precise locality; 2,000–2,800 m.

Elleanthus aurantiacus is a species of wide distribution that frequently forms large colonies in forest clearings or on road cuts. The label on one collection from the park (*Stergios et al. 6536*) describes the flowers as "azul-moradas," which probably can be attributed to the specimen being collected postanthesis since floral tissues turn black with age. We treat a yellow-flowered variant in the *E. aurantiacus* complex as a distinct species, *E. flavescens* (Lindl.) Rchb. f.

Elleanthus columnaris (Lindl.) Rchb. f., Ann. Bot. Syst. 6: 483. 1861 [1863]; Dunsterville and Garay, Venez. Orchids Ill. 2:



MAP 149. *Elleanthus columnaris* occurrence in Venezuela.



MAP 150. *Elleanthus confusus* occurrence in Venezuela.

94–95. 1961; Foldats, Fl. Venez. 15(1): 217–219, fig. 80. 1969; Romero and Carnevali, Orchids Venez., 2nd ed., 1: 177. 2000; Carnevali and Ramírez-Morillo, in Berry et al., Fl. Venez. Guayana 7: 313, fig. 298. 2003; Fernández, Orquídeas Nat. Táchira 62. 2003. *Evelyna columnaris* Lindl., Orchid. Linden. 11. 1846.

Terrestrial, lithophytic or epiphytic herbs, 0.6–1.5 m tall. Leaf blades 1.3–3 × 3–6.5 cm. Bracts and flowers bright purple or magenta at anthesis. Dorsal sepal 9–13 mm long. Petals white with pink.

Found in South America (Colombia, Venezuela, Ecuador, Bolivia, and Brazil). In Venezuela, found in Amazonas, Bolívar, Falcón, Lara, Mérida, Táchira, and Trujillo (Map 149). In the park, found in cloud forest on both slopes of Guaramacal; 1,700–2,400 m.

Elleanthus confusus Garay, Bot. Mus. Leafl. 26: 13. 1978; Carnevali and Ramírez-Morillo, in Berry et al., Fl. Venez. Guayana 7: 313, fig. 298. 2003.

Elleanthus kermesinus auct., non (Lindl.) Rchb. f.; Foldats, Fl. Venez. 15(1): 226, fig. 83. 1970.

Elleanthus virgatus auct., non (Rchb. f.) C. Schweinf.; Dunsterville and Garay, Venez. Orchids Ill. 2: 100–101. 1961.

Epiphytic herbs, erect to pendulous, straggling. Leaf blades 3–9 × 0.5–1.5 cm. Bracts and flowers pink-lavender to deep purple. Dorsal sepal 8–10 mm long.

Found in South America (Venezuela and possibly adjacent Brazil). In Venezuela, restricted to high elevations in the Andes (Táchira and Trujillo), the Sierra de Perijá (Zulia), the Cordillera de la Costa (Aragua), and the Venezuelan Guayana (Amazonas and Bolívar; Map 150). In the park, collected once in forest on the south slope; 1,850 m.

Elleanthus flavescens (Lindl.) Rchb. f., Ann. Bot. Syst. 6: 479. 1861 [1862]; Romero and Carnevali, Orchids Venez., 2nd ed., 1: 179. 2000. *Evelyna flavescens* Lindl., Orchid. Linden. 11. 1846.

Terrestrial herbs, erect, 50–80 cm tall. Flowers yellow or pale yellow. Leaf blades 5–10 × 0.3–2 cm. Dorsal sepal 5–6 mm long.

Found in South America (Venezuela, Ecuador, and Peru). In Venezuela, restricted to the Andes (Mérida, Táchira, and

MAP 151. *Elleanthus flavescens* occurrence in Venezuela.

Trujillo) and the Sierra de Perijá (Zulia; Map 151). Collected in cloud forest on both slopes of Guaramacal and in the Páramo de Guaramacal; (2,000–)2,700–3,100 m.

This species is vegetatively indistinguishable from the much more common *Elleanthus aurantiacus,* and the two are sometimes considered to be conspecific. We choose to recognize them as distinct species because the color differences are consistent and *E. flavescens* grows in pure populations.

Elleanthus furfuraceus (Lindl.) Rchb. f., Ann. Bot. Syst. 6: 480. 1861 [1862]; Dunsterville and Garay, Venez. Orchids Ill. 1: 104–105. 1959; Foldats, Fl. Venez. 15(1): 221–224, fig. 81. 1969; Romero and Carnevali, Orchids Venez., 2nd ed., 1: 180. 2000; Morillo, in Morillo et al., Bot. Ecol. Monocot. Páramos Venez. 1: 130–131, fig. 24. 2011. *Evelyna furfuracea* Lindl., Orchid. Linden. 12. 1846.

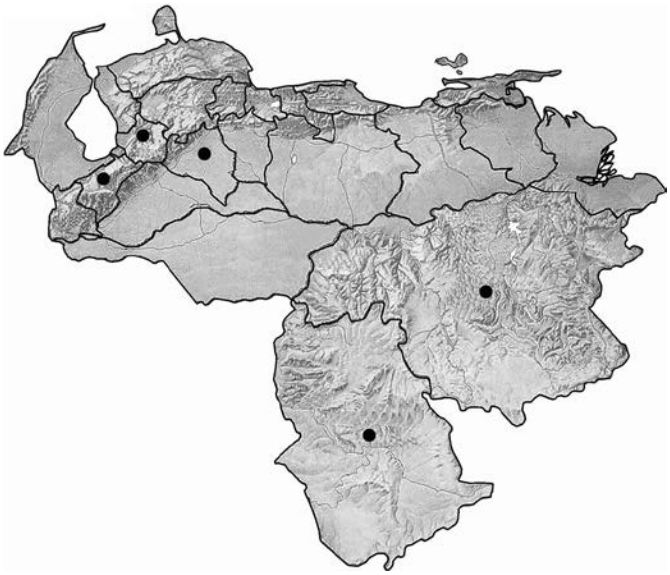
Epiphytic or more rarely terrestrial herbs, 30–110 cm tall. Leaf blades 6–14 × 1–2.5 cm. Flowers bright pink, purple-pink or reddish. Dorsal sepal 5–8 mm long.

Found in South America (Colombia, Venezuela, Guyana, Ecuador, Peru, and Brazil). Widespread in Venezuela (Amazonas, Aragua, Distrito Federal, Lara, Mérida, Miranda, Monagas, Sucre, Táchira, and Trujillo; Map 152). Collected in cloud forest on the north slope of Guaramacal; 1,800–2,350(–3,000) m.

Elleanthus gracilis (Rchb. f.) Rchb. f., Ann. Bot. Syst. 6: 481. 1861 [1863]; Foldats, Fl. Venez. 15(1): 225–226, fig. 82. 1969; Romero and Carnevali, Orchids Venez., 2nd ed., 1: 181. 2000. *Evelyna gracilis* Rchb. f., Linnaea 22: 843. 1849.

Elleanthus kermesinus auct., non (Lindl.) Rchb. f.; Dunsterville and Garay, Venez. Orchids Ill. 3: 78–79. 1965.

MAP 152. *Elleanthus furfuraceus* occurrence in Venezuela.



MAP 153. *Elleanthus gracilis* occurrence in Venezuela.

Epiphytic herbs, erect to pendulous, 20–50 cm tall. Leaf blades 7–13 × 0.8–1.3 cm. Bracts and flowers pink, rose-pink or pale purple. Dorsal sepal 6.2–7 mm long.

Restricted to South America (Colombia, Venezuela, Ecuador, Peru, and Bolivia). In Venezuela, found in the Cordillera de Mérida (Mérida, Portuguesa, and Trujillo) and in the Venezuelan Guayana (Amazonas and Bolívar; Map 153). Our collections are from fire-induced páramo on the north slope and cloud forest on the south slope of Guaramacal; 1,950–2,600 m.

This species is very similar to *Elleanthus furfuraceus* but is distinguished by its narrower floral bracts (1.5–3.5 vs. 4–12 mm wide) and petals (1.1–2 vs. 1.7–3.5 mm wide).

Elleanthus graminifolius (Barb. Rodr.) Løjtnant, Bot. Not. 129: 447. 1977; Romero and Carnevali, Orchid Venez., 2nd ed., 1: 182. 2000; Carnevali and Ramírez-Morillo, in Berry et al., Fl. Venez. Guayana 7: 313–314. 2003; Fernández, Orquídeas Nat. Táchira 63. 2003. *Adeneleuterophora graminifolia* Barb. Rodr., Gen. Spec. Orchid. 2: 171. 1881.

Elleanthus pusillus Schltr., Notizbl. Bot. Gart. Berlin-Dahlem 8: 117. 1922.

Elleanthus linifolius auct., non C. Presl; Dunsterville and Garay, Venez. Orchids Ill. 2: 98–99. 1961; Foldats, Fl. Venez. 15(1): 228–231, fig. 84. 1969.

Epiphytic herbs, usually erect, sometimes ascending, 10–50 cm tall. Leaf blades 3–15 × 0.1–0.4 cm. Flowers cream-colored or white. Dorsal sepal 3–3.8 mm long.

Found in Mexico, Central America, and South America (Colombia, Venezuela, the Guianas, Ecuador, Peru, Bolivia, and Brazil). Widespread in Venezuela (Amazonas, Anzoátegui, Aragua, Barinas, Bolívar, Carabobo, Miranda, Portuguesa, and Táchira; Map 154). La Divisoria de la Concepción; ~1,500 m.

MAP 154. *Elleanthus graminifolius* occurrence in Venezuela.

Mexican and Central American populations referred to *Elleanthus graminifolius* may represent a distinct species.

Elleanthus lupulinus (Lindl.) Rchb. f., Ann. Bot. Syst. 6: 483. 1861 [1863]; Foldats, Fl. Venez. 15(1): 231–233, fig. 85. 1969; Romero and Carnevali, Orchids Venez., 2nd ed., 1: 183. 2000; Fernández, Orquídeas Nat. Táchira 63. 2003; Morillo, in Morillo et al., Bot. Ecol. Monocot. Páramos Venez. 1: 132, fig. 25, foto 13. 2011. *Evelyna lupulina* Lindl., Orchid. Linden. 11. 1846.

Robust, terrestrial herbs, to 1.5 m tall. Leaf blades 15–19 × 1.7–5.3 cm. Floral bracts magenta. Flowers pinkish-purple. Dorsal sepal 15–18 mm long.

Found in South America (Colombia, Venezuela, Ecuador, and Peru). In Venezuela, recorded from the Andes (Mérida, Táchira, and Trujillo), the Cordillera de la Costa (Distrito Federal), and the Venezuelan Guayana (Bolívar; Map 155). Cloud forest and páramo near the television antennas in the Páramo de Guaramacal; 2,900–3,100 m.

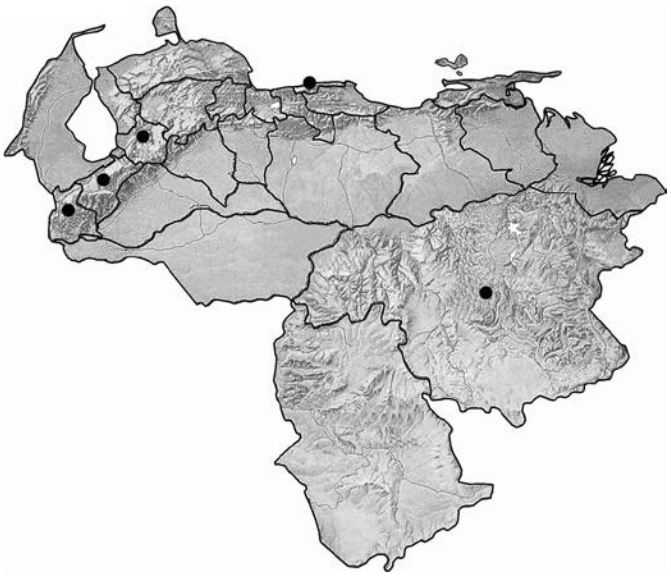
This is a robust, showy species that is easy to recognize by its long, acuminate floral bracts. *Elleanthus lupulinus* is sometimes considered to be a synonym of *E. maculatus* (Lindl.) Rchb. f., but we follow Garay (1978) in recognizing two distinct species.

Material from Peru identified as *Elleanthus lupulinus* by Bennett and Christenson (1995: t. 233) is less robust with much smaller flowers displaying a differently shaped column, and it may represent a distinct species.

Elleanthus wageneri (Rchb. f.) Rchb. f., Ann. Bot. Syst. 6: 474. 1861 [1862]; Dunsterville and Garay, Venez. Orchids Ill. 3: 80–81. 1965; Foldats, Fl. Venez. 15(1): 234–236, fig. 87. 1969; Romero and Carnevali, Orchids Venez., 2nd ed., 1: 189. 2000; Carnevali and Ramírez-Morillo, in Berry et al., Fl. Venez. Guayana 7: 315, fig. 299. 2003; Fernández, Orquídeas Nat. Táchira 64. 2003; Morillo, in Morillo et al., Bot. Ecol. Monocot. Páramos Venez. 1: 133, fig. 26, foto 14. 2011. *Evelyna wageneri* Rchb. f., Bonplandia (Hannover) 2: 21. 1854.

FIGURE 25F

Elleanthus columnaris auct., non (Lindl.) Rchb. f.; Dorr et al., Contr. U.S. Natl. Herb. 40: 49. 2000 [2001].



MAP 155. *Elleanthus lupulinus* occurrence in Venezuela.

MAP 156. *Elleanthus wageneri* occurrence in Venezuela.

Terrestrial or epiphytic herbs, 0.5–1.8 m tall. Leaf blades 12–25 × 2.5–7 cm. Floral bracts bright magenta. Flowers maroonish-brown, magenta at base. Dorsal sepal 9.5–11 mm long. Petals white flushed with magenta; labellum white with brown marks inside.

Known only from Venezuela, where it is found in the Andes (Mérida, Táchira, and Trujillo), the Cordillera de la Costa (Distrito Federal), and the Venezuelan Guayana (Bolívar) (Map 156). Park records are from cloud forest in Qda. Segovia and the area between El Campamento and Cerro El Diablo; 1,950–2,350 m.

This is a showy species superficially similar to *Elleanthus columnaris* but readily distinguished by its narrower floral bracts and fused labellar calli. *Elleanthus wageneri* also can be distinguished by its size as it has the largest leaves of all the *Elleanthus* species found in Guaramacal.

Epidendrum L.

Epidendrum L., Sp. Pl., 2nd ed., 1347. 1763, nom. cons.

Epidendropsis Garay & Dunst., in Dunsterville and Garay, Venez. Orchids Ill. 6: 39. 1976.

Kalopternix Garay & Dunst., in Dunsterville and Garay, Venez. Orchids Ill. 6: 40. 1976.

Minicolumna Brieger, in Brieger et al., Orchideen (Schlechter), 3rd ed., 8(29–32): 495. 1976, nom. illeg.

Neowilliamsia Garay, Orchid Digest 41: 20. 1977.

Takulumena Szlach., in Szlachetko et al., Orchidee (Hamburg) 57: 326. 2006.

Epiphytic, terrestrial or lithophytic herbs, to 3(–7) m tall; caespitose; sympodial or rarely monopodial; erect, creeping or scandent. Rhizomes short to elongate or absent. Stems usually cane-like, simple or branched, rarely thickened into pseudobulbs, distichously foliose or with the leaves clustered at the apex. Leaves conduplicate, occasionally terete or laterally compressed, slightly coriaceous to fleshy, sessile. Inflorescences usually terminal, sometimes axillary in leaf sheaths, rarely originating from rhizomes, 1-flowered, racemose or paniculate, sometimes umbellate; peduncles naked or sometimes completely or partially covered by spathes or imbricate bracts. Flowers resupinate or not, very variable in size and shape (sepals 1–100 mm long), most commonly green, white or yellow, but often more brightly colored, usually fleshy or subfleshy. Sepals free or rarely somewhat connate, often keeled dorsally. Petals free or rarely adnate basally to the column. Labellum completely or almost completely fused at the base to the apex of the column, free portion simple or lobed, often ornamented with calli or ridges, margins simple or fimbriate, erose or denticulate, the portion attached to the column forming a nectary tube; column usually compressed laterally; anther dorsal or subterminal, operculate, incumbent, 2- or imperfectly 4-locular; pollinaria variable, pollinia 4 or rarely 2 or 6; rostellum horizontal, slit-shaped, and rupturing longitudinally when pollinia are removed; viscidium usually well developed; stigma ventral. Ovary 1-locular. Capsules ellipsoid, pyriform or subspherical, 3-ribbed or sometimes winged, smooth or ornamented. [Epidendroideae: Epidendreae: Laeliinae.]

A subtropical and tropical American genus of ~1,500 species found in North America (USA), Mexico, Central America, the West Indies, and South America (Colombia, Venezuela, Trinidad and Tobago, the Guianas, Ecuador, Peru, Bolivia, Brazil, Paraguay, and Argentina); most diverse in the Andes. Approximately 160 species occur in Venezuela.

References. Berg et al. (2009); Dressler (1982, 1984a, 1984b); Pinheiro and Cozzolino (2013); Pridgeon et al. (2005).

In its current circumscription, *Epidendrum* is a monophyletic, albeit large, genus (Pridgeon et al., 2005). The actual number of species of *Epidendrum* is difficult to ascertain since until recently many species were very broadly circumscribed, particularly in some Andean groups such as the *E. cernuum* Kunth complex. Most species of *Epidendrum* have dull-colored flowers that are fragrant nocturnally, and they appear to be moth pollinated, whereas other species have brightly colored flowers and are likely butterfly or hummingbird pollinated.

KEY TO THE SPECIES OF *EPIDENDRUM*

1a. Stems 1-foliate or rarely 2-foliate, somewhat pseudobulbous-thickened, always composed of 1 internode; the 1 or 2 leaves apical or subapical 2
  2a. Inflorescences subumbellate, 2–8-flowered, 3–5 cm long; peduncles terete; petals narrowly lanceolate; labellum with 3 lobes of ± the same shape and size; labellum disk basally with 2 calli; leaf blades elliptic, 3–5× longer than wide . . . . . ***E. jajense***
  2b. Inflorescences racemes, many-flowered, 15–28 cm long; peduncles and sheaths winged; petals linear; labellum cordate-deltoid or shallowly 3-lobed, lateral lobes placed on the basal ½ of the labellum, perpendicular to the axis of the labellum or retrorse; labellum disk with 3 calli or keels; leaf blades linear-elliptic, ~8–15× longer than wide . . . . . ***E. attenuatum***

1b. Stems several- to many-leaved, not pseudobulbous-thickened, composed of 3 to many internodes; leaves distichous on the stem 3
  3a. Inflorescences lateral, subumbellate, several per stem, produced from the middle internodes . . . . . ***E. dendrobii***
  3b. Inflorescences terminal, racemose or paniculate, 1 per stem 4
    4a. Sympodial systems composed of long simple, erect stems that branch only at the base; leaves usually 7 or more per individual stem 5

5a. Inflorescences broadly paniculate, 2- or 3-branched 6
6a. Flowers pink or purple; labellum simple, deeply concave; dorsal sepal 5–8 mm long . . . . . ***E. frutex***
6b. Flowers white or green, labellum 3- or 4-lobed, convex, dorsal sepal ~10 mm long . . . . ***E. unguiculatum***
5b. Inflorescences simple or, if branched, then branches simple 7
7a. Leaf blades 3–8(–10) cm wide; dorsal sepal 3.5–6 cm long 8
8a. Leaf blades obovate, 6–8 cm wide, apices obtuse or rounded; leaf sheaths loosely clasping stems; labellum shallowly 3-lobed . . . . . ***E. lacustre***
8b. Leaf blades elliptic, 3–5(–10) cm wide, apices obtuse or acute; leaf sheaths tightly clasping stems; labellum sharply 3-lobed . . . . . ***E. leucochilum***
7b. Leaf blades 1–2.5 cm wide; dorsal sepal 0.5–1 cm long 9
9a. Inflorescences nutant, dense racemes; flowers opening ± simultaneously; rachises much longer than peduncles; labellar margins entire; calli 2; flowers greenish, yellowish or dull orange, sometimes with pink or purplish tinges 10
10a. Plants stout, mostly terrestrial; stems >1 m tall, at least 1 cm in diameter at base (in herbarium specimens); spathes 15–20 cm long; dorsal sepal 11–16 mm long; lateral sepals not or very shallowly keeled dorsally; central lobe of labellum oblong, obtuse, truncate or rounded, 3-keeled longitudinally . . . . . ***E. klotzscheanum***
10b. Plants less robust, usually epiphytic or less commonly terrestrial; stems <1 m tall, <0.5 cm in diameter at base (in herbarium specimens); spathes 5–9 cm long; dorsal sepal 7–9(15.5) mm long; lateral sepals sharply keeled dorsally; central lobe of labellum narrowly triangular, acute, not keeled . . . . . ***E. alpicola***
9b. Inflorescences erect, dense subumbels; flowers opening successively; occasionally branched and then the branches simple and originating from the peduncle below and chronologically posterior to the first inflorescence; rachises much shorter than peduncles; labellar margins fimbriate or laciniate 11
11a. Flowers not resupinate; callosity complex, composed of several tubercles and lamellae; flowers white or pale yellow (our material), pink or purple . . . . . ***E. secundum***
11b. Flowers resupinate; callosity simple, composed of 3 keels, central keel much longer than lateral keels; flowers orange, red, scarlet, yellow or white . . . . . ***E. ibaguense***
4b. Sympodial systems composed of stems that branch above the base, plants often shrub-like; leaves usually 7 or fewer per individual stem 12
12a. Many-branched, creeping or pendent plants; leaf blades 3–5 cm × 2–6 mm; inflorescences sessile or almost sessile, 1-flowered; labellum deeply concave . . . . . ***E. repens***
12b. Sparingly branched, usually erect plants, if pendent, then inflorescences multiflowered; leaf blades >4 cm × (4–)6–20(–25) mm (if shorter, then inflorescences subumbellate and, if narrower, then at least 5 cm long); inflorescences pedunculate (if peduncles almost absent, then flowers several); labellum concave or convex 13
13a. Rachises of inflorescences entirely covered by imbricate floral bracts; ovary pedicellate, partially enveloped by floral bracts 14
14a. Inflorescences much shorter than apical leaves, successively 2–4-flowered; leaf blades 12–25 mm wide; dorsal sepal 16–18 mm long; petals spathulate, ± as wide as sepals; labellum simple, suborbicular-cordate . . . . . ***E. cereiflorum***
14b. Inflorescences as long as or longer than apical leaves, simultaneously 6–9-flowered; leaf blades 3–8 mm wide; dorsal sepal 4–6 mm long; petals filiform, much narrower than sepals; labellum deeply 3-lobed . . . . . ***E. andinum***
13b. Rachises of inflorescences naked or floral bracts not imbricate; ovary pedicellate, not enveloped by floral bracts 15
15a. Sepals ~5 mm long, apically apiculate, not winged 16
16a. Inflorescences racemose or with 1 or 2 basal branches; floral bracts ~½ as long as pedicellate ovaries or longer; leaf blades 4–8 cm long; labellum deeply concave with entire margins; pedicellate ovaries smooth; petals filiform, much narrower than sepals; sepals lanceolate . . . . . ***E. guaramacalense***
16b. Inflorescences subumbellate; floral bracts much shorter than pedicellate ovaries; leaf blades 2–6 cm long; labellum flat or concave with margins finely erose; pedicellate ovaries verruculose; petals elliptic, ± as wide as sepals; sepals ovate or ovate-elliptic . . . . . ***E. caesaris***
15b. Sepals ≥5 mm long, terminating or not in a winged dorsal keel 17
17a. Racemes strictly erect, much longer than subtending leaves; flowers not resupinate; labellum concave, ovate-triangular, obtuse 18

18a. Flowers pale lavender or purplish; floral bracts 5–7 mm long; inflorescences dense with internodes of rachises much shorter than floral pedicels; stems 8–12 mm in diameter . . . . . ***E.* sp. B**

18b. Flowers greenish-white with some purple on labellum; floral bracts 9–18 mm long; inflorescences less dense with internodes of rachises longer than floral pedicels; stems 5–7 mm in diameter . . . . . ***E.* sp. A**

17b. Racemes suberect or pendent, shorter to ± as long as subtending leaves; flowers resupinate (or when morphologically not resupinate, then presented in a natural position with the labellum lowermost because of the pendulous nature of the inflorescence); labellum convex or flat, subquadrate to broadly oblong 19

19a. Labellum wider than long, lateral lobes larger than middle lobe, orbicular, middle lobe conspicuously emarginate . . . . . ***E. curtisii***

19b. Labellum ± as wide as long, lateral lobes smaller than middle lobe, trapezoidal or rounded, middle lobe apiculate or entire, not emarginate 20

20a. Inflorescences densely 8–20(–40)-flowered, arching or pendent . . . . . ***E. pseudocernuum***

20b. Inflorescences laxly 1–6-flowered, erect to arching 21

21a. Petals more than 3× as long as wide; leaf blades 0.7–2 cm wide 22

22a. Sepals conspicuously carinate-winged dorsally; inflorescences 1–3(–5)-flowered . . . . . ***E. urichianum***

22b. Sepals not carinate-winged dorsally; inflorescences 4–6-flowered . . . . . ***E.* sp. C**

21b. Petals less than 3× as long as wide; leaf blades 1.7–3.5 cm wide . . . . . ***E. chioneoides***

Epidendrum alpicola Rchb. f., Bonplandia (Hannover) 2: 110. 1854 ("*alpicolum*"); Foldats, Fl. Venez. 15(3): 171–172. 1970 ("*alpicolum*"); Dunsterville and Garay, Venez. Orchids Ill. 6: 116–117. 1976 ("*alpicolum*"); Romero and Carnevali, Orchids Venez., 2nd ed., 1: 205. 2000 ("*alpicolum*"); Fernández, Orquídeas Nat. Táchira 68. 2003 ("*alpicolum*").

Epiphytic or rarely terrestrial herbs; stems 50–70 cm tall. Leaf blades 8–15(–20) × 0.9–2.5 cm, apices acute. Inflorescences nutant, 10–15 cm long. Flowers resupinate, pale dull orange. Dorsal sepal 7–9(–15.5) mm long.

Found in South America (Colombia, Venezuela, Ecuador, and Peru). In Venezuela, the species has a disjunct distribution with records from the Andes (Mérida, Táchira, and Trujillo) and the Venezuelan Guayana (Amazonas; Map 157). In the park, found on the north slope along the Boconó–Guaramacal road; 2,200 m.

♦ ***Epidendrum andinum*** Carnevali & G. A. Romero, in Romero and Carnevali, Orchids Venez., 2nd ed., 3: 1131. 2000 (description); ibid., 2nd ed., 1: 209. 2000 (illustration); Fernández, Orquídeas Nat. Táchira 68. 2003.

Epidendrum bifarium auct., non Sw.; Dunsterville and Garay, Venez. Orchids Ill. 3: 84–85. 1965; Foldats, Fl. Venez. 15(3): 179–181, fig. 442. 1970; Ortega et al., BioLlania 5: 47. 1987; Dorr et al., Contr. U.S. Natl. Herb. 40: 49. 2000 [2001].

Epiphytic herbs, pendent or arching; stems 15–35 cm long. Leaf blades narrowly lanceolate, 2–7 cm × 3–8 mm, apices acute. Inflorescences pendent, 6–10-flowered. Flowers simultaneous;

MAP 157. *Epidendrum alpicola* occurrence in Venezuela.

MAP 158. *Epidendrum andinum* occurrence in Venezuela.

perianth segments spreading, yellow, translucent yellow or yellowish-green with maroon tinges. Dorsal sepal 4–6 mm long.

Found in South America (Colombia and Venezuela). In Venezuela, only known from the Andes (Táchira and Trujillo; Map 158). Cloud forest along the Boconó–Guaramacal road and on the north slope of Guaramacal; 1,800–2,600 m.

This species is well characterized by its elongated inflorescences with a zigzag rachis completely obscured by floral bracts. It is closely related to *Epidendrum bifarium* Sw. from Jamaica, but *E. andinum* has smaller flowers, and the midlobe of the labellum is not 2-lobed.

Epidendrum attenuatum Lindl., Fol. Orchid. 3: Epidendrum 41. 1853, non Lindl., Fol. Orchid. 3: Epidendrum 69. 1853; Dunsterville and Garay, Venez. Orchids Ill. 4: 76–77. 1966; Foldats, Fl. Venez. 15(3): 176–179, fig. 441. 1970; Romero and Carnevali, Orchids Venez., 2nd ed., 1: 212. 2000; Carnevali and Ramírez-Morillo, in Berry et al., Fl. Venez. Guayana 7: 334. 2003; Fernández, Orquídeas Nat. Táchira 70. 2003; Morillo, in Morillo et al., Bot. Ecol. Monocot. Páramos Venez. 1: 135–136, fig. 27. 2011.

Epiphytic herbs; stems to 30 cm tall; pseudobulbs present. Leaf blades linear-elliptic, 4–12 × 0.3–0.7 cm, apices acute. Inflorescences erect or arching, many-flowered, 15–28 cm long. Perianth segments widely spreading or subreflexed, green or yellow-green. Sepals 6–7.5 mm long.

Found in South America (Venezuela and Ecuador). Fairly widespread in Venezuela, occurring in the Andes (Mérida, Táchira, and Trujillo), the Cordillera de la Costa (Distrito Federal and Miranda), and the Venezuelan Guayana (Bolívar; Map 159). Cloud forest along the Boconó–Guaramacal road; 2,000–3,000 m.

Epidendrum attenuatum is easy to recognize because of its 1- or 2-leaved pseudobulbs and elongated racemose inflorescences.

Epidendrum caesaris Hágsater & E. Santiago, Icon. Orchid. (Mexico) 9(6): t. 915. 2007; Morillo, in Morillo et al., Bot. Ecol. Monocot. Páramos Venez. 1: 136–137, fig. 28. 2011.

Epidendrum globiflorum auct., non F. Lehm. & Kraenzl.; Foldats, Fl. Venez. 15(3): 262–264, fig. 265. 1970; Ortega et al., BioLlania 5: 47. 1987.

Epidendrum restrepoanum auct., non A. D. Hawkes; Dunsterville and Garay, Venez. Orchids Ill. 4: 98–99. 1966; Romero and Carnevali, Orchids Venez., 2nd ed., 1: 289. 2000; Dorr et al., Contr. U.S. Natl. Herb. 40: 50. 2000 [2001]; Fernández, Orquídeas Nat. Táchira 89. 2003.

Epiphytic or subterrestrial herbs; stems 20–30 cm tall. Leaf blades narrowly lanceolate, 2–6 cm × 4–11 mm, apices emarginate. Inflorescences subumbellate, few-flowered. Flowers subcampanulate, yellow or brownish with pinkish tinges. Dorsal sepal 5–7 mm long.

Found in South America (Colombia and Venezuela). In Venezuela, restricted to the Andes (Lara, Mérida, Táchira, and Trujillo; Map 160). Cloud forest, subpáramo, and páramo especially on the north slope of Guaramacal; 2,200–3,000 m.

This species has been confused with *Epidendrum globiflorum* F. Lehm. & Kraenzl., which is endemic to Ecuador, and with *E. restrepoanum* A. D. Hawkes, which occurs in Colombia, Venezuela, and Ecuador. *Epidendrum caesaris* and *E. restrepoanum* are sympatric (Hágsater and Santiago, 2007) but not so far as we know in Guaramacal. According to Hágsater and Santiago (2007), *E. caesaris* can be distinguished from *E. restrepoanum* by flower color. The former has translucent pale pink flowers with the base of the sepals and petals yellow (similar to our material), whereas the latter has scarlet red flowers with a yellow labellum and column.

MAP 159. *Epidendrum attenuatum* occurrence in Venezuela.

MAP 160. *Epidendrum caesaris* occurrence in Venezuela.

MAP 161. *Epidendrum cereiflorum* occurrence in Venezuela.

MAP 162. *Epidendrum chioneoides* occurrence in Venezuela.

Epidendrum cereiflorum Garay & Dunst., in Dunsterville and Garay, Venez. Orchids Ill. 3: 88. 1965; Foldats, Fl. Venez. 15(3): 188–190, fig. 445. 1970; Romero and Carnevali, Orchids Venez., 2nd ed., 1: 218. 2000; Fernández, Orquídeas Nat. Táchira 72. 2003.

Epiphytic herbs, straggling or creeping; stems to 1.2 m long. Leaf blades 5–15 cm × 12–25 mm, apices acute to acuminate. Inflorescences 2–4-flowered, 5–7 cm long. Flowers successive, green. Dorsal sepal 16–18 mm long.

Endemic to Venezuela, where it is found in the Andes (Lara, Portuguesa, Táchira, and Trujillo) and in the Cordillera de la Costa (Distrito Federal and Miranda; Map 161). Cloud forest along the Boconó–Guaramacal road; ~2,000 m.

Epidendrum chioneoides Carnevali & G. A. Romero, in Romero and Carnevali, Orchids Venez., 2nd ed., 3: 1131. 2000 (description); ibid., 2nd ed., 1: 220. 2000 (illustration); Morillo, in Morillo et al., Bot. Ecol. Monocot. Páramos Venez. 1: 139–140, fig. 30. 2011.

Epidendrum mojandae auct., non Schltr.; Dunsterville and Garay, Venez. Orchids Ill. 1: 120–121. 1959 ("*moyandae*"); Foldats, Fl. Venez. 15(3): 318–319, fig. 498. 1970, pro parte, excluding type & fig. 498; Dunsterville and Garay, Orchids Venez., ed. 1, 1: 258. 1979 ("*moyandae*").

Terrestrial herbs; stems to 70 cm long. Leaf blades lanceolate, 4.5–5.5 cm × 17–35 mm, apices blunt to acute. Inflorescences erect to arching, few-flowered. Flowers yellow. Sepals 8–11 mm long.

Endemic to Venezuela, where it is found in the Cordillera de Mérida (Trujillo) and in the Cordillera de la Costa (Distrito Federal; Map 162). Fire-induced páramo below the Páramo del Pumar and along the track from El Campamento to Qda. Honda; 1,900–2,600 m.

Epidendrum curtisii A. D. Hawkes, Orquídea (Rio de Janeiro) 18: 170. 1957; Romero and Carnevali, Orchids Venez., 2nd ed., 1: 232. 2000, nom. nov. *Epidendrum lansbergii* Rchb. f., Ned. Kruidk. Arch. 4: 316. 1859, non Regel, 1855.

Epidendrum superpositum Garay, Bot. Mus. Leafl. 18: 203, t. 38. 1958; Dunsterville and Garay, Venez. Orchids Ill. 1: 136–137. 1959; Foldats, Fl. Venez. 15(3): 415–416, fig. 537. 1970.

Epiphytic herbs; stems to 15–40 cm tall. Leaf blades 2.6–7 × 0.8–1.8 cm, apices acute. Inflorescences suberect or pendent,

MAP 163. *Epidendrum curtisii* occurrence in Venezuela.

5–15-flowered. Flowers resupinate, green, suffused on back with light maroon. Dorsal sepal 8–10.5 mm long.

Endemic to Venezuela, where it is found in the Cordillera de Mérida (Trujillo) and in the Cordillera de la Costa (Aragua, Distrito Federal, and Miranda; Map 163). Collected once between Boconó and Batatal; 1,800 m.

Epidendrum dendrobii Rchb. f., Linnaea 22: 841. 1849; Dunsterville and Garay, Venez. Orchids Ill. 5: 82–83. 1972; Foldats, Fl. Venez. 15(3): 226–228, fig. 461. 1970; Romero and Carnevali, Orchids Venez., 2nd ed., 1: 234. 2000; Fernández, Orquídeas Nat. Táchira 74. 2003.

Epidendrum pileatum Rchb. f., Bonplandia (Hannover) 3: 68. 1855.

Terrestrial herbs; stems 0.5–2.5 m tall. Leaf blades narrowly lanceolate, 9–16 × 0.8–2.7 cm, apices attenuate. Inflorescences lateral, subumbellate, few-flowered. Flowers green, several opening simultaneously. Dorsal sepal 7–9 mm long.

Found in South America (Colombia, Venezuela, Ecuador, Peru, and Bolivia). In Venezuela, restricted to the Andes (Mérida, Táchira, and Trujillo; Map 164). In the park, found in forest in Qda. Jirajara on the south slope of Guaramacal; 1,900–2,900 m.

When encountered, *Epidendrum dendrobii* makes an attractive display on road cuts and often attains fairly large dimensions vegetatively. It is found at much lower elevations (700 m) in Ecuador than it is in Colombia and Venezuela (1,700–2,900 m).

The flowers of this species are spicily fragrant at night, suggesting moth (or bat?) pollination.

Epidendrum frutex Rchb. f., Xenia Orchid. 1: 95, t. 37. 1855; Foldats, Fl. Venez. 15(3): 255–257. 1970, pro parte, excluding fig. 471; Dunsterville and Garay, Venez. Orchids Ill. 6: 124–125. 1976; Morillo, in Morillo et al., Bot. Ecol. Monocot. Páramos Venez. 1: 147. 2011.

MAP 164. *Epidendrum dendrobii* occurrence in Venezuela.

MAP 165. *Epidendrum frutex* occurrence in Venezuela.

Epidendrum frigidum auct., non Linden ex Lindl.; Romero and Carnevali, Orchids Venez., 2nd ed., 1: 242. 2000.

Terrestrial herbs; stems robust, erect, 1–3 m tall. Leaf blades narrowly lanceolate, 10–20 × 0.8–3 cm, apices acute. Inflorescences large, broadly paniculate, 2- or 3-branched, pendent. Flowers campanulate, opening in slow succession on the branches of the panicle, pale pinkish-purple to dull purple. Dorsal sepal 6–9 mm long.

Found in South America (Colombia, Venezuela, Ecuador, and Peru). In Venezuela, this species occurs in the Andes (Táchira and Trujillo) and in the Sierra de Perijá (Zulia; Map 165). In the park, found in subpáramo and páramo on both slopes of Guaramacal; 2,800–3,100 m.

This is a large species commonly found in páramo and subpáramo in the northern Andes. It is easily recognized by its 2- or 3-pinnate, pendent panicles of pinkish or purplish flowers.

♦ ***Epidendrum guaramacalense*** Hágsater, Icon. Orchid. (Mexico) 7(4): t. 740. 2004; Morillo, in Morillo et al., Bot. Ecol. Monocot. Páramos Venez. 1: 147–148. 2011.

Epidendrum aymardiorum Carnevali & I. Ramírez, nom. nud., in sched.; Dorr et al., Contr. U.S. Natl. Herb. 40: 49. 2000 [2001].

Terrestrial herbs; stems to 50 cm tall. Leaf blades lanceolate, 4–8 cm × 5–8 mm, apices acuminate. Inflorescences racemes with 1 or 2 basal branches, arched, few-flowered, to 3.7 cm long. Flowers campanulate, light green or yellow. Sepals 4.5–5 mm long.

Endemic to the Andes of Venezuela, where it is known only from the Cordillera de Mérida (Portuguesa and Trujillo; Map 166). Found in subpáramo on the Boconó–Guaramacal road and in disturbed páramo below Páramo del Pumar; 1,950–3,000 m.

MAP 166. *Epidendrum guaramacalense* occurrence in Venezuela.

This species belongs in the taxonomically difficult *Epidendrum elleanthoides* Schltr. complex. *Epidendrum guaramacalense* can be recognized within this group by stems that branch above midheight, relatively large leaf blades, and relatively long linear or linear-elliptic floral bracts.

Epidendrum ibaguense Kunth, in H. B. K., Nov. Gen. Sp. [fol.] 1: 282. 1815 [1816]; ibid. [qu.] 1: 352. 1815 [1816] ("*ybaguense*"); Dunsterville and Garay; Venez. Orchids Ill. 2: 96, 97, 128–129. 1961; Foldats, Fl. Venez. 15(3): 277–279. 1970; Carnevali and G. Romero, Orchids Venez., 2nd ed., 1: 246. 2000; Carnevali and Ramírez-Morillo, in Berry et al., Fl. Venez. Guayana 7: 338, fig. 325. 2003; Fernández, Orquídeas Nat. Táchira 80. 2003.

Terrestrial or lithophytic, rarely epiphytic herbs; stems erect or pendulous, to 1 m long. Leaf blades oblong-elliptic, 1.5–16 × 0.6–5.6 cm, apices rounded to obtuse. Inflorescences erect, to 70 cm long. Flowers resupinate, orange, red, scarlet, yellow or white. Sepals 7–22 mm long.

Found in Mexico, Central America, and South America (Colombia, Venezuela, Guyana, French Guiana, Peru, Bolivia, and Brazil). Widespread in Venezuela (Amazonas, Aragua, Bolívar, Falcón, Lara, Mérida, Táchira, Trujillo, and Zulia; Map 167). Found below the lower boundary of the park on the north slope in Qda. Chandá, but probably present within the boundaries of the park; 1,350 m.

Epidendrum jajense Rchb. f., Bonplandia (Hannover) 2: 20. 1854; Foldats, Fl. Venez. 15(3): 289–290. 1970; Dunsterville and Garay, Venez. Orchids Ill. 6: 130–131. 1976; Romero and Carnevali, Orchids Venez., 2nd ed., 1: 250. 2000; Fernández, Orquídeas Nat. Táchira 82. 2003.

Epidendrum breviracemum C. Schweinf., Bot. Mus. Leafl. 15: 139, t. 41. 1952.

Epiphytic herbs; stems 5–12 cm tall; pseudobulbs present. Leaf blades elliptic, 4.5–8 × ~1.3 cm, apices acute or subacute. Inflorescences subumbellate, 2–8-flowered, 3–5 cm long. Flowers with widely spreading segments, yellow-green. Dorsal sepal 10–15 mm long.

Found in South America (Colombia, Venezuela, Ecuador, Peru, and Bolivia). Venezuelan material is from the Andes (Lara, Mérida, Táchira, and Trujillo; Map 168). Cloud forest on the north slope of Guaramacal; 2,100 m.

MAP 167. *Epidendrum ibaguense* occurrence in Venezuela.

MAP 168. *Epidendrum jajense* occurrence in Venezuela.

This is an interesting species characterized by its apically 1-leaved, thinly fusiform stems and subumbellate inflorescences. *Epidendrum jajense* resembles some species of *Pleurothallis* or species of *Prosthechea* Knowles & Westc.

Epidendrum jajense typically turns a distinctive black color when material is pressed and dried for the herbarium.

Epidendrum klotzscheanum Rchb. f., Linnaea 22: 838. 1849; Dunsterville and Garay, Venez. Orchids Ill. 3: 102–103. 1965; Foldats, Fl. Venez. 15(3): 292–295, fig. 486. 1970; Romero and Carnevali, Orchids Venez., 2nd ed., 1: 251. 2000; Carnevali and Ramírez-Morillo, in Berry et al., Fl. Venez. Guayana 7: 338–339. 2003; Morillo, in Morillo et al., Bot. Ecol. Monocot. Páramos Venez. 1: 150–152, fig. 37, foto 19. 2011.

Terrestrial herbs; stems 1.5–3 m tall. Leaf blades oblong or oblong-lanceolate, 9–25 × 1.6–4 cm, apices acute or obtuse. Inflorescences nutant, densely many-flowered. Flowers with widely spreading perianth segments, creamy green, often with pink or purplish tinges. Dorsal sepal 11–16 mm long.

Found in South America (Colombia, Venezuela, Ecuador, and Brazil). In Venezuela, found in the Andes (Lara, Mérida, Táchira, and Trujillo), the Cordillera de la Costa (Anzoátegui, Aragua, Distrito Federal, and Sucre), and the Venezuelan Guayana (Amazonas; Map 169). On road cuts in cloud forest on the south slope of Guaramacal; 1,800–3,000 m.

Epidendrum lacustre Lindl., Fol. Orchid. 3: Epidendrum 50. 1853; Dunsterville and Garay, Venez. Orchids Ill. 5: 92–93. 1972; Foldats, Fl. Venez. 15(3): 295–297, fig. 487. 1970; Romero and Carnevali, Orchids Venez., 2nd ed., 1: 252. 2000; Fernández, Orquídeas Nat. Táchira 83. 2003.

MAP 169. *Epidendrum klotzscheanum* occurrence in Venezuela.

MAP 170. *Epidendrum lacustre* occurrence in Venezuela.

Terrestrial or epiphytic herbs; stems erect, to 1.2 m tall. Leaf blades obovate, 20–25 × 6–8 cm, apices obtuse or rounded. Inflorescences erect, lax, to 40 cm long; spathe subtending inflorescences 10–15 cm long. Flowers white. Sepals 3.5–6 cm long.

Found in Central America and South America (Colombia, Venezuela, Ecuador, and Peru). In Venezuela, confined to the Andes (Mérida, Táchira, and Trujillo; Map 170). Found between El Campamento below Cerro El Diablo and Maciegal; 1,800 m.

Carnevali et al. in Hokche et al. (2008) stated that this species was endemic to Venezuela, but that is not the case.

Epidendrum leucochilum Link et al., Allg. Gartenzeitung 11: 145. 1843; Dunsterville and Garay, Venez. Orchids Ill. 1: 114–115. 1959; Foldats, Fl. Venez. 15(3): 301–304, fig. 490. 1970; Dunsterville and Garay, Orchids Venez., ed. 1, 1: 246. 1979; Carnevali and Ramírez-Morillo, in Berry et al., Fl. Venez. Guayana 7: 339. 2003; Fernández, Orquídeas Nat. Táchira 84. 2003; Llamozas et al., Libro Rojo Fl. Venez. 418. 2003.

Epidendrum longiflorum Kunth, in H. B. K., Nov. Gen. Sp. [fol.] 1: 284. 1815 [1816]; ibid. [qu.] 1: 354. 1815 [1816], non J. Koenig, 1791; Romero and Carnevali, Orchids Venez., 2nd ed., 1: 255. 2000; Dorr et al., Contr. U.S. Natl. Herb. 40: 50. 2000 [2001].

Epiphytic or terrestrial herbs; stems erect, 60–120 cm tall. Leaf blades elliptic, 10–15(–30) × 3–5(–10) cm, apices obtuse or acute. Inflorescences erect, lax, 3–7(–12 or more)-flowered. Flowers resupinate, simultaneous. Sepals 4.5–5.5 cm long.

Found in South America (Colombia, Venezuela, and Ecuador). In Venezuela, known from the Andes (Barinas, Lara, Mérida, Táchira, and Trujillo), the Sierra de Perijá (Zulia), and

MAP 171. *Epidendrum leucochilum* occurrence in Venezuela.

MAP 172. *Epidendrum pseudocernuum* occurrence in Venezuela.

the Cordillera de la Costa (Aragua and Distrito Federal; Map 171). Laguna de Aguas Negras; 1,900 m.

There is a doubtful record of this species occurring in the Venezuelan Guayana (Carnevali and Ramírez-Morillo in Berry et al., 2003: 339). The record is not mapped here as it is based on suspect locality data associated with a living collection cultivated in Mexico.

♦ ***Epidendrum pseudocernuum*** Carnevali & I. Ramírez, Harvard Pap. Bot. 3: 241, fig. 1. 1998; Romero and Carnevali, Orchids Venez., 2nd ed., 1: 280. 2000; Fernández, Orquídeas Nat. Táchira 88. 2003; Morillo, in Morillo et al., Bot. Ecol. Monocot. Páramos Venez. 1: 159, fig. 42, foto 27. 2011.

Epidendrum cernuum auct., non Kunth; Dunsterville and Garay, Venez. Orchids Ill. 3: 90–91. 1965; Foldats, Fl. Venez. 15(3): 190–192, fig. 446. 1970; Ortega et al., BioLlania 5: 47. 1987; Dorr et al., Contr. U.S. Natl. Herb. 40: 49. 2000 [2001].

Terrestrial or epiphytic herbs; stems 0.5–1 m tall. Leaf blades oblong, 4.5–11 × 1–2.5 cm, apices obtuse. Inflorescences arching or pendent, 8–20(–40)-flowered. Flowers with widely spreading perianth segments, pale green or creamy white. Dorsal sepal 12–14 mm long.

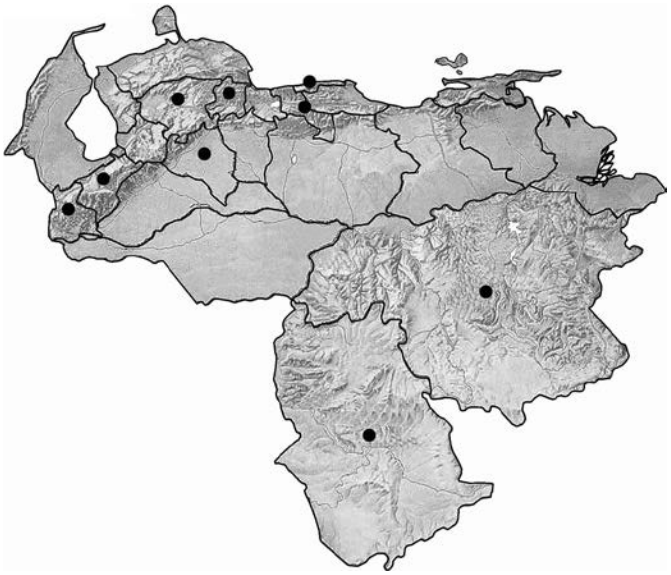
Endemic to the Andes of Venezuela (Barinas, Mérida, Táchira, and Trujillo; Map 172). Cloud or elfin forest and páramo, often on steep road cuts but certainly also as an epiphyte, both slopes of Guaramacal and in the Páramo de Guaramacal; 2,000–3,100 m.

Epidendrum pseudocernuum is one of several closely related taxa in the *E. cernuum* species complex. Within the complex, our species is characterized by the oblong, truncate central lobe of the labellum that has a subapical apiculate tooth and relatively small, reniform or transversely ovate, falcate lateral lobes placed in a basal position. *Epidendrum cernuum* s. str. has an acuminate, proportionally narrower central lobe of the labellum; it is also a taxon from the western slopes of the Andes in Colombia and Ecuador. The two populations currently assigned to *E. pseudocernuum* are somewhat variable in flower size, the degree to which the lateral sepals are subapically keeled, and subtle details of the shape of the lateral lobes, but for both populations the central lobe is consistent in shape and general morphology. A thorough revision of the *E. cernuum* complex is warranted.

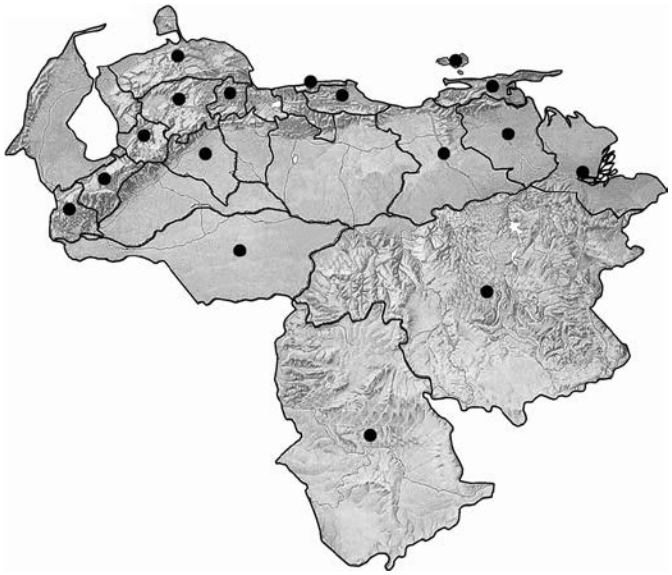
Epidendrum repens Cogn., Repert. Spec. Nov. Regni Veg. 7: 122. 1909; Dunsterville and Garay, Venez. Orchids Ill. 4: 96–97. 1966; Foldats, Fl. Venez. 15(3): 365–366, fig. 515. 1970; Romero and Carnevali, Orchids Venez., 2nd ed., 1: 288. 2000; Carnevali and Ramírez-Morillo, in Berry et al., Fl. Venez. Guayana 7: 342. 2003.

Small, epiphytic, pendulous or creeping herbs; stems to 60 cm long. Leaf blades linear-oblong, 3–5 cm × 2–6 mm, apices obtuse. Inflorescences 1-flowered, sessile or almost sessile. Flowers solitary in apices of branches, green or cream-colored. Sepals 8–13 mm long.

Found in Mexico, Central America, the Greater Antilles, and South America (Colombia, Venezuela, Guyana, Ecuador, Peru, and Bolivia). In Venezuela, known from the Andes (Lara, Mérida, Portuguesa, and Táchira), the Cordillera de la Costa (Aragua, Distrito Federal, and Yaracuy), and the Venezuelan Guayana (Amazonas and Bolívar; Map 173). La Divisoria de la Concepción; 1,700 m.



MAP 173. *Epidendrum repens* occurrence in Venezuela.



MAP 174. *Epidendrum secundum* occurrence in Venezuela.

Epidendrum secundum Jacq., Enum. Syst. Pl. 29. 1760; Foldats, Fl. Venez. 15(3): 391–395, fig. 527. 1970; Romero and Carnevali, Orchids Venez., 2nd ed., 1: 295. 2000; Carnevali and Ramírez-Morillo, in Berry et al., Fl. Venez. Guayana 7: 342–343, fig. 326. 2003; Fernández, Orquídeas Nat. Táchira 92. 2003.

FIGURE 25I

Terrestrial or rarely epiphytic herbs; stems 0.5–2.5 m tall. Leaf blades elliptic, 5–9 × 1.5–2.5 cm, apices obtuse, retuse or emarginate. Inflorescences erect, densely many- to few-flowered. Flowers not resupinate; petals and sepals widely spreading or reflexed, white with a bright yellow labellum or pale yellow. Dorsal sepal 9–11 mm long.

Found in Mexico, Central America, the Lesser Antilles, and South America (Colombia, Venezuela, Trinidad and Tobago, Guyana, Ecuador, Peru, Bolivia, Brazil, and Paraguay). Widespread in Venezuela (Amazonas, Anzoátegui, Apure, Bolívar, Delta Amacuro, Distrito Federal, Falcón, Lara, Mérida, Miranda, Monagas, Nueva Esparta, Portuguesa, Sucre, Táchira, Trujillo, and Yaracuy; Map 174). On road and trail cuts on both slopes of Guaramacal; 1,700–2,100(–3,000) m.

Our material belongs to an entity within the *Epidendrum secundum* complex characterized by narrow, reflexed, white perianth segments and a relatively narrow labellum with an irregularly erose or paucidentate apex. The labellum in this species is provided with a relatively small callus, and the keels and grooves of this callus are shallow and have smooth surfaces. This entity is apparently rare in cloud forest of the Cordillera de la Costa and Andean portions of Venezuela, usually occurring as an epiphyte, but its distribution outside Venezuela as well as its identity are difficult to ascertain because of confusion in the taxonomy of the *E. secundum* complex.

Epidendrum secundum is visited by butterflies in South America, which are presumed to be its principal pollinators (Pansarin and Amaral, 2008).

We consider *Epidendrum secundum* sensu Dunsterville and Garay (1966: 74, 1976: 40) to be *E. anceps* Jacq., a distinct species not found in the Venezuelan Andes.

Epidendrum unguiculatum (C. Schweinf.) Garay & Dunst., in Dunsterville and Garay, Venez. Orchids Ill. 6: 38. 1976; Romero and Carnevali, Orchids Venez., 2nd ed., 1: 314. 2000; Carnevali and Ramírez-Morillo, in Berry et al., Fl. Venez. Guayana 7: 344. 2003; Fernández, Orquídeas Nat. Táchira 98. 2003. *Epidendrum paniculatum* var. *unguiculatum* C. Schweinf., Bot. Mus. Leafl. 11: 107. 1943.

Epidendrum paniculatum auct., non Ruiz & Pav.; Foldats, Fl. Venez. 15(3): 332–335, fig. 503. 1970, pro parte.

Epidendrum fastigiatum auct., non Lindl.; Dunsterville and Garay, Venez. Orchids Ill. 2: 118–119. 1961.

Epiphytic or terrestrial herbs; stems to 1 m tall. Leaf blades elliptic-ovate, 10–14 × 3–4.5 cm, apices acute to acuminate. Inflorescences broadly paniculate, 2- or 3-flowered, exceeding the leaves in size. Perianth segments bright green, labellum white with callus and disk purple. Dorsal sepal 12–15 mm long.

Found in South America (Colombia, Venezuela, Suriname, French Guiana, Ecuador, Peru, and Brazil). In Venezuela, collections have been made in Amazonas, Apure, Falcón, Mérida, Miranda, Monagas, Táchira, and Trujillo (Map 175). Our records

MAP 175. *Epidendrum unguiculatum* occurrence in Venezuela.

are from Qda. Segovia and Qda. Honda in sector El Santuario; 1,800–2,350 m.

Epidendrum urichianum Carnevali et al., Orquídea (Mexico City), ser. 2, 12: 151, figs. 1992; Romero and Carnevali, Orchids Venez., 2nd ed., 1: 315. 2000.

Epiphytic herbs; stems to 30 cm long. Leaf blades narrowly oblong-elliptic to elliptic, 3.8–4.7 × 0.8–1.2 cm, apices rounded to obtuse. Inflorescences erect, 1–3(–5)-flowered. Flowers pale green or yellow, sometimes suffused with pale lavender. Dorsal sepal 7–7.5 mm long.

Found in South America (Venezuela and Guyana). In Venezuela, found in the Cordillera de Mérida (Portuguesa) and the Venezuelan Guayana (Amazonas and Bolívar; Map 176). Cloud forest near La Divisoria de la Concepción; 1,700 m.

Our record is based on an identification by Hágsater (in sched.) of a specimen (*van der Werff et al. 7593*, MO) collected in the park. The specimen clearly belongs in the *Epidendrum ramosum* Jacq. species complex, as does *E. urichianum* (described from the Venezuelan Guayana), but we are not altogether convinced that our material and the few specimens known from the Venezuelan Guayana are identical. Resolution of this problem will require further study as *E. ramosum* s.l. is polymorphic and one of the most widespread and common of all neotropical orchids.

***Epidendrum* sp. A**

Epidendrum macrostachyum auct., non Lindl.; Ortega et al., BioLlania 5: 47. 1987; Dorr et al., Contr. U.S. Natl. Herb. 40: 50. 2000 [2001], pro parte.

Terrestrial herbs; stems to 50 cm tall. Leaf blades lanceolate to narrowly ovate, 12–15 × 1.2–1.9 cm, apices obtuse. Inflorescences erect, many-flowered, to 15 cm long. Flowers campanulate, greenish-white with purple on labellum. Sepals 7.5–8.5 mm long.

Evidently endemic to the Cordillera de Mérida of Venezuela (Trujillo; Map 177). Cloud forest below the Páramo de Guaramacal; ~1,500–2,600 m.

This undescribed species belongs to the difficult *Epidendrum macrostachyum* Lindl. complex. Its long floral bracts distinguish it from other Venezuelan taxa belonging to this complex.

MAP 176. *Epidendrum urichianum* occurrence in Venezuela.

MAP 177. *Epidendrum* sp. A occurrence in Venezuela.

MAP 178. *Epidendrum* sp. B occurrence in Venezuela.

MAP 179. *Epidendrum* sp. C occurrence in Venezuela.

***Epidendrum* sp. B**

Epidendrum macrostachyum auct., non Lindl.; Dorr et al., Contr. U.S. Natl. Herb. 40: 50. 2000 [2001], pro parte.

Epidendrum obovatipetalum auct., non Hágsater & Dodson; Dorr et al., Contr. U.S. Natl. Herb. 40: 50. 2000 [2001].

Terrestrial herbs; stems 60–100 cm tall. Leaf blades lanceolate to narrowly ovate, 8–12 × 0.2–0.3 cm, apices rounded, minutely apiculate. Inflorescences erect, many-flowered, to 18 cm long. Flowers pale lavender or purplish. Sepals 8–11 mm long.

Evidently endemic to the Cordillera de Mérida of Venezuela (Trujillo; Map 178). Cloud forest, often on road cuts and in other disturbed areas such as El Campamento in Qda. Jirajara; 2,200–2,900 m.

***Epidendrum* sp. C**

Epidendrum cardioglossum auct., non Rchb. f.; Dunsterville and Garay, Venez. Orchids Ill. 4: 78–79. 1966; Foldats, Fl. Venez. 15(3): 185–188. 1970, pro parte; Ortega et al., BioLlania 5: 47. 1987; Romero and Carnevali, Orchids Venez., 2nd ed., 1: 213. 2000; Dorr et al., Contr. U.S. Natl. Herb. 40: 49. 2000 [2001].

Terrestrial or epiphytic herbs; stems to 1 m tall. Leaf blades oblong to linear-oblong, 8–11 × 1–2 cm, apices obtuse. Inflorescences erect, 4–6-flowered. Flowers opening widely, pale green. Sepals 8–9 mm long.

Evidently endemic to Venezuela, where it has been found only in Guaramacal (Trujillo state; Map 179). Páramo or subpáramo at the summit of the Boconó–Guaramacal road; ~3,000–3,100 m.

This species belongs to an Andean complex that includes species such as *Epidendrum cernuum*, *E. fruticetorum* Schltr., *E. mojandae* Schltr., *E. pichinchae* Schltr., and *E. pseudocernuum*. The taxa in this complex are characterized by stems branching above the base, forming shrub-like, erect or subscandent plants, with short, simultaneously flowered, nutant racemes and ± 3-lobed labella. This complex seems to be composed of several to many locally restricted species, and a careful revision is required. The type of *E. cardioglossum* Rchb. f. is from the Cordillera de la Costa and has a sharply 3-lobed labellum, whereas our material of *E.* sp. C displays an ovate-cordate, shallowly lobed labellum.

The following species of *Epidendrum* is excluded from the flora of Guaramacal: *Epidendrum vareschii* Foldats was attributed to the flora of Guaramacal by Ortega et al. (1987: 47), but at present it is known only from the type locality, the Páramo de Boconó (i.e., the Páramo de La Cristalina in Dinira National Park).

Fernandezia Ruiz & Pav.

Fernandezia Ruiz & Pav., Fl. Peruv. Prodr. 123. 1794.

Pachyphyllum Kunth, in H. B. K., Nov. Gen. Sp. [fol.] 1: 271. 1815 [1816]; ibid. [qu.] 1: 338. 1815 [1816].

Centropetalum Lindl., Sert. Orch. sub. t. 21. 1839.

Nasonia Lindl., in Bentham, Pl. Hartw. 150. 1844.

Orchidotypus Kraenzl., Bot. Jahrb. Syst. 34: 383. 1906.

Raycadenco Dressler, Icon. Pl. Trop., ser. 2, 6: t. 577. 1989.

Epiphytic, lithophytic or subterrestrial herbs; vegetatively reduced. Stems monopodial, simple or branching from the base in age, elongate, completely covered by sheaths. Leaves distichous, articulate, conduplicate; leaf blades mostly oblong or elliptic, margins usually denticulate, usually succulent. Inflorescences lateral racemes emerging from the axils of leaf sheaths, shorter to ± as long as leaves; peduncles abbreviated, subterete or

angled; rachises densely or laxly flowered, occasionally abbreviated, and the inflorescences becoming subumbellate; floral bracts short. Flowers resupinate, inconspicuous, white or greenish (our species), yellow with reddish-brown maculations or bright red, red-orange or yellow; perianth segments campanulate or with the apical ½ spreading, margins often ciliate. Sepals free or connate in the lower ½, equal, mostly elliptic or triangular elliptic. Petals similar to the sepals, often more obtuse. Labellum free to base, enclosed in the sepaline cup, elliptic or oblong, basally clawed or sessile, usually pandurate or constricted about midlength, in lateral profile sigmoid, the basal ½ concave, the apical ½ recurved, disk bicallose or bilamellate; column broadly petaloid, hoodlike, easily flattened into a lamina, basally often produced into a small foot; anther deeply seated under the hoodlike clinandrium, operculate, 1-locular; pollinia 2, waxy, on narrow, spathulate stipes that in turn are united to small, disciform viscidia; stigmatic surface narrow, at the base of the ventral face of the column. Ovary cylindrical to trigonous, pedicellate, glabrous. Capsules often 3-winged. [Epidendroideae: Cymbidieae: Oncidiinae.]

A neotropical genus of ~50 species found in Central America and South America (Colombia, Venezuela, Ecuador, Peru, and Bolivia). Four species occur in Venezuela, usually above 2,500 m elevation in cloud or elfin forest at the limit of páramo.

References. Chase and Whitten (2011); Christenson (2008); Neubig et al. (2012); Pridgeon et al. (2009); Senghas (1974, 1995a).

KEY TO THE SPECIES OF *FERNANDEZIA*

1a. Plants small, >5 cm long; leaf blades 8–12(–15) mm long, leathery; flowers 2.5–3 mm long, perianth segments free . . . . . ***F. crystallina***

1b. Plants minute, <5 cm long; leaf blades 3–6 mm long, fleshy-coriaceous; flowers 1.8–2 mm long, basal ½ of perianth segments connate . . . . . ***F. schultesii***

Fernandezia crystallina (Lindl.) M. W. Chase, in Chase and Whitten, Phytotaxa 20: 29. 2011. *Pachyphyllum crystallinum* Lindl., Orchid. Linden. 18. 1846; Dunsterville and Garay, Venez. Orchids Ill. 3: 234–235. 1965; Foldats, Fl. Venez. 15(5): 408–409. 1970; Romero and Carnevali, Orchids Venez., 2nd ed., 3: 718. 2000; Dorr et al., Contr. U.S. Natl. Herb. 40: 52. 2000 [2001]; Fernández, Orquídeas Nat. Táchira 169. 2003; Morillo, in Morillo et al., Bot. Ecol. Monocot. Páramos Venez. 1: 240. 2011.

Pachyphyllum pastii Rchb. f., Bonplandia (Hannover) 3: 239. 1855; Foldats, Fl. Venez. 15(5): 412–414, fig. 903. 1970; Ortega et al., BioLlania 5: 48. 1987. *Fernandezia pastii* (Rchb. f.) M. W. Chase, in Chase and Whitten, Phytotaxa 20: 30. 2011.

Epidendrum frutex auct., non Rchb. f.; Ortega et al., BioLlania 5: 47. 1987.

Epiphytic herbs; stems 5–18(–30) cm long. Leaf blades 8–12(–15) mm long. Inflorescences 2- or 3(5)-flowered. Sepals pale-green or yellowish; dorsal sepal ~2 mm long. Petals white; labellum white and green toward base.

Found in Central America (Costa Rica and Panama) and South America (Colombia, Venezuela, Ecuador, and Peru). In Venezuela, known from the Andes (Mérida, Táchira, and Trujillo) and the Cordillera de la Costa (Distrito Federal, Miranda, and Sucre; Map 180). Found in páramo in the park, including the Fila de Los Recostaderos; 2,100–3,100 m.

MAP 180. *Fernandezia crystallina* occurrence in Venezuela.

Fernandezia schultesii (L. O. Williams) Carnevali & Dorr, **comb. nov.** *Pachyphyllum schultesii* L. O. Williams, Caldasia 1(3): 15, t. p. 16. 1941; Dunsterville and Garay, Venez. Orchids Ill. 6: 310–311. 1976; Romero and Carnevali, Orchids Venez., 2nd ed., 3: 720. 2000; Fernández, Orquídeas Nat. Táchira 170. 2003; Morillo, in Morillo et al., Bot. Ecol. Monocot. Páramos Venez. 1: 241, fig. 89. 2011. *Orchidotypus schultesii* (L. O. Williams) Senghas, Orchideen I/B, 31: 1923. 1995.

Pachyphyllum hispidulum auct., non (Rchb. f.) Garay & Dunst.; Foldats, Fl. Venez. 15(5): 409–410. 1970, pro parte.

Epiphytic herbs; stems 1–4 cm long. Leaf blades 3–6 mm long. Inflorescences 1(2)-flowered. Sepals, petals, and labellum fused over ½ their length into a single tube, white grading to pale green at the base. Dorsal sepal ~2 mm long.

Found in South America (Colombia and Venezuela). In Venezuela, found only in the Andes (Táchira and Trujillo; Map 181). Forest on the south slope of Guaramacal; 2,000–2,750 m.

We have two collections from the park of this small and easily overlooked species; one of the two was found in a mixture

MAP 181. *Fernandezia schultesii* occurrence in Venezuela.

with *Trichosalpinx pusilla* (Kunth) Luer, one of several small, lepanthiform orchids found in Guaramacal.

Gomphichis Lindl.

Gomphichis Lindl., Gen. Sp. Orchid. Pl. 446. 1840.

Terrestrial, subterrestrial, or, more rarely, subepiphytic herbs, erect. Roots fleshy, relatively long, fascicled, pubescent. Stems simple, terete, densely leafy basally, loosely leafy apically. Leaves not articulate, convolute, herbaceous or subplicate, basal leaves larger, often basally attenuate into a pseudopetiole and then leaf base sheathing; leaf blades narrowly elliptic to rarely obovate. Inflorescences terminal, erect, loose to densely many-flowered spikes, glabrous to variously pubescent; peduncles much longer than rachises, wrapped in several tubular or foliar sheaths; floral bracts conspicuous, membranous. Flowers not resupinate, patent or nutant, campanulate; perianth segments free, white, green or yellow (labellum white), variously pubescent or ciliate. Sepals subequal, erect or patent in the apical ½, subfleshy. Petals linear to obovate, membranous. Labellum more fleshy than other perianth segments, free from the column, commonly rhombic-ovate or suborbicular, entire or 3-lobed, usually pubescent, disk thickened-fleshy; column clavate, sigmoid, usually pubescent or papillose, without wings or foot, apically obtuse; rostellum erect, broad, clinandrium well developed, membranous; anther dorsal, erect, subequal to the rostellum; pollinia 4, smooth, without caudicles; viscidium terminal; stigma entire. [Orchidoideae: Cranichideae: Cranichidinae.]

Approximately 20 species found in Central America (Costa Rica and Panama) and South America (Colombia, Venezuela, Guyana, Ecuador, Peru, Bolivia, and Brazil). The center of species diversity for the genus is in the northern Andes of Colombia and Venezuela; ~10 species are found in Venezuela.

References. Alvarez (2005); Álvarez-Molina and Cameron (2009); Pridgeon et al. (2003); Salazar Chávez et al. (2009); Senghas (1994d).

Species of *Gomphichis* are typically shade tolerant.

Specimens of *Gomphichis* prepared for the herbarium are usually black or dark brown when dry.

There is molecular support for the monophyly of *Gomphichis* (Álvarez-Molina and Cameron, 2009; Salazar Chávez et al., 2009). The genus is closely related to several other genera of terrestrial orchids found in Central America and the Andes and Guayana Highlands of South America, including *Aa*.

KEY TO THE SPECIES OF *GOMPHICHIS*

1a. Leaf blades 15–25 cm long, elliptic or oblanceolate; bracts ovate, glabrous, sparsely pubescent at base; petal apex acute, glandular-ciliate apically with simple hairs . . . . . ***G. adnata***

1b. Leaf blades 20–35(–50) cm long, oblong-lanceolate; bracts lanceolate, pilose; petal apex acute or obtuse, glandular-ciliate apically with simple and branched retrorse hairs . . . . . ***G. altissima***

Gomphichis adnata (Ridl.) Schltr., Repert. Spec. Nov. Regni Veg. Beih. 6: 51. 1919; Morillo, in Morillo et al., Bot. Ecol. Monocot. Páramos Venez. 1: 181–182, fig. 55B. 2011. *Stenoptera adnata* Ridl., in Thurn, Timehri 5: 205. 1886.

Gomphichis gracilis Schltr., Repert. Spec. Nov. Regni Veg. Beih. 6: 29. 1919.

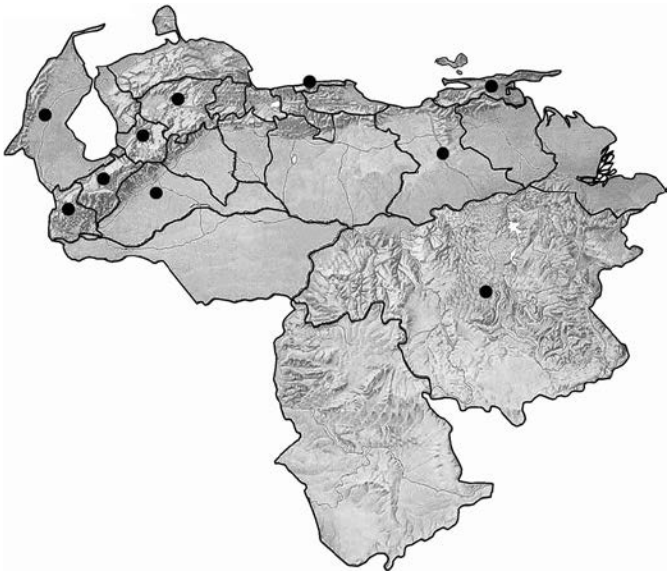
Gomphichis steyermarkii Foldats, Acta Bot. Venez. 3: 331, fig. 8A. 1968.

Gomphichis viscosa auct., non (Rchb. f.) Schltr.; Dunsterville and Garay, Venez. Orchids Ill. 2: 162–163. 1961; Foldats, Fl. Venez. 15(1): 393–396, fig. 147. 1969.

Gomphichis costaricensis auct., non (Schltr.) Ames et al.; Romero and Carnevali, Orchids Venez., 2nd ed., 1: 347. 2000; Dorr et al., Contr. U.S. Natl. Herb. 41: 50. 2000 [2001], pro parte; Carnevali and Ramírez-Morillo, in Berry et al., Fl. Venez. Guayana 7: 369, fig. 345. 2003, pro parte.

Terrestrial or rarely epiphytic herbs, to 90(–120) cm tall (in flower). Leaf blades elliptic or oblanceolate, 15–25 cm long. Flowers white, whitish-green or greenish-yellow. Dorsal sepal (4.5–)5–6(–8) mm long. Labellum 5–7 mm long.

Found in South America (Colombia and Venezuela). Widely distributed in the mountains of Venezuela (Anzoátegui, Barinas, Bolívar, Distrito Federal, Lara, Mérida, Sucre, Táchira, Trujillo, and Zulia; Map 182). In the park, collected in subpáramo in Qda. Jirajara, in the Páramo de Guaramacal below the television



MAP 182. *Gomphichis adnata* occurrence in Venezuela.

MAP 183. *Gomphichis altissima* occurrence in Venezuela.

antennas, and near the summit of the Fila de Agua Fría; (2,200–) 2,800–3,000 m.

Earlier, Dorr et al. (2000) confused this species with *Gomphichis costaricensis* (Schltr.) Ames et al., which Alvarez (2005) indicates has been collected in Venezuela only in Henri Pittier National Park (Aragua) and on the Chimantá Massif (Bolívar).

Gomphichis altissima Renz, Candollea 11: 253, figs. 5, 7A, a–g. 1948; Morillo, in Morillo et al., Bot. Ecol. Monocot. Páramos Venez. 1: 183, fig. 55A. 2011.

Gomphichis cladotricha Renz, Candollea 11: 256, figs. 5, 7B, h–n. 1948.

Gomphichis costaricensis auct., non (Schltr.) Ames et al.; Dorr et al., Contr. U.S. Natl. Herb. 41: 50. 2000 [2001], pro parte.

Terrestrial herbs, to 135(–180) cm tall (in flower). Leaf blades oblong-lanceolate, 20–35(–50) cm long. Flowers white or greenish. Dorsal sepal 6–7(–8) mm long. Labellum 6.7–8.5(–10) mm long.

Found in South America (Colombia, Venezuela, Ecuador, and Peru). In Venezuela, found in the Andes (Mérida, Portuguesa, Táchira, and Trujillo) and in the Sierra de Perijá (Zulia; Map 183). In the park, found on both slopes of Guaramacal; 1,600–2,300(–2,750) m.

Gomphichis altissima is more robust (taller and with larger leaves) than *G. adnata* and generally is found at lower elevations.

The following species of *Gomphichis* is excluded from the flora of Guaramacal: *Gomphichis traceyae* Rolfe has been collected near Boconó (Trujillo state) at an unspecified locality or localities (*Renz 7561*, *7566*), and it is possible that it will be found in Guaramacal. It can be distinguished from our species by its linear-oblong to elliptic-lanceolate leaf blades; subdense inflorescence; wider than long labellum with rotund lateral lobes; broadly elliptic, 3-nerved, always glabrous petals that show densely glandular retrorse cilia; and strongly sigmoid column.

Habenaria **Willd.**

Habenaria Willd., Sp. Pl. 4(1): 5, 44. 1805.

Terrestrial (our species) or semiaquatic herbs, rarely subepiphytic; erect, often ± succulent. Tubers (rhizoids) 1–3, subterranean, aerial portion usually caducous in the dry season and plants persisting via basal tubers. Stems terete, completely or nearly completely covered by sheaths. Leaves not articulate, prefoliation convolute, usually distichous or spirally arranged along the stem, in some species rosulate basally or less commonly above the base, occasionally leaves absent or reduced and sheath-like; leaf sheaths infundibuliform (funnel shaped), usually appressed to the stem, rarely surrounding the stem more loosely, usually shorter than the leaf blade; leaf blades usually lanceolate to linear-elliptic, sometimes setaceous or suborbicular, membranous to thinly fleshy. Inflorescences terminal racemes or erect, lax or dense terminal spikes, usually with few to many flowers opening in succession or ± simultaneously, rarely 1-flowered; floral bracts usually ± conspicuous, sometimes spathaceous. Flowers resupinate, inconspicuous to relatively large and showy, usually green, white or yellowish opaque (or combinations of these colors), less commonly (not our species) orange, bright yellow, pink or purple, usually fragrant at night; perianth segments free, spreading or dorsal sepal and petals (or part thereof) in the form of a cap on the column, fleshy or subfleshy. Sepals subequal

or lateral ones larger than the dorsal one, usually wider than the petals; petals usually 2-lobed, less commonly simple, very rarely 3-lobed. Labellum usually 3-lobed, less commonly simple basally with a conspicuous spur, rarely (usually in teratological cases) spur absent, lateral lobes usually as wide or much narrower than the central lobe (linear or filiform), rarely wider; column short and wide; anther erect, firmly attached to the column, 2-locular, each locule projecting over an elongate canal; pollinia 2, sectile, with 2 basal, interlocular caudicles; stigmas convex, 2-lobed, the lobes often pedunculate. Ovary often conspicuously pedicellate. Capsules ellipsoid. [Orchidoideae: Orchideae: Orchidinae.]

A cosmopolitan genus of 500–600 species that is most diverse in the tropics, especially in Brazil. In the Americas, *Habenaria* has been collected in North America (USA), Mexico, Central America, the West Indies, and South America (Colombia, Venezuela, the Guianas, Ecuador, Peru, Bolivia, Brazil, Paraguay, Argentina, and Uruguay). Twenty-five species are found in Venezuela, most of them in the Venezuelan Guayana.

References. Batista et al. (2011, 2013); Kränzlin (1893); Pridgeon et al. (2001a); Renz (1992).

The neotropical species of *Habenaria* form a monophyletic group (Batista et al., 2013), and this neotropical clade together with certain African species forms a highly supported core *Habenaria* clade, which includes the Old World type of the genus. It appears that the neotropical species originated in Africa and that the radiation in the Americas is relatively recent (Batista et al., 2013).

KEY TO THE SPECIES OF *HABENARIA*

1a. Leaves linear-oblong to linear-elliptic oblong; stems entirely dark green; flowers mainly green in dense racemes; anterior lobe of petal conspicuously shorter than the posterior lobe; lateral lobes of labellum conspicuously shorter than the central lobe; nectary <15 mm long . . . . . ***H. gollmeri***

1b. Leaves elliptic; stems light green with darker green nerves and purple dots or lines; flowers white in loose racemes; anterior lobe of petal as long as or exceeding in length the posterior lobe; lateral lobes of labellum as long as or exceeding in length the central lobe; nectary >15 mm long (usually >20 mm long) . . . . . ***H. monorrhiza***

Habenaria gollmeri Schltr., Repert. Spec. Nov. Regni Veg. Beih. 6: 27. 1919; Foldats, Fl. Venez. 15(1): 64–66, fig. 17. 1969; Fernández, Orquídeas Nat. Táchira 104. 2003; Morillo, in Morillo et al., Bot. Ecol. Monocot. Páramos Venez. 1: 189–190, fig. 57. 2011.

FIGURE 25J

Habenaria parviflora auct., non Lindl.; Dunsterville and Garay, Venez. Orchids Ill. 6: 160–161. 1976; Dorr et al., Contr. U.S. Natl. Herb. 40: 50. 2000 [2001], pro parte.

MAP 184. *Habenaria gollmeri* occurrence in Venezuela.

Terrestrial herbs, to 30 cm tall. Leaf blades linear-lanceolate, 6–12 × 8–15 cm. Inflorescences dense racemes. Flowers green with a purple spot on the labellum. Dorsal sepal 2.5–5 × 1.5–4 mm.

Found in South America (Colombia, Venezuela, and Ecuador). In Venezuela, found in the Andes (Mérida, Táchira, and Trujillo), the Cordillera de la Costa (Distrito Federal and Miranda), and the Venezuelan Guayana (Amazonas; Map 184). In the park, encountered on both slopes of Guaramacal; 1,800–2,100(–2,600) m.

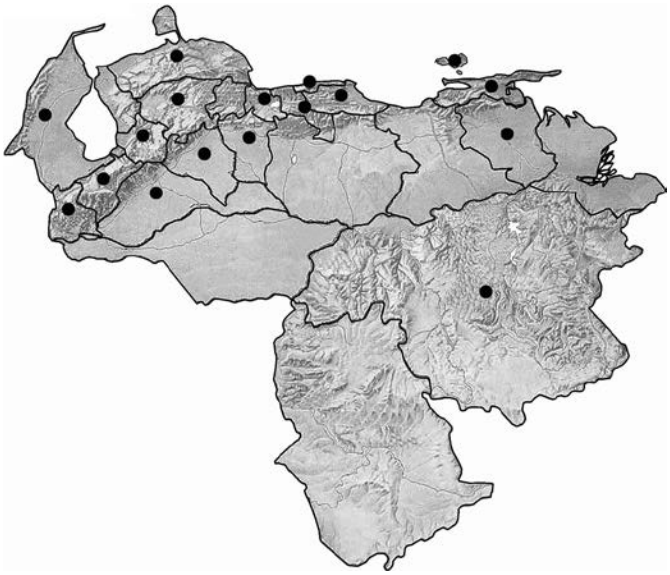
Habenaria monorrhiza (Sw.) Rchb. f., Ber. Deutsch. Bot. Ges. 3: 274. 1885; Foldats, Fl. Venez. 15(1): 74–76, fig. 21. 1969; Dunsterville and Garay, Venez. Orchids Ill. 2: 170–171. 1961; Foldats et al., in Berry et al., Fl. Venez. Guayana 7: 380. 2003; Fernández, Orquídeas Nat. Táchira 105. 2003. *Orchis monorrhiza* Sw., Prodr. 118. 1788.

Habenaria speciosa Poepp. & Endl., Nov. Gen. Sp. Pl. 1: 44. 1835 [1836].

Terrestrial herbs, to 1 m tall. Leaf blades lanceolate to ovate or elliptic-oblong, 4–15 × 1.5–4 cm. Inflorescences loose racemes. Flowers white. Dorsal sepal 5–14 × 4–7 mm.

Found in Mexico, Central America, the West Indies, and South America (Colombia, Venezuela, Trinidad and Tobago, Ecuador, Peru, Bolivia, and Brazil). Widely distributed in Venezuela (Aragua, Barinas, Bolívar, Carabobo, Cojedes, Distrito Federal, Falcón, Lara, Mérida, Miranda, Monagas, Nueva Esparta, Portuguesa, Sucre, Táchira, Trujillo, and Zulia; Map 185). Our record is from the south slope of Guaramacal near Qda. Honda; 1,950–2,100 m.

This is one of the most common, widely distributed, and variable species in the genus. It is possible that several species are included in the wide species concept adopted here and in other floristic treatments.



MAP 185. *Habenaria monorrhiza* occurrence in Venezuela.

Jacquiniella Schltr.

Jacquiniella Schltr., Repert. Spec. Nov. Regni Veg. Beih. 7: 123. 1920.
Dressleriella Brieger, Orchideen (Schlechter), 3rd ed., 9(33–36): 555. 1977, nom. nud.
Briegeria Senghas, Orchidee (Hamburg) 31: 29. 1980.
Acrorchis Dressler, Orquidía (Mexico City), n.s., 12: 14. 1990.

Epiphytic or lithophytic, rarely subterrestrial, herbs; small to medium size; erect to pendulous, caespitose. Rhizomes almost absent, thin. Stems terete or somewhat compressed laterally, with leaves almost to the base and completely or almost completely enveloped by leaf sheaths, straight or ± zigzag in orientation. Leaves distichous, articulate, prefoliation duplicative (conduplicate), subterete or laterally compressed in cross section; sheaths often rugulose or striate. Inflorescences terminal, solitary or fascicled, pedunculate or not, when pedunculate, peduncles flattened and with 1 or 2 bract-like sheaths. Flowers resupinate, inconspicuous, minute to small, usually opening successively, often autogamous to cleistogamous; floral bracts relatively large to inconspicuous, acute to obliquely subtruncate, apiculate; pedicels short; perianth segments widely spreading to more commonly subparallel to the column, usually green but in some species red or brown, fleshy. Sepals subequal, free or shortly fused at the base, concave. Petals subsimilar to the sepals, sometimes somewhat shorter and narrower. Labellum fused to the base of the column or almost completely free, sessile or shortly unguiculate, very fleshy, sometimes geniculate and contracted beneath the base, entire or 3-lobed apically, concave, usually elliptic or subrhombic; column relatively short, subterete, somewhat dilated apically, without a foot; anther terminal or dorsal, operculate, incumbent, 2- or 4-locular; clinandrium small, sometimes inflated or elongate, margins entire, erose or denticulate; pollinia 4, waxy, compressed laterally, attached to a small viscidium; rostellum horizontal, slot-shaped, rupturing longitudinally when the pollinia are removed; stigma ventral. Ovary often subglobose or ellipsoid, with a cuniculus (i.e., a tubular nectary hidden within the floral tube above the ovary). Capsules ovoid, globose to ellipsoid. [Epidendroideae: Epidendreae: Laeliinae.]

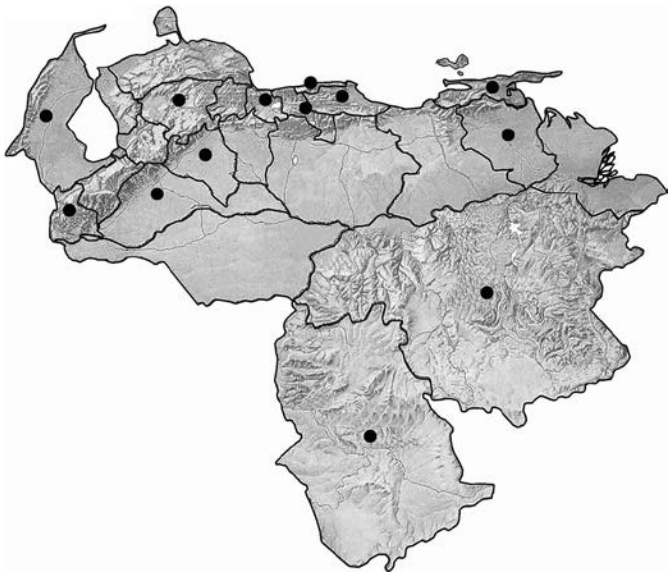
A neotropical genus of 8 or 9 species found in Mexico, Central America, the West Indies, and South America (Colombia, Venezuela, Trinidad and Tobago, the Guianas, Ecuador, Peru, and Brazil), with a center of diversity in Costa Rica and Panama, where all but 2 of the species are found. Three species occur in Venezuela.

References. Berg et al. (2009); Dressler (1982, 1984a, 1984b); Pridgeon et al. (2005).

Jacquiniella appears to be monophyletic and is closely related to *Scaphyglottis* Poepp. & Endl. (Berg et al., 2009). We fail to see the rationale for maintaining the monotypic *Acrorchis* Dressler distinct from *Jacquiniella* and consider it to be a synonym.

Jacquiniella teretifolia (Sw.) Britton & P. Wilson, Sci. Surv. Porto Rico & Virgin Islands 6: 340. 1926; Romero and Carnevali, Orchids Venez., 2nd ed., 2: 387. 2000; Carnevali and Ramírez-Morillo, in Berry et al., Fl. Venez. Guayana 7: 398, fig. 363. 2003; Fernández, Orquídeas Nat. Táchira 108. 2003. *Epidendrum teretifolium* Sw., Prodr. 121. 1788; Dunsterville and Garay, Venez. Orchids Ill. 1: 138–139. 1959; Foldats, Fl. Venez. 15(3): 422–425, fig. 550. 1970. *Dressleriella teretifolium* (Sw.) Brieger, Orchideen (Schlechter), 3rd ed., 9(33–36): 555. 1977, nom. illeg. *Briegeria teretifolia* (Sw.) Senghas, Orchidee (Hamburg) 31: 30. 1980.

Epiphytic or more rarely lithophytic herbs; erect or ascending. Leaf blades ± terete, 1.5–5 cm × 1.5–2.5 mm. Inflorescences



MAP 186. *Jacquiniella teretifolia* occurrence in Venezuela.

1-flowered, long-pedunculate. Flowers greenish yellow. Sepals 8–12.5 mm long.

Found in Mexico, Central America, the West Indies, and South America (Colombia, Venezuela, the Guianas, and Brazil). Widespread in Venezuela (Amazonas, Aragua, Barinas, Bolívar, Carabobo, Distrito Federal, Lara, Miranda, Monagas, Portuguesa, Sucre, Táchira, and Zulia; Map 186). La Divisoria de la Concepción; 1,300–1,500 m.

Lepanthes Sw.

Lepanthes Sw., Nova Acta Regiae Soc. Sci. Upsal., ser. 2, 6: 85. 1799.

Epiphytic, lithophytic or subterrestrial herbs; caespitose; creeping, erect or pendulous. Rhizomes very short to elongate. Stems sometimes prolific, 1-leaved apically, densely or laxly covered by a series of tubular, ribbed, ± imbricate sheaths with oblique, dilated ostia or mouths (i.e., lepanthiform sheaths), margins of ostia visibly or microscopically ciliate or scabrous, occasionally glabrous. Leaves conduplicate; leaf blades mostly flat, sometimes concave or convex, linear-elliptic to orbicular, membranous or rarely subfleshy, petiolate. Inflorescences 1 to several, originating from an annulus near stem apex, few- to many-flowered racemes; rachises straight to fractiflex; floral bracts small to conspicuous. Flowers not resupinate, usually small, several, opening singly or more commonly successively, often lasting 1 day, commonly brightly colored. Sepals glabrous or ciliate, usually dorsally carinate; dorsal sepal entirely free to variously connate with basal portion of synsepal; lateral sepals usually fused into a synsepal, rarely almost free, membranous. Petals generally wider than long, very rarely longer than wide and then linear or very narrowly triangular, commonly differentiated into distinct upper and lower lobes, upper lobe pointing toward dorsal sepal, lower lobe pointing toward lateral sepals, morphological apex of petals flat, convex, apiculate concave or emarginate. Labellum usually 3-lobed, very rarely entire; central lobe modified into a variously shaped and sculptured appendix; lateral lobes often peltate or semilunate and embracing the column; base of labellum connate to the under surface of column, often near its base; column footless, usually subcylindrical, very short to relatively elongate; anther operculate, apical, subapical or ventral; pollinia 2, attached to a small viscidium; stigma apical, subapical or ventral. Ovary terete or 3-angled, pedicellate. Capsules ellipsoid to obovoid. [Epidendroideae: Epidendreae: Pleurothallidinae.]

A neotropical genus found in Mexico, Central America, the West Indies, and South America (Colombia, Venezuela, the Guianas, Ecuador, Peru, Bolivia, and Brazil). There are 600–800 species; ~50 are found in Venezuela.

References. Luer (1986a, 1986b); Pridgeon and Chase (2001); Pridgeon et al. (2001b, 2005).

Although there appears to be support for the monophyly of *Lepanthes*, the support is based on molecular sequences from only four species (Pridgeon and Chase, 2001; Pridgeon et al., 2001b). Morphologically, lepanthiform sheaths unite *Lepanthes*, *Lepanthopsis* (Cogn.) Ames, and *Trichosalpinx* Luer, and floral characters (see Subkey V) can be used to separate these three closely related genera.

Lepanthes is composed of many narrow endemics differing from one other in structural details of the petal and labellum shape. The genus is most diverse in the northern Andes, where the majority of the species occur in cloud or otherwise humid forest at intermediate or high elevations. Few species of *Lepanthes* grow at low elevations or in dry forest.

In Costa Rica, Blanco and Barboza (2005) observed pseudocopulatory pollination in *Lepanthes glicensteinii* Luer by a fungus gnat (Diptera: Sciaridae). They postulate that pollination by sexual deception is prevalent in the genus because most species of *Lepanthes* have a similar flower structure.

KEY TO THE SPECIES OF *LEPANTHES*

1a. Inflorescences densely flowered; floral bracts equal to or longer than rachis internodes and the ovary (at least the portion that remains on the rachis after flower dehiscence) much longer than rachis internodes 2
  2a. Leaf blades elliptic or ovate-elliptic, apices obtuse or acute; sepals ~3 mm long; petals asymmetrical, anterior and posterior lobes different . . . . . ***L. wageneri***
  2b. Leaf blades suborbicular, apices rounded; sepals 3.5–4 mm long; petals symmetrical, anterior and posterior lobes similar (each petal resembling a ± regular diamond shape) . . . . . **L. sp. A**
1b. Inflorescences laxly flowered; floral bracts and the ovary shorter than rachis internodes 3
  3a. Peduncles exceeding the leaves in length; flowers remote, successive . . . . . **L. sp. B**
  3b. Peduncles shorter than or subequal to the leaves in length; flowers ± clustered, ± simultaneous 4
    4a. Apex of both lobes of the petals long-acuminate; leaf blades narrowly lanceolate, at least 3.5× longer than wide, apices long-acuminate-caudate . . . . . ***L. glochidea***
    4b. Apex of the petals rounded or obtuse; leaf blades elliptic, 2 or 3× longer than wide, apices acute to obtuse 5
      5a. Dorsal sepal ~2× longer than wide, <3.5 mm long; appendix of labellum several times longer than wide; attachment point of labellum to column well above the base of the lateral lobes; clinandrium with a tooth in the center of the emargination; petals and labellum finely papillose; flowers resupinate . . . . . ***L. scolex***
      5b. Dorsal sepal at least 3× longer than wide, >4 mm long; appendix of labellum broadly ovate or suborbicular, ± as long as wide; attachment point of labellum to column at the base of the lateral lobes; clinandrium without a tooth in the emargination; petals and labellum ciliolate; flowers not resupinate . . . . . ***L. vareschii***

MAP 187. *Lepanthes glochidea* occurrence in Venezuela.

MAP 188. *Lepanthes scolex* occurrence in Venezuela.

♦ ***Lepanthes glochidea*** Luer, Phytologia 59: 446. 1986; Romero and Carnevali, Orchids Venez., 2nd ed., 2: 411. 2000.

Lepanthes millei auct., non Schltr.; Dunsterville and Garay, Venez. Orchids Ill. 4: 124–145. 1966; Foldats, Fl. Venez. 15(2): 484–485, fig. 372. 1970; Ortega et al., BioLlania 5: 48. 1987; Morillo, in Morillo et al., Bot. Ecol. Monocot. Páramos Venez. 1: 198, fig. 632. 2011.

Epiphytic herbs, 7.5–11 cm tall. Leaf blades narrowly lanceolate, 2–4 × 0.5–0.8 cm. Flowers not resupinate. Sepals yellowish with reddish tinges; dorsal sepal 3.5–4.1 mm long, narrowly ovate, apices acuminate. Petals yellow-orange with brownish tinges. Labellum brownish or reddish-purple.

Endemic to the Andes of Venezuela (Táchira and Trujillo; Map 187). Cloud forest along the Boconó–Guaramacal road; 1,800–2,750 m.

Lepanthes millei Schltr. is an Ecuadorian species with narrowly obovate leaves and narrower petals with obtuse or rounded lobes.

♦ ***Lepanthes scolex*** Luer, Phytologia 59: 450. 1986; Romero and Carnevali, Orchids Venez., 2nd ed., 2: 431. 2000; Fernández, Orquídeas Nat. Táchira 122. 2003.

Lepanthes acuminata auct., non Schltr.; Dunsterville and Garay, Venez. Orchids Ill. 4: 118–119. 1966.

Lepanthes lindleyana auct., non Oerst. & Rchb. f.; Foldats, Fl. Venez. 15(2): 480–482, fig. 370. 1970, pro parte; Ortega et al., BioLlania 5: 47. 1987 (as to *Dunsterville 724*).

Lepanthes stenophylla auct., non Schltr.; Dunsterville and Garay, Venez. Orchids Ill. 2: 184–185. 1961; Foldats, Fl. Venez. 15(2): 503–504, fig. 382. 1970.

Epiphytic herbs, 3–5 cm tall. Leaf blades elliptic or narrowly elliptic, 1–2 × 0.3–0.9 cm. Flowers resupinate. Dorsal sepal 2.8–3.1 mm long, ovate, apices shortly acuminate.

Endemic to the Andes of Venezuela (Táchira and Trujillo; Map 188). Cloud forest along the Boconó–Guaramacal road; ~2,000 m.

This species belongs to the widespread and taxonomically difficult *Lepanthes lindleyana* Oerst. & Rchb. f. complex, but the small, elongate, hirsute appendix of the labellum readily sets this species apart from its closest relatives. In the park, *L. lindleyana* could be confused with *L. vareschii* Garay as sterile material of these two species is indistinguishable. However, the floral characters given in the key permit ready identification.

Lepanthes vareschii Garay, Canad. J. Bot. 34: 252, fig. 11A. 1956; Dunsterville and Garay, Venez. Orchids Ill. 3: 156–157. 1965; Foldats, Fl. Venez. 15(2): 516–517, 387A. 1970; Romero and Carnevali, Orchids Venez., 2nd ed., 2: 439. 2000; Fernández, Orquídeas Nat. Táchira 120. 2003.

Epiphytic herbs, 3–9 cm tall. Leaf blades elliptic or narrowly elliptic, 1–4 cm × 6–9 mm. Flowers not resupinate, yellowish. Dorsal sepal 4–4.5 mm long, ovate, apices shortly acuminate.

Endemic to the Andes of Venezuela (Mérida, Táchira, and Trujillo; Map 189). Cloud forest along the Boconó–Guaramacal road; ~2,450 m.

Lepanthes wageneri Rchb. f., Bonplandia (Hannover) 3: 70. 1855; Dunsterville and Garay, Venez. Orchids Ill. 1: 190–191. 1959; Foldats, Fl. Venez. 15(2): 519–521, fig. 388. 1970; Romero and Carnevali, Orchids Venez., 2nd ed., 2: 440. 2000; Morillo, in Morillo et al., Bot. Ecol. Monocot. Páramos Venez. 1: 207, fig. 70. 2011.

Lepanthes barbae auct., non Schltr.; Foldats, Fl. Venez. 15(2): 463–464, fig. 465. 1970, pro parte; Ortega et al., BioLlania 5: 47. 1987.

MAP 189. *Lepanthes vareschii* occurrence in Venezuela.

MAP 190. *Lepanthes wageneri* occurrence in Venezuela.

Lepanthes decipiens auct., non Ames & C. Schweinf.; Dunsterville and Garay, Orchids Venez., ed. 1, 2: 387. 1979.

Epiphytic herbs, 2–7.5 cm tall. Leaf blades ovate to broadly elliptic or ovate-elliptic, 1.5–2.5 cm × 6–20 mm. Flowers not resupinate. Sepals yellow-brown; dorsal sepal 2.3–4 mm long, ovate, apices acute. Petals and labellum orange.

Found in South America (Colombia, Venezuela, Ecuador, and Bolivia). In Venezuela, occurs in the Andes (Mérida, Táchira, and Trujillo) and in the Cordillera de la Costa (Aragua, Distrito Federal, Falcón, Miranda, Sucre, and Yaracuy; Map 190). Park records are from the north slope of Guaramacal between El Cafenol and Fila de Los Recostaderos and along the Boconó–Guaramacal road; 1,800–2,200 m.

The material collected in the Guaramacal area is included here in a broadly conceived *Lepanthes wageneri* (fide Luer, 1996: 180–181, fig. 260). This concept includes a series of populations found in the Venezuelan Andes, the Cordillera de la Costa, and possibly Colombia. These populations are characterized by plants of small or intermediate size; dense, abbreviated inflorescences with imbricate, pubescent or hispid floral bracts; and elongate floral pedicels. There is, however, some diversity in petal and labellum shape. Within the *L. wageneri* complex, the Guaramacal populations are characterized by their small vegetative size, thickly succulent leaves, and short pedicels. The populations could represent an undescribed species that we hesitate to describe until a revision of the complex is completed.

***Lepanthes* sp. A**

Epiphytic herbs, 5–9 cm tall. Leaf blades suborbicular, 2–2.5 × 2–2.5 mm. Flowers not resupinate, color unknown. Dorsal sepal 3.5–4 mm long, elliptic, apices acuminate.

Evidently endemic to the Andes of Venezuela (Trujillo; Map 191). Cloud forest along the Boconó–Guaramacal road; 1,800 m.

This appears to be an undescribed species that presently is known only from the park.

***Lepanthes* sp. B**

Tiny, epiphytic herbs, 4–6.5 cm tall (including the inflorescences). Leaf blades broadly elliptic or broadly obovate to

MAP 191. *Lepanthes* sp. A occurrence in Venezuela.

MAP 192. *Lepanthes* sp. B occurrence in Venezuela.

suborbicular, 10–20 mm long. Inflorescences 25–35 mm long. Sepals 2.3–2.5 mm long, reddish-purple.

Evidently endemic to the Andes of Venezuela (Portuguesa; Map 192). La Divisoria de la Concepción; 1,700 m.

This appears to be an undescribed species that is known from a single collection in fruit made in the park.

Lepanthopsis (Cogn.) Ames

Lepanthopsis (Cogn.) Ames, Bot. Mus. Leafl. 1(9): 3. 1933. *Pleurothallis* sect. *Lepanthopsis* Cogn., in Martius, Fl. Bras. 3(4): 591. 1896.

Expedicula Luer, Monogr. Syst. Bot. Missouri Bot. Gard. 103: 308. 2005.

Epiphytic to rarely lithophytic herbs; small to medium in size; caespitose. Stems erect, arching or pendulous, thin, terete, 1-leaved apically, enclosed by a series of tubular, ribbed, ± imbricate sheaths with oblique, dilated ostia or mouths (i.e., lepanthiform sheaths), ribs and margins of ostia visibly or microscopically ciliate or scabrous; stems often apically proliferous and rooting at the base and apex. Leaves articulate, conduplicate; leaf blades elliptic, narrowly elliptic to ovate or obovate, bases rounded or attenuate, apices obtuse to acuminate, flat or ± concave, subsessile or short-pseudopetiolate. Inflorescences terminal, 1 to several, originating from near stem apex, with an annulus, racemose, 1-flowered (our species) or many-flowered, shorter to much longer than subtending leaves; peduncles short or elongate; rachises straight or fractiflex. Flowers resupinate, minute to small, opening widely, often simultaneous or opening in slow succession and then usually several to many flowers open simultaneously, bronzy-green, hyaline, yellowish to deep wine-purple. Sepals usually acuminate; dorsal sepal usually 3-nerved; lateral sepals free to variously connate, similar to the dorsal sepal, often falcate or oblique, usually 1-nerved. Petals often shorter and narrower than sepals, 1-nerved, membranous. Labellum usually entire, rarely 3-lobed, often concave and somewhat concealing the column, generally much shorter than sepals; disk callose or ecallose, attached to column base; column short and thick, apically dilated, footless; anther terminal, operculate, incumbent; pollinia 2, waxy, subpyriform, attached to a small viscidium; rostellum transversal; stigma apical, 2-lobed, continuous under rostellar flap. Ovary articulate, minutely pedicellate, smooth to costate. Capsules ovoid, obovoid or ellipsoid. [Epidendroideae: Epidendreae: Pleurothallidinae.]

A subtropical and tropical American genus of ~50 species found in North America (USA), Mexico, Central America, the Greater Antilles, and South America (Colombia, Venezuela, Guyana, French Guiana, Ecuador, Peru, Bolivia, and Brazil). Species diversity is greatest in the Greater Antilles and the Andes. Eight species occur in Venezuela.

References. Luer (1986a, 1991); Pridgeon et al. (2001b, 2005).

The monophyly of *Lepanthopsis* has not been established yet on a molecular basis, and its relationship to other lepanthiform pleurothallids is not well resolved. Pridgeon et al. (2001b), who examined only one species of *Lepanthopsis*, noted that it resolved as part of a larger clade with *Frondaria* Luer and *Trichosalpinx*.

♦ ***Lepanthopsis apoda*** (Garay & Dunst.) Luer, Selbyana 7: 100. 1982; Romero and Carnevali, Orchids Venez., 2nd ed., 2: 442. 2000; Fernández, Orquídeas Nat. Táchira 124. 2003; Morillo, in Morillo et al., Bot. Ecol. Monocot. Páramos Venez. 1: 209–210, fig. 72, foto 36. 2011. *Pleurothallis apoda*

MAP 193. *Lepanthopsis apoda* occurrence in Venezuela.

Garay & Dunst., in Dunsterville and Garay, Venez. Orchids Ill. 3: 246–247. 1965; Foldats, Fl. Venez. 15(2): 203–204, fig. 254A. 1970; Ortega et al., BioLlania 5: 49. 1987. *Trichosalpinx apoda* (Garay & Dunst.) Luer, Phytologia 54: 394. 1983. *Expedicula apoda* (Garay & Dunst.) Luer, Monogr. Syst. Bot. Missouri Bot. Gard. 103: 308. 2005.

Epiphytic herbs; stems 2–4.5 cm tall. Leaf blades narrowly elliptic, 2–2.8 cm × 3.5–5 mm. Sepals yellow to light red-orange; dorsal sepal 5–7 mm long. Petals yellow to light red-orange. Labellum orange.

Found in South America (Colombia, Venezuela, Ecuador, and Bolivia). In Venezuela, known only from the Andes (Táchira and Trujillo; Map 193). Rare or overlooked in dwarf cloud forest below the summit of Guaramacal; 2,700–2,850 m.

In some respects this species appears to be intermediate between *Lepanthopsis* and *Trichosalpinx*. Its 1-flowered inflorescence, however, is exceptional among the three lepanthiform-sheathed genera (*Lepanthes*, *Lepanthopsis*, and *Trichosalpinx*) found in Guaramacal. This inflorescence character led Luer (2005) to create the genus *Expedicula* to accommodate our species and a second species, also with a 1-flowered inflorescence, from Colombia. Nonetheless, phenetically, our species still seems to be better placed in *Lepanthopsis*.

Lindleyalis Luer

Lindleyalis Luer, Monogr. Syst. Bot. Missouri Bot. Gard. 95: 258. 2004.

Epiphytic, rarely lithophytic or terrestrial herbs; erect or patent; relatively robust (in comparison to other Pleurothallidinae). Rhizomes short, creeping. Stems terete, erect, straight or somewhat recurved, covered with a remote tubular, appressed central sheath and several smaller sheaths at the base; unifoliate apically. Leaves articulate; leaf blades elliptic or oblong to ovate-oblong, coriaceous. Inflorescences few-flowered racemes or reduced to a fascicle of successive flowers, emerging from the apex of the stem with an annulus that is very close to the leaf abscission zone; racemes usually patent, nutant or pendulous; peduncles with few sheaths or remote bracts. Flowers long-pedicellate, resupinate, relatively large and showy (in comparison to other Pleurothallidinae), relatively long-lived; perianth segments translucent or hyaline, nerves red, purple or dark burgundy. Sepals slightly exserted, ringent, elliptic, narrowly elliptic or lanceolate, acute or long-acuminate; lateral sepals fused into a synsepal ± similar to dorsal sepal in shape and size, sometimes wider. Petals elliptic basally, then prolonged in linear tails 2 or 3× longer than the basal portion. Labellum ± adnate to the basal portion of the column or spine or sometimes articulate with it, subentire or with basal lobes ± hooked, porrect, central lobe much larger than lateral lobes, elliptic to broadly elliptic, obtuse to acute, with dark burgundy veins, glabrous or conspicuously pubescent toward the apex; column short, robust, columnar foot pedestal-like; anther subventral beneath laminar hood; pollinia 2 on a small hamulus and a tiny, subspherical viscidium; stigma ventral, oblong to subquadrate. [Epidendroideae: Epidendreae: Pleurothallidinae.]

A neotropical genus of 8 species found in Central America and South America (Colombia, Venezuela, Ecuador, Peru, and Bolivia); most diverse in Colombia and Venezuela. Four species are found in Venezuela.

The recognition of this genus is based solely on morphology. No molecular data have been published that would either support or refute the hypothesis that these species form a distinct, monophyletic lineage.

Lindleyalis glossopogon (Rchb. f.) Luer, Monogr. Syst. Bot. Missouri Bot. Gard. 95: 258. 2004. *Pleurothallis glossopogon* Rchb. f., Bonplandia (Hannover) 3: 71. 1855; Morillo, in Morillo et al., Bot. Ecol. Monocot. Páramos Venez. 1: 250–251, fig. 95, foto 46. 2011.

Pleurothallis biserrula Rchb. f., Bonplandia (Hannover) 3: 71. 1855; Dunsterville and Garay, Venez. Orchids Ill. 3: 248–249. 1965; Foldats, Fl. Venez. 15(2): 213–215, fig. 258. 1970; Ortega et al., BioLlania 5: 49. 1987; Romero and Carnevali, Orchids Venez., 2nd ed., 3: 757. 2000; Dorr et al., Contr. U.S. Natl. Herb. 40: 52. 2000 [2001]; Fernández, Orquídeas Nat. Táchira 175. 2003.

Epiphytic herbs, to 45 cm long (usually shorter). Leaf blades oblong to ovate-oblong, 7–15 × 1.8–5 cm. Inflorescences arching. Flowers large and showy. Sepals translucent in basal ⅓ (throughout the basal ½ in dorsal sepal), otherwise opaque pale burgundy, nerves dark burgundy; dorsal sepal 3–6.7 cm long. Petals white; labellum opaque burgundy, apex pale greenish-yellow.

Found in South America (Colombia, Venezuela, and Ecuador). In Venezuela, known only from the Andes (Mérida, Táchira, and Trujillo; Map 194). Collected along the Boconó–Guaramacal road and on the trail from Casa Vicuyal to Páramo de Vicuyal; (1,850–)2,150–2,800 m.

MAP 194. *Lindleyalis glossopogon* occurrence in Venezuela.

Lockhartia Hook.

Lockhartia Hook., Bot. Mag. 54: t. 2715. 1827.
Neobennettia Senghas, J. Orchideenfreund 8: 364. 2001.

Epiphytic herbs; small to medium-sized; erect to pendulous; caespitose. Stems elongate, subterete to flattened, wholly covered by short, imbricating, laterally compressed sheaths. Leaves laterally compressed, narrowly oblong to narrowly or broadly triangular, sometimes dorsally keeled, bases imbricate and articulate with their sheaths, apices acute to rounded. Inflorescences originating from the leaf axils, usually subapically, frequently from the middle or lower internodes of the stem, 1 to many simultaneously, 1- to many-flowered, when many-flowered, short, successively to simultaneously few-flowered racemes, rarely short, simultaneously flowered lax panicles; bracts of rachis and peduncle usually ± foliaceous, flat to concave, relatively conspicuous. Flowers resupinate or not, inconspicuous to relatively showy, usually yellow with purple or maroon tinges or spots or totally white; floral bracts usually ± foliaceous, flat to concave, relatively conspicuous; perianth segments membranous or subfleshy, widely spreading. Petals and sepals similar, sometimes the petals somewhat wider, usually elliptic or oblong, rarely ovate or obovate, acute, rounded or truncate. Labellum usually flat to convex, entire or 3-lobed, when lobed, usually with a pair of erect, antrorse to retrorse, short, slender basal lobes, frequently ± pandurate; apex obtuse to deeply emarginate; disk ecallose or variously callose, the upper surface of labellum glabrous to variously pubescent; column relatively short, subparallel with the labellum forming an obtuse to acute angle with it, laterally produced in a pair of well-developed wings; anther apical to ventral, operculate, incumbent; pollinarium consisting of a small viscidium, a short or elongate hyaline tegula and 2 obpyriform pollinia; rostellum transverse; stigma ventral or subapical. Ovary terete. Capsules almost globular. [Epidendroideae: Cymbidieae: Oncidiinae.]

A neotropical genus of ~30 species found in Mexico, Central America, and South America (Colombia, Venezuela, Trinidad and Tobago, the Guianas, Ecuador, Peru, Bolivia, and Brazil). Seven species are known from Venezuela.

References. Lambert (1977); Neubig et al. (2012); Pridgeon et al. (2009); Senghas (1995b).

Lockhartia chocoensis Kraenzl., in Engler, Pflanzenr. IV (Heft 83): 19, t. 2, fig. E. 1923; Dunsterville and Garay, Venez. Orchids Ill. 6: 220. 1976; Romero and Carnevali, Orchids Venez., 2nd ed., 2: 456. 2000 ("*chacoënsis*"); Fernández, Orquídeas Nat. Táchira 125. 2003 ("*chacoënsis*").

Epiphytic herbs, erect or ± pendulous, 20–27 cm tall. Leaves 1.5–2 cm long. Flowers yellow with purple areas. Sepals 5–7 mm long.

Found in Central America (Costa Rica and Panama) and South America (Colombia, Venezuela, Ecuador, and Peru). In Venezuela, known only from the Andes (Táchira and Trujillo) (Map 195). Found once in the karst area above the Río Amarillo near the lower limits of the southern boundary of the park; ~1,200–1,400 m.

MAP 195. *Lockhartia chocoensis* occurrence in Venezuela.

Malaxis Sol. ex Sw.

Malaxis Sol. ex Sw., Prodr. 8, 119. 1788.
Tamayorkis Szlach., Fragm. Florist. Geobot., Suppl. 3: 121. 1995.

Terrestrial or rarely epiphytic herbs. Rhizomes usually well developed and creeping or very short, prostrate or ascending to erect. Stems usually thickened into a pseudobulb or not; pseudobulbs narrowly ovoid, pyriform to subcylindrical, erect, covered by sheaths, with 1–3 apical or subapical leaves, rarely distichously leaved. Leaves herbaceous or subplicate, not articulate; leaf blades usually diverging and appearing subopposite, bases contracted into a long sheath-like petiole, membranous to subfleshy; petioles clasping the basal part of the peduncle and usually the entire pseudobulb. Inflorescences terminal, racemose or (more rarely) spicate, emerging from the pseudostem formed by leaf petioles; peduncles terete or ± compressed, usually much longer than rachises; rachises often very short and flowers arranged in subumbels; floral bracts inconspicuous. Flowers small or minute, usually greenish or yellowish, usually not resupinate and presented horizontally; perianth segments usually widely spreading, subfleshy. Sepals free or lateral sepals connate below the basal ½, subequal. Petals usually narrower than the sepals, often filiform, sometimes twisted. Labellum sessile, not articulate and rigidly adnate to the column, fleshier and broader than the other perianth segments, entire or 2- or 3-lobed, base concave, rounded, cordate, auriculate or sagittate, margins entire or lacerate; column very short, erect, terete; clinandrium conspicuous, membranous, oblique; anther terminal, erect, 2-locular; pollinia

4 in 2 subequal pairs, waxy; rostellum erect; stigma ventral to subterminal. Capsules ovoid to ellipsoid. [Epidendroideae: Malaxideae.]

Malaxis s.l. is a cosmopolitan genus of 250–300 species, with its greatest species diversity in Asia and Oceania and secondary centers of diversity in Mexico and the Andes. In the Americas, the genus is found in North America (Canada and USA), Mexico, Central America, the West Indies, and South America (Colombia, Venezuela, Ecuador, Peru, Bolivia, Brazil, and Argentina). Approximately 15 species occur in Venezuela.

REFERENCES. Cameron (2005); Pridgeon et al. (2005).

The species of *Malaxis* are fundamentally shade loving but very variable in terms of their habitat and ecological preferences. The two species found in Guaramacal have a pair of subopposite leaves and subumbellate inflorescences.

Molecular data indicate that *Malaxis* s.l. is polyphyletic (Cameron, 2005; Pridgeon et al., 2005), and the genus is likely to be broken up into seven or more genera. It appears likely that our species will remain in *Malaxis* s. str., a large clade of predominantly American taxa. Preliminary data (Pridgeon et al., 2005) also indicate that in addition to this large predominantly American clade, there are temperate Eurasian–North American, African, and Asian clades.

KEY TO THE SPECIES OF *MALAXIS*

1a. Labellum apex 3–5-toothed, oblong-obovate in general outline; petals normally straight . . . . . ***M. licatae***
1b. Labellum apex rounded or apiculate, ovate-suborbicular in general outline; petals normally spiraled (i.e., twisted like a corkscrew) . . . . . ***M. nidiae***

♦ ***Malaxis licatae*** Carnevali & I. Ramírez, Harvard Pap. Bot. 3: 244, fig. 3. 1998 ("*licatiae*").

Malaxis sp. A; Dorr et al., Contr. U.S. Natl. Herb. 40: 51. 2000 [2001].

Terrestrial herbs, 14–25 cm tall. Leaves 2, 4.5–15 × 2.5–7.5 cm. Flowers green. Dorsal sepal 4–4.5 mm long. Labellum 4–4.5 mm long.

Endemic to the Cordillera de Mérida in Venezuela (Portuguesa and Trujillo; Map 196). Cloud forest near La Divisoria de la Concepción and on the north slope of Guaramacal; 1,700–2,350 m.

Malaxis licatae belongs to the taxonomically difficult complex of species surrounding *M. excavata* (Lindl.) Kuntze. The latter name has been applied indiscriminately to a large number of taxa that have superficially similar labella. This group of species is characterized by having apically 3-toothed labella. *Malaxis excavata* is known with certainty only from Mexico, whereas many of the other species in the group are found in southern Central America and in the Andes. This species complex merits further study.

♦ ***Malaxis nidiae*** Carnevali & I. Ramírez, Harvard Pap. Bot. 3: 246, fig. 4. 1998; Romero and Carnevali, Orchids Venez., 2nd ed., 2: 482. 2000; Fernández, Orquídeas Nat. Táchira 128. 2003.

Malaxis parthonii auct., non C. Morren; Foldats, Fl. Venez. 15(1): 439–441, fig. 164. 1969, pro parte (i.e., fig. 164, the lower margin depicting the labellum in the left of the drawing).

MAP 196. *Malaxis licatae* occurrence in Venezuela.

MAP 197. *Malaxis nidiae* occurrence in Venezuela.

Terrestrial herbs, 13–24 cm tall. Leaves 2, 4.5–7 × 2.5–4 cm. Flowers green to brown. Dorsal sepal 3 mm long. Labellum 3 mm long.

Endemic to the Andes of Venezuela (Táchira and Trujillo; Map 197). Cloud forest on the north slope of Guaramacal; 2,100 m.

Masdevallia Ruiz & Pav.

Masdevallia Ruiz & Pav., Fl. Peruv. Prodr. 122. 1794.
Luerella Braas, Orchidee (Hamburg) 30: 108. 1979.
Rodrigoa Braas, Orchidee (Hamburg) 30: 203. 1979.
Portillia Königer, Arcula 6: 154. 1996.
Masdevallia subgen. *Fissia* Luer, Monogr. Syst. Bot. Missouri Bot. Gard. 77: 10. 2000. *Fissia* (Luer) Luer, Monogr. Syst. Bot. Missouri Bot. Gard. 105: 9. 2006.
Jostia Luer, Monogr. Syst. Bot. Missouri Bot. Gard. 79: 2. 2000.
Actinopetala Luer, Monogr. Syst. Bot. Missouri Bot. Gard. 105: 3. 2006.
Alaticaulia Luer, Monogr. Syst. Bot. Missouri Bot. Gard. 105: 4. 2006.
Buccella Luer, Monogr. Syst. Bot. Missouri Bot. Gard. 105: 7. 2006.
Byrsella Luer, Monogr. Syst. Bot. Missouri Bot. Gard. 105: 7. 2006.
Luzama Luer, Monogr. Syst. Bot. Missouri Bot. Gard. 105: 10. 2006.
Megema Luer, Monogr. Syst. Bot. Missouri Bot. Gard. 105: 11. 2006.
Petalodon Luer, Monogr. Syst. Bot. Missouri Bot. Gard. 105: 11. 2006.
Regalia Luer, Monogr. Syst. Bot. Missouri Bot. Gard. 105: 12. 2006.
Reichantha Luer, Monogr. Syst. Bot. Missouri Bot. Gard. 105: 13. 2006.
Spectaculum Luer, Monogr. Syst. Bot. Missouri Bot. Gard. 105: 14. 2006.
Spilotantha Luer, Monogr. Syst. Bot. Missouri Bot. Gard. 105: 15. 2006.
Sterptoura Luer, Monogr. Syst. Bot. Missouri Bot. Gard. 105: 16. 2006.
Triotosiphon Schltr. ex Luer, Monogr. Syst. Bot. Missouri Bot. Gard. 105: 16. 2006.
Zahleria Luer, Monogr. Syst. Bot. Missouri Bot. Gard. 105: 17. 2006.

Epiphytic, lithophytic or humicolous herbs; very small and inconspicuous to large and showy; erect or patent, rarely pendulous; usually caespitose but with some species creeping. Stems unifoliate, short to virtually absent compared to the length of the leaf, rarely slightly elongate, usually terete, more rarely angled, covered with 1 to several scarious sheaths, sometimes pustular or dyed black. Leaves with duplicative prefoliation, flat to rarely subterete, articulate; leaf blades usually narrowly obovate-elliptic but often elliptic to linear-elliptic, sessile to long-petiolate, leathery or fleshy, petiolate. Inflorescences emerging from an annulus below the abscission zone (leaf articulation), short- to long-pedunculate, erect, patent to pendulous, 1- to many-flowered, rarely racemose with several flowers opening simultaneously; peduncles terete or triquetrous, sometimes basally triquetrous and apically terete, more rarely somewhat laterally compressed, covered with 1–4 sheaths; rachises very short to long, usually much shorter than peduncles. Flowers usually resupinate, small or minute to large and showy, short- to long-pedicellate. Sepals variously connate, forming a basal cup, rarely nearly free, lateral sepals usually forming a conspicuous synsepal, apices caudate, color variable but often the inside face a different color than the outside one. Petals much smaller than sepals and usually enclosed in the sepaline cup, free, flanking the column and labellum, usually oblong to oblong-elliptic, apically lobed, toothed to rarely entire, with a callus on the margin that is usually developed into a ± conspicuous tooth, fleshy. Labellum small, parallel to the column, oblong to elliptic or obovate, ± fleshy, articulate with a curving extension of the apex of the columnar foot, often contracted near or above the middle and then with an apical lobe and basal blade; column terete or semiterete, enclosed in the sepaline cup, straight or curved, winged or not; anther ventral or subterminal, operculate, incumbent, 1-locular; clinandrium entire or variously toothed; pollinia 2, ovoid, waxy, attached to a small viscidium; rostellum transverse; stigma ventral. Ovary 3-valvate, articulate with pedicel, smooth, verruculose to rugulose. Capsules ellipsoid. [Epidendroideae: Epidendreae: Pleurothallidinae.]

A neotropical genus of ~400 species found in Mexico, Central America, and South America (Colombia, Venezuela, the Guianas, Ecuador, Peru, Bolivia, and Brazil). The genus is most diverse in the Andes, especially in Colombia, Ecuador, and Peru. Approximately 55 species occur in Venezuela.

References. Abele (2007); Luer (1986c, 2000a, 2000b, 2002a, 2006); Pridgeon and Chase (2001); Pridgeon et al. (2001b, 2005).

Masdevallia is a well-supported monophyletic genus most closely related to *Dracula* Luer, *Trisetella* Luer, and *Porroglossum* Schltr. (Pridgeon and Chase, 2001; Pridgeon et al., 2001b; Abele, 2007). The many segregate genera proposed by Luer (2006) scarcely merit mention.

KEY TO THE SPECIES OF *MASDEVALLIA*

1a. Inflorescences conspicuously longer than the leaves, with several simultaneous flowers; mature leaf blades 15–25 × 3.5–5 cm; synsepal purplish in the apical ½, bright yellow in the basal ½, sepal tails pale purple . . . . . ***M. schlimii***

1b. Inflorescences slightly longer to conspicuously shorter than the leaves when 1-flowered; mature leaf blades to 11 × 1.5 cm; synsepal the same color as the sepal tails, white, green or yellow 2

2a. Stems and petioles ± black; inflorescences erect, longer than the petioles; flowers white with yellow sepal tails; sepal tube narrowly cylindrical, longer than wide, sepal tails linear; labellum simple; petals truncate or obtuse, apically lobed . . . . . ***M. tubulosa***

2b. Stems and petioles green; inflorescences pendulous, shorter than the petioles; flowers including sepal tails sulfurous-yellow with greenish-yellow veins; sepal tube campanulate, as wide as long, sepal tails triangular; labellum with a well developed apical lobe; petals acute, simple . . . . . ***M. gerlachii***

MAP 198. *Masdevallia gerlachii* occurrence in Venezuela.

MAP 199. *Masdevallia schlimii* occurrence in Venezuela.

♦ ***Masdevallia gerlachii*** Königer, Arcula 2: 38, t. p. 39. 1994.

Masdevallia macroglossa auct., non Rchb. f.; Luer, Monogr. Syst. Bot. Missouri Bot. Gard. 82: 323, figs. 162, 163. 2000.

Masdevallia civilis auct., non Rchb. f. & Warsz.; Foldats, Fl. Venez. 15(3): 26–28, fig. 393. 1970, pro parte.

Epiphytic herbs, to 15 cm tall. Leaf blades oblong, 7–11 cm long, obtuse. Inflorescences 1-flowered, pendulous. Flowers small, to 16 mm long, 2 cm in diameter.

Endemic to the Cordillera de Mérida in Venezuela (Trujillo; Map 198). Known only from the "Páramo de Guaramacal" without a precise locality, but certainly from the Trujillo and not the Portuguesa portion of the park; 1,800 m.

Masdevallia gerlachii has been confused with *M. civilis* Rchb. f. & Warsz., a species evidently endemic to Peru, but the inflorescence is pendulous and the labellum is clearly lobed in the former as opposed to erect and simple in the latter.

We are not altogether convinced that *Masdevallia macroglossa* Rchb. f., described from the Cordillera de la Costa, is the same as *M. gerlachii*, described from the Andes, but examination of their types could prove us to be wrong.

Masdevallia schlimii Linden ex Lindl., Orchid. Linden. 5. 1846; Dunsterville and Garay, Venez. Orchids Ill. 3: 170–171. 1965; Romero and Carnevali, Orchids Venez., 2nd ed., 2: 503. 2000; Fernández, Orquídeas Nat. Táchira 136. 2003; Morillo, in Morillo et al., Bot. Ecol. Monocot. Páramos Venez. 1: 216–217, fig. 76, foto 38. 2011. *Alaticaulia schlimii* (Linden ex Lindl.) Luer, Monogr. Syst. Bot. Missouri Bot. Gard. 105: 6. 2006.

Epiphytic herbs, to 40 cm tall. Leaf blades obovate-elliptic, 10–21 cm long, obtuse. Inflorescences 4–6-flowered, erect. Flowers showy, to 2 cm long, 10 cm in diameter.

Found in South America (Colombia and Venezuela). In Venezuela, known only from the Andes (Mérida, Táchira, and Trujillo; Map 199). Without precise locality; 2,500 m.

There is some doubt as to whether or not this species has been collected within the boundaries of Guaramacal National Park. The locality of our voucher (*Renz 4651*, RENZ) is vague, and the specimen may have been collected to the northwest of the park along the Boconó–Trujillo road.

Masdevallia tubulosa Lindl., Orchid. Linden. 4. 1846; Foldats, Fl. Venez. 15(3): 59–61, fig. 406. 1970; Dunsterville and Garay, Venez. Orchids Ill. 5: 178–179. 1972; Romero and Carnevali, Orchids Venez., 2nd ed., 2: 511. 2000; Fernández, Orquídeas Nat. Táchira 137. 2003; Morillo, in Morillo et al., Bot. Ecol. Monocot. Páramos Venez. 1: 219–220, fig. 792. 2011.

Epiphytic herbs, 6.5–11 cm tall. Leaf blades oblong-oblanceolate, 4–12 cm long, acute or subacute. Inflorescences 1-flowered, erect. Flowers 3–7 cm long, to 10 cm in diameter, tubular, white.

Found in South America (Colombia, Venezuela, Ecuador, and Peru). In Venezuela, reported from the Andes (Mérida, Táchira, and Trujillo) and the Cordillera de la Costa (Aragua and Distrito Federal; Map 200). Collected on the north slope of Guaramacal; 1,850–2,200 m.

Maxillaria Ruiz & Pav.

Maxillaria Ruiz & Pav., Fl. Peruv. Prodr. 116. 1794.

Calawaya Szlach. & Sitko, in Szlachetko et al., Biodivers. Res. Conservation 25: 23. 2012.

Pseudocymbidium Szlach. & Sitko, in Szlachetko et al., Biodivers. Res. Conservation 25: 33. 2012.

MAP 200. *Masdevallia tubulosa* occurrence in Venezuela.

Epiphytic, lithophytic or rarely terrestrial herbs; caespitose to climbing or creeping. Rhizomes very short to long and creeping or climbing; pseudobulbs present (our species) or absent, spherical, ovoid or oblongoid, with or without distichous and ± imbricate sheaths, innermost sheaths sometimes with foliar blades. Leaves conduplicate to semiterete, articulate with their sheaths or with the apex of the pseudobulb; pseudobulbs 1-foliate (our species) or leaves distributed distichously along the stems; leaf blades oblong, oblong-elliptic, linear or subterete to broadly elliptic to suborbicular, apices irregularly oblique, bases attenuate, submembranous, leathery to succulent, sessile or petiolate. Inflorescences 1-flowered, 1 or several flowers produced simultaneously, originating from the bases of the pseudobulbs or from the axils of the leaf sheaths, covered with scarious sheaths. Flowers inconspicuous to large and showy, usually resupinate, variously colored; floral bracts usually inconspicuous, shorter than the ovary; perianth free, parallel to the column to widely expanded, submembranous or fleshy. Sepals usually longer and wider than petals; lateral sepals oblique. Petals subparallel to the column. Labellum fleshy, articulate or not to the column foot, usually 3-lobed, central lobe usually larger than the lateral lobes; labellar disk usually equipped with several calli or longitudinal ridges that are usually made of wax; other calli are located on the central lobe; column usually long, cylindrical or semicylindrical, straight or recurved; anther apical, operculate, incumbent; clinandrium often provided with teeth or marginal cilia; pollinia 4 in 2 unequal pairs, superimposed dorsoventrally; viscidium well developed, hippocrepiform, stipes lunate or absent sometimes elongate; rostellum transverse; stigma solitary, ventral, transverse to ovoid. Ovary cylindrical to 3-angled, pedicellate. Capsules ellipsoid or subspherical, sometimes 3-angled, surface usually smooth, laterally dehiscent, marcescent perianth often at apex. [Epidendroideae: Cymbidieae: Maxillariinae.]

A neotropical genus of 200–250 species found in Mexico, Central America, and South America (Colombia, Venezuela, the Guianas, Ecuador, Peru, Bolivia, Brazil, and Argentina); most diverse in the Andes and southern Central America. Approximately 100(or fewer) species are found in Venezuela.

References. Blanco et al. (2007); Christenson (2002a, 2002b); Pridgeon et al. (2009); Senghas (2002); Whitten et al. (2007).

Maxillaria s.l. is grossly polyphyletic (Blanco et al., 2007; Whitten et al., 2007), which presents a number of taxonomic challenges. Most fundamentally, either one recognizes an extremely large and variable genus within the "core Maxillariinae," or one divides *Maxillaria* s.l. into many smaller, monophyletic clades. We have attempted to follow the latter course by recognizing not only *Maxillaria* s. str. but also *Camaridium* and *Ornithidium* R. Br. None of the other segregate genera of a much-reduced *Maxillaria* are known to occur in Guaramacal. The many generic segregates proposed by Szlachetko et al. (2012) seem to be based on a few homoplasious morphological characters and/or incomplete molecular sampling, and we see no value in adopting their concepts that diverge from those based on the published molecular phylogeny of Whitten et al. (2007).

KEY TO THE SPECIES OF *MAXILLARIA*

1a. Pseudobulbs widely separated, conical-fusiform, completely covered when young by several imbricate sheaths of which the innermost 1 or 2 have foliar blades; leaf blades ≤15 cm long, 15–20× longer than wide; sepals ≤2.5 cm long . . . . . ***M. meridensis***

1b. Pseudobulbs clustered on short rhizomes, not fully covered by their sheaths, which lack foliar blades; leaf blades usually ≥15 cm long, 8–15× longer than wide; sepals ≥2.5 cm long 2

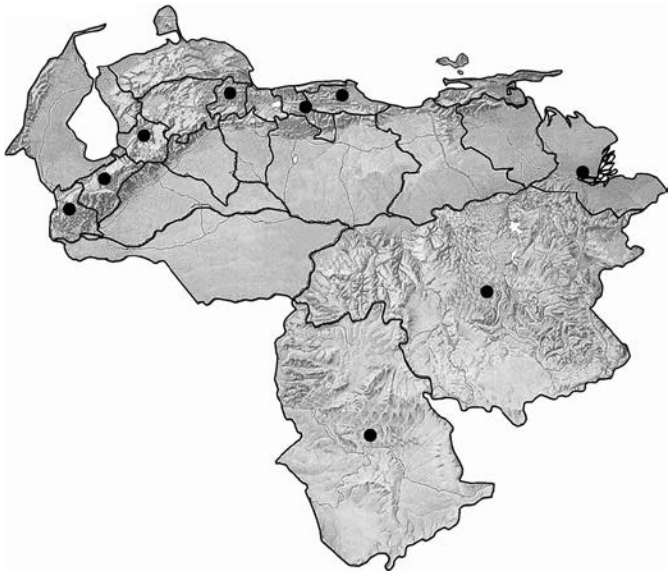
2a. Sepals 9–10 cm long, linear-elliptic; dorsal sepal long and narrowing apically; flowers pale purple or pink with dark purple longitudinal striations; callus small, restricted to the basal ¼ of the labellum; pollinia suborbicular . . . . . ***M. macrura***

2b. Sepals 5–7 cm long, oblong or elliptic; dorsal sepal not narrowing apically or only abruptly in the lower ⅙; flowers yellow, orange or dark purple; callus large, occupying the entire basal ½ of the labellum; pollinia narrowly elliptic . . . 3

3a. Flowers deep wine-purple; labellum simple, subquadrate or oblong-subquadrate in general outline; dorsal sepal oblong-elliptic . . . . . ***M. nigrescens***

3b. Flowers orange-yellow, with white areas; labellum conspicuously 3-lobed, ovate-elliptic in general outline; dorsal sepal spathulate . . . . . ***M. triloris***

MAP 201. *Maxillaria macrura* occurrence in Venezuela.



MAP 202. *Maxillaria meridensis* occurrence in Venezuela.

Maxillaria macrura Rchb. f., Linnaea 41: 28. 1877 [1876]; Dunsterville and Garay, Venez. Orchids Ill. 3: 186–187. 1965; Foldats, Fl. Venez. 15(4): 476–478, fig. 737. 1970; Romero and Carnevali, Orchids Venez., 2nd ed., 2: 556. 2000.

Epiphytic herbs. Leaf blades 15–35 cm long. Inflorescences much longer than the pseudopetioles of the leaves. Perianth segments widely spreading, bases pale flesh color suffused with a maroon-tan. Sepals 9–10 cm long.

Endemic to the Venezuelan Andes (Mérida, Táchira, and Trujillo; Map 201). In cloud forest in Qda. Segovia along the Boconó–Guaramacal road; ~2,600 m.

This species is extremely showy. Sterile material can be confused in our area with *Maxillaria nigrescens* Lindl., but the old peduncles of the inflorescences of *M. macrura* are much longer than the pseudopetioles of the leaves.

A yellow-flowered form of this Venezuelan endemic, *Maxillaria macrura* f. *aurea* Christenson, was described from material flowering in cultivation in England. The exact provenance of this form either is unknown or was suppressed by the author.

Maxillaria meridensis Lindl., Orchid. Linden. 19. 1846; Dunsterville and Garay, Venez. Orchids Ill. 2: 206–207. 1961; Foldats, Fl. Venez. 15(4): 483–486, fig. 740. 1970; Romero and Carnevali, Orchids Venez., 2nd ed., 2: 561. 2000; Carnevali and Ramírez-Morillo, in Berry et al., Fl. Venez. Guayana 7: 440. 2003; Fernández, Orquídeas Nat. Táchira 146. 2003. *Calawaya meridensis* (Lindl.) Szlach. & Sitko, in Szlachetko et al., Biodivers. Res. Conservation 25: 24. 2012.

Subterrestrial, lithophytic or epiphytic herbs, erect or creeping, 25–100 cm long. Leaf blades 10–15 cm long. Inflorescences solitary in the sheath axils; peduncles 1.5–3 cm long. Perianth segments not widely spreading, greenish, yellowish-brown to pink tinged or orange-pink. Dorsal sepal 1.8–2.5 cm long.

Found in Central America (Costa Rica and Panama), the Lesser Antilles (Guadeloupe), and South America (Colombia, Venezuela, Guyana, Ecuador, Peru, Bolivia, and Brazil). In Venezuela, this species is reported from Amazonas, Aragua, Bolívar, Delta Amacuro, Mérida, Miranda, Táchira, Trujillo, and Yaracuy (Map 202). The sole collection made in the park was from a disturbed area below the Páramo del Pumar; ~2,600 m.

Maxillaria nigrescens Lindl., Orchid. Linden. 20. 1846; Dunsterville and Garay, Venez. Orchids Ill. 3: 188–189. 1965; Foldats, Fl. Venez. 15(4): 493–494, fig. 744. 1970; Romero and Carnevali, Orchids Venez., 2nd ed., 2: 565. 2000; Fernández, Orquídeas Nat. Táchira 147. 2003.

Epiphytic herbs. Leaf blades 25–52 cm long. Inflorescences ± as long as the pseudopetioles of the leave. Perianth segments widely spreading; reddish-brown, maroon or yellow with a dark maroon throat. Sepals 2.5–6.7 cm long, widely spreading.

Found in South America (Colombia and Venezuela). In Venezuela, known from the Andes (Mérida, Táchira, and Trujillo) and the Cordillera de la Costa (Miranda; Map 203). In the park, found in cloud forest in Qda. Segovia on the north slope and along the trail between El Campamento (below Cerro El Diablo) and El Maciegal on the south slope; 1,800–1,900 m.

In this species, the petals arch downward.

Material from Ecuador and Peru identified as *Maxillaria nigrescens* can be referred to *M. calantha* Schltr. and is readily distinguished by its longer peduncles.

MAP 203. *Maxillaria nigrescens* occurrence in Venezuela.

MAP 204. *Maxillaria triloris* occurrence in Venezuela.

Maxillaria triloris E. Morren, Belgique Hort. 20: 240, t. 13. 1870; Dunsterville and Garay, Venez. Orchids Ill. 1: 244. 1959; Foldats, Fl. Venez. 15(4): 538–539, fig. 762. 1970; Fernández, Orquídeas Nat. Táchira 153. 2003.

FIGURE 25K

Maxillaria luteograndiflora Hort. ex Dombrain, Fl. Mag. (London) 10: t. 559. 1871, nom. nud.

Epiphytic herbs, to 70 cm tall. Leaf blades 45–55 cm long. Inflorescences shorter than petioles. Perianth segments widely spreading. Sepals white basally, yellow in the upper ½ with some purplish-brown in the middle; dorsal sepal 7–7.5 cm long. Petals white. Labellum white with yellow in the central lobe and purple veins on the labellar disk.

Found in South America (Colombia and Venezuela). In Venezuela, restricted to the Andes (Mérida, Táchira, and Trujillo; Map 204). Collected in forest near the lower limits of the southern boundary of the park in the karst area above the Río Amarillo; ~1,200–1,400 m.

Although *Maxillaria triloris* is very showy, it can be confused with several other species found in Venezuela, including *M. setigera* Lindl. and *M. luteoalba* Lindl. Unlike our species, *M. setigera*, a species of lower elevations, is smaller vegetatively and has strongly compressed and disciform pseudobulbs that are proportionally wider and flowers that are smaller with narrower sepals to 4.5 cm long. Similarly, *M. luteoalba*, unlike *M. triloris*, has sharply defined petioles and flowers that lack any suggestion of brown pigmentation.

Christenson (2004) argued that *Maxillaria luteograndiflora* Hort. ex Dombrain is the correct name for *M. triloris*, but we are not convinced by his arguments, and in any case the name he adopted is a nomen nudum as it lacks a description or diagnosis. *Maxillaria triloris* was described from material cultivated in Belgium, and although the exact provenance of this material was unknown, there was speculation in the protologue that the plants originated in Caracas. Christenson (2004) ignored this suggestion and argued that material matching what he called the "type" (presumably the plate) only occurs in Ecuador and Peru, but the distinguishing petal characters that he cited (petals initially straight and parallel to the column and then curving outward) cannot be interpreted from the protologue or accompanying plate.

Microchilus C. Presl

Microchilus C. Presl, Rel. Haenk. 1: 94. 1827.

Primarily terrestrial and secondarily subepiphytic herbs; sympodial; sympodia consisting of stems that are initially erect and then become decumbent and prostrate, basally trailing; stems terete, rooting at the internodes, leafy in the middle or upper third, sheaths remote. Leaves convolute, spirally arranged on the stem, not articulate, blades usually elliptic or lanceolate, obtuse, basally attenuate into a channeled pseudopetiole extending to a funnel-shaped sheath that embraces the stem, apically acute or acuminate, usually green but often spotted or variegated with silvery streaks or purple tints, herbaceous to herbaceous-subfleshy. Inflorescences terminal, usually many-flowered spikes; peduncles and rachises glandular-pubescent; peduncles usually well developed, covered by 2 or 3 tubular, appressed sheaths; floral bracts ± conspicuous, usually elliptic to ovate-elliptic, glabrous or pubescent, subequal to ovary in

length. Flowers resupinate, small, usually rather thin-textured; sepals free, subequal; dorsal sepal concave to cymbiform, connivent with the petals; lateral sepals connivent to spreading. Petals connivent with the dorsal sepal to form a galea or ± 3-lobed hood, linear to oblong-lanceolate. Labellum attached by its margins to the basal portion (⅓–½) of the column, divided into hypochile (i.e., basal part of a complex labellum, which is divided into 2 or 3 distinct parts) and epichile (i.e., terminal part of a complex labellum, which is divided into 2 or 3 distinct parts), extended basally into a cylindrical or ellipsoidal spur, sometimes conically bilobed, obtuse or subacute, usually with low thickenings that extend in veins from the base to the apex of the spur; hypochile semitubular, flattened rectangular to broadly elliptic, rarely keeled internally, often constricted apically; epichile sessile or with a short claw, often with a keel or papillose thickening extending to the opening of the hypochile, entire or transversely bilobed, apical lobes perpendicular to the labellar axis or retrorse. Column relatively short, fusiform, basally semiterete, sessile or subsessile, somewhat dilated around the stigmatic lobes; anthers erect, dorsal, ovoid to lanciform, bilocular; pollinia 4, sectile, clavate-obovoid, attached the length of the rostellum that is narrowly clavate-linear, caudicles attached to a well-defined viscidium; rostellum elongate, broadly triangular, the remains (after removal of the pollinia) deeply bifid; stigmatic lobes 2, ventral, confluent to connate, transversely elliptic or V-shaped. Ovary cylindric, glabrous to (more commonly) pubescent, spirally twisted. Capsules fusiform to obovoid; pedicels not elongating. [Orchidoideae: Cranichideae: Goodyerinae.]

A neotropical genus of 45–50 species found in Mexico, Central America, the West Indies, and South America (Colombia, Venezuela, Guyana, Suriname, Ecuador, including the Galapagos Islands, Peru, Bolivia, Brazil, Paraguay, Argentina, and Uruguay). Sixteen species occur in Venezuela.

References. Ormerod (2002); Pridgeon et al. (2003).

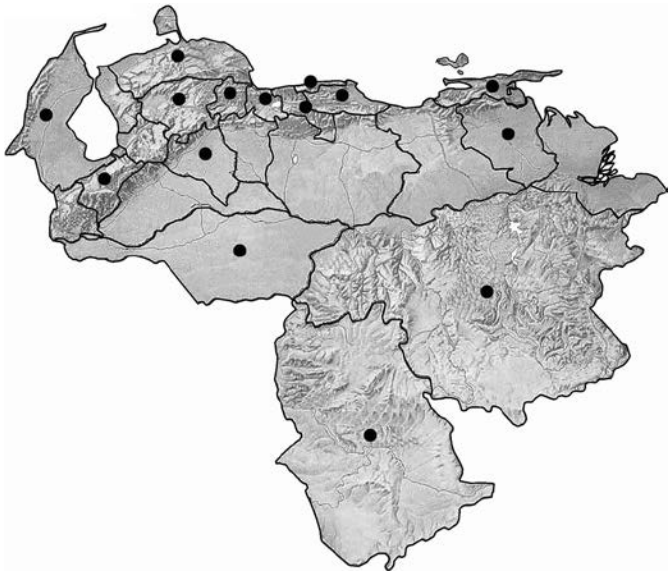
Species of *Microchilus* are usually shade loving and found in leaf duff.

Microchilus, which often is included in a broadly circumscribed *Erythrodes* Blume, can be distinguished by its deeply bifid rostellum (following removal of the pollinia) and by its neotropical distribution.

Microchilus paleaceus (Schltr.) Ormerod, Lindleyana 17: 219. 2002. *Physurus paleaceus* Schltr., Repert. Spec. Nov. Regni. Veg. Beih. 7: 72. 1920. *Erythrodes paleacea* (Schltr.) Ames, Orchidaceae 7: 75. 1922; Romero and Carnevali, Orchids Venez., 2nd ed., 1: 327. 2000; Dorr et al., Contr. U.S. Natl. Herb. 40: 50. 2000 [2001]; Carnevali and Ramírez-Morillo, in Berry et al., Fl. Venez. Guayana 7: 361. 2003.

Terrestrial humicolous, umbraticolous herbs, 50–100 cm tall. Flowers pubescent externally; perianth segments parallel to the column. Sepals green or yellow; dorsal sepal 6–8 mm long. Petals and labellum white or whitish; spur greenish.

Found in South America (Colombia, Venezuela, Trinidad and Tobago, Guyana, Suriname, Ecuador, Peru, and Brazil).



MAP 205. *Microchilus paleaceus* occurrence in Venezuela.

Widespread in Venezuela (Amazonas, Apure, Aragua, Bolívar, Carabobo, Distrito Federal, Falcón, Lara, Mérida, Miranda, Monagas, Portuguesa, Sucre, Yaracuy, and Zulia; Map 205). In the park, found near La Divisoria de la Concepción; 1,500–1,800 m.

Myoxanthus Poepp. & Endl.

Myoxanthus Poepp. & Endl., Nov. Gen. Sp. Pl. 1: 50. 1835 [1836].

Epiphytic but sometimes lithophytic or terrestrial herbs or suffruticose; inconspicuous to rather large in size; caespitose. Rhizomes very short to long and creeping, appressed to substrate or rarely ascending, simple or branched, mostly covered with hispidulous sheaths. Stems erect to ascending, 3–50 cm tall, subterete, apically 1-foliate, wiry to stout, sometimes distinctly swollen at the base, often apically proliferous, clothed by large, papery, usually hispidulous sheaths that often are easily shed. Leaves conduplicate, linear to broadly elliptic or oblong, thin to rigidly coriaceous. Inflorescences originating without an annulus from or near the apex of stem and then 1-flowered, or a fascicle of single flowers produced successively or simultaneously. Flowers resupinate, inconspicuous to relatively showy, campanulate to widely spreading; perianth segments often fleshy, variously pubescent; floral bracts inconspicuous, often hispidulous. Sepals free or the laterals variously connate into a synsepal, often fleshier and broader than the petals. Petals similar to sepals or longer and thinner or much shorter, often variously thickened, the apices sometimes developed into osmophores. Labellum articulate to column foot, simple to 3- or 5-lobed, usually much smaller than the other perianth segments, often convex and recurved, variously callose or ecallose;

column well developed, basally produced into a well-developed column foot, apically variously toothed or winged; anther ventral to subterminal, incumbent, operculate, sometimes spiculate; clinandrium entire to variously dentate or lacerate; pollinia 2, attached to a small viscidium; rostellum transverse; stigmatic surface ventral. Ovary smooth or hispidulous to echinate. Capsules ovoid, mostly hispidulous to echinate. [Epidendroideae: Epidendreae: Pleurothallidinae.]

A neotropical genus of ~40 species found in Mexico, Central America, and South America (Colombia, Venezuela, Guyana, Suriname, Ecuador, Peru, Bolivia, and Brazil). The greatest species diversity is in the Andes; ~12 species occur in Venezuela.

References. Luer (1982, 1992); Pridgeon and Chase (2001); Pridgeon et al. (2001b, 2005).

There is strong molecular support for the monophyly of *Myoxanthus* (Pridgeon and Chase, 2001; Pridgeon et al., 2001b). Morphologically, most species of *Myoxanthus* are distinguished easily from other pleurothallid orchids by the pubescent to hispidulous sheaths on their stems. This character, however, is not exclusive to *Myoxanthus*.

Myoxanthus reymondii (H. Karst.) Luer, Selbyana 7: 49. 1982; Romero and Carnevali, Orchids Venez., 2nd ed., 2: 612. 2000 ("*raymondii*"); Carnevali and Ramírez-Morillo, in Berry et al., Fl. Venez. Guayana 7: 460. 2003; Fernández, Orquídeas Nat. Táchira 157. 2003 ("*raymondii*"). *Duboisia reymondii* H. Karst., Allg. Gartenzeitung 15: 394. 1847 ("*Reymondi*"). *Pleurothallis reymondii* (H. Karst.) Rchb. f., Ann. Bot. Syst. 3(3): 520. 1852 ("*reymondi*"); Dunsterville and Garay, Venez. Orchids Ill. 1: 342–343. 1959 ("*raymondii*"); Foldats, Fl. Venez. 15(2): 381–383, fig. 329. 1970 ("*reymondi*"); Ortega et al., BioLlania 5: 49. 1987 ("*raymondii*").

MAP 206. *Myoxanthus reymondii* occurrence in Venezuela.

Epiphytic or rarely lithophytic herbs. Leaf blades 8–20 cm long. Sepals spreading, externally purple-brown, internally pale or dark honey-brown; dorsal sepal 5–8 mm long. Petals parallel to column, basally pale yellow-brown, apically with dark purple-brown osmophores. Labellum yellow with dark brown patches.

Found in South America (Colombia, Venezuela, Ecuador, and Peru). Venezuelan records are from the Andes (Lara, Mérida, Portuguesa, Táchira, and Trujillo), the Cordillera de la Costa (Aragua, Distrito Federal, Falcón, Miranda, and Yaracuy), and the Venezuelan Guayana (Bolívar; Map 206). Rare in cloud forest along the Boconó–Guaramacal road; 2,100–2,300 m.

Odontoglossum Kunth

Odontoglossum Kunth, in H. B. K., Nov. Gen. Sp. [fol.] 1: 281. 1815 [1816]; ibid. [qu.] 1: 350. 1815 [1816].

Symphyglossum Schltr., Orchis 13: 8. 1919, nom. cons.

Epiphytic, lithophytic or subterrestrial herbs; inconspicuous to large and showy; usually erect but sometimes pendulous; caespitose to creeping or scandent. Rhizomes abbreviated to elongate, prostrate to ascendent, naked or covered with sheaths bearing pseudobulbs at variable distances; pseudobulbs heteroblastic, usually ovoid to subspheroidal, sometimes oblong, apically 1–3(–4)-foliate, usually clothed by 1 to several imbricate sheaths, the innermost 1–3 of which may have foliar blades. Leaves conduplicate, articulate, erect or spreading, coriaceous to fleshy, sessile to shortly pseudopetiolate. Inflorescences originating from the base of pseudobulbs or from axils of pseudobulb sheaths, usually racemose or variously branched panicles, rarely few-flowered, erect, arching or pendulous, sometimes voluble; peduncles, rachises, and bracts various. Flowers resupinate, medium-sized to large and showy, patent to nodding, usually long-lasting; perianth segments spreading to campanulate, flat or undulate, mostly white, yellowish or pink, usually spotted, striped or blotched with red, purple, maroon, pink or brown, sometimes the entire flower purple or maroon. Sepals usually subequal, free or rarely lateral sepals connate in the basal ⅓, usually ovate-elliptic or elliptic, acute to acuminate, sometimes basally clawed. Petals usually similar to the sepals, rarely different. Labellum basally ± parallel to column, then usually deflexed and making an angle of ± 90° to the column, margin entire or denticulate to fimbriate, simple or 3-lobed; lateral lobes erect or spreading; disk variously callose, the callus denticulate or cristate or composed of several longitudinal ridges or plates, very rarely ecallose; column usually elongate and straight, footless, usually with a pair of entire or denticulate to lacerate or setiform subapical wings; anther terminal, operculate, incumbent, 1-locular or imperfectly 2-locular; pollinia 2, waxy, mostly ovoid, stipe narrowly oblong, viscidium small; clinandrium usually entire, shallow; rostellum transverse; stigma ventral. Ovary mostly terete, pedicellate. Capsules various. [Epidendroideae: Cymbidieae: Oncidiinae.]

A South American genus of ~100 species found almost exclusively in the Andes of Colombia, Venezuela, Ecuador, Peru, and Bolivia, but with 1 species also in the Guayana Highlands (Venezuela and Guyana). Fifteen species occur in Venezuela.

References. Bockemühl (1989); Chase (1997, 2002); Garay (1970); Neubig et al. (2012); Senghas (1997c).

A revision of *Odontoglossum* by Bockemühl (1989) settled briefly the long-standing debate regarding the distinctiveness of *Odontoglossum* and *Oncidium*, but with the introduction of molecular characters the debate has been renewed. *Oncidium* has been a catchall genus, and work to delimit a monophyletic *Oncidium* is incomplete; a number of segregate genera have been described or resurrected, including *Cyrtochilum*, *Otoglossum* (Schltr.) Garay & Dunst., and *Trichocentrum* Poepp. & Endl., which are recognized in this flora. There is a core group of *Odontoglossum* species that are monophyletic, but they are deeply embedded in a broadly circumscribed *Oncidium* (Chase et al., 2008; Neubig et al., 2012; Pridgeon et al., 2009). Inasmuch as these species of *Odontoglossum* also share a similar morphology, geography, and ecology, we have chosen to recognize them at the generic level. We appreciate that strict adherence to our circumscription implies that *Oncidium* will be further subdivided into smaller genera.

KEY TO THE SPECIES OF *ODONTOGLOSSUM*

1a. Petals and sepals 25–35 × 3–5 mm, narrowly lanceolate, acuminate, 4–5× longer than wide; pseudobulbs 2- or 3-foliate with conspicuously thickened internode of the second leaf ..... ***O. dormanianum***

1b. Petals and sepals 20–26 × 8–11 mm, elliptic or lanceolate, acute, ~2× as long as wide; pseudobulbs 1- or 2-foliate without thickened internodes ..... ***O. schillerianum***

Odontoglossum dormanianum Rchb. f., Gard. Chron., n.s., 21: 11. 1884 ("*Dormanianum*"); Dunsterville and Garay, Venez. Orchids Ill. 4: 172–173. 1966 ("*dormannianum*"); Foldats, Fl. Venez. 15(5): 213–214, fig. 840. 1970 ("*dormannianum*"). *Odontoglossum crocidipterum* subsp. *dormanianum* (Rchb. f.) Bockemühl, Odontoglossum, Monogr. 162. 1989; Dorr et al., Contr. U.S. Natl. Herb. 40: 51–52. 2000 [2001] ("*dormannianum*"). *Odontoglossum crocidipterum* f. *dormanianum* (Rchb. f.) O. Gruss & M. Wolff, Orchid Atlas 244. 2007. *Oncidium crocidipterum* subsp. *dormanianum* (Rchb. f.) M. W. Chase & N. H. Williams, in Chase et al., Lindleyana 21: 24. 2008.

MAP 207. *Odontoglossum dormanianum* occurrence in Venezuela.

Odontoglossum crocidipterum auct., non Rchb. f.; Romero and Carnevali, Orchids Venez., 2nd ed., 2: 655. 2000; Fernández, Orquídeas Nat. Táchira 161. 2003.

Odontoglossum sanderianum auct., non Rchb. f.; Dorr et al., Contr. U.S. Natl. Herb. 40: 52. 2000 [2001].

Epiphytic herbs; pseudobulbs ~6 × 3 cm. Leaf blades ~25 × 4 cm. Inflorescences suberect. Sepals and petals white or clear pale yellow to brownish-yellow with maroon spots. Labellum the same color as perianth but lighter.

Found in South America (Colombia and Venezuela). In Venezuela, found in the Andes (Lara, Mérida, Táchira, and Trujillo) and in the Cordillera de la Costa (Sucre; Map 207). In cloud forest along the Boconó–Guaramacal road and in sector El Santuario on the south slope of Guaramacal; 1,950–2,700 m.

This species belongs in the taxonomically difficult *Odontoglossum constrictum* Lindl. complex, which is most diverse in Colombia.

Odontoglossum schillerianum Rchb. f., Bonplandia (Hannover) 2: 12. 1854; Dunsterville and Garay, Venez. Orchids Ill. 3: 214–215. 1965; Foldats, Fl. Venez. 15(5): 235–237, fig. 850. 1970; Romero and Carnevali, Orchids Venez., 2nd ed., 2: 667. 2000; Fernández, Orquídeas Nat. Táchira 163. 2003; Morillo, in Morillo et al., Bot. Ecol. Monocot. Páramos Venez. 1: 230–231, fig. 83, foto 42. 2011.

Odontoglossum cinnamomeum R. Warner & B. S. Williams, Orchid Album 3: t. 143. 1884. *Oncidium cinnamomeum* (R. Warner & B. S. Williams) M. W. Chase & N. H. Williams, in Chase et al., Lindleyana 21: 22. 2008.

Epiphytic herbs; pseudobulbs 4–7.5 × 2.5–3.5 cm. Leaf blades 9–30 × 1.8–3 cm. Inflorescences erect. Sepals yellow with brown or purple spots. Labellum white basally.

Endemic to Venezuela, where it is found only in the Andes (Lara, Mérida, Táchira, and Trujillo; Map 208). Collected in cloud forest along the Boconó–Guaramacal road; 2,450 m.

MAP 208. *Odontoglossum schillerianum* occurrence in Venezuela.

This species is a member of the *Odontoglossum constrictum* complex. In Guaramacal National Park, this species can only be confused with the more common *O. dormanianum*. *Odontoglossum schillerianum*, however, is easy to recognize by its smaller flowers with broader perianth segments.

If one considers *Odontoglossum* to be a synonym of *Oncidium*, then the correct name for this species is *Oncidium cinnamomeum* (R. Warner & B. S. Williams) M. W. Chase & N. H. Williams because a new combination in *Odontoglossum* is blocked by *Odontoglossum schillerianum* Rchb. f. (Bonplandia (Hannover) 2: 91. 1854).

Oncidium Sw.

Oncidium Sw., Kongl. Vetensk. Acad. Nya Handl. 21: 239. 1800, nom. cons. *Heteranthocidium* Szlach. et al., Polish Bot. J. 51: 54. 2006.

Epiphytic or terrestrial, occasionally lithophytic, herbs; caespitose to prostrate. Roots thin to thick, white. Rhizomes short or long and creeping to scandent. Stems thickened into well-developed, clustered, laterally compressed, apically 2- or 3-foliate pseudobulbs; pseudobulbs partially covered by foliose sheaths or not, triangular when sheathless. Leaves conduplicate, articulate; leaf blades at the apex of pseudobulbs, flat, flexible or rigid, leathery, usually keeled on the back along the midvein. Inflorescences lateral, usually originating from base of mature pseudobulbs in axils of leaf sheaths, paniculate, occasionally racemose, erect or arched; floral bracts triangular. Flowers resupinate, inconspicuous to large and showy, usually yellow with brown spots, but in several species entirely white or pink with or without brown or purple spots, or entirely coffee-brown, membranous to fleshy. Sepals subequal; lateral sepals oblique, spreading to reflexed, free or basally connate. Petals mostly subequal to sepals. Labellum at the base of the column, entire, panduriform or 3-lobed, usually middle lobe larger than lateral ones; callus at the base of the labellum, glabrous or papillose, rarely pubescent, formed by keels or tubercles, usually a different color than the labellum; column usually thick and short, sometimes thin and elongate, without a foot, usually with a pair of petaloid processes (wings or projections) on the sides of the stigma, usually with a thickening at the base; anther terminal, operculate, incumbent, concave, 1- or 2-locular; pollinarium consisting of 2 obovoid or oblong-obovoid pollinia, usually yellow or orange, sulcate, with white hyaline laminar or tubular stipe, and viscidium usually ovoid, brown; rostellum usually short, sometimes elongate, generally triangular; stigmatic cavity on the ventral side of the column, entire, ovate to suborbicular or triangular, concave, shiny. Ovary terete, sulcate, pedicellate. Capsules generally ellipsoid to obovoid. [Epidendroideae: Cymbidieae: Oncidiinae.]

A neotropical genus of ~450 species found in Mexico, Central America, the West Indies, and South America (Colombia, Venezuela, the Guianas, Ecuador, Peru, Bolivia, and Brazil); most diverse in the Andes. Approximately 38–40 species occur in Venezuela.

References. Chase (1986, 1997, 2002); Chase and Palmer (1992); Chase et al. (2008, 2009); Garay (1970); Garay and Stacy (1974); Neubig et al. (2012); Pridgeon et al. (2009); Senghas (1997a); Williams et al. (2001).

Circumscription of *Oncidium* has been contentious, and our treatment of the genus in a more or less traditional sense may not prove to be defensible as molecular studies (Chase et al., 2008; Pridgeon et al., 2009; Neubig et al., 2012) indicate that *Odontoglossum* and other morphologically distinguishable genera such as *Sigmatostalix* Rchb. f. are deeply embedded within a larger *Oncidium* clade. Although these segregate genera are monophyletic, their position within the phylogenies in the molecular studies cited above suggests their recognition would require the creation of many new genera. Whether or not that is useful taxonomically is beyond the scope of this flora. We do accept the exclusion of almost all of the Brazilian species of *Oncidium*, which are now treated as *Gomesa* R. Br. (Pridgeon et al., 2000; Chase et al., 2009).

Many species and hybrids of *Oncidium* s.l. are grown as ornamentals.

Oncidium abortivum Rchb. f., Linnaea 22: 847. 1849; Dunsterville and Garay, Venez. Orchids Ill. 1: 262–263. 1959; Foldats, Fl. Venez. 15(5): 271–274, fig. 858. 1970; Romero and Carnevali, Orchids Venez., 2nd ed., 2: 670. 2000. *Heteranthocidium abortivum* (Rchb. f.) Szlach. et al., Polish Bot. J. 51: 54. 2006.

Small epiphytic herbs, often growing on twigs, erect; pseudobulbs 2–5 cm in diameter, suborbicular, strongly laterally compressed, 1-foliate laterally. Leaf blades oblong to oblong-lanceolate, 5–15 cm long. Inflorescences with fertile and abortive

MAP 209. *Oncidium abortivum* occurrence in Venezuela.

flowers. Fertile flowers yellow with brownish-red spots and lines. Labellum proportionally large, 1.5–2 cm wide.

Found in Central America (Panama) and South America (Colombia, Venezuela, Ecuador, and Peru). In Venezuela, this species is known from the Andes (Portuguesa and Táchira) and the Cordillera de la Costa (Aragua, Distrito Federal, Miranda, and Yaracuy; Map 209). La Divisoria de la Concepción; 1,300–1,500 m.

Ornithidium Salisb. ex R. Br.

Ornithidium Salisb. ex R. Br., in W. T. Aiton, Hortus Kew., 2nd ed., 5: 210. 1813. *Maxillaria* sect. *Ornithidium* (Salisb. ex R. Br.) Christenson, Richardiana 2(2): 52. 2002.

Siagonanthus Poepp. & Endl., Nov. Gen. Sp. Pl. 1: 40. 1836. *Maxillaria* sect. *Siagonanthus* (Poepp. & Endl.) Christenson, Proc. 16th World Orchid Conf. 286. 2002.

Neourbania Fawc. & Rendle, J. Bot. 47: 125. 1909 ("*Neo-urbania*").

Maxillaria sect. *Reflexae* Christenson, Proc. 16th World Orchid Conf. 285. 2002.

Laricorchis Szlach., in Szlachetko and Śmiszek, Richardiana 7(1): 27. 2007 [2006].

Primarily epiphytic but also lithophytic or terrestrial herbs; highly variable vegetatively. Monopodial, sympodial or sympodial as juveniles with monopodial adult shoots. Roots often orange-brown. Rhizomes creeping or attached only at base, producing erect shoots, rooting at internodes just below pseudobulbs or both. Pseudobulbs heteroblastic, ovoid or suborbicular, not or slightly compressed laterally, surface usually shiny and minutely reticulate (reminiscent of old varnish; best seen in living material), 1- or 2(–4)-foliate apically, usually enveloped by 2–5 imbricate sheaths, of which 1–3 internal ones have foliar blades, or pseudobulbs completely absent (e.g., *Ornithidium serrulatum* Lindl.). Leaves conduplicate, articulate; leaf blades often oblong-elliptic, occasionally linear or suborbicular, coriaceous to subfleshy. Inflorescences 1-flowered, usually fasciculate, rarely solitary, emerging from the sheaths subtending pseudobulbs or from sheaths of rhizomes, or stems erect; peduncles usually much longer than the pedicels; floral bracts inconspicuous, much shorter than the pedicels. Flowers small to (rarely) medium-sized, resupinate, usually brightly colored, yellow, red, orange, less commonly white or greenish, perianth segments fleshy, fibers absent, usually porrect, forming a tubular flower, subglobose or campanulate, often producing nectar at the base of the labellum; petals and sepals subequal, free, ovate or broadly elliptic, less commonly lanceolate, obtuse or broadly acute (rarely acute or acuminate), usually many-nerved. Labellum fleshier than other perianth segments, rigidly fused to the column foot or somewhat articulate, often geniculate, simple or 3-lobed, usually with a simple, conspicuous callus, fleshy in the middle of the disk; column cylindrical, straight or somewhat geniculate, with a short foot; anther terminal, operculate, incumbent, glabrous; pollinia 4, in 2 unequal pairs, usually white; stigmatic surface ventral, variable. Ovary terete or 3-angled, often much longer than peduncle. Capsules ellipsoid; dehiscent apically. [Epidendroideae: Cymbidieae: Maxillariinae.]

A genus of 55–60 species found in Mexico, Central America, the West Indies, and South America (Colombia, Venezuela, Trinidad and Tobago, the Guianas, Ecuador, Peru, Bolivia, and Brazil). The greatest species diversity occurs in the Andes; ~20 species are found in Venezuela.

References. Atwood (1993); Blanco et al. (2007); Christenson (2002b); Pridgeon et al. (2009); Senghas (1993b, 2002); Whitten et al. (2007).

Many species of *Ornithidium* with brightly colored, cuplike flowers fit the hummingbird-pollination syndrome, including the two species found in the park.

Authorship of the generic name *Ornithidium* occasionally is attributed to Salisbury (1812: 293), but he failed to provide a diagnostic character, stating only that the labellum of *Ornithidium* is more similar to that of *Dendrobium* Sw. than that of *Cymbidium* Sw. (see also Mabberley, 1980: 601).

KEY TO THE SPECIES OF *ORNITHIDIUM*

1a. Plants with large pseudobulbs at the base of long leafy stems (often missing in herbarium specimens), 5.5–9 cm long; leaf blades 7–10 × 0.1–1.8 cm; flowers in fascicles of 4–10, bright yellow with a red dot on the labellum; ovary 3–4 cm long, about 4× longer than the sepals; petals 1.7–2 mm wide, spathulate, much narrower than the sepals . . . . . ***O. miniatum***

1b. Plants with small pseudobulbs scattered over long rhizomes, 2–4 cm long; leaf blades 3–5 × 0.6–1 cm; flowers originating from the axils of the sheaths of the newly forming pseudobulbs, bright red-scarlet with purple at the apex of labellum and bright yellow at the base; ovary 1.5–2 cm long, ~2× longer than the sepals; petals 5–6 mm wide, broadly elliptic or ovate-elliptic, as wide or wider than the sepals . . . . . ***O. ruberrimum***

Ornithidium miniatum Lindl., Edwards's Bot. Reg. 31: Misc. 62. 1845. *Maxillaria miniata* (Lindl.) L. O. Williams, Caldasia 1(3): 14. 1941; Dunsterville and Garay, Venez. Orchids Ill. 2: 208–209. 1961; Foldats, Fl. Venez. 15(4): 486–488, fig. 741. 1970; Ortega et al., BioLlania 5: 48. 1987; Romero and Carnevali, Orchids Venez., 2nd ed., 2: 562. 2000; Dorr et al., Contr. U.S. Natl. Herb. 40: 51. 2000 [2001]; Fernández, Orquídeas Nat. Táchira 147. 2003; Morillo, in Morillo et al., Bot. Ecol. Monocot. Páramos Venez. 1: 236–238, fig. 87, foto 44. 2011.

Maxillaria sp. A; Dorr et al., Contr. U.S. Natl. Herb. 40: 51. 2000 [2001].

Epiphytic, lithophytic or subterrestrial herbs; pseudobulbs to 9 cm long. Flowers axillary, in fascicles of 3–10. Sepals 6.5–10 mm long. Petals bright yellow with a red dot on the apex of the labellum.

Found in South America (Colombia and Venezuela). In Venezuela, this species occurs in the Andes (Lara, Mérida, Táchira, and Trujillo), the Sierra de Perijá (Zulia), and the Cordillera de la Costa (Aragua, Distrito Federal, Falcón, Miranda, and Yaracuy; Map 210). Cloud forest on both slopes of Guaramacal; 1,800–2,600 m.

Flower color in this species is extremely variable, and local populations with entirely red, orange or yellow flowers are known. So far, the only color form collected in the Guaramacal area displays yellow petals and sepals with a bright red dot on the apex of the labellum.

Ornithidium ruberrimum (Lindl.) Rchb. f., Ann. Bot. Syst. 6(4): 489. 1861 [1863]. *Scaphyglottis ruberrima* Lindl., Orchid. Linden. 22. 1846; Morillo, in Morillo et al., Bot. Ecol. Monocot. Páramos Venez. 1: 2386–2397, fig. 882. 2011. *Maxillaria ruberrima* (Lindl.) Garay, Bot. Mus. Leafl. 21: 260. 1967; Dunsterville and Garay, Venez. Orchids Ill. 6: 266–267. 1976; Ortega et al., BioLlania 5: 48. 1987; Romero and Carnevali, Orchids Venez., 2nd ed., 2: 584. 2000; Dorr et al., Contr. U.S. Natl. Herb. 40: 51. 2000 [2001]; Fernández, Orquídeas Nat. Táchira 151. 2003.

Maxillaria aggregata auct., non (Kunth) Lindl.; Foldats, Fl. Venez. 15(4): 398–400, fig. 707. 1970; Ortega et al., BioLlania 5: 48. 1987.

Epiphytic, lithophytic or subterrestrial herbs; pseudobulbs 5–10 cm distant on rhizomes. Flowers axillary, in groups of 1–3. Sepals 8–10 mm. Petals bright red with a purple labellum.

Found in South America (Colombia, Venezuela, and Brazil). In Venezuela, restricted to the Cordillera de Mérida (Mérida and Trujillo; Map 211). In the park, found on road cuts in cloud forest on both slopes of Guaramacal; (1,500–)1,800–2,600 m.

Ornithidium vagans Schltr. (=*Camaridium bracteatum* (Schltr.) Schltr.), described from Cauca, Colombia, was included in the synonymy of *Maxillaria ruberrima* by Dunsterville and Garay (1976: 266), but the former name applies to a concept of the Cordillera Occidental of Colombia that has longer, narrower leaves, narrower petals, and more acute sepals and that is better accommodated in the related genus *Camaridium*.

MAP 210. *Ornithidium miniatum* occurrence in Venezuela.

MAP 211. *Ornithidium ruberrimum* occurrence in Venezuela.

Otoglossum (Schltr.) Garay & Dunst.

Otoglossum (Schltr.) Garay & Dunst., in Dunsterville and Garay, Venez. Orchids Ill. 6: 41. 1976. *Odontoglossum* subgen. *Otoglossum* Schltr., Repert. Spec. Nov. Regni Veg. Beih. 27: 109. 1924.

Oncidium subsect. *Serpentia* Kraenzl., in Engler, Pflanzenr. IV, 50 (Heft 80): 167. 1922. *Oncidium* sect. *Serpentia* (Kraenzl.) Garay, Taxon 19: 455. 1970.

Brevilongium Christenson, Richardiana 6(1): 47. 2006.

Ecuadorella Dodson & G. A. Romero, in Harling and Persson, Fl. Ecuador 87: 345. 2010.

Epiphytic, lithophytic or terrestrial herbs, 20–100 cm tall, erect. Rhizomes creeping, well developed, thick, appressed to substrate or ascendent. Pseudobulbs heteroblastic, distant on rhizomes, 1- or 2-foliate apically, mostly oblong or ovoid to subspherical, clothed by several imbricate sheaths, the 1–3 innermost of which may have foliar blades. Leaves conduplicate, articulate, flat or concave, erect or spreading, mostly oblong, apically rounded or obtuse, often emarginate, fleshy or thickly coriaceous, sessile or with a ± developed pseudopetiole. Inflorescences originating from the base of the pseudobulb or among the enveloping sheaths, racemose, (1–)2–15(–25)-flowered, erect, dense; peduncles straight, terete, remotely sheathed, 1–3(–5)× longer than leaves; rachis straight or ± fractiflex; floral bracts often conspicuous but always shorter than the pedicellate ovary, navicular, often papery. Flowers resupinate, showy, widely spreading; perianth segments yellow or yellow-brown with darker brown or orange-brown blotches; labellum usually bright yellow. Sepals subequal, free, mostly obovate or elliptic-obovate, bases sometimes ± clawed, apices broadly obtuse to rounded. Petals subequal to the sepals. Labellum deflexed, the base replicate and adnate to column base, constricted about or below its middle (pandurate), below the constriction produced into a pair of spreading or retrorse basal lobes; central lobe obovate to suborbicular, rounded to truncate; disk with a complex callosity composed of several lamellae and teeth. Column short, semiterete, ascendent, forming a small, obtuse mentum with the ovary, footless, apically with 2 conspicuous, dolabriform wings; anther dorsal or subventral, operculate, incumbent; pollinia 2, waxy, stipe subquadrate, viscidium small; clinandrium cucullate, entire or erose; rostellum transverse; stigma ventral, subquadrate. Ovary terete, pedicellate. Capsules triangular in cross section. [Epidendroideae: Cymbidieae: Oncidiinae.]

A genus of 5 to 7 species found in Central America (Costa Rica and Panama) and South America (Colombia, Venezuela, Ecuador, Peru, Bolivia, and Brazil). Four species occur in Venezuela.

References. Neubig et al. (2012); Pridgeon et al. (2009); Senghas (1997d); Williams et al. (2001).

Superficially species of *Otoglossum* resemble those of *Odontoglossum*, especially in floral morphology.

Otoglossum coronarium (Lindl.) Garay & Dunst., in Dunsterville and Garay, Venez. Orchids Ill. 6: 41. 1976. *Odontoglossum coronarium* Lindl., Fol. Orchid. 1: Odontoglossum 21. 1852.

Odontoglossum brevifolium auct., non Lindl.; Foldats, Fl. Venez. 15(5): 202–205, excluding fig. 837. 1970.

MAP 212. *Otoglossum coronarium* occurrence in Venezuela.

Epiphytic herbs. Leaf blades to 30 cm long, 1 on top of the pseudobulb. Petals and sepals 3–6 cm long, dark brown-red with wavy, often yellowish margins. Labellum pandurate, yellow with red-brown on the constriction; callus brown and yellow.

Found in South America (Colombia, Venezuela, Ecuador, and Bolivia). In Venezuela, known only from the Cordillera de Mérida (Trujillo; Map 212). In the park, collected once in cloud forest without precise locality or elevation.

Platystele Schltr.

Platystele Schltr., Repert. Spec. Nov. Regni Veg. 8: 565. 1910.

Epiphytic, lithophytic or terrestrial herbs; caespitose or creeping, erect, small to diminutive. Rhizomes almost absent to creeping and branching. Upright portion of stem 1-foliate, very short to relatively elongate, with 1(to several) sheath at base. Leaves conduplicate, articulate, erect to prostrate, ovate, broadly elliptic or obovate, fleshy to thinly coriaceous, subsessile to (more commonly) subpetiolate. Inflorescences arising from near stem apex with an annulus just below the abscission layer; racemes short- to long-stalked, shorter than to conspicuously exceeding the subtending leaf, usually filiform; rachis often zigzag, less commonly straight, rarely very short and inflorescences capitate-umbellate; floral bracts inconspicuous. Flowers relatively small to tiny, usually resupinate, opening in slow succession or rarely ± simultaneously; perianth segments free,

widely spreading, variable in shape but often acuminate, usually ± translucent, tinged with purple or lilac to yellow, usually 1-nerved, membranous. Sepals similar or dorsal sepal longer than the others. Petals similar to sepals but often narrower and with ciliolate margins. Labellum simple to rarely sub-3-lobed, often ovate to narrowly ovate or elliptic, articulate with the column foot, margins often erose or ciliolate; column short and wide, membranous, widened apically; anther apical, incumbent, operculate; pollinia 2, narrowly pyriform to subspherical, stigmatic surface 2-lobed, transverse, near the apex of the column. Ovary filiform-pedicellate, smooth to costate. Capsules ellipsoid, usually crowned by the persistent perianth. [Epidendroideae: Epidendreae: Pleurothallidinae.]

Found in Mexico, Central America, the Greater Antilles, and South America (Colombia, Venezuela, the Guianas, Ecuador, Peru, Bolivia, and Brazil). The genus includes ~70 species, of which 8 occur in Venezuela.

References. Luer (1990); Pridgeon and Chase (2001); Pridgeon et al. (2001b, 2005).

Species of *Platystele* are typically shade loving.

Molecular support for the monophyly of *Platystele* is weak (Pridgeon and Chase, 2001; Pridgeon et al., 2001b).

Platystele pisifera (Lindl.) Luer, Selbyana 3: 232. 1977. *Pleurothallis pisifera* Lindl., Fol. Orchid. 9: Pleurothallis 36. 1859. *Platystele hypsitera* Luer & R. Escobar, Orquideología 16: 14, t. 1983.

Epiphytic herbs, diminutive; densely caespitose. Leaf blades narrowly elliptical-obovate, 1–4 cm long. Inflorescences racemes, 3–6 cm long. Flowers translucent yellow or pink. Dorsal sepal 5–6 mm long. Labellum purple.

MAP 213. *Platystele pisifera* occurrence in Venezuela.

Found in South America (Colombia, Venezuela, Ecuador, Peru, and Bolivia). In Venezuela, found only in the Andes (Mérida, Portuguesa, Táchira, and Trujillo; Map 213). Collected on both slopes of Guaramacal, including near La Divisoria de la Concepción and in Sector El Cafenol; 1,700–2,400 m.

Pleurothallis R. Br.

Pleurothallis R. Br., in W. T. Aiton, Hort. Kew., 2nd ed., 5: 211. 1813.

Epiphytic, lithophytic or terrestial herbs; caespitose to repent; rhizomes short or creeping; stems not thickened into pseudobulbs, cylindrical, triangular or angular in cross-section to laterally compressed, apically 1-foliate, occasionally apically proliferous (i.e., stems arising in the apex of others); leaves articulate, conduplicate and more commonly plane (dorsoventrally flattened), occasionally terete or laterally compressed, usually ovate, elliptic or obovate, less commonly linear or suborbicular, bases sessile or pseudopetiolate, sometimes cordate or decurrent on the stem, apices acute to rounded or emarginate, glabrous, sometimes glaucous, usually coriaceous. Inflorescences 1-flowered to racemose, arising from the apex of the stem associated with an annulus in multi-flowered inflorescences (annulus not evident in 1-flowered inflorescences), pedunculate or sessile, subtended by one spathe or not, flowering successively or simultaneously. Flowers resupinate or not, tiny to medium-sized or less commonly large; floral bracts variable, usually small and inconspicuous; pedicels usually short, articulate with the ovary. Sepals variable in shape, position, color, and ornamentation, membranous to fleshy; lateral sepals completely fused (less commonly only partially fused) into a synsepal of variable dimensions; dorsal sepal essentially free, similar to or very different than synsepal. Petals usually small and narrower than sepals, always free, sub-parallel to the labellum or widely divergent. Labellum usually fleshier than other perianth segments, simple or less commonly 3 (–5)-lobed, often provided with a glenion, plane, concave or convex, labellar base variably articulate with the base or the column or rigidly adnate to same and inflexible; column semiterete, relatively short, unwinged; clinandrium usually entire or not projecting forward, basally robust with a pedestal-shaped foot or foot sometimes absent; anther apical or subapical; pollinia 2, naked or with rudimentary caudicles, with or without a removable viscidium, pyriform or spherical; stigma transverse, 1- or 2-lobed. Ovary 3-valvate, smooth to verrucose or muricate, keeled or crested. Capsules ellipsoid or obclavate. [Epidendroideae: Epidendreae: Pleurothallidinae.]

A neotropical genus of ~1,000 species found in Mexico, Central America, the West Indies, and South America (Colombia, Venezuela, Trinidad and Tobago, the Guianas, Ecuador, Peru, Bolivia, Brazil, and Argentina). The genus is most diverse in the Andes; ~50–60 species occur in Venezuela.

References. Luer (1986d, 1999, 2002b); Pridgeon and Chase (2001); Pridgeon et al. (2001b, 2005).

KEY TO THE SPECIES OF *PLEUROTHALLIS*

1a. Leaves petiolate or subpetiolate; inflorescences nutant or arching, 3–8-flowered; flowers translucent with purple or deep violet nerves; dorsal sepal >10 mm long . . . . . ***P. dorrii***

1b. Leaves sessile; inflorescences rigidly erect, at least 10-flowered (usually many more); flowers yellow, white or ± translucent green; dorsal sepal <10 mm long . . . . . ***P. xanthochlora***

MAP 214. *Pleurothallis dorrii* occurrence in Venezuela.

MAP 215. *Pleurothallis xanthochlora* occurrence in Venezuela.

Pleurothallis dorrii Luer, Lindleyana 12: 45, fig. 8. 1997.

Pleurothallis strobilifera auct., non F. Lehm. & Kraenzl.; Dorr et al., Contr. U.S. Natl. Herb. 40: 53. 2000 [2001].

Epiphytic herbs, erect, 20–36 cm tall. Leaf blades elliptical-obovate, 10–18 × 0.35–0.4 cm. Inflorescences nutant or arching, 3–8-flowered, 5–11 cm long, much shorter than the subtending leaves. Flowers not resupinate, translucent with purple or deep violet nerves. Dorsal sepal 13–15 mm long.

Endemic to the Cordillera de Mérida of Venezuela (Portuguesa and Trujillo; Map 214). Found in La Divisoria de la Concepción and on the north slope of Guaramacal; 1,700–2,700 m.

This species was described from the nearby Montañas de Misisí (Trujillo state). It had been confused with *Pleurothallis strobilifera* F. Lehm. & Kraenzl., a species restricted to Bolivia.

Pleurothallis xanthochlora Rchb. f., Linnaea 22: 823. 1849; Dunsterville and Garay, Venez. Orchids Ill. 2: 312–313. 1961; Foldats, Fl. Venez. 15(2): 449–450, fig. 359. 1970; Romero and Carnevali, Orchids Venez., 2nd ed., 3: 868. 2000.

Pleurothallis revoluta auct., non (Ruiz & Pav.) Garay; Dorr et al., Contr. U.S. Natl. Herb. 40: 53. 2000 [2001].

Epiphytic or subterrestrial herbs, 35–75 cm tall. Leaf blades oblong-elliptic to ovate, 10–22 × 4.5–7 cm. Inflorescences rigidly erect, 10-flowered (usually many more), 14–23 cm long. Flowers not resupinate, yellow, white or ± translucent green. Dorsal sepal 4.5–5.5 mm long.

Found in South America (Colombia, Venezuela, Ecuador, Peru, and Bolivia). In Venezuela, known from the Andes (Lara, Mérida, Portuguesa, and Trujillo) and the Cordillera de la Costa (Miranda; Map 215). In the park, found on both slopes of Guaramacal; 1,800–2,400 m.

Pleurothallopsis Porto & Brade

Pleurothallopsis Porto & Brade, Arq. Inst. Biol. Veg. 3: 133. 1937. *Octomeria* subgen. *Pleurothallopsis* (Porto & Brade) Luer, Monogr. Syst. Bot. Missouri Bot. Gard. 39: 80. 1991.

Restrepiopsis Luer, Selbyana 2: 199. 1978.

Epiphytic, lithophytic or terrestrial herbs; caespitose, erect to repent, usually inconspicuous. Rhizomes abbreviated. Stems 1-leaved apically, erect, terete, enveloped by several scarious, tubular sheaths that are usually glabrous. Leaves conduplicate, articulate, linear-elliptic to suborbicular, sometimes attenuated into a pseudopetiole, coriaceous to fleshy coriaceous. Inflorescences originating from near the apex of the stem without an annulus, 1-flowered, solitary or in fascicles; peduncles short, terete; floral bracts tubular; pedicels short or rarely very elongate,

always longer than the floral bracts, articulate with the ovary. Flowers resupinate, usually greenish, yellowish or hyaline, often with reddish or purplish nerves. Perianth segments membranous, usually widely spreading. Sepals subequal or the dorsal sepal broader, free or more often the lateral sepals connate in the basal ½. Petals subequal to the sepals or more commonly smaller, frequently subparallel to the column. Labellum articulate to the column foot, erect, fleshier than the other perianth segments, subsimple or 3-lobed below the middle; lateral lobes much smaller than the central lobe, usually ± falcate, porrect and erect, ± embracing the column; central lobe usually flat or ± concave, ovate-oblong, oblong to obovate; disk with 2 or 4 longitudinal keels; column erect or ± curved, subterete, elongate; anther apical, incumbent, operculate, 2- or imperfectly 4-locular; pollinia 4, waxy, pyriform or ± clavate, viscidium very small; clinandrium shallow, mostly entire; rostellum transverse; stigma ventral, small. Ovary terete, often ridged. Capsules ellipsoid. [Epidendroideae: Epidendreae: Pleurothallidinae.]

Found in Central America and South America (Colombia, Venezuela, Ecuador, Peru, Bolivia, and Brazil). The genus includes ~15 species, 5 or 6 of which occur in Venezuela.

REFERENCES. Luer (1991); Pridgeon and Chase (2001); Pridgeon et al. (2001b, 2005).

Pridgeon and Chase (2001: 255) argue that the molecular evidence for a sister relationship between *Restrepiopsis* Luer (four pollinia) and *Pleurothallopsis* (eight pollinia) does not support treating them as separate genera and that the proposed relationship with *Octomeria* R. Br. is strongly refuted. They further argue that the use of pollinia number alone is an unreliable generic character.

KEY TO THE SPECIES OF *PLEUROTHALLOPSIS*

1a. Labellum with well-developed basal lateral lobes; leaf blades linear-oblong or linear-elliptic, 4–10× longer than wide, equal to or longer than the stem, fleshy . . . . . ***P. striata***

1b. Labellum without well-developed lateral lobes, but erect basal margins; leaf blades lanceolate, 3–4× longer than wide, shorter than the stem, coriaceous . . . . . ***P. tubulosa***

Pleurothallopsis striata (Luer & R. Escobar) Pridgeon & M. W. Chase, Lindleyana 16: 255. 2001. *Restrepiopsis striata* Luer & R. Escobar, Orquideología 16: 43. 1983; Romero and Carnevali, Orchids Venez., 2nd ed., 3: 933. 2000; Dorr et al., Contr. U.S. Natl. Herb. 40: 53. 2000 [2001].

Restrepiella tubulosa auct., non (Lindl.) Garay & Dunst.; Foldats, Fl. Venez. 15(2): 28–30, fig. 195. 1970; Ortega et al., BioLlania 5: 49. 1987.

Epiphytic herbs, 5–15 cm tall, erect. Leaf blades linear oblong or linear-elliptic, 4–7.5 × 0.5–0.7 cm. Flowers translucent yellow-green with purple veins in the dorsal sepal. Dorsal sepal 6–8 mm long. Labellum yellow with purple veins.

MAP 216. *Pleurothallopsis striata* occurrence in Venezuela.

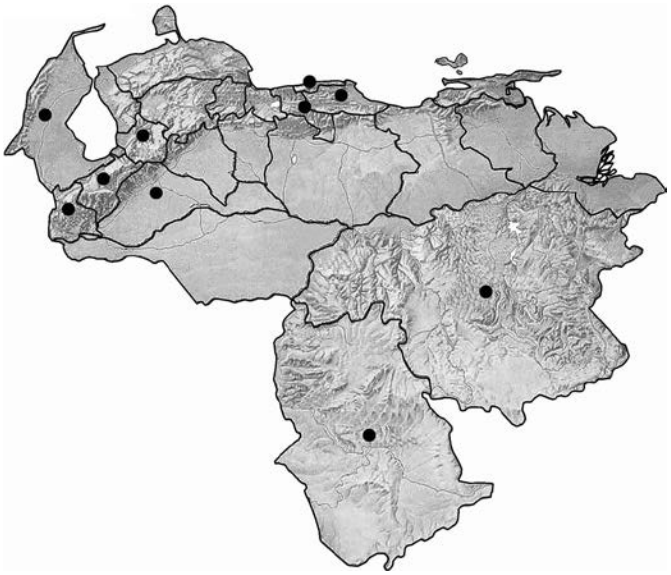
Found in South America (Colombia and Venezuela). In Venezuela, confined to the Andes (Mérida, Táchira, and Trujillo; Map 216). In the park, found in cloud forest along the Boconó–Guaramacal road; 1,850 m.

Pleurothallopsis tubulosa (Lindl.) Pridgeon & M. W. Chase, Lindleyana 16: 255. 2001. *Pleurothallis tubulosa* Lindl., Fol. Orchid. 9: Pleurothallis 19. 1859. *Restrepiella tubulosa* (Lindl.) Garay & Dunst., in Dunsterville and Garay, Venez. Orchids Ill. 4: 266. 1966. *Restrepiopsis tubulosa* (Lindl.) Luer, Selbyana 2: 200. 1978; Romero and Carnevali, Orchids Venez., 2nd ed., 3: 934. 2000; Dorr et al., Contr. U.S. Natl. Herb. 40: 53. 2000 [2001]; Carnevali and Ramírez-Morillo, in Berry et al., Fl. Venez. Guayana 7: 547, fig. 456. 2003; Fernández, Orquídeas Nat. Táchira 210. 2003; Morillo, in Morillo et al., Bot. Ecol. Monocot. Páramos Venez. 1: 272–273, fig. 108, foto 55. 2011.

Pleurothallis viridula Lindl., Fol. Orchid. 9: Pleurothallis 19. 1859. *Restrepiella viridula* (Lindl.) Garay & Dunst., in Dunsterville and Garay, Venez. Orchids Ill. 4: 268. 1966; Foldats, Fl. Venez. 15(2): 30–32, fig. 196. 1970. *Restrepiopsis viridula* (Lindl.) Luer, Selbyana 2: 200. 1978.

Epiphytic herbs, 6.5–21 cm tall, erect. Leaf blades lanceolate, 2–6 × 1–3 cm. Flowers greenish-yellow, often with 3 purple stripes in the dorsal sepal. Dorsal sepal 6–10 mm long; lateral sepals free or connate only at the very base. Labellum with a pair of small lateral lobes in the basal ¼.

Found in Central America (Costa Rica and Panama) and South America (Colombia, Venezuela, and Ecuador). In Venezuela, recorded from Amazonas, Aragua, Barinas, Bolívar, Distrito



MAP 217. *Pleurothallopsis tubulosa* occurrence in Venezuela.

Federal, Mérida, Miranda, Táchira, Trujillo, and Zulia (Map 217). Found above Boconó in cloud forest; 2,400 m.

We accept this species as part of the flora on the basis of a voucher cited by Dunsterville and Garay (1966: 268), which, given the locality and elevation, suggests their specimen might have been collected in Guaramacal National Park. We have, however, not seen their specimen, nor have we recollected the species within the boundaries of the park.

Pleurothallis tubulosa and *P. viridula* were published simultaneously. Luer (1991: 116) was the first to consider these two species synonyms, and he adopted the name *Restrepiopsis tubulosa* (≡*Pleurothallopsis tubulosa*). His choice of epithet must be followed (McNeill et al., 2012: Art. 11.5).

Ponthieva R. Br.

Ponthieva R. Br., in W. T. Aiton, Hort. Kew., 2nd ed., 5: 199. 1813.
Ocampoa A. Rich. & Galeotti, Ann. Sci. Nat., Bot., sér. 3, 3: 31. 1845.
Exalaria Garay & G. A. Romero, Harvard Pap. Bot. 4: 479. 1999.

Terrestrial or rarely epiphytic herbs; caespitose, erect, sympodial, each sympodium consisting of a rosette terminating in an inflorescence, rosettes dying annually after flowering is renewed by a new rosette that emerges from the base of the previous year. Roots few, fleshy, pubescent, emerging from stem base. Stems relatively short, completely covered by leaf sheaths. Leaves 2–7, not articulate, ovate to lanceolate, acute or obtuse, suberect, arching to prostrate on the substrate, often puberulent to pubescent, membranous or herbaceous; petiolate or subpetiolate; petioles often puberulent to pubescent. Inflorescences terminal, erect, few- to many-flowered racemes, peduncle and rachis usually puberulent to pubescent; peduncles terete, with 2–5 internodes, internodes subtended by remote tubular, appressed or more rarely subfoliaceous sheaths; rachis usually shorter than peduncle, terete, flowers spiraled. Floral bracts subfoliaceous, usually much shorter than the pedicellate ovaries, rarely subequal. Flowers not resupinate, small to medium, usually inconspicuous, delicate-textured, usually white or greenish-white, sometimes tinged with pink, lilac or brown in perianth segments and sepal apices or nerves brown or greenish; petals and labellum sometimes yellow. Sepals usually concave, adaxially puberulent, free, membranous or lateral sepals partially or completely fused into a broadly ovate or suborbicular synsepal; dorsal sepal usually thinner than the lateral ones. Petals adnate to the column above the receptacle, usually thinner than the sepals, oblique and basally attenuated in a ± conspicuous claw, connivent with the dorsal sepal and often constituting the most conspicuous part of the flower. Labellum fleshier and much smaller than the other segments of the perianth, adnate to the column above the receptacle in a complex structure, frequently concave and 3-lobed, central lobe usually shorter than the lateral ones or reduced to a mucro-like structure; column fleshy, massive, abbreviated in apical ½, lacking a foot; anther erect or subdorsal, articulate with the apex of the column, 2-locular, incumbent; pollinia 2, puberulent with a small, soft, triangular hamulus and a small, suborbicular viscidium; clinandrium short; rostellum erect, digitate, elongate, soft, fleshy, canaliculate. Ovary terete, pedicellate, usually much longer than the sepals, puberulent or pubescent. Capsules ovoid, ellipsoid or fusiform. [Orchidoideae: Cranichideae: Cranichidinae.]

A tropical and subtropical American genus of 25–30 species found in North America (USA), Mexico, Central America, the West Indies, and South America (Colombia, Venezuela, Ecuador, Peru, Bolivia, Brazil, Paraguay, and Argentina). Nine species occur in Venezuela.

References. Pridgeon et al. (2003); Salazar Chávez et al. (2009).

Salazar Chávez et al. (2009), in a molecular phylogenetic study, determined that *Ponthieva* was polyphyletic. They recognized that a clade containing the type of the genus would be monophyletic if the monotypic genera *Ocampoa* A. Rich. & Galeotti and *Exalaria* Garay & G. A. Romero were placed in synonymy, which they did, and this is the concept of the genus *Ponthieva* accepted here. Salazar Chávez et al. (2009) also noted that a second clade with *Ponthieva* species appeared to be allied to *Baskervilla* Lindl., which occurs in Central America and South America.

Ponthieva fertilis (F. Lehm. & Kraenzl.) Salazar, Ann. Bot. (Oxford), n.s., 104: 416. 2009. *Goodyera fertilis* F. Lehm. & Kraenzl., Bot. Jahrb. Syst. 26: 498. 1899. *Cranichis fertilis* (F. Lehm. & Kraenzl.) Schltr., Repert. Spec. Nov. Regni Veg. Beih. 8: 115. 1921; Dunsterville and Garay, Venez. Orchids Ill. 5: 60–61. 1972; Dorr et al., Contr. U.S. Natl. Herb. 40: 49. 2000 [2001].

Ophrys parviflora C. Presl, Reliq. Haenk. 1: 92. 1830 [1827], non *Ponthieva parviflora* Ames & C. Schweinf., Bot. Mus. Leafl. 4: 39. 1936. *Exalaria*

MAP 218. *Ponthieva fertilis* occurrence in Venezuela.

parviflora (C. Presl) Garay & G. A. Romero, Harvard Pap. Bot. 4: 480. 1999; Romero and Carnevali, Orchids Venez., 2nd ed., 1: 333. 2000; Fernández, Orquídeas Nat. Táchira 101. 2003; Morillo, in Morillo et al., Bot. Ecol. Monocot. Páramos Venez. 1: 176–178, fig. 532. 2011.

Cranichis pycnantha Schltr., Repert. Spec. Nov. Regni Veg. Beih. 7: 62. 1920; Foldats, Fl. Venez. 15(1): 419–421, fig. 157. 1969.

Terrestrial herbs, 20–45 cm tall. Leaf blades elliptic to oblong-lanceolate, 3–7 cm long. Flowers campanulate, white. Ovary 8–9 mm tall. Sepals 2–3.5 mm long.

Found in South America (Colombia, Venezuela, Ecuador, and Peru). In Venezuela, known from the Andes (Mérida, Táchira, and Trujillo) and the Cordillera de la Costa (Aragua, Distrito Federal, Falcón, and Miranda; Map 218). In the park, collected in forest on the south slope between Qda. Honda and El Santuario; 1,800–2,100 m.

Within *Ponthieva*, our species is somewhat anomalous by virtue of its small floral size, campanulate flowers, non-oblique petals, very short column with a large, completely dorsal anther, and segments of the perianth emerging from the base of the receptacle. These characters first caused this species to be described in *Cranichis* and later led to the creation of the monotypic *Exalaria*, but molecular phylogenetic analyses now support the placement of this species in *Ponthieva*.

Prescottia Lindl.

Prescottia Lindl., in Hooker, Exot. Fl. 2: t. 115. 1824 ("*Prescotia*"), nom. & orth. cons.

Terrestrial or rarely epiphytic herbs; acaulescent to shortly caulescent; glabrous to pubescent. Roots fleshy, often tuberous, fasciculate, usually villose. Leaves rosulate or less commonly somewhat cauline, frequently only a single leaf present, usually erect, less commonly the leaf appressed to the substrate; leaf blades widely elliptic or suborbicular to linear, prefoliation convolute, herbaceous, membranous to subfleshy, petiolate or sessile; petioles canaliculate. Inflorescences terminal, always erect and exceeding the leaves, simple, spicate with flowers appressed to the rachis; peduncles straight and ± rigid, often thick, variously covered with bract-like sheaths; rachis straight, densely many-flowered. Floral bracts ± equal in length to the ovary and pedicel. Flowers inconspicuous, not resupinate, short-lived, opening successively, erect, greenish to reddish. Sepals basally connate, forming a short cup, extended or more commonly reflexed, thin-textured. Petals thinner than sepals, basally adnate to the sepaline cup, often circinate. Labellum fleshy, slipper-shaped, galeate or cochleate, often involving the column, basally with 2 retrorse auricles, claw adnate to sepaline cup; disk without a callus; column erect, short, fleshy, apically winged, basally extended into a short foot joining the labellar claw; anther erect, dorsal; pollinia 4, without a tegula or caudicles; viscidium small; clinandrium erect, acuminate, margins connate with rostellum; rostellum laminar, smooth, emarginate, parallel to the anther and ± the same length; stigma entire, ventral. Ovary with thick, straight, fusiform to clavate pedicel, often longer than sepals. Capsules ovoid to ellipsoid. [Orchidoideae: Cranichideae: Cranichidinae.]

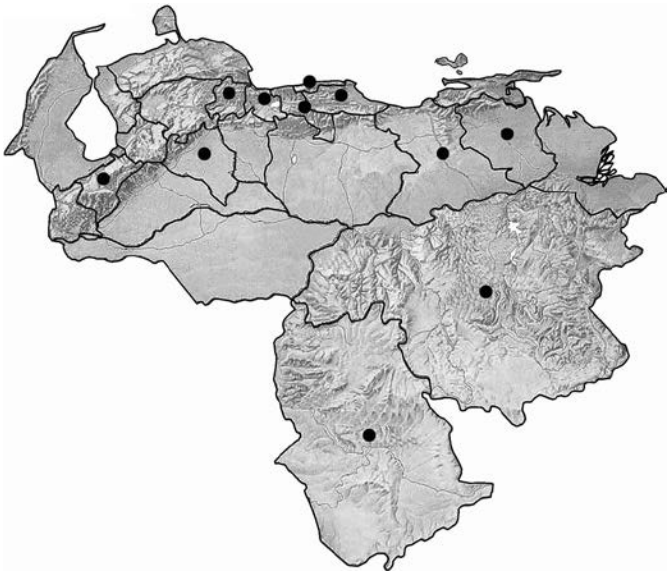
An American genus of ~25 species found in North America (USA), Mexico, Central America, the West Indies, and South America (Colombia, Venezuela, the Guianas, Ecuador, Peru, Bolivia, Brazil, Paraguay, Argentina, and Uruguay). The genus is most diverse in Brazil; 6 species occur in Venezuela.

References. Álvarez-Molina and Cameron (2009); Pridgeon et al. (2003); Salazar Chávez et al. (2009).

According to a molecular phylogenetic analysis by Salazar Chávez et al. (2009), a monophyletic *Prescottia* can be achieved either by sinking the monotypic *Pseudocranichis* Garay in *Prescottia* or by removing *Prescottia tubulosa* (Lindl.) L. O. Williams from *Prescottia*. They chose to adopt the latter solution and applied the generic name *Galeoglossum* A. Rich. & Galeotti to the clade that includes *Pseudocranichis* and *P. tubulosa*. *Galeoglossum*, restricted to Mexico and Central America, can be distinguished from *Prescottia* by a labellum with incurved lateral margins that are open apically (not calceolate) and provided with a distinct apical lobule, the saddle-shaped stigma with two receptive areas separated by a central sterile area, and the hairpin-shaped, slender pollinia.

Prescottia stachyodes (Sw.) Lindl., Edwards's Bot. Reg. 22: t. 1915 [as "1916"]. 1836; Dunsterville and Garay, Venez. Orchids Ill. 1: 366–367. 1959; Foldats, Fl. Venez. 15(1): 379–381, fig. 140. 1969; Romero and Carnevali, Orchids Venez., 2nd ed., 3: 891. 2000; Carnevali et al., in Berry et al., Fl. Venez. Guayana 7: 535–536. 2003. *Cranichis stachyodes* Sw., Prodr. 120. 1788.

Subterrestrial herbs, (25–)50–100 cm tall, very variable in size and leaf form. Petioles, peduncles, rachises, bracts, flowers,



MAP 219. *Prescottia stachyodes* occurrence in Venezuela.

and fruit green, opaque red, brown, reddish or pink. Leaf blades elliptic-oblong to narrowly ovate or rounded-ovate, 5–20 × 2.5–16 cm. Dorsal sepal 3–4 mm long.

Found in Mexico, Central America, the West Indies, and South America (Colombia, Venezuela, Trinidad and Tobago, the Guianas, Ecuador, Peru, Bolivia, Brazil, and Argentina). In Venezuela, known from Amazonas, Anzoátegui, Aragua, Bolívar, Carabobo, Distrito Federal, Mérida, Miranda, Monagas, Portuguesa, and Yaracuy (Map 219). La Divisoria de la Concepción; 1,700 m.

This species is very variable throughout its extensive range, and we suspect that the taxon described here is actually part of a species complex.

Prosthechea Knowles & Westc.

Prosthechea Knowles & Westc., Fl. Cab. 2: 111. 1838.

Epithecia Knowles & Westc, Fl. Cab. 2: 167. 1839, nom. illeg.

Epidendrum subgen. *Osmophytum* Lindl., Edwards's Bot. Reg. 25: Misc. 85. 1839. *Encyclia* subgen. *Osmophytum* (Lindl.) Dressler & G. E. Pollard, Phytologia 21: 433. 1971. *Encyclia* sect. *Osmophytum* (Lindl.) Dressler & G. E. Pollard, Phytologia 21: 433. 1971.

Epidendrum subgen. *Hormidium* Lindl., J. Bot. (Hooker) 3: 81. 1841 [1840]. *Hormidium* (Lindl.) Heynh., Nom. Bot. Hort. 2: 880. 1841. *Encyclia* sect. *Hormidium* (Lindl.) Dressler & G. E. Pollard, Phytologia 21: 433. 1971. *Prosthechea* subgen. *Hormidium* (Lindl.) Charon & V. P. Castro, Richardiana 4(1): 29. 2003.

Anacheilium Rchb. ex Hoffmanns., Preiss-Verzeichn. Pflanzen 21. 1842.

Encyclia sect. *Euchile* Dressler & G. E. Pollard, Phytologia 21: 434. 1971. *Euchile* (Dressler & G. E. Pollard) Withner, Cattleyas & Relatives 5: 137. 1998.

Pseudencyclia Chiron & V. P. Castro, Richardiana 4(1): 31. 2003.

Panarica Withner & P. A. Harding, Cattleyas & Relatives: Debatable Epidendrums 207. 2004.

Pollardia Withner & P. A. Harding, Cattleyas & Relatives: Debatable Epidendrums 217. 2004, nom. illeg.

Epiphytic, lithophytic or rarely terrestrial herbs; glycoside crystals present in all tissues of the majority of species. Roots relatively thick. Rhizomes short or creeping. Stems usually thickened into pseudobulbs (always in our species), heteroblastic (composed of a single thickened internode, sometimes 1 or more additional thickened internodes toward the base or apex), apically with 1–3 (–4) leaves. Leaves conduplicate, articulate, linear, elliptic or more commonly linear-oblong. Inflorescences terminal, 1-flowered (not our species), racemose or paniculate; peduncles subtended by a spathe or not, naked or partly covered by tubular sheaths. Flowers usually not resupinate, usually fragrant and long-lasting, showy to inconspicuous; floral bracts usually inconspicuous; perianth fleshy or fleshy-membranous, variously colored but more often greenish or yellow with brown or purple tints or white with the labellum with purple streaks and nerves. Sepals free, similar to one another. Petals free, usually similar to the sepals. Labellum fused to the column in the basal ⅓–½ portion, blade simple or 2-lobed; lateral lobes usually shorter and thinner than central lobe; disk of labellum often with callus, calli variable; column erect on pedicel, without columnar foot, parallel to the labellum; clinandrium 3-toothed, teeth conspicuous, central tooth with an appendage; anther operculate, incumbent, 2-locular; pollinia 4, subreniform with caudicles of pollen material; rostellum transverse to the axis of the column; stigma ventral, semiorbicular, obcordate or transversely pandurate. Ovary pedicellate, smooth or variously ornamented, usually 3-winged. Capsules ellipsoid, fusiform, or ovoid, 3-winged. [Epidendroideae: Epidendreae: Laeliinae.]

An American genus found in Mexico, Central America, the West Indies, and South America (Colombia, Venezuela, the Guianas, Ecuador, Peru, Bolivia, Brazil, and Paraguay). *Prosthechea* is most diverse in Mexico and Brazil and moderately diverse in the Andes. There are ~100 species in the genus, 19 of which are found in Venezuela.

References. Berg and Chase (2004); Chiron (2003); Chiron and Castro Neto (2003); Higgins (1997, 1999); Higgins et al. (2003); Pridgeon et al. (2005).

Species of *Prosthechea* generally inhabit humid forest at low to intermediate elevations, and as a consequence, the genus is poorly represented in our flora.

When the genus *Prosthechea* first was proposed, it was considered to be monotypic and closely allied to the large genus *Epidendrum*. However, the name *Prosthechea* generally was not adopted until Higgins (1997, 1999) resurrected and expanded it, also transferring to *Prosthechea* species belonging to *Encyclia* subgen. *Osmophytum* (Lindl.) Dressler & G. E. Pollard. Molecular evidence (Higgins et al., 2003) indicates that *Prosthechea* is monophyletic, and various morphological characters also can be used to distinguish it from *Encyclia* s. str., including the fusiform, often flattened (vs. ovoid) pseudobulbs and the presence (vs. absence) of glycoside crystals.

KEY TO THE SPECIES OF *PROSTHECHEA*

1a. Pseudobulbs 9–18 cm long; sepals and petals yellow with brown or purplish-brown marks of various shapes; lateral lobes of labellum yellow or yellowish-cream, apices parallel to the central axis of the labellum, central lobe oblong; callus occupying most of the labellum disk and inserted at the base of the central lobe . . . . . ***P. brachychila***

1b. Pseudobulbs 5–12 cm long; sepals and petals dark reddish-brown with yellowish or greenish apices; lobes of labellum white with red nerves, lateral lobes with retrorse apices, central lobe cordate; callus restricted to the basal ½ of the labellum . . . . . ***P. lindenii***

Prosthechea brachychila (Lindl.) W. E. Higgins, Phytologia 82: 376. 1997 [1998]; Romero and Carnevali, Orchids Venez., 2nd ed., 3: 893. 2000; Fernández, Orquídeas Nat. Táchira 202. 2003; Morillo, in Morillo et al., Bot. Ecol. Monocot. Páramos Venez. 1: 263–264, fig. 102, foto 53. 2011. *Epidendrum brachychilum* Lindl., Orchid. Linden. 9. 1846; Dunsterville and Garay, Venez. Orchids Ill. 3: 86–87. 1965. *Encyclia brachychila* (Lindl.) Carnevali & I. Ramírez, Ernstia, ser. 1, 36: 9. 1986. *Anacheilium brachychilum* (Lindl.) Withner & P. A. Harding, Cattleya & Relatives: Debatable Epidendrums 52. 2004.

FIGURE 26D

Epidendrum hartwegii auct., non Lindl.; Foldats, Fl. Venez. 15(3): 268–271, fig. 477. 1970, pro parte.

Epiphytic herbs, 30–40 cm tall. Leaf blades oblong, 15–20 × 1.3–1.8 cm. Inflorescences 15–17 cm tall, 8–10-flowered. Dorsal sepal 12–13 mm long.

Found in South America (Colombia and Venezuela). In Venezuela, confined to the Andes (Lara, Mérida, Táchira, and Trujillo; Map 220). Cloud forest on the north slope of the park, including cloud forest below the Páramo del Pumar; 1,850–2,600 m.

Prosthechea brachychila is similar and certainly related to *P. hartwegii* (Lindl.) W. E. Higgins, with which it is sympatric (at least in Venezuela). The latter species, however, has smaller flowers that are more opaque and less showy and a labellum with much wider lateral lobes. *Prosthechea hartwegii* occurs from Venezuela to Bolivia in the Andes, whereas *P. brachychila* is restricted to the Cordillera Oriental in Colombia and the Andes in Venezuela.

Prosthechea lindenii (Lindl.) W. E. Higgins, Phytologia 82: 379. 1997 [1998]; Romero and Carnevali, Orchids Venez., 2nd ed., 3: 901. 2000; Fernández, Orquídeas Nat. Táchira 204. 2003; Morillo, in Morillo et al., Bot. Ecol. Monocot. Páramos Venez. 1: 265–266, fig. 103, foto 54. 2011. *Epidendrum lindenii* Lindl., Ann. Mag. Nat. Hist., ser. 1, 12: 397. 1843; Dunsterville and Garay, Venez. Orchids Ill. 2: 96, 132–133. 1961; Foldats, Fl. Venez. 15(3): 306–308, fig. 492. 1970. *Encyclia lindenii* (Lindl.) Carnevali & I. Ramírez, Ernstia, ser. 1, 36: 9. 1986. *Anacheilium lindenii* (Lindl.) Hágsater, in Escobar, Nat. Colombian Orchids 1: 28. 1990.

Epiphytic or terrestrial herbs, 15–20 cm tall. Leaf blades oblong or oblong-lanceolate, 10–22 × 1–2.5 cm. Inflorescences 10–40 cm tall, 4–18-flowered. Dorsal sepal 15–20 mm long.

Found in South America (Colombia and Venezuela). In Venezuela, found in the Andes (Lara, Mérida, Táchira, and Trujillo)

MAP 220. *Prosthechea brachychila* occurrence in Venezuela.

MAP 221. *Prosthechea lindenii* occurrence in Venezuela.

and in the Sierra de Perijá (Zulia; Map 221). Cloud forest on the north slope of the park and forest below the Páramo del Pumar; 1,950–2,600 m.

Psilochilus Barb. Rodr.

Psilochilus Barb. Rodr., Gen. Spec. Orchid. 2: 272. 1882.

Terrestrial herbs; sympodial. Rhizomes terete, basally creeping and leafless, apically erect and spirally leaved, rooting at the internodes, usually branching below the middle after anthesis. Roots few, fleshy, pubescent. Leaves distichous, sheathing, petiolate or clasping, not articulate, prefoliation convolute, 2–5 per stem, distant and leaving most of the stem naked, elliptic, ovate or lanceolate, green concolorous or variegated with silvery longitudinal zones, plicate, membranous. Inflorescences terminal, racemose (rarely branching), 2–10(–20)-flowered, usually shorter than the leaves; floral bracts conspicuous, navicular or subfoliaceous. Flowers resupinate, subcampanulate, short-lived, successive or rarely several flowering simultaneously; perianth segments free, membranous, whitish or greenish, often with purple lines or tinges; petals and sepals narrowly lanceolate to narrowly obovate, subequal, equal or lateral sepals oblique, dorsally carinate. Petals usually narrower than the sepals, often falcate. Labellum completely free from the column, equal to petals; blade narrowed toward the base, wider and sharply 3-lobed above the middle, less commonly lobed below the middle, central lobe sessile or with a conspicuous claw; disk with several longitudinal keels; column elongate, terete, tapering toward the base, usually arched; anther terminal, erect, articulate with the apex of the column, 2-locular; pollinia 4, granulose; stigma ventral. Ovary pedicellate, terete or subtrigonous, arched. Capsules ellipsoid to obovoid, often ± trigonous. [Epidendroideae: Triphoreae.]

A genus of 9 species found in Mexico, Central America, the West Indies, and South America (Colombia, Venezuela, Guyana, Ecuador, Peru, Bolivia, and Brazil). Four species occur in Venezuela.

References. Pridgeon et al. (2005); Rothacker (2007).

Species of *Psilochilus* are generally shade loving.

Psilochilus macrophyllus (Lindl.) Ames, Orchidaceae 7: 45. 1922; Foldats, Fl. Venez. 15(1): 159–161, fig. 56. 1969, pro parte. *Pogonia macrophylla* Lindl., Ann. Mag. Nat. Hist., ser. 3, 1: 335. 1858.

Terrestrial herbs, to 40 cm tall. Leaves sheathing, sessile, clasping or lower leaves sometimes short-petiolate; leaf blades ovate, 5–10 × 2.5–7 cm. Inflorescences erect, 1- to several-flowered. Flowers successive. Sepals equal, ~11–12 × 2 mm, greenish yellow or green. Petals linear falcate, equal to sepals. Labellum cuneate, ~12–15 mm long, 3-lobed.

Found in Mexico, Central America, the West Indies, and South America (Colombia, Venezuela, Bolivia, and Brazil). In Venezuela, known only from the Andes (Trujillo; Map 222). Our collections are from Qda. Segovia on the north slope of the park; 2,100–2,550 m.

MAP 222. *Psilochilus macrophyllus* occurrence in Venezuela.

Psilochilus macrophyllus is often confused with *P. physurifolius* (Rchb. f.) Løjtnant, and in Venezuela the latter generally has been considered a synonym of the former. The two species, however, can be distinguished by vegetative characters; our species has amplexicaul or clasping leaves (some lower leaves are occasionally short-petiolate), whereas *P. physurifolius* has only petiolate leaves. Both species are found in the Venezuelan Andes. It appears that material from the Venezuelan Guayana referred to a broadly circumscribed *P. macrophyllus* (see Foldats, 1969; Carnevali and Ramírez-Morillo in Berry et al., 2003; Carnevali et al. in Hokche et al., 2008) is *P. physurifolius*, which was described from Guyana. We have not reviewed the material from the Cordillera de la Costa assigned by these same authors to *P. macrophyllus,* and we do not know its correct identity.

Pterichis Lindl.

Pterichis Lindl., Gen. Sp. Orchid. Pl. 444. 1840.

Terrestrial herbs; caespitose. Rhizomes short or absent. Roots tuberous, linear-fusiform, fasciculate at the base of the rosette. Plants rosulate, 1 or 2(3) leaves per rosette, leaf blades herbaceous, attenuate basally into a canaliculate pseudopetiole, often withered and absent at anthesis (i.e., plants hysteranthous). Inflorescences lateral; peduncles erect, rigid, simple, pubescent, with several sheaths; sheaths tubular, remote and leaving most of the peduncle naked; rachis in the apical ¼ of the inflorescence, lax to densely spiciform. Floral bracts conspicuous, naviculiform, usually not exceeding the pedicellate ovary in length. Flowers not

resupinate, successive or 2–4 in simultaneous anthesis, lasting 1 or 2 days; perianth segments subfleshy, pubescent externally, usually reddish, brown or yellow with red or red-brown streaks. Sepals free or lateral sepals somewhat connate basally, similar or the lateral sepals somewhat wider, usually elliptic or lanceolate. Petals free, narrower than sepals, straight to somewhat falcate. Labellum free to base, fleshier than the other perianth segments, deeply concave (in living material), simple or with an apical lobe, broadly transverse-ovate in general outline, often with verrucose-glandular (papillate) structures along margins, apical lobe usually recurved, labellar margins partially clasping the column; disk variously pubescent or glandular-pubescent; column short and lacking a foot; anther dorsal, erect; clinandrium small; rostellum horizontal; pollinia 4, ovoid-clavate, brittle, with small terminal caudicles attached to a small hamulus; viscidium terminal, relatively small; stigma ventral, entire. Ovary pedicel thickened, pubescent, equal to or conspicuously longer than its bract. Capsules oblong or ellipsoid. [Orchidoideae: Cranichideae: Cranichidinae.]

A neotropical genus of 15–20 species found in Central America, the Greater Antilles, and South America (Colombia, Venezuela, Ecuador, Peru, Bolivia, and Argentina). The greatest species diversity is in the tropical Andes. Five species are known from Venezuela.

References. Morales (1986); Pridgeon et al. (2003); Salazar Chávez et al. (2009).

Species of *Pterichis* are sun-loving plants found in open areas at high elevations (2,500–4,000 m).

Limited molecular sampling suggests that *Pterichis* is monophyletic (Salazar Chávez et al., 2009). Salazar Chávez et al. (2009) also speculate that the morphologically similar monotypic *Fuertesiella* Schltr., restricted to the Greater Antilles, might prove to be synonymous with *Pterichis*. A revision of this relatively small genus could resolve this question.

Pterichis multiflora (Lindl.) Schltr., Bot. Jahrb. Syst. 45: 389. 1911; Dunsterville and Garay, Venez. Orchids Ill. 4: 256–257. 1966; Foldats, Fl. Venez. 15(1): 399–401, fig. 149. 1969. *Acraea multiflora* Lindl., Orch. Linden. 26. 1846.

Pterichis diuris auct., non Rchb. f.; Dunsterville and Garay, Venez. Orchids Ill. 6: 40. 1976; Romero and Carnevali, Orchids Venez., 2nd ed., 3: 914. 2000.

Terrestrial herbs, 16–55 cm tall. Leaf blades oblong or oblong-lanceolate, 4–15 × 1.1–2.9 cm. Floral bracts 12–13 × 6.5 mm. Flowers yellow-green with deep-brown or reddish streaks. Sepals 3-nerved, pubescent; dorsal sepal 9–11 × 3.4–3.6 mm; lateral sepals 8–9 × 3.9–4.1 mm. Petals 9–11 × 1.9–2.1 mm (5× longer than wide), 3-nerved. Labellum 6.5–7 × 10–11 mm, densely pubescent internally.

Found in South America (Colombia, Venezuela, and Ecuador). In Venezuela, known only from the Andes (Mérida, Táchira, and Trujillo; Map 223). In the park, found in páramo near the Laguna del Pumar; ~3,000 m.

MAP 223. *Pterichis multiflora* occurrence in Venezuela.

Scaphyglottis Poepp. & Endl.

Scaphyglottis Poepp. & Endl., Nov. Gen. Sp. Pl. 1: 58. 1835 [1836], nom. cons.

Hexisea Lindl., J. Bot. (Hooker) 1: 7. 1834, nom. rej.

Cladobium Lindl., Intr. Nat. Syst. Bot., 2nd ed., 446. 1836.

Hexadesmia Brongn., Ann. Sci. Nat., Bot., sér. 2, 17: 44. 1842.

Tetragamestus Rchb. f., Bonplandia (Hannover) 2: 21. 1854.

Reichenbachanthus Barb. Rodr., Gen. Sp. Orchid. 2: 164. 1881 [1882] ("*Reichembachanthus*").

Epiphytic, rarely lithophytic or subterrestrial, herbs; small and inconspicuous to large; usually caespitose; erect to arching or subpendulous. Roots relatively thin, white, numerous, arising from the base of pseudobulbs. Rhizomes short. Pseudobulbs heteroblastic or partially homoblastic, basally surrounded by few to several sheaths, of which only rarely 1 or 2 have foliar blades, usually narrowly cylindrical to narrowly cylindrical-fusiform, sessile to stipitate, 1- or 2(3)-leaved apically, new pseudobulbs originating either from the bases of old pseudobulbs or their apices, often proliferous, making plants architecturally complex as they consist of 2–6 superimposed levels of pseudobulbs. Leaves conduplicate, articulate, linear, oblong, oblong-elliptic to ovate-elliptic, acute to obtuse, usually unequally 2-lobed and mucronate apically, leaf blades concolorous or mottled with purple or reddish, sessile or rarely subpetiolate. Inflorescences terminal, originating from the apices of the most recent pseudobulbs and/or the lowermost pseudobulbs when superimposed, usually 1-flowered, rarely racemose or paniculate, commonly reduced, when solitary, frequently fasciculate and successive and the flowers arising from a mass of sheaths and bracts. Floral bracts

usually inconspicuous. Flowers resupinate or not, usually inconspicuous, sometimes relatively attractive, subcampanulate to widely open, relatively short-lived, often cleistogamous; perianth segments membranous to ± fleshy, white, green, yellow, pink or bright orange, often mottled or with red or purple nerves, less commonly the entire flower or labellum violet-blue. Sepals subsimilar or sides of lateral sides slightly wider and somewhat oblique, partially fused to the sides or foot of the column, forming a mentum; dorsal sepal free. Petals similar to sepals but usually shorter and narrower, rarely wider. Labellum articulate or rigidly attached to the apex of the column foot, erect, ± spreading or recurved, variously sessile or with a simple or lobed claw, often emarginate to 2-lobed apically; disk ± ecallose; labellar base fused with columnar base to form a nectariferous cup (in a group of species with orange flowers and ornithophilous pollination syndrome); column short to relatively elongate, erect or forming an angle with the pedicellate ovary, without a wing or variously winged in the upper ½, basally expressed as a ± well-developed columnar foot; anther terminal, operculate, incumbent; pollinia 4, 6 or 8, waxy, laterally compressed, with caudicles, yellow or cream (in orange-flowered species); clinandrium entire or variously 3-lobed; rostellum transverse, stigma ventral. Ovary terete, pedicellate, often relatively elongate, sometimes recurved. Capsules ellipsoid to subglobose, often beaked. [Epidendroideae: Epidendreae: Laeliinae.]

A neotropical genus of ~60 species found in Mexico, Central America, the West Indies, and South America (Colombia, Venezuela, the Guianas, Ecuador, Peru, Bolivia, and Brazil). The genus is most diverse in Costa Rica and Panama, but 21 species are found in Venezuela.

References. Berg et al. (2009); Dressler et al. (2004); Pridgeon et al. (2005).

As a consequence of molecular phylogenetic analyses (Dressler et al., 2004), the circumscription of *Scaphyglottis* has been expanded, and the genus now includes species formerly assigned to *Hexisea* Lindl. (a generic name rejected in favor of *Scaphyglottis*), *Hexadesmia* Brongn., *Reichenbachanthus* Barb. Rodr., *Cladobium* Lindl., and *Tetragamestus* Rchb. f.

Scaphyglottis summersii L. O. Williams, Bot. Mus. Leafl. 9: 14, t. 3, figs. 4–7. 1940; Romero and Carnevali, Orchids Venez., 2nd ed., 3: 962. 2000; Fernández, Orquídeas Nat. Táchira 214. 2003.

Epiphytic herbs, to 45 cm long. Leaf blades linear or linear-lanceolate, (2–)5–8 cm × 2–5 mm. Inflorescences 1-flowered, single or fascicled. Flowers pale purplish-brown. Dorsal sepal 1–1.5 cm long.

Found in South America (Colombia, Venezuela, Ecuador, Peru, and Bolivia). In Venezuela, known only from the Cordillera de Mérida (Trujillo; Map 224). Collected on the north slope of the park near the Laguna de Aguas Negras and on the south slope between El Campamento and Qda. Honda; 1,900–2,100 m.

MAP 224. *Scaphyglottis summersii* occurrence in Venezuela.

Schlimmia Planch. & Linden

Schlimmia Planch. & Linden, in Linden, Établ. Linden, Prix-Courant 7: 5. 1852.

Primarily epiphytic or terrestrial herbs; erect; sympodial; caespitose. Roots few, relatively thick. Pseudobulbs ovoid or subcylindrical, erect, heteroblastic, 1(2)-foliate, enclosed by scarious sheaths that lack blades, smooth. Leaves plicate, glossy gray-green, elliptic, long-petiolate, prominently 5-nerved below. Inflorescences solitary, pendulous or seemingly creeping, 2–5(–10)-flowered; peduncles terete, filiform, covered with a few appressed, remote bracts. Flowers fleshy, not resupinate, white, lasting to 10 days (relatively long-lived in comparison to other Stanhopeinae). Floral bracts conspicuous. Dorsal sepal free, lateral sepals fused to form a helmet or deeply concave sac, ovate. Petals free, oblong-spathulate, falcate, less fleshy than the sepals. Labellum shorter than the column, hidden in the sepaline sac, divided into an entire hypochile with rugose, yellow callus and smooth, elliptic-ovate epichile; column semiterete, auriculate on distal ½, with a conspicuous foot at the base to which the lateral sepals are attached; anther subventral, operculate, pollinaria composed of 2 yellow, oblong, dorsiventrally flattened pollinaria, long and slender stipe, and semilunate viscidium; rostellum long filiform; stigmatic surface narrow, transverse. Ovary pedicellate, longer than the sepals, 6-furrowed. [Epidendroideae: Cymbidieae: Stanhopeinae.]

A neotropical genus of 6 or 7 species restricted to South America (Colombia, Venezuela, Guyana, Ecuador, Peru, and Bolivia). A single species occurs in Venezuela.

References. Gerlach (1999a); Pridgeon et al. (2009); Sweet (1973); Whitten et al. (2000).

MAP 225. *Schlimmia alpina* occurrence in Venezuela.

Schlimmia alpina Rchb. f. & Warsz., Bonplandia (Hannover) 2: 98. 1854; Romero and Carnevali, Orchids Venez., 2nd ed., 3: 967. 2000 ("*Schlimia*"); Llamozas et al., Libro Rojo Fl. Venez. 459. 2003 ("*Schlimia*").

Schlimmia trifida Rchb. f., Gard. Chron., n.s., 2: 708. 1876 ("*Schlimia*"); Dunsterville and Garay, Venez. Orchids Ill. 3: 282–283. 1965 ("*Schlimia*"); Foldats, Fl. Venez. 15(4): 110–112. 1970 ("*Schlimia*").

Epiphytic or subterrestrial herbs; pseudobulbs narrowly pyriform. Leaf blades elliptic, 15–20 cm long. Inflorescences 10–15 cm long. Flowers white. Dorsal sepal 2–2.5 cm long.

Found in South America (Colombia, Venezuela, Guyana, and Ecuador). In Venezuela, known from the Andes (Lara and Trujillo) and the Cordillera de la Costa (Yaracuy; Map 225).

Inclusion of this species in the flora is based on a sight record made in the park by G. Gerlach (pers. comm.).

Sobralia Ruiz & Pav.

Sobralia Ruiz & Pav., Fl. Peruv. Prodr. 120. 1794, nom. cons. prop.

Terrestrial, lithophytic or epiphytic herbs; relatively small to large and robust; caespitose; when epiphytic occasionally subpendulous, ascending or patent. Rhizomes short, thick. Stems terete or laterally compressed, sometimes slightly woody at base, usually simple but sometimes somewhat branched or proliferous, becoming scandent, partly or completely enclosed by leaf sheaths. Leaves distichous, plicate, articulate, sessile on the sheaths, elliptic or ovate-elliptic, rarely linear, ± rigid to subcoriaceous, less commonly thin; sheaths tubular and clasping the stem or funnel-shaped and greatly inflated, glabrous, verruculose, rugose or variously pubescent. Inflorescences terminal or axillary, sessile or pedunculate, racemose or paniculate; peduncles terete, laterally flattened or angled. Floral bracts cucullate, inconspicuous to large and subfoliaceous. Flowers showy, medium-sized to very large, resupinate, short-lived (lasting 1 or 2 [3] days), usually white, yellow, lilac, pink or purple, less commonly greenish or brown, opening widely or subcampanulate; sepals and petals similar or petals slightly wider than sepals, free, membranous or somewhat subfleshy. Labellum entire or more rarely lobed, usually more conspicuous than other perianth segments, basally surrounding the column, apically opening in a blade ornamented with bristles, keels or dentate crests; column without a foot, relatively large and narrow, with membranous, apical wings that terminate in a pair of falcate, dentate or digitate structures on both sides of the stigma; anther terminal, incumbent, long, operculate, 2-locular; pollinia 8, 4 in each locule, dusty-grained in texture, rarely somewhat waxy; stigmatic surface reniform, transverse; rostellum large, convex. Capsules relatively large-oblongoid or linear-oblongoid. [Epidendroideae: Sobralieae.]

As traditionally construed, a genus of ~100 species found in Mexico, Central America, and South America (Colombia, Venezuela, the Guianas, Ecuador, Peru, Bolivia, and Brazil). The genus is most diverse in Central America and the Andes; ~20 species occur in Venezuela.

References. Dressler (2002); Neubig et al. (2011); Pridgeon et al. (2005).

A molecular phylogenetic study of the Sobralieae (Neubig et al., 2011) identified a core *Sobralia* clade that was monophyletic, but several species of *Sobralia* sect. *Sobralia* fell outside this clade. This is problematic nomenclaturally as the type of the genus is among these outliers, and this is the basis for a conservation proposal by Dressler et al. (2011), which has received preliminary approval (Applequist, 2012: 1113).

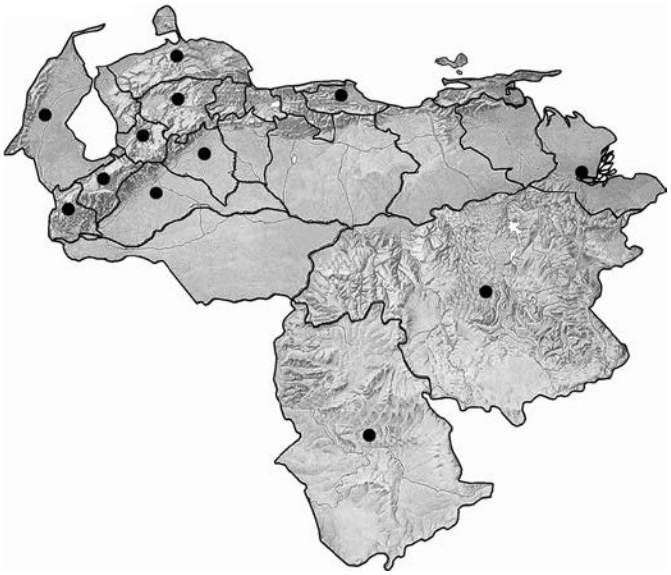
The one species encountered in Guaramacal falls within the core *Sobralia* clade.

Sobralia violacea Linden ex Lindl., Orchid. Linden. 26. 1846; Dunsterville and Garay, Venez. Orchids Ill. 1: 400–401. 1959; Foldats, Fl. Venez. 15(1): 197–199, fig. 73B. 1969; Romero and Carnevali, Orchids Venez., 2nd ed., 3: 993. 2000; Carnevali and Ramírez-Morillo, in Berry et al., Fl. Venez. Guayana 7: 574. 2003.

Sobralia yauaperyensis auct., non Barb. Rodr.; Dunsterville and Garay, Venez. Orchids Ill. 2: 324–325. 1961; Foldats, Fl. Venez. 15(1): 199–201, fig. 73A. 1969.

Terrestrial or rarely epiphytic herbs; stems erect, to 1.5(–2) m tall. Leaf blades lanceolate to oblong-lanceolate, 15–25 × 4–7 cm. Inflorescences terminal. Flowers 1(–3) successive, emerging from a mass of sheaths; perianth segments usually pink or pale lilac-violet, more rarely dark violet or totally white. Sepals 5–7 cm long. Labellum tube and calli yellow.

Found in South America (Colombia, Venezuela, Ecuador, Peru, Bolivia, and Brazil). Widespread in Venezuela, including the Andes (Barinas, Lara, Mérida, Portuguesa, Táchira, and



MAP 226. *Sobralia violacea* occurrence in Venezuela.

Trujillo), the Sierra de Perijá (Zulia), the Cordillera de la Costa (Falcón and Miranda), and the Venezuelan Guayana (Amazonas, Bolívar, and Delta Amacuro; Map 226). In the park, found on the north slope below Páramo del Pumar and on the south slope between El Campamento and Qda. Honda; 1,900–2,100 m.

This species is sun loving, locally common, and often found on road cuts.

Specklinia Lindl.

Specklinia Lindl., Gen. Sp. Orchid. Pl. 8. 1830. *Pleurothallis* subgen. *Specklinia* (Lindl.) Garay, Orquideología 9: 121. 1974.

Epiphytic, lithophytic or terrestrial herbs. Rhizomes short, creeping. Stems erect, usually very short, terete or ventrally canaliculate, often covered by 1 to several appressed, imbricate tubular sheaths. Leaves erect with respect to the stem, commonly elliptic to linear or obovate, rarely subcylindric, bases usually attenuate, apices minutely 3-toothed, coriaceous, fleshy or fleshy-coriaceous. Inflorescences terminal, racemose, solitary or (less commonly) in fascicles, shorter than the subtending leaves to several times longer, erect or less commonly patent, associated with an annulus and emerging from its apex and just below the leaf articulation, flowers opening successively or simultaneously. Floral bracts membranous, usually reduced. Flowers membranous (compared to most Pleurothallidinae), commonly resupinate, variously colored, small or medium-sized. Sepals almost free or lateral sepals fused for varying lengths (often completely fused) into a plane, or more commonly, concave synsepal supporting the labellum, externally smooth or verruculose, dorsal sepal often more slender than synsepal and differently shaped, apices often caudate. Petals less fleshy and conspicuously smaller than sepals, variously shaped, parallel to the column or somewhat divergent, margins entire or often dentate to fimbriate or laciniate. Labellum articulate with the column foot and rarely with a pair of tiny lobes or retrorse teeth at the base of each side of the articulation with the column foot, blade deeply 3-lobed to more commonly simple, lateral lobes relatively small, erect, apical lobe entire, verruculose or pubescent, margins entire to more commonly erose to laciniate, disk often with 2 or more longitudinal calli in the basal or middle portion, often concave; column elongated, semicylindrical and ventrally concave, erect or ± arched, foot well developed; clinandrium usually erose or dentate to fimbriate; anther operculate, subventral; stigma and rostellum ventral; pollinia 2. Ovary articulate with pedicel, terete or subtriangular; pedicel usually filiform and much longer and thinner than the ovary. Capsules globose to obovoid. [Epidendroideae: Epidendreae: Pleurothallidinae.]

A neotropical genus of ~200 species found in Mexico, Central America, the West Indies, and South America (Colombia, Venezuela, Ecuador, Peru, Bolivia, Brazil, and Argentina). The genus is most diverse in the Andes; 5 or more species are found in Venezuela.

References. Luer (1986d, 2006); Pridgeon and Chase (2001); Pridgeon et al. (2005).

Specklinia lacks obvious morphological synapomorphies, but the majority of species are small caespitose plants with short stems with an annulus and a hinged labellum. The limits of the genus and its relationship to other pleurothallids are still a subject of debate (Luer, 2004, 2006; Pridgeon et al., 2005). Neither of the two species found in Guaramacal would remain in *Specklinia* as defined by Luer (2004, 2006), who dismembered the genus, dividing it into 23 vegetatively similar genera.

KEY TO THE SPECIES OF *SPECKLINIA*

1a. Inflorescences including peduncle, rachis and floral bracts laterally compressed; flowers relatively large with sepals >1 cm long; sepals green, orange or red, 3–5-nerved; dorsal sepal elliptic, at least 6 mm wide midlength, much longer than the petals; petals emerging from the basal portion of the column; labellum deeply geniculate in living material, shorter than or equal to column in length . . . . . ***S. endotrachys***

1b. Inflorescences including peduncle and rachis terete, floral bracts concave; flowers relatively small; sepals translucent or creamy, 1-nerved; dorsal sepal linear, <1 mm wide midlength, slightly longer than the petals; petals emerging from the apex of the floral receptacle; labellum flat in living material, longer than column in length . . . . . ***S. zephyrina***

MAP 227. *Specklinia endotrachys* occurrence in Venezuela.

MAP 228. *Specklinia zephyrina* occurrence in Venezuela.

Specklinia endotrachys (Rchb. f.) Pridgeon & M. W. Chase, Lindleyana 16: 257. 2001. *Pleurothallis endotrachys* Rchb. f., Linnaea 41: 95. 1877 [1876]; Dunsterville and Garay, Venez. Orchids Ill. 3: 250–251. 1965; Foldats, Fl. Venez. 15(2): 265–266, fig. 279. 1970; Ortega et al., BioLlania 5: 49. 1987; Romero and Carnevali, Orchids Venez., 2nd ed., 3: 779. 2000; Dorr et al., Contr. U.S. Natl. Herb. 40: 52. 2000 [2001]. *Empusella endotrachys* (Rchb. f.) Luer, Monogr. Syst. Bot. Missouri Bot. Gard. 95: 258. 2004.

Epiphytic herbs, to 50 cm tall (including the inflorescences). Leaf blades oblanceolate to narrowly oblanceolate, 12–20 cm × 1–3 mm. Inflorescences 10–45 cm long, straight or curved, few-flowered. Sepals 2–2.5 cm long.

Found in Mexico, Central America, and South America (Colombia and Venezuela). In Venezuela, known only from the Cordillera de Mérida (Barinas and Trujillo; Map 227). In the park, found along the Boconó–Guaramacal road; ~2,450 m.

Specklinia zephyrina (Rchb. f.) Luer, Monogr. Syst. Bot. Missouri Bot. Gard. 95: 265. 2004. *Pleurothallis zephyrina* Rchb. f., Bonplandia (Hannover) 3: 71. 1855; Romero and Carnevali, Orchids Venez., 2nd ed., 3: 870. 2000; Dorr et al., Contr. U.S. Natl. Herb. 40: 52. 2000 [2001]; Carnevali and Ramírez-Morillo, in Berry et al., Fl. Venez. Guayana 7: 523. 2003; Fernández, Orquídeas Nat. Táchira 197. 2003. *Trichosalpinx zephyrina* (Rchb. f.) Luer, Phytologia 54: 398. 1983. *Muscarella zephyrina* (Rchb. f.) Luer, Monogr. Syst. Bot. Missouri Bot. Gard. 105: 124. 2006.

Pleurothallis setigera Lindl., Fol. Orchid. 9: Pleurothallis 38. 1859; Dunsterville and Garay, Venez. Orchids Ill. 4: 242–243. 1966; Foldats, Fl. Venez. 15(2): 412–414, fig. 342B. 1970; Ortega et al., BioLlania 5: 49. 1987.

Tiny epiphytic herbs, to 5 cm tall (including inflorescences). Leaf blades narrowly obovate, 1–2.5(–3.5) × 2.5–4.5 cm. Inflorescences 5–10 cm long, suberect. Dorsal sepal 7–8.5 mm long.

Found in South America (Colombia, Venezuela, Ecuador, Peru, and Bolivia). In Venezuela, known only from the Andes (Lara, Mérida, Táchira, and Trujillo; Map 228). In the park, found along the Boconó–Guaramacal road; ~2,550 m.

Stelis Sw.

Stelis Sw., J. Bot. (Schrader) 1799(2): 239. 1800, nom. cons.

Apatostelis Garay, Bot. Mus. Leafl. 27: 185. 1979 [1980] ("*Apatoselis*").

Epiphytic, terrestrial or lithophytic herbs; caespitose or creeping, minute to fairly large (in comparison to other Pleurothallidinae). Rhizomes prostrate or ascendent, sometimes distinctly pendent, often branching and then plants mat-forming. Stems almost absent to very elongated, shorter than to much longer than the single apical leaf, terete, covered partially or totally by sheaths, in many species apically proliferous (and then producing chains of superposed stems). Leaves solitary on top of the stems, articulate, usually elliptic or elliptic-obovate, sometimes linear or oblong, thinly coriaceous to fleshy or even subterete, sessile to conspicuously subpetiolate. Inflorescences racemes, few- to many-flowered, solitary to several, flowers opening successively or simultaneously, originating on or just below apex of the stem from a swollen annulus, basally often subtended by a spathe, rachis straight or zigzag, rarely very abbreviated and then inflorescences umbellate. Flowers usually resupinate, spreading widely to campanulate, triangular sepals variously connate, forming a triangular-shaped flower made of

3 triangles fused at base, the central portion of the triangle occupied by an apparatus composed of the column, the 2 petals, and the labellum; perianth segments membranous to thinly coriaceous, usually white, green, yellow or purple, often variously pubescent. Sepals connate basally, 1-, 3-, 5-, 7- or 9-veined, similar or the lateral sepals fused together to form a bilabiate flower, or the dorsal sepal larger than the other 2. Petals usually much smaller than the sepals, fleshy, transverse, margin thickened, fitting snugly in the shallow tube formed by the base of the sepals and closely flanking the labellum and column. Labellum small, thick, usually shaped like ¼ of a sphere, the uppermost plane of the labellum resting beneath the column and often bearing a glenion and 1 or few keels or ridges, basally sessile on the column. Column short and broad, dilated apically; anther apical, incumbent, operculate; pollinia 2, usually pyriform; stigma apical, transverse, 1- or 2-lobed, when 2-lobed, the lateral lobes protrude to either side of the anther under the flap on the rostellum, stigma lobes often so elongated that the receptive surfaces are held far to either side of the anther. Capsules ellipsoidal, fusiform or cylindrical. [Epidendroideae: Epidendreae: Pleurothallidinae.]

A neotropical genus of ~900 species found in Mexico, Central America, the West Indies, and South America (Colombia, Venezuela, the Guianas, Ecuador, Peru, Bolivia, and Brazil). The genus is most diverse in the Andes and southern Central America; ~80 species occur in Venezuela.

References. Duque (2003a, 2003b, 2008); Garay (1979); Karremans et al. (2013); Pridgeon and Chase (2001); Pridgeon et al. (2001b, 2005).

The flowers of *Stelis* species often are sensitive to light or temperature and open or close at particular times of the day in response to the appropriate stimulus.

The generic concept presented here is that of *Stelis* s. str., which corresponds to Clade F in the molecular phylogeny of Karremans et al. (2013). As such, the species are united by terminal, racemose, fascicled, few- to many-flowered inflorescences; triangular, almost radially symmetrical flowers with ± identical sepals; diversely connate sepals that are much larger than the petals and labellum; greatly reduced petals with thick margins; a thickened labellum similar to the petals; and a very short, unwinged column with an apical stigma and anther (Pridgeon et al., 2001b; Karremans et al., 2013). An alternative molecular classification (Pridgeon and Chase, 2001; Pridgeon et al., 2001b) accepts *Stelis* s.l. and includes *Crocodeilanthe* in synonymy. Luer (2004, 2006) rejected this latter interpretation and, using mostly morphological characters, argued for an even greater splitting of the genus than is accepted in this flora or by Karremans et al. (2013).

KEY TO THE SPECIES OF *STELIS*

1a. Rhizomes elongate, plants creeping or ascending 2
  2a. Plants diminutive; leaf blades ≤0.6 cm wide; sepals <2 mm long . . . . . ***S. pusilla***
  2b. Plants larger; leaf blades ≥0.6 cm wide; sepals >2 mm long 3
    3a. Inflorescences solitary, 2 or 3× longer than the leaves in length; stems clustered and ascending, rhizomes growing upward; labellum semicircular (as seen from above), as long as wide; sepals pubescent, subequal . . . ***S. ascendens***
    3b. Inflorescences 1(–3), shorter than, subequal to or slightly exceeding the leaves in length; rhizomes clearly creeping; labellum subquadrate-obovate (as seen from above), longer than wide; sepals glabrous; dorsal sepal larger than lateral sepals . . . . . ***S. atra***
1b. Rhizomes short, plants caespitose, never creeping or ascending 4
  4a. Lateral sepals more fused to each other than to the dorsal sepal; synsepal concave 5
    5a. Petals and labellum terminating in a long acumen; dorsal sepal 1.7–2.5 mm long . . . . . ***S. biserrula***
    5b. Petals and labellum not terminating in a long acumen; dorsal sepal 4–6 mm long . . . . . ***S. vulcani***
  4b. Lateral sepals as fused to each other as they are to the dorsal sepal; synsepal flat or convex 6
    6a. Plants very large, 25–30(–70) cm tall; leaf blades ≥5 cm wide; sepals 5-nerved, very wide (broadly deltoid) and almost completely fused, sinuses of synsepal very shallow . . . . . ***S. lindenii***
    6b. Plants smaller, to 15(–35) cm tall; leaf blades ≤5 cm wide; sepals 3-nerved, narrower (lanceolate or ovate) and fused <½ their length, sinuses of synsepal very deep 7
      7a. Sepals revolute so that the flower is convex; petals apiculate . . . . . ***S. hylophila***
      7b. Sepals not revolute so that the synsepal is flat or concave; petals not apiculate 8
        8a. Mature plants producing 4–8 inflorescences per stem; stem conspicuously longer (2 or 3×) than the leaves . . . . . ***S. striolata***
        8b. Mature plants producing 1–3 inflorescences per stem; stem either shorter or longer than the leaves, but never 2 or 3× longer 9
          9a. Inflorescences very lax; rachis internodes much longer than the sepals; sepals lanceolate, ~2× longer than wide 10
            10a. Stems >5 cm long; usually multiple inflorescences per stem; labellum 3-lobed, longer than wide . . . . . ***S. chamaestelis***
            10b. Stems 1–3 cm long; inflorescences 1(–2) per stem; labellum simple, as wide as long . . . . ***S. nitens***

9b. Inflorescences denser; rachis internodes shorter than to ± equal to the sepals; sepals broadly ovate, as long as wide or at most 1.5× longer than wide 11
11a. Stems very short, 1–2 cm long in adult plants; inflorescences shorter than or exceeding the leaves . . . . . ***S. humilis***
11b. Stems longer, at least 3 cm long in adult plants; inflorescences always exceeding the leaves . . . 12
12a. Inflorescences dense; floral bracts imbricate; sepals unequal . . . . . ***S. oblonga***
12b. Inflorescences lax; floral bracts contiguous or remote; sepals subequal 13
13a. Inflorescences emerging from a spathe appressed to the pseudopetiole; labellum with an apiculus; petal margins glandular-verruculose . . . . . ***S. argentata***
13b. Inflorescences emerging from a spathe diverging from the pseudopetiole; labellum without an apiculus; petal margins entire or only cellular-verruculose . . . . . ***S. atroviolacea***

Stelis argentata Lindl., Edwards's Bot. Reg. 28: Misc. 64. 1842; Dunsterville and Garay, Venez. Orchids Ill. 1: 414–415. 1959; Foldats, Fl. Venez. 15(2): 62–64, fig. 203. 1970; Romero and Carnevali, Orchids Venez., 2nd ed., 3: 1005. 2000; Carnevali and Ramírez-Morillo, in Berry et al., Fl. Venez. Guayana 7: 584. 2003; Fernández, Orquídeas Nat. Táchira 220. 2003.

Epiphytic herbs, to 30 cm tall. Leaf blades oblong to oblong-oblanceolate, (2–)6.5–12.5 × 0.7–2.5(–4) cm. Inflorescences solitary, erect, 10–25 cm long, usually greatly exceeding the leaves, many-flowered. Flowers greenish-yellow to reddish-brown. Sepals patent, subequal, broadly elliptic ovate, 2–5.5 × 2–5.5 mm, ± pubescent on margins and villous-papillose on lamina. Petals broadly cuneate-rhomboid. Labellum fleshy, globular.

Found in Central America and South America (Colombia, Venezuela, the Guianas, Ecuador, Peru, Bolivia, and Brazil). Widespread in Venezuela (Amazonas, Anzoátegui, Apure, Aragua, Bolívar, Delta Amacuro, Distrito Federal, Mérida, Monagas, Sucre, Táchira, and Trujillo; Map 229). In the park, found along the Boconó–Guaramacal road; 2,100–2,300 m.

This species as currently construed is very variable morphologically and has a very wide range.

Stelis ascendens Lindl., in Hooker, Companion Bot. Mag. 2: 353. 1836; Foldats, Fl. Venez. 15(2): 64–67, fig. 204A. 1970 ("*ascendants*"); Morillo, in Morillo et al., Bot. Ecol. Monocot. Páramos Venez. 1: 281, fig. 112. 2011.

Epiphytic herbs, to 20 cm tall. Leaf blades oblong-elliptic to narrowly oblong-obovate, 2.7–7.5 × 0.7–1.6 cm. Inflorescences solitary, ± erect, 8–22 cm long, greatly exceeding the leaves, secund, many-flowered. Flowers green with purple or violet. Sepals ± patent, ovate, subequal, 2–2.6 × 2–2.6 mm, pilose, margins sometimes appearing ciliate. Petals narrowly elliptic. Labellum fleshy, semicircular.

Found in South America (Colombia, Venezuela, Ecuador, and Peru). In Venezuela, occurs in the Andes (Mérida, Táchira,

MAP 229. *Stelis argentata* occurrence in Venezuela.

MAP 230. *Stelis ascendens* occurrence in Venezuela.

and Trujillo) and in the Cordillera de la Costa (Sucre; Map 230). In the park, collected in cloud forest on both slopes of Guaramacal; 1,700–2,700 m.

Whether or not this is the correct name for this species needs to be resolved as Duque (2008) considers *Stelis ascendens*, described from Peru, to be a synonym of *S. jamesonii* Lindl. (J. Bot. (Hooker) 1: 11. 1834), which he restricts to Colombia, Ecuador, and Peru.

Stelis atra Lindl., Orchid. Linden. 3. 1846; Garay and Dunsterville, Venez. Orchids Ill. 4: 290–291. 1966; Foldats, Fl. Venez. 15(2): 66–68, fig. 204B. 1970; Romero and Carnevali, Orchids Venez., 2nd ed., 3: 1006. 2000; Morillo, in Morillo et al., Bot. Ecol. Monocot. Páramos Venez. 1: 282–283, fig. 113. 2011. *Stelis hallii* var. *atra* (Lindl.) Garay & C. Schweinf., Fieldiana, Bot., n.s., 33: 11. 1970; Dorr et al., Contr. U.S. Natl. Herb. 40: 54. 2000 [2001].

Epiphytic or terrestrial herbs, <10 cm tall. Leaf blades lanceolate to oblanceolate, 4.5–8 × 0.9–2 cm. Inflorescences 1(–3), erect, 3.5–8 cm long, slightly shorter or longer than the leaves, many-flowered. Flowers purple, reddish-purple, wine-colored or pinkish. Sepals unequal, glabrous; dorsal sepal broadly ovate, 2.5–3 × 2.5–3 mm; lateral sepals ovate, 1.7–2 × 1.5–2 mm. Petals trapezoid obtuse. Labellum subquadrate-obovate.

Found in South America (Colombia, Venezuela, Ecuador, Peru, and Bolivia). In Venezuela, apparently restricted to the Cordillera de Mérida (Mérida, Portuguesa, and Trujillo; Map 231). In the park, known from cloud forest on both slopes of Guaramacal; 1,700–3,100 m.

Stelis atroviolacea Rchb. f., Bonplandia (Hannover) 3: 70. 1855; Dunsterville and Garay, Venez. Orchids Ill. 2: 330–331. 1961; Foldats, Fl. Venez. 15(2): 68–70, fig. 205A. 1970; Romero and Carnevali, Orchids Venez., 2nd ed., 3: 1007. 2000.

Epiphytic herbs, 18–27 cm tall. Leaf blades ovate-oblong to spathulate, 7–12 × 1.6–2.5 cm. Inflorescences 1(or more?), to 18 cm long, shorter or slightly longer than the leaves, many-flowered. Flowers deep purple to clear green. Sepals subequal, elliptic-ovate, 2–3 × 2–3 mm, shortly villous. Petals reniform. Labellum oblong, concave.

Found in South America (Colombia, Venezuela, and Ecuador). In Venezuela, found in the Andes (Lara, Mérida, Táchira, and Trujillo) and in the Cordillera de la Costa (Aragua, Carabobo, and Miranda; Map 232). Guaramacal, without precise locality; 2,400–2,600 m.

Stelis biserrula Lindl., Fol. Orchid. 8: Stelis 16. 1858 [1859]; Dunsterville and Garay, Venez. Orchids Ill. 3: 298–299. 1965; Foldats, Fl. Venez. 15(2): 73–76, fig. 207. 1970; Morillo, in Morillo et al., Bot. Ecol. Monocot. Páramos Venez. 1: 283–284. 2011.

Stelis triseta auct., non Lindl.; Romero and Carnevali, Orchids Venez., 2nd ed., 3: 1053. 2000; Dorr et al., Contr. U.S. Natl. Herb. 40: 54. 2000 [2001]; Fernández, Orquídeas Nat. Táchira 225. 2003.

Epiphytic or terrestrial herbs, to 16 cm tall; stems long trailing. Leaf blades lanceolate to narrowly elliptic, (3.5–)6–10 × 0.6–1.8 (–2.5) cm. Inflorescences 1(–3), erect, 5–10(–25) cm tall, exceeding the leaves or not, many-flowered. Flowers secund, nutant, green,

MAP 231. *Stelis atra* occurrence in Venezuela.

MAP 232. *Stelis atroviolacea* occurrence in Venezuela.

MAP 233. *Stelis biserrula* occurrence in Venezuela.

MAP 234. *Stelis chamaestelis* occurrence in Venezuela.

translucent green, pale green, pale yellow, whitish-green or whitish translucent. Sepals unequal, glabrous; dorsal sepal elliptic-ovate, 1.7–2.5 × 1.6–3 mm, lateral sepals smaller, 1.6–4 × 1.6–3 mm. Petals rhombic. Labellum trapezoidal, apiculate.

Found in Central America and South America (Colombia, Venezuela, Ecuador, Peru, and Bolivia). Venezuelan records are all from the Andes (Mérida, Portuguesa, Táchira, and Trujillo; Map 233). In the park, found in cloud forest on both slopes of Guaramacal; 1,800–2,700 m.

We follow Luer (2009) in considering *Stelis biserrula* to be distinct from *S. bicornis* Lindl. (=*S. triseta* Lindl.), which nonetheless is a closely related species restricted to the Andes of Ecuador, Peru, and Bolivia. In fact, Luer (2009: 53) states that *S. biserrula* is "possibly only a variation of the common and widely distributed *Stelis bicornis* Lindl. with a small habit and flowers."

Dunsterville and Garay (1965) illustrated *Stelis biserrula* and vouchered their illustration with *Dunsterville & Dunsterville 720* (AMES), a specimen collected between Boconó and Guaramacal. Ortega et al. (1987) and Dorr et al. (2000), however, cited *Dunsterville & Dunsterville 772* (VEN) as a voucher for *S. biserrula*, which makes us now suspect that the label on the duplicate in Caracas was miscopied as that collection number (i.e., *772*) is a paratype of *Encyclia ivonae* Carnevali & G. A. Romero, a species found in the Venezuelan Guayana.

Stelis chamaestelis (Rchb. f.) Garay & Dunst., in Dunsterville and Garay, Venez. Orchids Ill. 4: 292. 1966; Foldats, Fl. Venez. 15(2): 77–78, fig. 208B. 1970; Romero and Carnevali, Orchids Venez., 2nd ed., 3: 1011. 2000; Morillo, in Morillo et al., Bot. Ecol. Monocot. Páramos Venez. 1: 284, fig. 114. 2011. *Pleurothallis chamaestelis* Rchb. f., Linnaea 22: 825. 1849. *Apatostelis chamaestelis* (Rchb. f.) Garay, Bot. Mus. Leafl. 27: 187. 1979 [1980].

Epiphytic herbs, to 35 cm tall. Leaf blades narrowly elliptic-oblong, 3.5–12 × 1.4–1.7 cm. Inflorescences 1 to several, fasciculate, ± erect, 7–12(–19) cm long, exceeding the leaves, lax, many-flowered. Flowers white or yellowish-green. Sepals equal, narrowly elliptical, 1.2–2 × 0.6–1.1 mm, glabrous. Petals obtusely rhombic. Labellum subquadrate, 3-lobed, longer than wide.

Found in South America (Colombia and Venezuela). In Venezuela, restricted to the Andes (Lara, Mérida, Portuguesa, Táchira, and Trujillo; Map 234). In the park, collected along the Boconó–Guaramacal road and on the south slope in Sector Paramito–La Aguadita and near La Divisoria de la Concepción; 1,700–1,900(–3,000) m.

One Guaramacal collection (*Cuello et al. 1604*) describes the flowers as "moradas," but that is certainly an error.

Stelis humilis Lindl., Fol. Orchid. 8: Stelis 10. 1858 [1859]; Garay and Dunsterville, Venez. Orchids Ill. 1: 420–421. 1959; Foldats, Fl. Venez. 15(2): 104–106, fig. 220. 1970; Romero and Carnevali, Orchids Venez., 2nd ed., 3: 1023. 2000; Morillo, in Morillo et al., Bot. Ecol. Monocot. Páramos Venez. 1: 288–2893, fig. 117. 2011.

Epiphytic herbs, 6–20 cm tall. Leaf blades narrowly elliptic to oblong-elliptic, 3–12 × 0.3–1 cm. Inflorescences solitary, ± erect, 4–12 cm long, shorter or longer than the leaves, densely many-flowered. Flowers nutant, greenish-brown. Sepals equal, ovate, 2–3.5 × 1.7–3 mm, ± hairy, especially near margins. Petals subrhomboid. Labellum subtrapezoidal to subquadrate.

MAP 235. *Stelis humilis* occurrence in Venezuela.

Found in South America (Colombia and Venezuela). In Venezuela, found in the Andes (Lara, Mérida, Táchira, and Trujillo) and in the Cordillera de la Costa (Aragua, Cojedes, Distrito Federal, Falcón, Miranda, and Yaracuy; Map 235). In the park, found on the north slope in Qda. Segovia; ~1,850–1,900 m.

Stelis hylophila Rchb. f., Bonplandia (Hannover) 3: 241. 1855; Garay and Dunsterville, Venez. Orchids Ill. 4: 302–303. 1966; Foldats, Fl. Venez. 15(2): 106–108, fig. 221. 1970; Romero and Carnevali, Orchids Venez., 2nd ed., 2: 1024. 2000; Morillo, in Morillo et al., Bot. Ecol. Monocot. Páramos Venez. 1: 290–291, fig. 118. 2011. *Apatostelis hylophila* (Rchb. f.) Garay, Bot. Mus. Leafl. 27: 189. 1979 [1980].

Epiphytic herbs, to 30 cm tall. Leaf blades oblong or narrowly elliptic-oblong, 6–12 × 0.8–2.5 cm. Inflorescences 1 to several, 5–11 cm long, equal to or exceeding leaves, densely many-flowered. Flowers translucent white with a dark center (or yellowish-green). Sepals equal, ovate-elliptic, 1.1–1.4 × 1–1.3 mm, papillate at the apices, often reflexed. Petals cuneate, apiculate. Labellum subquadrate, rounded or subcuneate.

Found in South America (Colombia, Venezuela, Ecuador, and Peru). In Venezuela, evidently restricted to the Andes (Mérida, Táchira, and Trujillo; Map 236). Collected along the Boconó–Guaramacal road on the north slope of Guaramacal; 2,100–2,200 m.

Stelis lindenii Lindl., Orchid Linden. 3. 1846 ("*Lindeni*"); Foldats, Fl. Venez. 15(2): 118–120, fig. 227. 1970; Morillo, in Morillo et al., Bot. Ecol. Monocot. Páramos Venez. 1: 194. 2011.

Stelis purdiaei auct., non Lindl.; Romero and Carnevali, Orchid Venez., 2nd ed., 3: 1042. 2000.

Epiphytic herbs, 25–35(–70) cm tall. Leaf blades oblong, 10–20 × 3.5–7 cm. Inflorescences 1 to several, 15–25 cm long, as long as or exceeding the leaves, many-flowered. Flowers greenish-yellow suffused with pink. Sepals equal, broadly deltoid and almost completely fused, 4–6 × 3–4.5 mm, minutely pubescent or glabrous. Petals rounded to subquadrate. Labellum subquadrate to suboblong.

Found in South America (Colombia and Venezuela). In Venezuela, found only in the Andes (Lara, Mérida, Táchira, and Trujillo; Map 237). Infrequently collected in the park, where it has been found near the Boconó–Guaramacal road and along the track from El Campamento to Qda. Honda; 1,900–2,100 m.

This is the largest of the *Stelis* species found in Guaramacal.

MAP 236. *Stelis hylophila* occurrence in Venezuela.

MAP 237. *Stelis lindenii* occurrence in Venezuela.

MAP 238. *Stelis nitens* occurrence in Venezuela.

MAP 239. *Stelis oblonga* occurrence in Venezuela.

Stelis nitens Rchb. f., Bonplandia (Hannover) 2: 22. 1854; Garay and Dunsterville, Venez. Orchids Ill. 4: 310–311. 1966; Foldats, Fl. Venez. 15(2): 130–132, fig. 232. 1970; Romero and Carnevali, Orchids Venez., 2nd ed., 2: 1036. 2000; Fernández, Orquídeas Nat. Táchira 224. 2003; Morillo, in Morillo et al., Bot. Ecol. Monocot. Páramos Venez. 1: 295, fig. 122, foto 59. 2011.

Epiphytic herbs, to 25 cm tall. Leaf blades oblong-elliptic to ± spathulate, 3.5–11 × 1–2 cm. Inflorescences 1(–2), erect, 10–18 cm long, as long as or exceeding the leaves, ± lax, many-flowered apically. Flowers green or greenish-yellow. Sepals subequal, narrowly ovate-lanceolate, 2.5–3.5 × 1.8–2 mm. Petals cochleate-oblong. Labellum subquadrate.

Found in South America (Colombia, Venezuela, and Ecuador). In Venezuela, principally found in the Andes (Mérida, Portuguesa, Táchira, and Trujillo), but the type is from Caracas (Distrito Federal), and there is a collection from Zulia (Map 238). In the park, found in El Cafenol and Qda. Segovia on the north slope of Guaramacal; 1,800–2,300 m.

Stelis oblonga (Ruiz & Pav.) Willd., Sp. Pl. 4(1): 139. 1805; Dunsterville and Garay, Venez. Orchids Ill. 4: 312–313. 1966; Foldats, Fl. Venez. 15(2): 134–136, fig. 234A. 1970; Romero and Carnevali, Orchids Venez., 2nd ed., 2: 1038. 2000; Morillo, in Morillo et al., Bot. Ecol. Monocot. Páramos Venez. 1: 296–297, fig. 123. 2011. *Humboltia oblonga* Ruiz & Pav., Syst. Veg. Fl. Peruv. Chil. 1: 236. 1798 ("*Humboldtia*").

?*Stelis alba* Kunth, in H. B. K., Nov. Gen. Sp. [fol.] 1: 291. 1815 [1816]; ibid. [qu.] 1: 363. 1815 [1816]; Dunsterville and Garay, Venez. Orchids Ill. 5: 288. 1972; Romero and Carnevali, Orchids Venez., 2nd ed., 2: 1004. 2000.

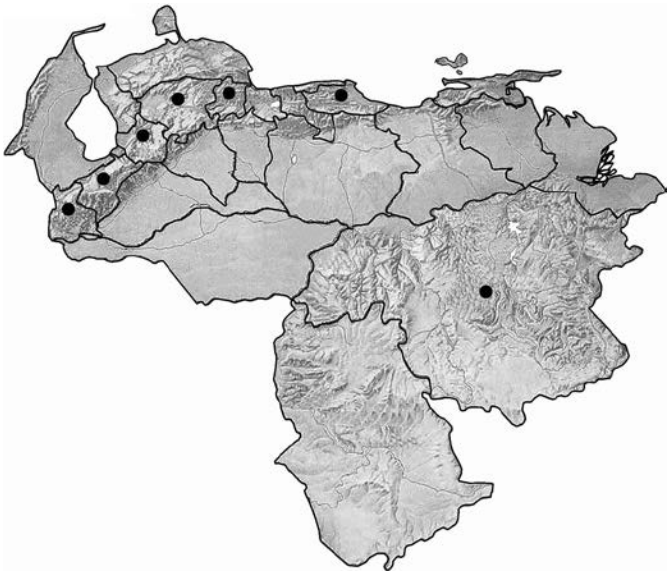
Epiphytic or lithophytic herbs, 7–22 cm tall. Leaves oblong to oblong-elliptic, 7–9 × 2–3.5 cm. Inflorescences 1 to several, erect, 6.5–17 cm long, many-flowered. Flowers congested, yellow, green or greenish-yellow. Sepals unequal, broadly ovate, papillose at the apices; dorsal sepal 1.9–2.5 × 1.7–2.2 mm; lateral sepals 1.6–2 × 1.6–2 mm. Petals subrhomboid. Labellum suborbicular to subrhomboid.

Found in South America (Colombia, Venezuela, Ecuador, and Peru). Infrequently collected in the Venezuelan Andes (Lara, Mérida, Táchira, and Trujillo; Map 239). In the park, found near the Laguna de los Cedros and on both slopes of Guaramacal; 1,850–2,350 m.

We suspect that a specimen (*Dunsterville 653*, AMES-fragment) collected on the Boconó–Guaramacal road at 2,100–2,400 m and used to illustrate *Stelis alba* (Dunsterville and Garay, 1972) is the same as our *S. oblonga*, but that needs to be confirmed. The two names are sometimes considered synonyms, but both species are recognized by Duque (2008), who although he acknowledges that their floral structures are similar, argues without elaboration that their habits differ.

Stelis pusilla Kunth, in H. B. K., Nov. Gen. Sp. [fol.] 1: 289. 1815 [1816]; ibid. [qu.] 1: 361. 1815 [1816]; Foldats, Fl. Venez. 15(2): 145–147, fig. 238. 1970; Romero and Carnevali, Orchids Venez., 2nd ed., 3: 1043. 2000; Carnevali and Ramírez-Morillo, in Berry et al., Fl. Venez. Guayana 7: 586. 2003; Morillo, in Morillo et al., Bot. Ecol. Monocot. Páramos Venez. 1: 300, fig. 126. 2011.

Epiphytic herbs, 6–10(–22) cm tall. Leaf blades linear-oblanceolate to lanceolate, 1.5–4.5 × 0.2–0.6 cm. Inflorescences solitary, 2–6 cm long, erect, many-flowered. Flowers yellow-green. Sepals subequal, ovate to ovate-elliptic,



MAP 240. *Stelis pusilla* occurrence in Venezuela.

MAP 241. *Stelis striolata* occurrence in Venezuela.

1.3–1.8 × 1.2–1.8 mm. Petals cuneate, slightly apiculate. Labellum ± suborbicular.

Found in the Greater Antilles and South America (Colombia, Venezuela, Ecuador, Peru, Bolivia, and Brazil). In Venezuela, found in the Andes (Lara, Mérida, Táchira, and Trujillo), the Cordillera de la Costa (Miranda and Yaracuy), and the Venezuelan Guayana (Bolívar; Map 240). We have a single record from Qda. Jirajara where the specimen was collected on a log that had fallen across a cascading stream; 2,000 m.

Stelis striolata Lindl., Fol. Orchid. 8: Stelis 4. 1858 [1859]; Dunsterville and Garay, Venez. Orchids Ill. 4: 318–319. 1966; Foldats, Fl. Venez. 15(2): 156–158, fig. 244. 1970; Romero and Carnevali, Orchids Venez., 2nd ed., 3: 1051. 2000; Morillo, in Morillo et al., Bot. Ecol. Monocot. Páramos Venez. 1: 303–304, fig. 128. 2011.

Epiphytic herbs, to 30 cm tall. Leaf blades oblanceolate to obovoid, 6–15 × 1.5–3(–5) cm. Inflorescences 4 to several, fasciculate, 3.5–22 cm long, shorter than or exceeding the leaves, many-flowered. Flowers secund, nutant, yellowish-green. Sepals subequal, ovate to elliptic-ovate, 2–5 × 1.8–3 mm. Petals trapezoidal. Labellum oblong to rounded.

Found in South America (Venezuela, Colombia, Ecuador, and Peru). In Venezuela, evidently confined to the Andes (Mérida, Táchira, and Trujillo; Map 241). Collected along the Boconó–Guaramacal road; 2,100–2,300 m.

The status of this record is uncertain since we have not seen the voucher (*Steyermark & Rabe 97317*, VEN) cited by Foldats (1970: 158) and subsequently listed by Ortega et al. (1987: 50). Foldats (1970: 158) wrote that this species is very close to *Stelis oblonga*. Jørgensen and León-Yánez (1999: 764), however, considered *S. striolata* to be endemic to Ecuador.

Stelis vulcani Rchb. f., Otia Bot. Hamburg. 1: 19. 1878; Dunsterville and Garay, Venez. Orchids Ill. 4: 324–325. 1966; Foldats, Fl. Venez. 15(2): 170–172, fig. 251. 1970; Romero and Carnevali, Orchids Venez., 2nd ed., 3: 1056. 2000; Fernández, Orquídeas Nat. Táchira 226. 2003; Morillo, in Morillo et al., Bot. Ecol. Monocot. Páramos Venez. 1: 306–308, fig. 131. 2011.

Epiphytic or lithophytic herbs, 3–12(–28) cm tall. Leaf blades oblong, narrowly oblong to oblong-elliptic, (2.5–)7–12 ×

MAP 242. *Stelis vulcani* occurrence in Venezuela.

(0.6–)2.5–3 cm. Inflorescences 1–4, erect, to 18 cm long, exceeding the leaves, multiflowered. Flowers secund, slightly nutant, white, light yellow or green. Sepals unequal, glabrous; dorsal sepal elliptic-ovate, 4–6 × 1.7–3.2 mm; lateral sepals 2.8–4 × 1–1.4 mm. Petals rhomboid. Labellum suborbicular.

Found in South America (Colombia, Venezuela, Ecuador, and Peru). In Venezuela, evidently restricted to the Andes (Lara, Táchira, and Trujillo; Map 242). In the park, found in cloud forest on both slopes of Guaramacal; 1,850–2,600 m.

Telipogon Kunth

Telipogon Kunth, in H. B. K., Nov. Gen. Sp. [fol.] 1: 269. 1815 [1816]; ibid. [qu.] 1: 335. 1815 [1816].

Stellilabium Schltr., Orchideen 530. 1914.

Epiphytic, rarely terrestrial herbs, often growing on twigs or thin branches; stems elongated or abbreviated, with monopodial or sympodial growth, completely clothed by leaf sheaths; without pseudobulbs. Leaves distichous, articulate, elliptic or lanceolate, conduplicate, coriaceous or fleshy. Inflorescences terminal or lateral racemes, 1–10-flowered, usually longer than the subtending leaves; flowers opening successively (often 1–3 open simultaneously per inflorescence); peduncles often 3- or 4-edged; rachis straight or flexuous. Flowers small and inconspicuous or more typically medium to large and showy, resupinate or not, with widely spreading perianth segments. Floral bracts fleshy, navicular, conspicuous or inconspicuous. Sepals free, subequal, typically lanceolate or elliptic. Petals much longer and broader than the sepals, free, overlapping and hiding the sepals from view, typically broadly ovate, triangular, or suborbicular, acute or apiculate apically, with 5–15 nerves. Labellum similar to the petals or somewhat broader, with 10–30 longitudinal nerves, simple, disk naked or provided at the base with a small cushion-like, pubescent or hairy callus; column short and thick, wingless, footless, usually bristly or pubescent or both; anther dorsal, erect with reduced partitions; pollinia 4, unequal, with a long, narrow stipe and a small hooked viscidium; stigmatic surface apical or subapical, entire; rostellum erect, elongated. Capsules 3-angled to terete in cross section. [Epidendroideae: Cymbidieae: Oncidiinae.]

A neotropical genus of ~170 species found in Central America (Costa Rica and Panama) and South America (Colombia, Venezuela, Ecuador, Peru, and Bolivia), with a center of diversity in Colombia and Ecuador. Approximately 11 species occur in Venezuela.

References. Dressler (1999); Kränzlin (1919); Pridgeon et al. (2009); Sánchez (2002); Senghas (1994b, 1994c); Williams et al. (2005).

Telipogon is composed of many narrowly endemic species that are often locally common. Plants are usually found at elevations above 2,000 m in constantly cloud-shrouded elfin forest and frequently as twig epiphytes.

The number of nerves in the petals (including labellum) is an important taxonomic character for distinguishing species.

There is a report, which is not well documented, that the flowers of *Telipogon* are pseudocopulated by tachinid flies (Tachinidae; Maduro in Dressler, 1981: 252). If this can be confirmed, then *Telipogon* is another example of an orchid being pollinated by deceit.

KEY TO THE SPECIES OF *TELIPOGON*

1a. Inflorescences many-flowered ..... ***T. astroglossus***
1b. Inflorescences 1–4-flowered 2
2a. Petals subrotund to narrowly ovoid; ecallose ..... ***T. andicola***
2b. Petals oval to obovate-oblanceolate; callus pilose ..... ***T. latifolius***

Telipogon andicola Rchb. f., Bonplandia (Hannover) 3: 239. 1855; Dunsterville and Garay, Venez. Orchids Ill. 5: 304–305. 1972; Foldats, Fl. Venez. 15(5): 34–36, fig. 777. 1970 Romero and Carnevali, Orchids Venez., 2nd ed., 3: 1067. 2000.

Epiphytic herbs, 8–13 cm tall (including the inflorescence). Leaves oblanceolate, 4–6 × 0.7–1.2 cm, bases attenuate, apices acute. Inflorescences 2–4-flowered, 1(–2) flowers open at a time. Flowers pale green with a maroon-purple center and maroon nerves on petals and labellum. Dorsal sepal navicular, 9–14 mm long. Petals subrotund to narrowly ovoid, 10–15 × 8–14 mm, shortly apiculate, 5–7-nerved.

Found in South America (Colombia, Venezuela, Ecuador, and Peru). In Venezuela, known only from the Andes (Táchira and Trujillo; Map 243). In the park, found only on the Fila de Agua Fría; 2,700–2,800 m.

MAP 243. (*Right*) *Telipogon andicola* occurrence in Venezuela.

Telipogon astroglossus Rchb. f., Xenia Orchid. 1: 16, t. 7, fig. II, 12–19. 1854.

Cordanthera andina L. O. Williams, Lilloa 6: 244, t. 2. 1941. *Stellilabium andinum* (L. O. Williams) Garay & Dunst., in Dunsterville and Garay, Orchids Venez., ed. 1, 3: 1004. 1979; Romero and Carnevali, Orchids Venez., 2nd ed., 3: 1059. 2000; Dorr et al., Contr. U.S. Natl. Herb. 40: 54. 2000 [2001]. *Telipogon andinus* (L. O. Williams) N. H. Williams & Dressler, Lankesteriana 5: 168. 2005, non Dodson, 1984.

Stellilabium pogonostalix auct., non (Rchb. f.) Garay & Dunst.; Dunsterville and Garay, Venez. Orchids Ill. 2: 336. 1961, pro parte, excluding type & fig.; Foldats, Fl. Venez. 15(5): 46–48, fig. 782. 1970, pro parte, excluding type & fig.

Epiphytic herbs. Leaf blades linear to oblong, 0.5–5 × 0.1–1 cm, apices obtuse to acute. Inflorescences 1(–2), erect or ascending, many-flowered, 5–10 cm long and up to 2× as long as the leaves, subterete or only slightly flattened laterally. Flowers yellow-green with maroon areas and spots. Sepals ovate, narrowly lanceolate or elliptic, 2.5–4 × 1.2–2 mm. Petals broadly oblanceolate, 2.5–4 ×1–2 mm, acute or subulate.

Found in South America (Colombia, Venezuela, Ecuador, and Peru). In Venezuela, confined to the Cordillera de Mérida (Mérida and Trujillo; Map 244). Collected in cloud forest along the Boconó–Biscucuy road; 1,800 m.

We are not certain that this species has been collected within the boundaries of the park. Nonetheless, the locality ("Boconó–Biscucuy road") cited by Dunsterville (1986: 336) combined with the elevation he reported (1,800 m) suggests that this species eventually will be found within the boundaries of the park.

The column of *Telipogon astroglossus* lacks the apically branched hairs that characterize its closest relative, *T. alticola* (Dodson & R. Escobar) N. H. Williams & Dressler (=*Stellilabium pogonostalix* sensu Foldats, pro parte). The latter species has entirely yellow or green flowers as opposed to the former species, which has flowers with deep maroon areas at the base of the labellum and spots of the same color on petals and sepals. *Telipogon astroglossus* has been confused with *T. pogonostalix* Rchb. f. (≡ *S. pogonostalix* (Rchb. f.) Garay & Dunst.), which is endemic to Ecuador and Peru and has a conspicuously flattened inflorescence.

Telipogon latifolius Kunth, in H. B. K., Nov. Gen. Sp. 1 [fol.]: 270. 1815 [1816]; ibid. [qu.] 1: 336. 1815 [1816]; Fernández, Orquídeas Nat. Táchira 230. 2003.

Telipogon bruchmuelleri Rchb. f., Linnaea 41: 28. 1877 [1876]; Dunsterville and Garay, Venez. Orchids Ill. 3: 308–309. 1965; Foldats, Fl. Venez. 15(5): 37–39, fig. 778. 1970; Ortega et al., BioLlania 5: 50. 1987; Romero and Carnevali, Orchids Venez., 2nd ed., 3: 1068. 2000 ("*bruechmuelleri*").

Epiphytic herbs; stems short, 2–4 cm long, 3–6-leaved. Leaf blades broadly lanceolate, 2.5–6 × 0.4–1.5 cm, bases cuneate, apices acute to apiculate. Inflorescences 1- to few-flowered, 4–10 cm long. Flowers greenish or green-yellow. Dorsal sepal lanceolate, 10–20 mm long. Petals ovate to obovate-oblanceolate, 12–24 × 6.5–11 mm, bases conspicuously clawed or attenuate, apices acuminate, 5–7-nerved.

Found in South America (Colombia, Venezuela, Ecuador, and Peru). In Venezuela, this species occurs only in the Andes (Mérida, Táchira, and Trujillo; Map 245). Cloud forest along the Boconó–Guaramacal road; 1,950 m.

MAP 244. *Telipogon astroglossus* occurrence in Venezuela.

MAP 245. *Telipogon latifolius* occurrence in Venezuela.

Trichocentrum Poepp. & Endl.

Trichocentrum Poepp. & Endl., Nov. Gen. Sp. Pl. 2: 11. 1838 [1836].

Epiphytic, rarely lithophytic herbs; caespitose or with short rhizomes; sympodia terminating in small, subspherical or subcylindric pseudobulbs; pseudobulbs covered by 1 or 2 non-leaf-bearing scarious sheaths, apically 1-foliate. Leaves conduplicate, articulate, elliptic, oblong-elliptic or narrowly obovate, erect, arched or subpendulous, fleshy to fleshy-coriaceous. Inflorescences axillary from base of pseudobulbs, 1- to few-flowered racemes, shorter than the leaves, flowers opening in slow gradual succession, usually patent, sometimes subpendulous; peduncles covered by a few remote, scarious sheaths. Flowers resupinate, small to relatively large and showy, relatively short-lived (lasting 2–5 days); perianth segments subfleshy, usually spreading, sometimes fragrant, usually white with or without red-purple or purplish-brown stripes or spots, sometimes completely pink. Sepals similar, free. Petals similar to sepals. Labellum usually larger, fleshier, and showier than other perianth segments, adnate to the base of the column and parallel to it, usually simple or very slightly 3-lobed, basally produced into a conspicuous nectariferous spur of variable length, labellar disk simple or with multiple keels or lamellae; column erect, relatively short and thick, winged apically, footless; anther terminal, operculate, united to a wide tegula, ± triangular, relatively short; viscidium small; rostellum short; stigma ventral. Capsules ellipsoidal or somewhat 3-angled, pendent. [Epidendroideae: Cymbidieae: Oncidiinae.]

A subtropical and tropical American genus of 25–50 species found in North America (USA), Mexico, Central America, the West Indies, and South America (Colombia, Venezuela, Trinidad and Tobago, the Guianas, Ecuador, Peru, Bolivia, Brazil, Paraguay, and Argentina). Three species are known from Venezuela.

References. Pridgeon et al. (2009); Pupulin (1995, 2000); Senghas (1995c); Williams et al. (2001).

Trichocentrum pulchrum Poepp. & Endl., Nov. Gen. Sp. Pl. 2: 11, t. 115. 1838 [1836]; Dunsterville and Garay, Venez. Orchids Ill. 3: 314–315. 1965; Foldats, Fl. Venez. 15(5): 74–76, fig. 790. 1970; Romero and Carnevali, Orchids Venez., 2nd ed., 3: 1075. 2000.

Epiphytic herbs. Leaf blades linear-oblong to oblong-lanceolate, 4.5–9 × 1.5–2.5 cm. Inflorescences 1- or 2-flowered. Flowers relatively large compared to the size of the plant, white with rose tinge. Dorsal sepal 1.8–2.5 cm long. Labellum with a yellow and green throat with rose tinge; spur conspicuous, 5–6 cm long.

Found in South America (Colombia, Venezuela, Ecuador, and Peru). In Venezuela, known from the Andes (Lara, Mérida, Portuguesa, and Trujillo) and the Sierra de Perijá (Zulia; Map 246). In the park, found on the south slope in sector Paramito–La Aguadita; 1,800 m.

Amazingly, the first record of the presence of *Trichocentrum pulchrum* in the park was a sight record by G. Gerlach (pers. comm.), who after finding the pollinarium of this species on an euglossine bee, *Eulaema meriana* (Oliver, 1789), that he had baited with scent, then looked for and found this epiphytic orchid in nearby forest.

MAP 246. *Trichocentrum pulchrum* occurrence in Venezuela.

Trichopilia Lindl.

Trichopilia Lindl., Edwards's Bot. Reg. 22: t. 1863. [1 Jun] 1836; Lindl., Intr. Nat. Syst. Bot., 2nd ed., 446. [Jul?] 1836.

Pilumna Lindl., Bot. Reg. 30: Misc. p. 73. 1844.

Helcia Lindl., Edwards's Bot. Reg. 31: Misc. 18. 1845.

Leucohyle Klotzsch, Index Seminum [Berlin] 1854, App.: 1. 1855.

Neoescobaria Garay, Orquideología 7: 194. 1973.

Epiphytic herbs, caespitose, erect, inconspicuous to large and showy. Pseudobulbs heteroblastic, unifoliate, usually ovoid or fusiform to ovoid, usually strongly compressed laterally, covered by a few scarious sheaths lacking foliar blades. Leaves conduplicate, articulate, usually oblong or elliptic, sessile or with a short pseudopetiole, coriaceous. Inflorescences 1 or 2, originating from the bases of the pseudobulbs, racemose, usually shorter than the leaves, usually pendulous, rarely suberect or arching, 1–3(–15)-flowered; peduncles terete to somewhat compressed laterally, with a few remote sheaths. Floral bracts conspicuous, shorter than the pedicels. Flowers resupinate, showy, usually opening widely, usually without spurs, yellowish to white or creamy green, sometimes with red-brown spots and a yellow spot at the base of the labellum. Sepals free or lateral sepals shortly fused at the base, undulate-twisted in many species. Petals similar to dorsal sepal. Labellum large and more conspicuous than other segments of the perianth, simple, 3- or 4-lobed, lateral lobes enveloping column in a tube, with a conspicuous basal claw, the central lobe fused to the center of the column in

a group of species (*Trichopilia* s. str.) or completely free (*Helcia* Lindl., *Leucohyle* Klotzsch, *Neoescobaria* Garay); disk ecallose or consisting of a pair of long keels, aligned below with wings of the column near the base of the central lobe, often densely papillose. Column semiterete, straight, ~½ the length of the labellum; anther terminal, operculate, yellow cream, glabrous or papillose, subtended by a conspicuous entire or lacerate hood that exceeds the anther in length, oblong or subtriangular, caudicles irregular shaped; viscidium ventral, oval, apical on the rostellum; pollinia 2, yellow, waxy, obovoid or pyriform; rostellum shorter than the hood of the anther; stigmatic cavity ventral, circular, located just below the rostellum. Ovary glabrous, terete. Capsules ellipsoid or triangular in cross section. [Epidendroideae: Cymbidieae: Oncidiinae.]

A neotropical genus of ~25 species found in Mexico, Central America, the Greater Antilles, and South America (Colombia, Venezuela, Trinidad and Tobago, Guyana, Suriname, Ecuador, Peru, Bolivia, and Brazil) but best represented in the Andes. Seven species occur in Venezuela.

References. Cavestro (2000); Pridgeon et al. (2009); Senghas (1996).

Trichopilia laxa (Lindl.) Rchb. f., Hamburger Garten-Blumenzeitung 14: 229. 1858; Dunsterville and Garay, Venez. Orchids Ill. 3: 318–319. 1965; Foldats, Fl. Venez. 15(5): 113–115, fig. 803. 1970; Romero and Carnevali, Orchids Venez., 2nd ed., 3: 1077. 2000. *Pilumna laxa* Lindl., Edwards's Bot. Reg. 30: Misc. 74. 1844.

Trichopilia sp. A; Dorr et al., Contr. U.S. Natl. Herb. 40: 55. 2000 [2001].

Epiphytic herbs; pseudobulbs 4–5(–12) cm long. Leaf blades linear-oblong or lanceolate to elliptic, 14–20(–40) × 2–2.5 cm.

MAP 247. *Trichopilia laxa* occurrence in Venezuela.

Inflorescences 5–9-flowered, pendulous, 13–19 cm long. Flowers white or pink-tinged, sweetly fragrant. Sepals 3–4 cm long.

Found in the Greater Antilles and South America (Colombia, Venezuela, Ecuador, Peru, Bolivia, and Brazil). The West Indian record, however, is based on a single poorly preserved specimen. In Venezuela, restricted to the Andes (Lara, Mérida, Táchira, and Trujillo; Map 247). In the park, found once between El Campamento (below Cerro El Diablo) and Maciegal; 1,800 m.

Trichosalpinx Luer

Trichosalpinx Luer, Phytologia 54: 393. 1983.

Epiphytic, lithophytic or terrestrial herbs; mostly inconspicuous; usually caespitose but sometimes long-creeping, erect to pendulous. Rhizomes abbreviate to long and creeping; stems terete, much shorter to several times longer than the leaves, thin and wiry to relatively stout, 1-leaved at apex, sometimes apically prolific or superposed; enveloped by tubular, ribbed, ± imbricate sheaths (lepanthiform sheaths) with oblique, dilated, margined ostia, the ribs and margins of the ostia grossly or microscopically ciliate to scabrous, rarely glabrous. Leaves conduplicate, articulate, linear-elliptic to orbicular, usually flat, sometimes concave or convex, submembranous to coriaceous or fleshy-coriaceous, basally sessile to subpetioled, often purple or maroon-tinged. Inflorescences originating from apex of stems with an annulus, 1-flowered to racemose, lax to dense, much shorter to several times longer than subtending leaves, erect to pendulous; peduncles remotely sheathed; floral bracts usually inconspicuous; pedicels short and ± stout to filiform and much longer than ovary; ovary terete to, more often, obclavate, usually smooth. Flowers usually resupinate, usually inconspicuous, sometimes large (relative to plant size), opening widely to campanulate, sometimes cleistogamous; perianth segments hyaline, white, yellowish or variously streaked red or purple to completely red or dark purple, usually membranous, sometimes produced into tails. Sepals glabrous to pubescent, subsimilar and free, or the laterals variously connate into a flat, convex to concave synsepal. Petals free, usually smaller than sepals, usually parallel to column. Labellum hinged to column foot or base, simple or 3-lobed, basally often with 2 small, retrorse lobes; disk callose or ecallose, usually keeled; margins entire to denticulate or fimbriate to ciliate. Column short to long, erect, straight to somewhat arcuate, usually with a well-developed foot, sometimes footless, apically often winged; anther apical, subapical or ventral, operculate, incumbent, 1-locular; pollinia 2, subspherical to pyriform, unappendaged; clinandrium entire, lobed, fimbriate to ciliate; rostellum, ventral to subapical; stigma ventral to subapical. Capsules variable. [Epidendroideae: Epidendreae: Pleurothallidinae.]

Found in Mexico, Central America, the West Indies, and South America (Colombia, Venezuela, Trinidad and Tobago, the Guianas, Ecuador, Peru, Bolivia, and Brazil). *Trichosalpinx* includes ~150 species and is especially diverse in the Andes; ~20 species occur in Venezuela.

REFERENCES. Luer (1983, 1986a, 1997); Pridgeon and Chase (2001); Pridgeon et al. (2001b, 2005).

Trichosalpinx species resemble species in some groups of *Pleurothallis*, but the lepanthiform sheaths of the former genus permit ready identification.

There is a suggestion that *Trichosalpinx* may not be monophyletic (Pridgeon et al., 2005), but molecular sampling has not included the full range of infrageneric taxa recognized by Luer (1997).

KEY TO THE SPECIES OF *TRICHOSALPINX*

1a. Proliferous herbs (new shoots originating above the base of old stems), prostrate, rooting in the upper internodes of the stems; leaves terete or subterete, >15× longer than wide; flowers caudate, appendages >10 mm long ..... ***T. dunstervillei***

1b. Caespitose herbs (all new shoots originating from the base of old stems), erect, rooting only at the base of the stems; leaves never terete, never >6× longer than wide; flowers caudate or not 2

2a. Plants minute; leaf blades <10 mm long; flowers yellow to purple; sepals caudate ..... ***T. pusilla***

2b. Plants slightly larger; leaf blades >10 mm long; flowers variously colored; sepals not caudate 3

3a. Plants pendulous; stems with lax and not tightly clasping lepanthiform sheaths; leaf blades elliptic, apices short-acuminate; inflorescences much shorter than the leaves, 5–8-flowered; flowers red-brown to purple, ciliate; sepals obtuse; labellum simple, margins ciliate ..... ***T. dependens***

3b. Plants erect; stems with tightly clasping lepanthiform sheaths; leaf blades elliptic-spathulate to elliptic, apices broadly elliptic to obtuse, never acuminate; inflorescences subequal to or exceeding the leaves, 2–5-flowered; flowers yellow, glabrous; sepals acute; labellum 3-lobed, margins glabrous ..... ***T. deceptrix***

♦ ***Trichosalpinx deceptrix*** Carnevali & I. Ramírez, Harvard Pap. Bot. 3: 250, fig. 7. 1998; Romero and Carnevali, Orchids Venez., 2nd ed., 3: 1082. 2000; Morillo, in Morillo et al., Bot. Ecol. Monocot. Páramos Venez. 1: 316, fig. 1363. 2011.

Epiphytic herbs, 6–8 cm tall. Leaf blades elliptic-spathulate to elliptic, 22–30 × 6–8.5 mm; petioles to 4 cm long. Inflorescences 2–5-flowered. Sepals yellow; dorsal sepal deeply concave, 5 × 2–3 mm. Petals 3 × 0.7 mm, somewhat translucent. Labellum 3-lobed.

Endemic to Venezuela, where it is found only in the Cordillera de Mérida (Trujillo state; Map 248). Known only from the park, where it occurs in cloud forest; ~1,850 m.

Trichosalpinx dependens (Luer) Luer, Phytologia 54: 395. 1983; Romero and Carnevali, Orchids Venez., 2nd ed., 3: 1083. 2000; Fernández, Orquídeas Nat. Táchira 234. 2003. *Pleurothallis dependens* Luer, Selbyana 3: 94, fig. 150. 1976.

Lepanthes sp. A; Dorr et al., Contr. U.S. Natl. Herb. 40: 51. 2000 [2001].

MAP 248. *Trichosalpinx deceptrix* occurrence in Venezuela.

MAP 249. *Trichosalpinx dependens* occurrence in Venezuela.

Epiphytic herbs, 3–15 cm tall. Leaf blades elliptic to narrowly elliptic, 30–90 × 10–27 mm; petioles 1–3 mm long. Inflorescences congested, 5–8-flowered. Sepals red-brown to purple; dorsal sepal ovate, 2–5 mm long. Petals 1–2 × 0.5–1 mm, translucent. Labellum simple.

Found in South America (Colombia, Venezuela, French Guiana, Ecuador, Peru, and Bolivia). In Venezuela, found only in the Andes (Portuguesa and Táchira; Map 249). Cloud forest near La Divisoria de la Concepción; 1,700 m.

♦ ***Trichosalpinx dunstervillei*** Luer, Monogr. Syst. Bot. Missouri Bot. Gard. 64: 55, fig. 43. 1997; Romero and Carnevali, Orchids Venez., 2nd ed., 3: 1085. 2000.

Pleurothallis vagans Garay & Dunst., in Dunsterville and Garay, Venez. Orchids Ill. 6: 372–373. 1976, pro parte, excluding type.

Epiphytic herbs, to 15 cm tall. Leaf blades narrowly elliptic, 20–40 × 2.5–3 mm; petioles 1–2 mm long. Inflorescences few-flowered. Sepals yellow; dorsal sepal concave, 12–14 mm long. Petals 2–3 × 0.8 mm, translucent. Labellum 3-lobed.

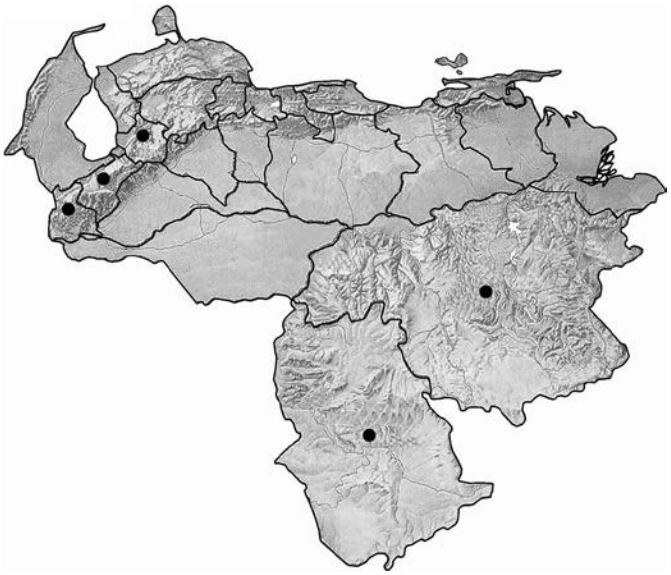
Endemic to Venezuela, where it is found only in the Cordillera de Mérida (Trujillo state; Map 250). Known from the north slope of Guaramacal; 2,350 m.

Trichosalpinx pusilla (Kunth) Luer, Phytologia 54: 397. 1983; Morillo, in Morillo et al., Bot. Ecol. Monocot. Páramos Venez. 1: 321. 2011. *Dendrobium pusillum* Kunth, in H. B. K., Nov. Gen. Sp. [fol.] 1: 286. 1815 [1816]; ibid. [qu.] 1: 357. 1815 [1816]. *Pleurothallis pusilla* (Kunth) Lindl., Edwards's Bot. Reg. 28: Misc. 82. 1842; Foldats, Fl. Venez. 15(2): 371–374, fig. 326. 1970.

Epiphytic, sometimes lithophytic herbs. Leaf blades elliptic to orbicular, 3–8 × 3–5 mm; petioles ~1–2 mm long. Inflorescences 1–3-flowered. Sepals yellow to purple; dorsal sepal subcarinate, 4–5.5 mm long. Petals 1.5–2 × 0.7–1 mm, translucent. Labellum 3-lobed.

Found in Central America (Costa Rica) and South America (Colombia, Venezuela, Ecuador, Peru, and Brazil). In Venezuela, the distribution is disjunct with records from the Andes (Mérida, Táchira, and Trujillo) and the Venezuelan Guayana (Amazonas and Bolívar; Map 251). Our material is from both slopes of Guaramacal; 1,950–2,750 m.

MAP 250. *Trichosalpinx dunstervillei* occurrence in Venezuela.

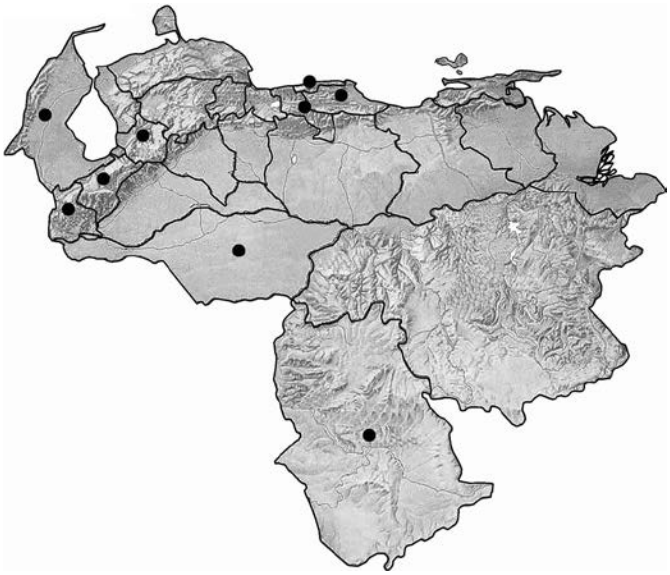


MAP 251. *Trichosalpinx pusilla* occurrence in Venezuela.

Warreella Schltr.

Warreella Schltr., Orchideen 424. 1914.

Terrestrial herbs, erect; caespitose; pseudobulbs present. Roots terete, produced from rhizomes at base of pseudobulbs; rhizomes short, brittle. Pseudobulbs clustered, fusiform or conical, homoblastic, with 3–8 internodes, of which 3 or 4 are more developed than the most basal or apical one, when young with 5–8 distichous leaves and completely hidden by leaf sheaths, at maturity with 3 or 4 leaves concentrated in the upper ½ of the plant and partly naked, covered in part by the fibrous remnants of leaf sheaths. Leaves plicate, articulate, membranous, linear-elliptic, basally attenuate in a conduplicate pseudopetiole, apically acute. Inflorescences erect, raceme emerging from the axils of the lower sheaths of the immature pseudobulbs, rachis concentrated in the apical ⅓, successively flowered, 2–7 flowers open simultaneously; peduncles terete with several internodes, each internode subtended by lanceolate-elliptic bracts, acute, clasping the peduncle; floral bracts narrowly lanceolate or triangular-lanceolate, acute, membranous, shorter than the pedicellate ovaries. Flowers resupinate, small, perianth segments widely spreading, white, pink or pale violet (often blue at anthesis), nerves often darker purple; labellum white with violet infusion, more intense in the apical ½; callus



MAP 252. *Warreella cyanea* occurrence in Venezuela.

white. Sepals free, somewhat concave, lanceolate to oblanceolate; dorsal sepal acute, somewhat reclinate over the column; lateral sepals wider, obtuse to rounded, dorsally carinate, the inner margin replicated and folded toward the base. Petals oblanceolate, subacute to rounded. Labellum sessile, articulate with the columnar foot, ovate to suborbicular, inconspicuously 3-lobed, apex truncate, somewhat emarginate, basal margins straight and partially enveloping the column, apical lobe somewhat reflexed, margins undulate; disk with 5 longitudinally flabellate keels originating in the labellar base and extending for ½ the labellar length. Column semiterete, recurved, with a conspicuous foot, widened apically; anther terminal, operculate, somewhat flattened; pollinia 4 in 2 unequal pairs, on a triangular stipe and triangular viscidium; stigmatic surface transversely narrowly elliptic. Capsules ellipsoidal. [Epidendroideae: Cymbidieae: Zygopetalinae.]

A genus of 3 shade-loving species confined to South America (Colombia, Venezuela, and Ecuador); 1 species found in Venezuela.

References. Pridgeon et al. (2009); Senghas (1993a).

Warreella cyanea (Lindl.) Schltr., Orchideen 425. 1914; Dunsterville and Garay, Venez. Orchids Ill. 3: 328–329. 1965; Foldats, Fl. Venez. 15(4): 265–267, fig. 666. 1970; Romero and Carnevali, Orchids Venez., 2nd ed., 3: 1108. 2000; Llamozas et al., Libro Rojo Fl. Venez. 471. 2003. *Warrea cyanea* Lindl., Edwards's Bot. Reg. 30: Misc. 2. 1844.

Terrestrial herbs. Leaf blades 20–50 × 6–10 cm. Flowers pale violet. Sepals 1.2–1.5 cm long.

Found in South America (Colombia, Venezuela, and Ecuador). Venezuelan records are from the Andes (Mérida, Táchira, and Trujillo), the Sierra de Perijá (Zulia), the Cordillera de la Costa (Apure, Aragua, Distrito Federal, and Miranda), and the Venezuelan Guayana (Amazonas Map 252). In the park, found once in forest below Páramo del Pumar; 1,950–2,150 m.

Poaceae

L. J. DORR, S. MIGUEL NIÑO, AND B. STERGIOS

Annual or perennial, herbaceous or woody plants; caespitose, rhizomatous, stoloniferous, scandent or aquatic. Culms (i.e., aerial stems) cylindrical, rarely flattened, hollow, pithy or solid; usually branched at the middle and upper nodes; branches usually solitary at the nodes (or in some Bambusoideae several per node). Leaves alternate, distichous or rarely spirally arranged, estipulate; sheaths open or less commonly closed; ligule(s) usually present at junction of sheath and blade; inner ligule present (rarely absent), membranous and/or ciliate; outer ligule present in some genera; blades usually linear or lanceolate to ovate, flat to inrolled, entire, venation parallel; pseudopetiolate or not. Inflorescences compound, terminal and/or axillary, open to contracted, composed of few to many discrete spikelets (i.e., reduced partial inflorescences) arranged in 1 to several spikes, racemes or panicles. Spikelets diverse, but typically composed of a rachilla (i.e., axis) bearing at its base 2 persistent or deciduous glumes (i.e., sterile bracts), 0- to several-nerved; rachilla above the glumes bearing 1 or more florets. Florets composed of a lemma (i.e., subtending bract) and palea (i.e., first appendage of the floral axis) that enclose a reduced flower; lemma 1- to many-nerved, awned or not; palea usually bicarinate, sometimes absent. Flower bisexual or unisexual (rarely gynodioecious), perianth reduced, composed of (0) 2 or 3 minute fleshy or scale-like lodicules (i.e., tepals). Stamens (1 or 2)3 or 6 (to many); filaments free, rarely connate; anthers basifixed. Ovary superior, 1-locular, 1-ovulate; placentation subapical to basal. Styles 2. Stigmas (1)2 or 3, hispid or plumose. Fruit usually a caryopsis, rarely a utricle; seed coat adnate to pericarp; endosperm abundant; embryo small to large.

A cosmopolitan family of ~750 genera and ~10,000 species. In Venezuela, there are ~140 genera and ~1,000 species.

References. Campbell (1985); Clark et al. (1995); Clayton and Renvoize (1986); Grass Phylogeny Working Group (2001); Grass Phylogeny Working Group II (2012); Luces de Febres (1963); Morrone et al. (2012).

KEY TO THE GENERA AND SELECT GROUPS OF POACEAE

1a. Perennial plants; culms usually highly lignified; leaves dimorphic, culm and foliage leaves distinct . . . . . **Bambusoideae** (see separate key)

1b. Annual or perennial plants; culms herbaceous or subwoody (i.e., easily crushed with the fingers); leaves not dimorphic (except *Dichanthelium* where basal and culm leaves are distinct) 2

2a. Spikelets disarticulating above the glumes; empty glumes remaining attached to the pedicels 3
3a. Spikelets with 1 floret, additional rudimentary florets lacking 4
4a. One or both glumes shorter than the lemma . . . . . ***Sporobolus***
4b. Both glumes longer than the lemma 5
5a. Plants delicate, <40 cm tall; panicles delicate, open, and plumose; paleas absent or minute . . . ***Agrostis***
5b. Plants robust, >40 cm tall; panicles dense to closed; paleas well developed, ± equal in length to lemmas . . . . . ***Calamagrostis***
3b. Spikelets with 2 to many florets, all well developed or several rudimentary (reduced or sterile) 6
6a. Plants gynodioecious; culms to 1.5 m tall; leaf sheaths often curling and disintegrating with age; inflorescences plumose . . . . . ***Cortaderia***
6b. Plants not gynodioecious; culms usually <1 m tall; leaf sheaths not as above; inflorescences not plumose 7
7a. Glumes subequal, equal to or longer than the spikelet (not including awns) . . . . . ***Danthonia***
7b. Glumes unequal, 1 or both much shorter than the spikelet 8
8a. Lemmas with 3 conspicuous nerves . . . . . ***Eragrostis***
8b. Lemmas with 5 or more inconspicuous nerves 9
9a. Leaf sheath margins joined for at least ⅓ of their length . . . . . ***Bromus***
9b. Leaf sheath margins usually free and overlapping 10
10a. Lemmas awnless, acute or blunt; leaf blades with navicular apices . . . . . ***Poa***
10b. Lemmas awned or conspicuously acuminate; leaf blades with acuminate apices . . . ***Festuca***
2b. Spikelets disarticulating individually below the glumes or falling in aggregates; empty glumes not remaining attached to pedicels 11
11a. Spikelets disarticulating individually without other structures attached 12
12a. Spikelets dorsally compressed or terete 13
13a. Spikelets subtended or concealed by long and conspicuous silky hairs or bristles 14
14a. Spikelets subtended by 1 to several bristles; bristles antrorsely scabrous . . . . . ***Setaria***
14b. Spikelets concealed by long, silky hairs; hairs not antrorsely scabrous . . . . . ***Eriochrysis***
13b. Spikelets glabrous or pubescent with short and inconspicuous hairs 15
15a. Inflorescence 1-pinnate, lateral racemes not branched 16
16a. Backs of fertile lemmas and upper glumes turned toward rachis . . . . . ***Paspalum***
16b. Backs of fertile lemmas and upper glumes turned away from rachis . . . . . ***Axonopus***
15b. Inflorescence 2- or 3-pinnate, lateral racemes (at least the lower ones) branched 17
17a. Spikelets globose, subglobose or obovoid, or, if ellipsoid, then inserted obliquely on the pedicel 18
18a. Ligules a row of hairs . . . . . ***Isachne***
18b. Ligules a membrane . . . . . ***Lasiacis***
17b. Spikelets ellipsoid or lanceoloid, not inserted obliquely on the pedicel 19
19a. Upper lemma with 2 winglike appendages adnate to the base of the lemma and free above, sometimes appendages reduced to swellings . . . . . ***Ichnanthus***
19b. Upper lemma without winglike appendages or swellings 20
20a. Glumes subequal, ± equal in length to spikelet . . . . . ***Homolepis***
20b. Glumes unequal, the lower glume conspicuously shorter than the spikelet 21
21a. Terminal inflorescences with chasmogamous spikelets; axillary inflorescences with cleistogamous spikelets; basal and culm leaves different in size and shape . . . . . ***Dichanthelium***
21b. Terminal and axillary inflorescences with chasmogamous spikelets only; basal and culm leaves similar 22
22a. Lower lemmas with 1 or 2(3) pairs of crateriform or ocellate glands . . . . . ***Ocellochloa***
22b. Lower lemmas without glands . . . . . ***Rugoloa***
12b. Spikelets compressed laterally 23
23a. Leaves densely viscid-hairy (our species); lower lemma awned; awn 5–8 mm long . . . . . ***Melinis***
23b. Leaves not viscid; lower lemma awnless or awn <5 mm long 24
24a. Glumes longer than the floret 25
25a. Glumes scabrous, awnless or minutely awn-tipped; awn <0.4 mm long . . . . . ***Cinna***
25b. Glumes hispidulous, awned; awns 1–2(–4) mm long . . . . . ***Polypogon***
24b. Glumes (at least the lower one) shorter than the floret . . . . . ***Ichnanthus***

11b. Spikelets (all or some) falling in clusters of 2 or more, or falling while attached to rachis internodes 26
26a. Spikelets surrounded by a fascicle of bristles . . . . . ***Cenchrus***
26b. Spikelets not surrounded by a fascicle of bristles 27
27a. Inflorescences complex plumose or cylindrical panicles with numerous rames (i.e., sessile-pedicellate spikelet pairs and internodes forming dispersal units) 28
28a. Spikelets visible between a pubescence of white or whitish-cream to cream hairs . . . . . ***Andropogon***
28b. Spikelets completely obscured by a pubescence of chestnut or coppery-brown hairs . . . . . ***Eriochrysis***
27b. Inflorescences flabellate (our species) with 12–20 rames . . . . . ***Arthraxon***

KEY TO THE GENERA OF BAMBUSOIDEAE

1a. Aerial culms never branched; leaf blades >50 cm long . . . . . ***Chusquea***
1b. Aerial culms branched; leaf blades <50 cm long 2
2a. Branch complement at midculm nodes consisting of 3 to many branchlets; leaf blades not reflexed 3
3a. Internodes of culms solid, sometimes becoming fistulose (i.e., reedlike or hollow) . . . . . ***Chusquea***
3b. Internodes of culms hollow 4
4a. Primary element of the branch complement at midculm nodes terete, segmented, and diverging from the culm; second-order branches fasciculate . . . . . ***Arthrostylidium***
4b. Primary element of the branch complement at midculm nodes flat, unsegmented, appressed and adnate to the culm surface; second-order branches flabellate . . . . . ***Didymogonyx***
2b. Branch complement at midculm nodes usually consisting of only 1 branchlet; leaf blades reflexed . . . . . ***Aulonemia***

Agrostis L.

Agrostis L., Sp. Pl. 61. 1753, nom. cons.

Perennial or less commonly annual plants; caespitose, sometimes rhizomatous or stoloniferous. Culms erect, ascending, decumbent or prostrate; unbranched or rarely sparsely branched. Leaves cauline and basal, few to many; sheaths open; ligules membranous, usually erose to lacerate; blades linear, flat, folded or involute, rigid or not. Inflorescences terminal panicles, open or contracted; primary panicle branches whorled or not. Spikelets 1-flowered, laterally compressed, with or without a barren rachilla extension; flowers perfect. Disarticulation above the glumes, below the florets. Glumes equal or subequal, rarely unequal, membranous, 1(–3)-nerved, acute, acuminate to awned. Lemmas usually shorter than the glumes, hyaline, faintly 3–5-nerved, apex blunt or narrow, sometimes toothed or awned. Paleas absent or minute. Lodicules 2. Anthers (1) 3. Ovary glabrous. Styles 2. Caryopses subterete, ellipsoid; pericarp adherent. [Pooideae.]

A cosmopolitan genus of ~220 species found in temperate and cool regions. In the Americas, found in North America (Greenland, Canada, and USA), Mexico, Central America, the West Indies, and South America (Colombia, Venezuela, Ecuador, Peru, Bolivia, Brazil, Chile, Paraguay, Argentina, and Uruguay). In Venezuela, ~15 species are known from the Andes and the Cordillera de la Costa.

References. Rúgolo de Agrasar and Molina (1992, 1993, 1997); Tucker (1996).

Agrostis is closely related to *Calamagrostis* Adans. and *Deyeuxia* Clarion ex P. Beauv. The relationship of these three genera, part of an intergrading complex of incompletely separated entities, is discussed under *Calamagrostis*.

KEY TO THE SPECIES OF *AGROSTIS*

1a. Awns on lemmas >2 mm long; leaves mostly basal 2
2a. Panicles linear, narrow, green; lemmas 1.9–2 mm long . . . . . ***A. pittieri***
2b. Panicles broadly ovate to lanceolate, spreading, purplish; lemmas 2–2.5 mm long . . . . . ***A. mertensii***
1b. Awns on lemmas <2 mm long or absent; leaves mainly cauline or basal and cauline 3
3a. Panicles broadly ovate 4
4a. Panicle branches divided below the middle; rachilla and pedicels glabrescent . . . . . ***A. perennans***
4b. Panicle branches divided above the middle; rachilla and pedicels notably scabrous . . . . . ***A. scabra***
3b. Panicles linear or ovate to narrowly ovate 5
5a. Glumes 3-nerved, 3.5–3.8 mm long . . . . . ***A. meridensis***
5b. Glumes 1-nerved, 3–3.3 mm long . . . . . ***A. venezuelana***

Agrostis meridensis Luces, Bol. Soc. Venez. Ci. Nat. 15: 11, fig. 7. 1953.

Perennial plants; caespitose. Culms 45–70 cm tall, ascending; nodes glabrous. Leaves mostly cauline; sheaths pubescent; ligules 1–2 mm long; blades linear, 7–15 cm × 3–7 mm, scabrous above and below. Inflorescences ovate to narrowly ovate, 10–15 × 4–9 cm long, open, green or purplish; branches whorled at nodes. Spikelets elliptic, 3.5–3.8 mm long. Glumes subequal, lanceolate,

MAP 253. *Agrostis meridensis* occurrence in Venezuela.

3.5–3.8 mm long, 3-nerved; lower glume hispidulous. Lemmas ovate, 2.2–2.5 mm long, 5-nerved, awnless. Palea minute.

Endemic to Venezuela, where it is known from the Cordillera de Mérida (Mérida and Trujillo) and the Cordillera de la Costa (Anzoátegui; Map 253). Páramo and subpáramo near the Laguna del Pumar; 3,000 m.

Agrostis mertensii Trin., Linnaea 10: 302. 1836.

Perennial plants; caespitose or rhizomatous. Culms 10–60 cm tall, erect or ascending. Leaves mostly basal or basal and cauline; sheaths glabrous; ligules 1–2(–6) mm long; blades flat, occasionally involute, (2.5–)5–10 cm × 1–3 mm, smooth or scaberulous. Inflorescences broadly ovate to lanceolate, 5–15 × 1.5–5(–16) cm, spreading, purplish; branches (1–)2–5 per lower nodes. Spikelets lanceolate to narrowly ovate, 2.5–3 mm long. Glumes unequal, elliptic to lanceolate, 2.5–3 mm long, 1-nerved, lower glume scaberulous. Lemmas elliptic, 2–2.5 mm long, 5-nerved, awned; awns 3–4.4 mm long. Palea absent or minute.

Found in North America (Greenland, Canada, and USA), Mexico, and South America (Venezuela, Ecuador, Peru, Bolivia, Brazil, Chile, and Argentina). In Venezuela, known only from the Cordillera de Mérida (Trujillo; Map 254). In the park, found in open areas of páramo and subpáramo near the Páramo de Guaramacal and the Laguna del Pumar; 3,000–3,100 m.

Agrostis perennans (Walter) Tuck., Amer. J. Sci. Arts 45: 44. 1843; Briceño, in Morillo et al., Bot. Ecol. Monocot. Páramos Venez. 2: 553, fig. 9. 2010. *Cornucopiae perennans* Walter, Fl. Carol. 74. 1788 ("*Cornucopiæ*").

Agrostis alba auct., non L.; Dorr et al., Contr. U.S. Natl. Herb. 40: 56. 2000 [2001] (as to *Cuello et al. 1267*).

Agrostis subrepens auct., non (Hitchc.) Hitchc.; Dorr et al., Contr. U.S. Natl. Herb. 40: 56. 2000 [2001].

Perennial plants; caespitose. Culms (10–)50–120 cm tall, erect or decumbent; sometimes rooting at the nodes. Leaves mostly cauline; sheaths glabrous; ligules 2–5 mm long; blades flat, rarely involute, 5–13(–20) cm × 2–5 mm, scaberulous. Inflorescences broadly ovate, 12–23(–30) × 2.5–11 cm, open and delicate, pale green or more commonly purple; branches 3–11 per node. Spikelets lanceolate to narrowly ovate, 2.5–3 mm long. Glumes unequal, ovate, 2–3 mm long, 1-nerved, nerves scabrous. Lemmas ovate, 1.7–2(–2.5) mm long, 5-nerved, awnless (rarely awned). Palea minute or absent.

MAP 254. *Agrostis mertensii* occurrence in Venezuela.

MAP 255. *Agrostis perennans* occurrence in Venezuela.

Found in North America (Canada and USA), Mexico, Central America, the Greater Antilles, and South America (Colombia, Venezuela, Ecuador, Peru, Bolivia, Chile, and Argentina). In Venezuela, found in the Andes (Barinas, Lara, Mérida, Táchira, and Trujillo), the Cordillera de la Costa (Aragua, Distrito Federal, Miranda, and Sucre), and possibly the Sierra de Perijá (Zulia; Map 255). In the park, found in open areas of cloud forest, subpáramo, and páramo on both slopes of Guaramacal; 2,000–3,100 m.

Agrostis pittieri Hack., Oesterr. Bot. Z. 52: 60. 1902.

Perennial plants; caespitose, densely clumped. Culms 30–70 cm tall, erect. Leaves mostly basal; sheaths glabrous or scaberulous apically; ligules 2.5–3.5 mm long; blades filiform, involute, 7–15 cm × 1–1.5 mm, coarsely ridged above, mostly scaberulous below. Inflorescences linear, 9–11 × 1–3 cm, narrow but loose, slender, erect, green; branches 2 to many per node. Spikelets elliptic, 3–4 mm long. Glumes subequal, oblong, 2.8–3.9 mm long, 1-nerved, keels scabrous. Lemmas ovate, 1.9–2 mm long, faintly nerved, awned; awns 2–3 mm long. Palea minute.

Found in Central America (Costa Rica) and South America (Venezuela). In Venezuela, known only from higher elevations in the Cordillera de Mérida (Mérida and Trujillo; Map 256). In the park, found in páramo between the Páramo de Guaramacal and the Laguna del Pumar; 2,900–3,000 m.

Our material is referred to this species with some doubt. Although *Agrostis pittieri* is accepted by Zuluoaga et al. in Hokche et al. (2008) as occurring in Venezuela, Pohl (1980) and Morales in Hammel et al. (2003b) consider the species to be endemic to Costa Rica.

MAP 256. *Agrostis pittieri* occurrence in Venezuela.

MAP 257. *Agrostis scabra* occurrence in Venezuela.

• ***Agrostis scabra*** Willd., Sp. Pl. 1(1): 370. 1797; Briceño, in Morillo et al., Bot. Ecol. Monocot. Páramos Venez. 2: 554, fig. 10. 2010.

Agrostis alba auct., non L.; Dorr et al., Contr. U.S. Natl. Herb. 40: 56. 2000 [2001] (as to *Stergios et al. 16114*).

Agrostis stolonifera auct., non L.; Bono, Cat. Fl. Vert. Occid. Cordillera Mérida 129. 2010.

Annual or perennial plants; caespitose. Culms 30–60 cm tall, erect. Leaves mostly cauline; sheaths usually glabrous, sometimes scabridulous; ligules 1.5–4 mm long; blades flat or involute, 4–14(–20) cm × 1–3 mm, scaberulous, especially margins. Inflorescences broadly ovate, 7–30 × 5–20 cm, open and spreading, greenish or reddish; branches 2–7 per node (entire panicle often detaching at base at maturity). Spikelets lanceolate, 2–3.5 mm long. Glumes unequal, lanceolate, 2–3.5 mm long. Lemmas oblong, 1–1.2(–2.5) mm long, 5-nerved, muticous, awned or not; awns minute, 0.2–0.3 mm long. Palea absent or minute.

Found in North America (Greenland, Canada, and USA), Mexico, and the northern Pacific Rim in Asia; introduced in the Greater Antilles, South America (Venezuela, Chile, and Argentina), and Europe. In Venezuela, only known from the Cordillera de Mérida (Mérida and Trujillo; Map 257). In the park, generally in disturbed sites and often on road or trail cuts; 2,000–2,600 m.

Agrostis venezuelana Mez, Repert. Spec. Nov. Regni Veg. 18: 4. 1922; Briceño, in Morillo et al., Bot. Ecol. Monocot. Páramos Venez. 2: 559, fig. 14. 2010.

Perennial plants. Culms 30–40 cm tall. Leaves mostly basal; sheaths glabrous; ligules 1–2 mm long; blades linear, ~15 cm × 2–3 mm, ± glabrous. Inflorescences linear to narrowly ovate, 8–10 × ~2 cm; branches whorled at nodes. Spikelets elliptic, 3.5–3.8 mm long. Glumes equal, lanceolate, 3–3.3 mm long,

MAP 258. *Agrostis venezuelana* occurrence in Venezuela.

1-nerved; lower glume scaberulous. Lemmas elliptic, ~1.8 mm long, 5-nerved. Palea absent or minute.

Endemic to Venezuela, where it is found in the Andes (Mérida, Táchira, and Trujillo) and the Cordillera de la Costa (Distrito Federal and Miranda; Map 258). In the park, found in open areas of páramo and subpáramo near the Páramo de Guaramacal and the Laguna del Pumar; 2,800–3,000 m.

Andropogon L.

Andropogon L., Sp. Pl. 1045. 1753, nom. cons.

Perennial or less commonly annual plants; caespitose, rarely rhizomatous. Culms erect or ascending, much-branched above the middle. Sheaths slightly inflated; ligules membranous, eciliate or ciliolate; blades linear. Inflorescences 1 or more terminal and axillary racemes, often forming complex, compound panicles; racemes composed of numerous rames; peduncles concealed by leaf sheaths; disarticulation in the rames below the sessile spikelets. Pedicellate spikelets usually vestigial or absent. Sessile spikelets bisexual (pistillate), awned or not (our species). Glumes dissimilar; lower glume 2-keeled, flattened or concave, unnerved between the keels or sometimes 2–9-nerved; upper glume strongly keeled, 1–3-nerved, usually awnless. Lodicules 2. Anthers 1, 3(2). Caryopses linear or narrowly ovoid; pericarp adherent. [Panicoideae.]

A cosmopolitan genus of 100–120 species found in tropical and temperate regions. In the Americas, found in North America (Canada and USA), Mexico, Central America, the West Indies, and South America (Colombia, Venezuela, Trinidad and Tobago, the Guianas, Ecuador, Peru, Bolivia, Brazil, Chile, Paraguay, Argentina, and Uruguay). In Venezuela, 16 species have been reported.

References. Campbell (1983); Mathews et al. (2002); Skendzic et al. (2007).

The morphological limits of *Andropogon,* a large and variable genus, are problematic. Mathews et al. (2002), in a molecular analysis of the Andropogoninae, suggested that *Andropogon* could prove to be paraphyletic. Skendzic et al. (2007) arrived at a similar conclusion, i.e., that *Andropogon* is not monophyletic, but these hypotheses largely remain untested, and generic circumscriptions and relationships within the tribe will not be resolved without extensive molecular sampling on a worldwide scale.

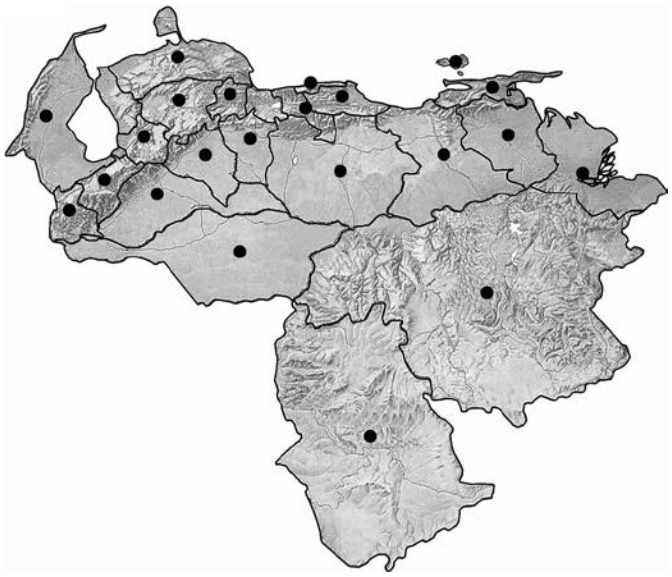
Andropogon bicornis L., Sp. Pl. 1046. 1753 ("*bicorne*"), nom. cons.; Davidse, in Berry et al., Fl. Venez. Guayana 8: 19. 2004.

FIGURE 26B

Andropogon bicornis var. *burchellii* Hack., in Martius, Fl. Bras. 2(3): 285. 1883; Davidse, in Berry et al., Fl. Venez. Guayana 8: 19. 2004.

Perennial plants; caespitose, in large clumps. Culms 1–1.5 (–2.5) m tall, branching above the middle. Sheaths densely overlapping below, shorter than internodes above, glabrous; ligules ~1 mm long; blades linear, 30–50 cm × 3–6 mm, margins scabrous, glabrous above and below. Inflorescence a large, plumose, whitish, obovate mass composed of numerous repeatedly branching axillary branches that terminate in peduncles bearing 1–3 bladeless sheaths and a pair of rames. Rames divergent, 2.5–3.5 cm long. Spikelets paired (pedicellate and sessile). Pedicellate spikelets rudimentary or absent; peduncles 3.5–4 mm long. Sessile (fertile) spikelets ovate, 3–3.5 mm long, acute; lower glume flattened, nerveless; upper glume naviculiform, 2–2.5 mm long, 1-nerved; lower (sterile) lemma resembling lower glume, hyaline, nerveless; upper (fertile) lemma smaller, 1.5–2 mm long, hyaline, nerveless. Anthers 3. Caryopses 1.5–2 mm long.

Found in Mexico, Central America, the West Indies, and South America (Colombia, Venezuela, Trinidad and Tobago, the



MAP 259. *Andropogon bicornis* occurrence in Venezuela.

Guianas, Ecuador, Peru, Bolivia, Brazil, Chile, Paraguay, and Argentina); also collected in Florida (USA) but probably not established in North America. Widespread in Venezuela (Amazonas, Anzoátegui, Apure, Aragua, Barinas, Bolívar, Cojedes, Delta Amacuro, Distrito Federal, Falcón, Guárico, Lara, Mérida, Miranda, Monagas, Nueva Esparta, Portuguesa, Sucre, Táchira, Trujillo, Yaracuy, and Zulia; Map 259). In disturbed, open areas of the park, especially along the track from El Campamento to Qda. Honda; 1,900–2,000 m.

• *Arthraxon* P. Beauv.

Arthraxon P. Beauv., Ess. Agrostogr. 111. 1812.

Annual or perennial herbs; caespitose. Culms ascending or decumbent, often rooting at nodes. Sheaths open, slightly inflated, glabrous to pubescent; ligules membranous, fimbriate or ciliate; blades flat, ovate, ovate-oblong or ovate-lanceolate, apex acute to acuminate, base cordate, ± amplexicaul, glabrous or pubescent. Inflorescences terminal and axillary panicles, panicles subdigitate, often flabellate, clusters of rames; disarticulation in the rames, beneath the sessile spikelets. Spikelets in sessile-pedicellate pairs or appearing solitary and sessile, pedicels greatly reduced and lacking spikelets. Sessile spikelets bisexual, florets 2; glumes equal or subequal; lower florets sterile, reduced to an unarmed lemma; upper florets bisexual, awned; anthers 2 or 3. Pedicellate spikelets absent or rudimentary. Caryopses ellipsoid or fusiform. [Panicoideae.]

Seven species found in tropical and subtropical Africa, Asia, and Australia, 1 of which is introduced and naturalized in the Americas.

References. van Welzen (1981, 1993).

• ***Arthraxon hispidus*** (Thunb.) Makino, Bot. Mag. (Tokyo) 26: 214. 1912. *Phalaris hispida* Thunb., in Murray, Syst. Veg., ed. 14, 104. 1784.

Alectoridia quartiniana A. Rich., Tent. Fl. Abyss. 2: 448, t. 99 [as "102" in text]. 1851. *Arthraxon quartinianus* (A. Rich.) Nash, N. Amer. Fl. 17(2): 99. 1912.

The nominate variety is the only one known from Guaramacal and Venezuela.

• ***Arthraxon hispidus*** var. ***hispidus***

Annual herbs; caespitose. Culms 50–75 cm long, often decumbent, rooting at nodes; nodes pubescent. Sheaths much shorter than internodes, glabrous with ciliate margins; ligules ciliate; blades ovate to ovate-lanceolate, 1–6 cm × 2–6 mm, glabrous above and below or hispidulous below, margins ciliate. Inflorescences terminal, flabellate, 1.5–5 cm long, purplish, with 12–20 rames; rame internodes pilose with long erect hairs. Sessile spikelets: glumes 3–6 mm long; lower lemmas minute; upper lemmas awned, awns 0–12 mm long, usually twisted below, exserted 3–5 mm; paleas absent. Pedicellate spikelets absent.

Native to tropical Africa, Asia, and Australia, but now naturalized throughout the world except for Europe and Antarctica. In the Americas, found in North America (USA), Central America, the West Indies, and South America (Venezuela and Ecuador). In Venezuela, known from scattered localities in the Andes (Lara, Portuguesa, and Trujillo) and the Cordillera de la Costa (Guárico; Map 260). In the park, known from the Laguna de Aguas Negras; 1,900 m.

MAP 260. *Arthraxon hispidus* var. *hispidus* occurrence in Venezuela.

The introduction and spread of *Arthraxon hispidus* var. *hispidus* in the Americas was traced by Dorr and Niño (2001); it first appeared in North America in the 1870s, the West Indies in the 1890s, Central America in the 1930s, and South America in the 1970s. Venezuelan collections (Dorr and Niño, 2001; Meier, 2005) were the first to document its occurrence in South America, where it has the potential to become an invasive weed.

Arthrostylidium Rupr.

Arthrostylidium Rupr., Bambuseae 27. 1839 [preprint]; Mém. Acad. Imp. Sci. Saint-Pétersbourg, sér. 6, Sci. Math., Seconde Pt. Sci. Nat. 5(2, Bot.): 117. 1840.

Small to medium-sized woody bamboos; caespitose; rhizomes pachyform. Culms unarmed, erect at base, scandent or climbing above; primary element of the branch complement at midculm nodes terete, segmented, and diverging from the culm; second-order branches fasciculate; internodes subequal, hollow. Culm leaves: well developed or not; sheaths without auricles, apices fimbriate or not, fimbriae inconspicuous to conspicuous; blades erect, rarely reflexed, bases continuous with the apex of sheaths (not constricted), persistent or deciduous. Foliage leaves: sheaths with fimbriate apices, fimbriae inconspicuous to conspicuous; ligules internal and external, membranous; oral setae inconspicuous to prominent, rarely absent; blades linear to lanceolate or ovate to elliptic, midnerve not prominent;

pseudopetiolate. Inflorescences spicate or racemose, terminal; rachises straight, flexuous or strongly zigzag. Spikelets subsessile, bisexual, 2- to many-flowered. Glumes 1 or 2, shorter than spikelets; lowermost florets usually sterile; functional florets 1 to several; florets disarticulating and falling attached to the rachilla internode; uppermost 1 to several florets successively reduced and sterile; lemmas and paleas subequal; paleas with unwinged keels; lodicules (0) 3; anthers 3; stigmas 2. [Bambusoideae.]

As presently construed, a neotropical genus of ~32 species found in Mexico, Central America, the West Indies, and South America (Colombia, Venezuela, Trinidad and Tobago, Guyana, Suriname, Ecuador, Peru, Bolivia, and Brazil). Seven species occur in Venezuela.

References. Clark and Ely (2011); Judziewicz and Clark (1993); Judziewicz et al. (1999); Tyrrell et al. (2012).

This genus has been a catchall among arthrostylidioid bamboos, and as a consequence, the current concept is polyphyletic (Judziewicz and Clark, 1993; Tyrrell et al., 2012). Delineation of a monophyletic genus likely will involve transferring most species of *Rhipidocladum* McClure (excepting sect. *Didymogonyx* L. G. Clark & Londoño) to *Arthrostylidium* and the exclusion of a number of morphologically anomalous species of *Arthrostylidium*.

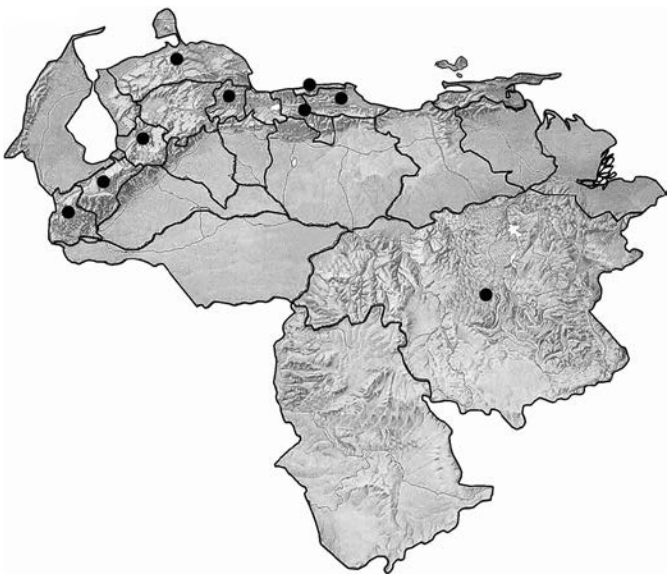
KEY TO THE SPECIES OF *ARTHROSTYLIDIUM*

1a. Rachises of mature inflorescences straight; spikelets 2–3 cm long; culms 10–25 mm in diameter; internodes 35–50 cm long . . . . . ***A. pubescens***

1b. Rachises of mature inflorescences flexuous or zigzag; spikelets 1–1.7(–3) cm long; culms 3–5(–12) mm in diameter; internodes 18–26 cm long . . . . . ***A. venezuelae***

Arthrostylidium pubescens Rupr., Bambuseae 29, t. 4, fig. 14. 1839 [preprint]; Mém. Acad. Imp. Sci. Saint-Pétersbourg, sér. 6, Sci. Math., Seconde Pt. Sci. Nat. 5(2, Bot.): 119, t. 4, fig. 14. 1840; Judziewicz, in Berry et al., Fl. Venez. Guayana 8: 36. 2004.

Woody bamboos. Culms scandent above, 5–8 m long, 5–25 mm in diameter, almost always wider than the secondary branches; internodes 35–50 cm long, glabrous or slightly scabrous; nodes with 3–20 or more secondary branches; branches subequal or with 1 more robust than the others. Culm leaves: 20–47 cm long, scabrous, deciduous; sheaths 8–17 cm long; blades narrowly triangular, 11–36 cm long, erect, persistent, apices acuminate, bases with tiny fimbriate auricles on 1 side only. Foliage leaves: 2–12 per branch; sheaths glabrous; ligules short, oral setae 3–10 mm long; blades ovate to lanceolate, 10–15 × 1–2 cm, glabrous above but usually 2 main nerves along 1 margin scabrous, glabrous below except short-pilose at base; pseudopetioles 2–4 mm long. Synflorescences spicate, terminal, 10–15 cm long, with 6–10 spikelets; rachises straight, glabrous. Spikelets appressed to rachis, 2–3 cm long, with 2–4 florets; lower glumes 4–7 mm long, 3-nerved; upper glumes 7–10 mm long, 3(–5)-nerved; lemmas often ciliolate apically, 9–11-nerved; paleas usually equal to or slightly longer than lemmas.



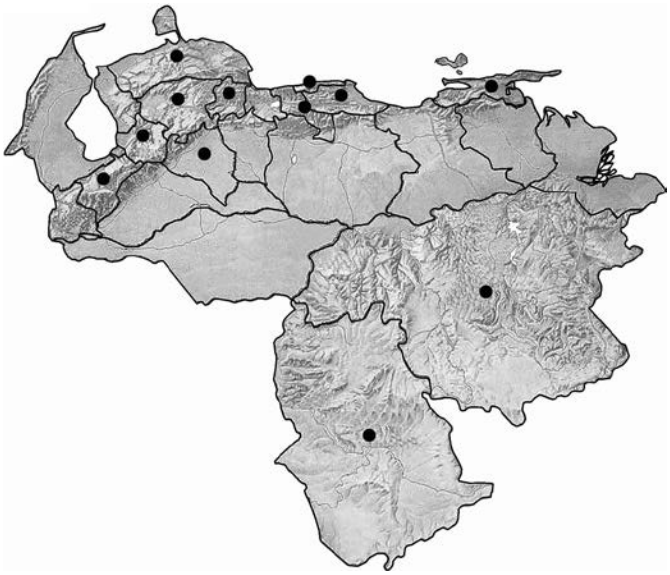
MAP 261. *Arthrostylidium pubescens* occurrence in Venezuela.

Found in Central America (Costa Rica and Panama) and South America (Colombia, Venezuela, and Trinidad and Tobago). Widespread in Venezuela (Aragua, Bolívar, Distrito Federal, Falcón, Mérida, Miranda, Táchira, Trujillo, and Yaracuy; Map 261). In the park, found in forest understory on the north slope; 1,950–2,300 m.

This species is distinguished easily from the following one when fertile but is confused with it when sterile.

Arthrostylidium venezuelae (Steud.) McClure, J. Wash. Acad. Sci. 32: 172. 1942; Judziewicz, in Berry et al., Fl. Venez. Guayana 8: 36. 2004. *Chusquea venezuelae* Steud., Syn. Pl. Glumac. 1: 337. 1854.

Woody bamboos. Culms scandent or climbing above, 3–10 m long, 3–5(–12) mm in diameter, almost always the same thickness as the branches or slightly thicker; internodes 18–26 cm long, glabrous; nodes with 10–18(–20) secondary branches; branches subequal or with 1 more robust than the others. Culm leaves (poorly known): ~24 cm long, glabrous, deciduous?; sheaths 9 cm long; blades 15 cm long, erect, persistent. Foliage leaves: 2–6 per branch; sheaths with apical appendices 3–5 mm long, ± glabrous; ligules short, oral setae 3–6 mm long, rarely absent; blades ovate to lanceolate, 4–15 cm × 6–18 mm, glabrous toward the apex, with scattered pubescence at base and on margins; pseudopetioles



MAP 262. *Arthrostylidium venezuelae* occurrence in Venezuela.

1–4 mm long. Synflorescences spicate or racemose, terminal, 5–10 cm long, with 5–8 spikelets; rachises flexuous or strongly zigzag at maturity, glabrous. Spikelets 1–1.7(–3) cm long, with 4–8 florets; lower glumes 3–4 mm long, 3–5-nerved; upper glumes 5.5–6.5 mm long, 5–7-nerved; lemmas glabrous to pilose, 9–11-nerved; paleas ± equal to lemmas or slightly shorter.

Found in Mexico, Central America, the Lesser Antilles, and South America (Colombia, Venezuela, Guyana, Peru, Bolivia, and Brazil). In Venezuela, very common in forest and disturbed areas in the Andes (Lara, Mérida, Portuguesa, and Trujillo), the Cordillera de la Costa (Aragua, Distrito Federal, Falcón, Miranda, Sucre, and Yaracuy), and the Venezuelan Guayana (Amazonas and Bolívar; Map 262). In the park, found in forest understory on both slopes; 1,600–2,300 m.

Aulonemia Goudot

Aulonemia Goudot, Ann. Sci. Nat., Bot., sér. 3, 5: 75. 1846.

Small to medium-sized bamboos; caespitose; rhizomes short, pachyform. Culms unarmed, erect or scandent, hollow; midculm nodes usually bearing a single, dominant branch; internodes subequal; secondary branches solitary or numerous, the same thickness as the main culm or slightly thinner. Culm leaves: sheaths persistent, apices fimbriate, not auriculate, margins fimbriate or not; ligules internal and external, oral setae present or absent; blades almost always deciduous. Foliage leaves: sheaths persistent, apices fimbriate, margins fimbriate or not; ligules internal and external, oral setae present or absent; blades pseudopetiolate, linear, lanceolate or ovate. Inflorescences paniculate, open, terminal. Spikelets pedicellate with 2–23 florets; uppermost floret reduced and sterile; disarticulation above the glumes. Lower glumes small, 1–3-nerved; upper glumes obtuse, 5–7-nerved; lowermost floret sometimes sterile; lemmas 7–9-nerved, mucronate or awned; paleas 2-keeled, not winged; lodicules 3; anthers 3; stigmas 2. [Bambusoideae.]

A neotropical genus of ~60 species found in Mexico, Central America, and South America (Colombia, Venezuela, Guyana, Suriname, Ecuador, Peru, Bolivia, and Brazil). Nine species occur in Venezuela, all in mountainous regions above 1,800 m elevation.

References. Calderón and Soderstrom (1980); Clark and Ely (2011); Judziewicz et al. (1999); McClure (1973); Tyrrell et al. (2012).

Aulonemia can be recognized by its reflexed leaf blades, well-developed apical and sometimes marginal fimbriae on leaf sheaths, paniculate inflorescences, and spikelets with two to many fertile florets. Molecular data (Tyrrell et al., 2012) suggest that *Aulonemia* as presently circumscribed is polyphyletic; it clearly shows an affinity to *Colanthelia* McClure & E. W. Sm., and at least one species described as *Aulonemia* is more closely related to the monotypic *Glaziophyton* Franch. than it is to other *Aulonemia* species.

KEY TO THE SPECIES OF *AULONEMIA*

1a. Sheaths without marginal fimbriae; lemmas 6.5–8 mm long, awns absent . . . . . ***A. trianae***
1b. Sheaths with marginal fimbriae along their entire length; lemmas 8–12.5 mm long, awns 1.5–5 mm long or absent . . . . . ***A. ximenae***

Aulonemia trianae (Munro) McClure, Smithsonian Contr. Bot. 9: 61. 1973. *Arundinaria trianae* Munro, Trans. Linn. Soc. London 26(1): 25. 1868.

Small bamboos. Culms erect or scandent, 0.5–2.5(–6) m tall, 5–10 mm in diameter; internodes 3–25 cm long. Culm leaves: deciduous; sheaths 5–10 cm long, glabrous, apices sparsely fimbriate, margins not fimbriate; blades 4–11.5 × 0.6–2.2 cm, reflexed. Foliage leaves: sheaths glabrous, apices sparingly fimbriate, fimbriae ~1 cm long, margins not fimbriate; blades lanceolate, 5–15 × 1–2.5 cm, reflexed, apices acuminate to slightly navicular, bases rounded, glabrous above, glabrous or scabrid below. Panicles 10–13 cm long. Spikelets 1–1.8 × 0.3–0.5 cm, with 5–6(–8) fertile florets; glumes acuminate to shortly subulate, awnless; lemmas 6.5–8 mm long, awns absent.

Found in South America (Colombia and Venezuela). In Venezuela, found only in the Andes (Lara, Mérida, Táchira, and Trujillo; Map 263). Páramo del Pumar; 2,500–2,600 m.

This species forms dense colonies.

MAP 263. *Aulonemia trianae* occurrence in Venezuela.

Aulonemia ximenae L. G. Clark et al., Bamboo Sci. Cult. 20(1): 3, fig. 1. 2007.

Small bamboos. Culms erect, climbing or scandent, to 2(–5) m tall, 3–6(–10) mm in diameter; internodes 10–26 cm long. Culm leaves: tardily deciduous; sheaths 10–18 cm long, sparsely hispid or glabrous, marginal fimbriae present the full length of sheath, apical fimbriae 7–15 mm long; blades lanceolate, 3–10 × 0.8–2.5 cm, strongly reflexed. Foliage leaves: sheaths glabrous below, glabrous to puberulent above, marginal fimbriae present the full length of sheath, apical fimbriae 7–15 mm long; blades lanceolate, 8–15(–17) × 1–2.5(–2.8) cm, reflexed, bases truncate, ± oblique, apices acuminate to slightly navicular, glabrous above, glabrous to puberulent below. Panicles 15–20 cm long. Spikelets 1.3–3(–3.6) × 0.3–0.6 cm, with (4–)5–9 fertile florets; glumes acute to awned; lemmas 8–12.5 mm long, awns 1.5–5 mm long or absent.

MAP 264. *Aulonemia ximenae* occurrence in Venezuela.

Found in South America (Colombia and Venezuela). In Venezuela, found only in the Andes (Lara, Mérida, Táchira, and Trujillo; Map 264). Páramo del Pumar; 2,500–2,600 m.

Axonopus P. Beauv.

Axonopus P. Beauv., Ess. Agrostogr. 12, 154. 1812.
Centrochloa Swallen, J. Wash. Acad. Sci. 25: 192. 1935.
Ophiochloa Filg. et al., Novon 3: 360. 1993.

Perennial, rarely annual plants; caespitose, stoloniferous or rhizomatous. Culms herbaceous, often decumbent, erect to ascending. Sheaths keeled, open; ligules membranous, ciliate; blades flat, folded or involute, linear to linear-lanceolate. Inflorescences terminal or axillary panicles, with 2 to many spikelike, often digitate branches; branches 3-angled; spikelets solitary, in 2 rows, appressed to rachises; disarticulation below the glumes. Spikelets subsessile or sessile, compressed dorsally, with 2 florets; lower florets sterile or staminate; upper florets bisexual. Lower glumes absent; upper glumes and lemmas subequal, membranous, 2–5-nerved; lower paleas absent; upper lemmas rigid, usually glabrous or with an apical tuft of hairs; upper paleas similar in texture to upper lemmas; anthers 3; styles 2, separate. Caryopses ellipsoid to ovoid, compressed. [Panicoideae.]

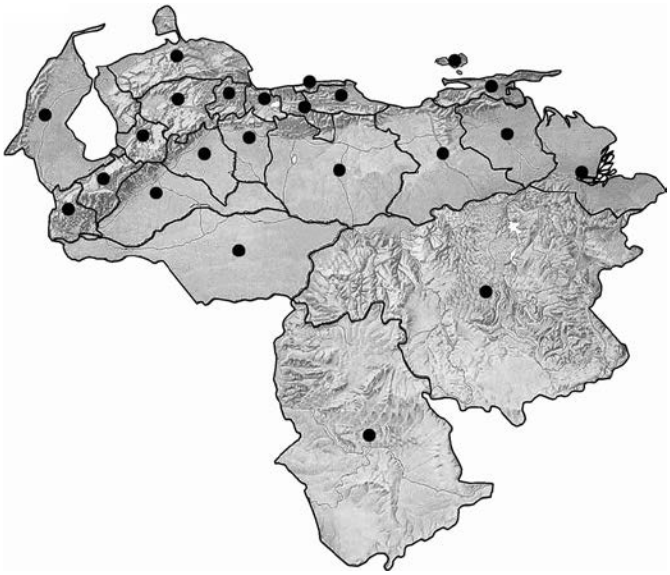
Approximately 85 species native to tropical and subtropical North America (USA), Mexico, Central America, the West Indies, and South America (Colombia, Venezuela, Trinidad and Tobago, the Guianas, Ecuador, Peru, Bolivia, Brazil, Chile, Paraguay, Argentina, and Uruguay); various species introduced and naturalized in Europe, Africa, Asia, Australia, and the Pacific Islands. Thirty-four species occur in Venezuela.

References. Crins (1991); Giraldo-Cañas (2007, 2008); López and Morrone (2012); Morrone et al. (2012); Webster (1988); Webster et al. (1989).

Spikelet orientation is the only morphological character that separates *Axonopus* from the closely related *Paspalum* L. In the former genus fertile lemmas and upper glumes are turned away from the inflorescence rachis.

Axonopus compressus (Sw.) P. Beauv., Ess. Agrostogr. 12, 154, 167. 1812; Davidse, in Berry et al., Fl. Venez. Guayana 8: 50–51. 2004; Briceño, in Morillo et al., Bot. Ecol. Monocot. Páramos Venez. 2: 574, fig. 28. 2010. *Millium compressum* Sw., Prodr. 24. 1788.

Perennial plants. Culms 10–50(–85) cm tall; nodes glabrous or pubescent. Leaves basal and cauline; sheaths compressed, pubescent; ligules 0.2–0.5 mm long; blades flat, subulate, linear-lanceolate to lanceolate, 5–20 × 0.5–1 cm, apices often ciliate, bases ciliate, glabrous or sparingly pubescent. Inflorescences terminal and axillary, composed of 1–5(–6) digitate branches; branches 3–10(–15) cm long; rachises 3-angled,



MAP 265. *Axonopus compressus* occurrence in Venezuela.

glabrous. Spikelets subsessile, 2–2.5 mm long, ovoid, ellipsoid or lanceoloid, pubescent; upper glumes and lower lemmas equal, 2–4(–5)-nerved, veins pubescent; upper lemmas and paleas 1.5–2 mm long, ellipsoid. Caryopses ellipsoid to ovoid, ~1 mm long.

Found in North America (USA), Mexico, Central America, the West Indies, South America (all upper-level political units), and naturalized in tropical and subtropical regions of the Old World. Widely distributed in Venezuela (Amazonas, Anzoátegui, Apure, Aragua, Barinas, Bolívar, Carabobo, Cojedes, Delta Amacuro, Distrito Federal, Falcón, Guárico, Lara, Mérida, Miranda, Monagas, Nueva Esparta, Portuguesa, Sucre, Táchira, Trujillo, Yaracuy, and Zulia; Map 265). In the park, found in wet, disturbed open areas on both slopes of Guaramacal; 1,800–2,000 m.

This species is used as a lawn and forage grass. It is, however, weedy and often found in wet disturbed areas.

Bromus L.

Bromus L., Sp. Pl. 76. 1753, nom. cons.

Annual, biennial or perennial plants; caespitose or rarely rhizomatous. Culms unbranched. Sheaths tubular, closed; blades linear, flat. Inflorescences terminal, solitary panicles, lax or contracted. Spikelets with 1 to many fertile florets, laterally compressed; disarticulation between the glumes and between the florets. Glumes 2, herbaceous, unequal, acute, smaller than florets, 1–9-nerved; lemmas herbaceous or subcoriaceous, 5–9-nerved, rounded or keeled, mucronate or awned; paleas 2-nerved, carinate, smaller than lemmas; lodicules 2, membranous; anthers 3; styles 2. Caryopses linear or ellipsoid. [Pooideae.]

A cosmopolitan genus of 140–160 species found mostly in temperate regions and at higher elevations in the tropics. In the Americas, found in North America (Canada and USA), Mexico, Central America, and South America (Colombia, Venezuela, Ecuador, Peru, Bolivia, Brazil, Chile, Paraguay, Argentina, and Uruguay); exotic in the West Indies. Many species are Andean; 4 or 5 occur in Venezuela.

References. Peterson and Planchuelo (1998); Pinto-Escobar (1981); Planchuelo and Peterson (2000); Saarela et al. (2007); Tucker (1996).

Bromus catharticus Vahl, Symb. Bot. 2: 22. 1791; Briceño, in Morillo et al., Bot. Ecol. Monocot. Páramos Venez. 2: 579, fig. 32. 2010.

Material from Venezuela and Guaramacal can be referred to the nominate variety.

Bromus catharticus var. ***catharticus***

Annual or biennial, occasionally perennial plants. Culms erect or somewhat decumbent, 25–100(–120) cm tall. Leaf sheaths glabrous or sparingly pubescent; ligules 2–5 mm long; blades 10–20 × 0.2–0.6 cm, glabrous or sparingly pubescent. Panicles 10–30 cm long, 5–9-flowered, erect or lax. Spikelets 15–25 mm long, 4–11-flowered. Glumes ovate, glabrous; lower glumes 6–12 mm long, 3–7-nerved; upper glumes, 8–14 mm long, (5–)7–9-nerved; lemmas ovate, 10–15 mm long, 7–11-nerved, glabrous or minutely pubescent, apices acute, aristate, awns 0.5–4(–5) mm long; paleas 5–10 mm long, strongly keeled, ciliate. Caryopses sulcate.

Found in South America (Colombia, Venezuela, Ecuador, Peru, Bolivia, Brazil, Chile, Paraguay, Argentina, and Uruguay); introduced in North America (Canada and USA), Mexico, Central America, the West Indies, Trinidad and Tobago, Europe, Africa, Asia, Australia, and the Pacific Islands. In Venezuela, reported from the Andes (Lara, Mérida, Táchira, and Trujillo) and the Cordillera de la Costa (Distrito Federal and Miranda; Map 266). Our sole record is from open areas near the Laguna de los Cedros; 2,000 m.

MAP 266. *Bromus catharticus* var. *catharticus* occurrence in Venezuela.

Bromus catharticus is highly variable and ecologically diverse. Nonetheless, in South America three varieties currently are recognized and can be separated by the length of their lemma awns. *Bromus catharticus* var. *rupestris* (Speg.) Planchuelo & P. M. Peterson, restricted to Argentina, has mucronate lemmas or lemmas with awns 0.3–0.5(–1) mm long, whereas *B. catharticus* var. *elatus* (É. Desv.) Planchuelo (=*B. cebadilla* Steud.), found in Peru, Chile, and Argentina, has lemmas with awns 5–10 mm long.

Bromus catharticus is used as a forage grass, which explains in part its extensive nonnative range.

Calamagrostis Adans.

Calamagrostis Adans., Fam. Pl. 2: 31, 530. 1763.

Deyeuxia Clarion ex P. Beauv., Ess. Agrostogr. 43. 1812. *Calamagrostis* sect. *Deyeuxia* (Clarion ex P. Beauv.) Dumort., Observ. Gramin. Belg. 126. 1823 [1824].

Perennial plants; caespitose, rhizomatous or not, rarely stoloniferous. Culms unbranched, erect, ascending or decumbent. Leaves cauline, few; sheaths open, glabrous or scabrous; ligules membranous, glabrous or pilose; blades filiform or linear, plane, convolute or conduplicate. Inflorescences terminal panicles, narrow or contracted, dense or lax. Spikelets lanceolate, 1(2)-flowered, somewhat laterally compressed; disarticulation above the glumes. Rachilla briefly prolonged or not. Glumes 2, subequal, lanceolate, 1–3-nerved, acute or acuminate, glabrous or scabridulous along midnerve; lemmas ellipsoid, 3(–5)-nerved, glabrous or scabrous, almost always awned; awn arising from near the base to near the apex, straight or geniculate, exserted (our species) or not; callus bearded or not; paleas membranous, ± equal to lemmas in length. Lodicules 2. Stamens (1–)3. Ovary glabrous. Styles separate, very short. Stigmas 2, plumose. Caryopses with adherent pericarp, usually glabrous. [Pooideae.]

A genus of ~270 species found worldwide in temperate areas and at higher elevations in the tropics. In the Americas, known to occur in North America (Greenland, Canada, and USA), Mexico, Central America, the Greater Antilles (Hispaniola), and South America (Colombia, Venezuela, Ecuador, Peru, Bolivia, Brazil, Chile, Paraguay, Argentina, and Uruguay). At least 16 species occur in Venezuela.

References. Phillips and Chen (2003); Rúgolo de Agrasar (1978); Saarela et al. (2010); Tucker (1996); Wasiljew (1960).

The genera *Calamagrostis*, *Deyeuxia*, and *Agrostis* are closely related and form an intergrading complex of incompletely separated entities (Phillips and Chen, 2003). Although *Agrostis* is always maintained separately, *Calamagrostis* and *Deyeuxia* are either considered to be separate genera (Rúgolo de Agrasar, 1978) or *Deyeuxia* is synonymized under *Calamagrostis* (Soreng and Greene, 2003), which is the treatment adopted here (see also the key to genera of Poaceae). Phillips and Chen (2003) argue that recognition of only two genera in this complex is not a tenable taxonomic solution as the boundaries between *Agrostis* and both *Calamagrostis* and *Deyeuxia* are as ill defined as those between *Calamagrostis* and *Deyeuxia*. Inasmuch as morphology does not resolve the problem, a satisfactory taxonomic treatment of this generic complex awaits a molecular phylogenetic study of the entire group worldwide.

KEY TO THE SPECIES OF *CALAMAGROSTIS*

1a. Awn slightly exceeding lemma in length by <2 mm; hairs on callus scarcely visible or absent . . . . . ***C. bogotensis***
1b. Awn exceeding lemma in length by >2 mm; hairs on callus visible 2
2a. Culms ± erect; leaf blades linear, 0.2–0.4 cm in width . . . . . ***C. planifolia***
2b. Culms decumbent or stoloniferous; leaf blades linear-lanceolate, 0.5–0.8 cm in width . . . . . **C. sp. A.**

Calamagrostis bogotensis (Pilg.) Pilg., Bot. Jahrb. Syst. 42: 60. 1908; Briceño, in Morillo et al., Bot. Ecol. Monocot. Páramos Venez. 2: 584. 2010. *Deyeuxia bogotensis* Pilg., Bot. Jahrb. Syst. 25: 712. 1898.

Deyeuxia nuda Pilg., Bot. Jahrb. Syst. 27: 29. 1899. *Calamagrostis nuda* (Pilg.) Pilg., Bot. Jahrb. Syst. 42: 60. 1908.

Rhizomatous. Culms 30–140 cm tall, ± erect. Sheaths glabrous; ligules eciliate; blades linear, convolute, 10–40 × 0.2–0.5 cm, glabrous or minutely scabrous above and below. Inflorescences compact, 5–22 × 1–2.5 cm; spikelets solitary, 3.5–4.5 mm long. Glumes subequal, 3.5–4.5 mm long, acute or acuminate, 1(–3)-nerved, glabrous or scabrous; lemmas 2.5–3.5 mm long, 5-nerved, apices bifid or 4-toothed, awned; awn ~4 mm long, dorsal, inserted near base of lemma and slightly exceeding (<2 mm) it in length; callus hairs scarcely visible or absent. Stamens (1) 3.

MAP 267. (*Right*) *Calamagrostis bogotensis* occurrence in Venezuela.

Found in Central America (Costa Rica and Panama) and South America (Colombia, Venezuela, and Ecuador). In Venezuela, found only in the Andes (Lara, Mérida, Táchira, and Trujillo; Map 267). In the park, found in the Páramo de Guaramacal, Páramo del Pumar, and Páramo de Vicuyal; 2,600–3,150 m.

Calamagrostis planifolia (Kunth) Trin. ex Steud., Nomencl. Bot., 2nd ed., 1: 251. 1840; Briceño, in Morillo et al., Bot. Ecol. Monocot. Páramos Venez. 2: 592, fig. 40. 2010. *Deyeuxia planifolia* Kunth, in H. B. K., Nov. Gen. Sp. [fol.] 1:117. 1815 [1816]; ibid. [qu.] 1: 145. 1815 [1816].

Calamagrostis pittieri auct., non Hack.; Dorr et al., Contr. U.S. Natl. Herb. 40: 56. 2000 [2001].

Rhizomatous. Culms 20–30(–100) cm tall, ± erect. Sheaths glabrous, scabrous or pilose; ligules ciliolate; blades linear, flat, 5–12 × 0.2–0.4 cm, scabrous above and below. Inflorescences lax, 8–15 × 1.5–4 cm; spikelets solitary, 3.8–5 mm long. Glumes equal or subequal, 3–5 mm long, acute or acuminate, 1–3-nerved, smooth or asperulous, lateral nerve scabrous; lemmas 3.6–5 mm long, 5-nerved, apices bifid, awned; awn 5–7 mm long, dorsal, inserted above the middle of the lemma and exceeding (>2 mm) it in length; callus pilose. Stamens 2.

Found in Central America (Costa Rica) and South America (Colombia, Venezuela, Ecuador, Peru, and Bolivia). In Venezuela, found at higher elevations in the Andes (Lara, Mérida, Táchira, and Trujillo), the Sierra de Perijá (Zulia), and the Cordillera de la Costa (Distrito Federal; Map 268). A subpáramo and páramo species found in the park in the Páramo de Guaramacal, Páramo del Pumar, and Fila de Agua Fría; (2,500–)2,600–3,100 m.

The inflorescences of this species are often purplish. *Calamagrostis planifolia* is very similar to *C. pittieri* Hack., and the two species are sometimes considered synonymous (Soreng and Greene, 2003). Zuloaga et al. in Hokche et al. (2008), however, recognized both species in the flora of Venezuela and gave them more or less overlapping ranges. Costa Rican floras (Pohl, 1980; Morales in Hammel et al., 2003b) also accept *C. pittieri* but consider it to be endemic to Costa Rica.

***Calamagrostis* sp. A**

Calamagrostis chaseae auct., non Luces; Dorr et al., Contr. U.S. Natl. Herb. 40: 56. 2000 [2001].

Stoloniferous. Culms 0.8–1 m tall, decumbent or stoloniferous. Sheaths glabrous; ligules eciliate; blades linear-lanceolate, flat, 15–25 × 0.5–0.8 cm, glabrous or slightly scabrous. Inflorescences lax, 10–20 × 3–5 cm; spikelets solitary, 3.5–4 mm long. Glumes equal, 3–4.4 mm long, 1-nerved, glabrous or scabrous; lemmas 3–4.2 mm long, 5-nerved, apices bifid, awned; awn 3.5–6 mm long, dorsal, inserted above the middle of the lemma and exceeding (>2 mm) it in length; callus puberulent. Stamens 3(2).

Evidently restricted to the Andes of Venezuela (Trujillo; Map 269). At present only known from the park, where it occurs in the Páramo de Guaramacal and on both slopes below the summit; (2,500–)2,700–3,000 m.

This taxon is similar to the Andean *Calamagrostis effusa* (Kunth) Steud. but differs in having decumbent or stoloniferous culms and broad, flat leaf blades.

Cenchrus L.

Cenchrus L., Sp. Pl. 1049. 1753.

Pennisetum Rich., in Persoon, Syn. Pl. 1: 72. 1805; Dorr et al., Contr. U.S. Natl. Herb. 40: 58. 2000 [2001].

Annual or perennial plants; caespitose, rhizomatous or stoloniferous. Culms erect, decumbent, geniculate or creeping, herbaceous, often branched; internodes solid or hollow. Sheaths

MAP 268. *Calamagrostis planifolia* occurrence in Venezuela.

MAP 269. *Calamagrostis* sp. A occurrence in Venezuela.

open; ligules membranous or ciliate; blades flat or folded, sometimes pseudopetiolate. Inflorescences terminal, terminal and axillary, or only axillary spicate panicles, with fascicles (i.e., highly reduced branches); rachises terete, with (1–)5 to many fascicles; fascicle axes with (1–)3–100+ bristles and 1–12 spikelets. Bristles free or fused at base; disarticulation at base of fascicles, sometimes also beneath upper florets. Spikelets with 2 florets. Lower glumes ovoid, rudimentary or absent, 0–5-nerved; upper glumes equal or subequal to spikelets, 0–11-nerved; lower florets sterile or staminate; lower lemmas as long as spikelets, membranous, 3–15-nerved; lower paleas shorter than or equaling lemmas; upper lemmas membranous to coriaceous, 5–12-nerved; upper paleas shorter than or subequal to lemmas; lodicules 0 or 2, glabrous; anthers (0) 3. [Panicoideae.]

A genus of 100–160 species found in tropical and subtropical regions worldwide, including North America (Canada and USA), Mexico, Central America, the West Indies, and South America (all country-level political units). Fourteen species occur in Venezuela.

References. Chase (1920, 1921); Chemisquy et al. (2010); Crins (1991); Morrone et al. (2012); Türpe (1983); Webster (1988); Webster et al. (1989).

KEY TO THE SPECIES OF *CENCHRUS*

1a. Low creeping plants; inflorescences axillary, partially or completely hidden in the upper leaf sheaths at maturity (only stamens and stigmas exserted) . . . . . ***C. clandestinus***
1b. Erect or decumbent plants; inflorescences terminal or terminal and axillary, fully exserted at maturity 2
2a. Panicles terminal and axillary, 5–10 cm long; bristles ± flexuous; leaf blades 10–25 × 1–2 cm . . . . . ***C. bambusiformis***
2b. Panicles terminal on the primary culm and leafy branches only, 10–25 cm long; bristles soft and silky; leaf blades 10–40 × 2–4 cm . . . . . ***C. peruvianus***

Cenchrus bambusiformis (E. Fourn.) Morrone, in Chemisquy et al., Ann. Bot. (Oxford), n.s., 106: 127. 2010. *Gymnotrix bambusiformis* E. Fourn., Mexic. Pl. 2: 48. 1886 ("*Gymnothrix*"). *Pennisetum bambusiforme* (E. Fourn.) Hemsl. ex B. D. Jacks., Index Kew. 2: 458. 1895; Dorr et al., Contr. U.S. Natl. Herb. 40: 58. 2000 [2001].

Perennial plants; caespitose. Culms erect or decumbent, 1–2(–4) m × 3–7 mm, branched; internodes hollow. Sheaths glabrous, papillose-ciliate on upper margins and auricles; ligules membranous and ciliate; blades lanceolate, 10–25 × 1–2 cm, flat, apices acuminate, ± hirsute above and below. Inflorescences axillary and terminal panicles; fascicles 5–10 × 1.5–2.5 cm; rachises scabrous. Bristles numerous, unequal, 5–15 mm long. Spikelets ovate, 3.5–4.5 mm long. Glumes unequal; lower glumes very small; upper glumes about ½ the length of spikelets; lower lemmas longer than upper lemmas; lodicules 2; anthers 3.

Found in Mexico, Central America, and South America (Colombia, Venezuela, Ecuador, Peru, and Bolivia). In Venezuela, collected in the Andes (Barinas, Lara, Mérida, Portuguesa, Táchira, and Trujillo) and in the Cordillera de la Costa (Aragua and Distrito Federal; Map 270). In the park, known from both slopes of Guaramacal; 1,600–2,100 m.

MAP 270. *Cenchrus bambusiformis* occurrence in Venezuela.

• ***Cenchrus clandestinus*** (Hochst. ex Chiov.) Morrone, in Chemisquy et al., Ann. Bot. (Oxford), n.s., 106: 127. 2010. *Pennisetum clandestinum* Hochst. ex Chiov., Annuario Reale Ist. Bot. Roma 8: 41, t. 5, fig. 2. 1903, nom. cons. prop.; Briceño, in Morillo et al., Bot. Ecol. Monocot. Páramos Venez. 2: 659, fig. 92. 2010.

Pennisetum longistylum Hochst. ex A. Rich., Tent. Fl. Abyss. 2: 388. 1850, nom. rej. prop.

Perennial plants; rhizomatous or stoloniferous. Culms prostrate, 3–15(–45) cm long, branched. Sheaths keeled, pilose-pubescent, somewhat inflated; ligules ciliate; blades flat or conduplicate, linear, 6–10 × 0.3–0.4 cm, apex obtuse, glabrous above and below or with scattered long hairs. Inflorescences compound panicles, reduced to a few (1–6) subsessile spikelets hidden in the upper sheaths, with only the stamens and stigmas exserted. Bristles 3–15 in principal whorl, unequal, shorter than the spikelets. Spikelets narrowly lanceolate, 10–20 mm long. Glumes absent or obscure; lower glumes reduced to brief scales; upper glumes 1–3 mm long; lower and upper lemmas equal in length; lodicules 0; anthers 3.

MAP 271. *Cenchrus clandestinus* occurrence in Venezuela.

MAP 272. *Cenchrus peruvianus* occurrence in Venezuela.

Native to Africa; introduced and naturalized throughout the tropics and subtropics. In the Americas, found in North America (USA), Mexico, Central America, the West Indies, and South America (Colombia, Venezuela, Ecuador, Peru, Bolivia, Brazil, Chile, Paraguay, Argentina, and Uruguay). In Venezuela, found only in the Andes (Lara, Mérida, Táchira, and Trujillo; Map 271). In the park, encountered in wet pastures on the north slope of Guaramacal; 2,100 m.

This species, well known in South America as "kikuyo" or "pasto kikuyo," may have been introduced to the Americas as late as the 1920s, probably through agricultural experiment station activity (Parsons, 1972) as opposed to accident. In South America it prefers higher elevations, which stands in contrast to other African forage grass introductions that favor lower, hotter elevations.

Gutiérrez (2014) proposed that the name *Pennisetum clandestinum* Hochst. ex Chiov. be conserved over the earlier *P. longistylum* Hochst. ex A. Rich. If his proposal fails, then the correct name for this species will be a combination based on the latter species name.

Cenchrus peruvianus (Trin.) Morrone, in Chemisquy et al., Ann. Bot. (Oxford), n.s., 106: 128. 2010. *Pennisetum peruvianum* Trin., Linnaea 10: 295. 1836; Ortega et al., BioLlania 5: 42. 1987; Dorr et al., Contr. U.S. Natl. Herb. 40: 58. 2000 [2001].

Perennial plants. Culms erect or decumbent, 1–3 m × 4–6 mm, branched; internodes hollow. Sheaths glabrous; ligules ciliate; blades lanceolate, 10–40 × 2–4 cm, flat, apices long-acuminate, glabrous above, pubescent below. Inflorescences terminal panicles (on primary culm and leafy branches only); fascicles 15–25 × 3–4.5 cm; rachises scabrous. Bristles numerous, ± equal, very dense and silky, 2–3 cm long. Spikelets lanceolate, 3–4 mm long. Glumes unequal; lower glumes much smaller than spikelets; upper glumes ± equal in length to spikelets. Lower and upper lemmas ± equal in length; lodicules 0; anthers 3.

Found in South America (Colombia, Venezuela, Ecuador, and Peru); adventive in the Pacific Islands. In Venezuela, found only in the Andes (Lara, Mérida, Táchira, and Trujillo; Map 272). In the park, known from both slopes of Guaramacal; 1,500–1,800(–2,700) m.

We also have seen a fragmentary specimen (*Linden 329*, US) of this species consisting of a few florets that is labeled "Caracas," but we are not convinced that *Cenchrus peruvianus* occurs in the Cordillera de la Costa as this incomplete specimen is the only record from a relatively well-collected area.

Chusquea Kunth

Chusquea Kunth, J. Phys. Chim. Hist. Nat. Arts 95: 151. 1822.

Neurolepis Meisn., Pl. Vasc. Gen. 1: 426. 1843; ibid. 2: 325. 1843; Dorr et al., Contr. U.S. Natl. Herb. 40: 57. 2000 [2001].

Swallenochloa McClure, Smithsonian Contr. Bot. 9: 106. 1973.

Woody bamboos; caespitose; often forming colonies. Rhizomes absent or present; pachyform, leptomorph or both pachyform and leptomorph. Culms unarmed or armed by a ring of short, sharp aborted roots at aboveground nodes (*C. fendleri* Munro only), erect or arched, sometimes scandent or climbing, solid, hollow or solid and becoming fistulose; internodes subequal, cylindric or terete; aerial culms branched or not. Branching extravaginal, infravaginal or intervaginal. Culm leaves: sheaths persistent or deciduous; blades triangular or lanceolate to linear. Foliage leaves: sheaths erect, without auricles or oral

setae; ligules external and internal or internal only, membranous; blades lanceolate to elliptic or oblong, basal or not, midrib prominent or not, articulate, persistent or deciduous; pseudopetiolate or sessile. Inflorescences axillary or terminal panicles, rarely racemes, open or contracted. Spikelets terete or laterally compressed, pedicellate; consisting of 2(4–5) glumes, 2 sterile lemmas, and 1 bisexual floret, rachilla not prolonged above the terminal fertile floret; disarticulation above the glumes and below the sterile lemmas. Lodicules (2) 3. Stamens (2) 3(–6). Ovary glabrous. Stigmas 2. Caryopses rarely seen. [Bambusoideae.]

A neotropical genus of 135–160(–200) species found in Mexico, Central America, the Greater Antilles, and South America (Colombia, Venezuela, Trinidad and Tobago, Guyana, Ecuador, Peru, Bolivia, Brazil, Chile, Paraguay, Argentina, and Uruguay). Twenty-two species occur in mountainous areas of Venezuela.

References. Calderón and Soderstrom (1980); Clark (1989, 1997); Clark and Ely (2011, 2013); Fisher et al. (2009); Judziewicz et al. (1999); McClure (1973); Niño et al. (2006); Soderstrom (1969).

KEY TO THE SPECIES OF *CHUSQUEA*

1a. Aerial culms abundantly branching at the middle and upper nodes; foliar leaf blades <40 cm long 2
2a. Plants scandent, stoloniferous; foliage leaf blades ovate to narrowly ovate, 2–5 cm wide . . . . . ***C. serpens***
2b. Plants erect, arching or scandent, never stoloniferous; foliage leaf blades lanceolate or linear to linear-lanceolate, 0.2–2 cm wide 3
3a. Foliage leaf blades lanceolate (rarely linear-lanceolate) 4
4a. Basal nodes of culms usually with curved adventitious roots; bases of foliage leaf blades attenuate or rounded, apices attenuate . . . . . ***C. fendleri***
4b. Basal nodes of culms without adventitious roots; bases of foliage leaf blades rounded or truncate, apices acuminate-subulate . . . . . ***C. tessellata***
3b. Foliage leaf blades linear to linear-lanceolate 5
5a. Culms scandent, long arching; 6–8 m long, 1–3 cm in diameter . . . . . ***C. multiramea***
5b. Culms erect, sometimes culm and branch tips pendulous 6
6a. Culms completely erect, 0.1–1.5(–3) m long, 0.3–1 cm in diameter; culm leaves smooth to scabrous or often pubescent near base; spikelets pubescent . . . . . ***C. angustifolia***
6b. Culms erect, but culm and branch tips pendulous, 2–6 m long, 0.5–4 cm in diameter; culm leaves hispid below; spikelets glabrous . . . . . ***C. spencei***
1b. Aerial culms never branched; foliar leaf blades (70–)150–300 cm long 7
7a. Panicle axis and branches glabrous; pedicels longer than spikelets . . . . . ***C. spectabilis***
7b. Panicle axis and branches densely and soft pubescent; pedicels shorter than spikelets . . . . . ***C. mollis***

Chusquea angustifolia (Soderstr. & C. E. Calderón) L. G. Clark, Ann. Missouri Bot. Gard. 74: 428. 1987; Briceño, in Morillo et al., Bot. Ecol. Monocot. Páramos Venez. 2: 598–599, fig. 45, foto 7. 2010. *Swallenochloa angustifolia* Soderstr. & C. E. Calderón, Brittonia 30: 303. 1978.

Shrubby, woody bamboos; forming dense colonies. Culms 0.1–1(–3) m × 3–12 mm, erect; internodes 4–15 cm long, solid, becoming fistulose, yellowish tan, smooth, waxy. Culm leaves: sheaths ± rectangular, 3–6(–10) cm long, smooth to scabrous or pubescent at base; blades narrowly triangular, 1–3(–5) cm long, erect, sparingly pubescent above and below, persistent. Branching intravaginal, up to 9 branches present in mature branch complement. Foliage leaves: 4–8(–13) per complement; sheaths 4–10 × 3–6 cm, usually glabrous, persistent; blades linear to linear-lanceolate, 4–11 cm × 3–7 mm, erect, bases attenuate, margins minutely scabrous, apices setose-subulate, glabrous above, usually pilose below; pseudopetiolate. Panicles narrow, congested, 3–9(–14) cm long, green to purple; primary panicle branches appressed, 1–2 cm long. Spikelets obovate-lanceolate, 4.5–7.4 mm long, pubescent.

Found in South America (Colombia and Venezuela). In Venezuela, found in the Andes (Apure, Lara, Mérida, Táchira, and Trujillo) and in the Sierra de Perijá (Zulia; Map 273). This species occurs in subpáramo and páramo throughout the park; (2,500–)2,700–3,100 m.

Chusquea angustifolia is closely related to *C. spencei* Ernst, and the two species are difficult to distinguish (see key). The latter species is much larger in stature than the former, and as detailed by Clark (1989), *C. spencei* has abaxially hirsute, glabrescent culm leaves; more complex branch complements; longer, narrower foliage leaves; somewhat longer inflorescences; and glabrous spikelets.

In Guaramacal, *Chusquea angustifolia* is variable in stature. Plants in exposed locations are more compact than those shielded by rocks or other barriers that provide shelter from the prevailing winds.

Chusquea angustifolia is reported to occur in Sucre, Venezuela (Clark and Ely, 2011), but we have not seen the voucher, and this record needs to be confirmed, especially as the closely related *C. spencei* is known to occur in the Cordillera de la Costa.

MAP 273. *Chusquea angustifolia* occurrence in Venezuela.

Chusquea fendleri Munro, Trans. Linn. Soc. London 26(1): 61. 1868.

FIGURE 26A

Woody bamboos. Culms 4–8 m × 10–20 mm, arching or scandent; internodes solid, 4–35 × 2–3 cm, reddish-purple, scabrous; nodes with recurved adventitious roots that often pierce the bases of culm leaves. Branch complement: many clumped, subequal branches, 1–3 mm in diameter (thinner than stems).

MAP 274. *Chusquea fendleri* occurrence in Venezuela.

Culm leaves: sheaths triangular, pubescent to scabrous below, persistent; blades 4–6.5(–15) cm long, margins smooth. Foliage leaves: 4–6 per complement; sheath apices conspicuously long-ciliate, surface glabrous; blades lanceolate (rarely narrowly lanceolate), 3–15 cm × (5–)10–20 mm, bases attenuate or rounded, margins ciliate, apices attenuate, glabrous above, pubescent below or not; pseudopetiolate. Panicles spiciform, linear, 8–12 (–20) cm long. Spikelets elliptic, 4–10 mm long.

Found in South America (Colombia and Venezuela). In Venezuela, recorded from the Andes (Lara, Mérida, and Trujillo) and the Cordillera de la Costa (Anzoátegui, Aragua, and Distrito Federal; Map 274). Found in cloud forest on both slopes of Guaramacal and in shrubby páramo along the main ridge of the park (i.e., Fila de Los Recostaderos–Páramo de Guaramacal–Páramo del Pumar); 1,800–3,100 m.

As noted in the generic description, this is the only "armed" species of *Chusquea,* with its short, sharp aborted roots piercing the bases of culm leaves at nodes.

Chusquea mollis (Swallen) L. G. Clark, in Fisher et al., Syst. Bot. 34: 681. 2009. *Neurolepis mollis* Swallen, J. Wash. Acad. Sci. 21: 14. 1931; Dorr et al., Contr. U.S. Natl. Herb. 40: 57. 2000 [2001]; Briceño, in Morillo et al., Bot. Ecol. Monocot. Páramos Venez. 2: 646, fig. 83, foto 11 (as *Neurolepis glomerata*). 2010, excluding fotos 12–14.

Neurolepis glomerata auct., non Swallen; Dorr et al., Contr. U.S. Natl. Herb. 40: 57. 2000 [2001].

Woody bamboos; forming dense colonies. Culms 1.5–4.5 m tall, erect, unbranched above the base. Sheaths longer than adjacent culm internodes, smooth, glabrous above and below, setose at the mouth; ligules membranous, ± lacerate above, 1–2 cm long; blades lanceolate, 1.5–2 m × 3–5.5 cm, bases attenuate, margins minutely scabrous, apices acuminate, sparsely pilose to glabrescent above, glabrous below; pseudopetiolate. Panicles lanceolate to ovate, narrow to expanded, 0.6–1.5 m long, contracted about primary branches (immature inflorescences?), dark purple to blackish; primary branches appressed or ascending, 5–15 cm long, bearing spikelets almost to the base; panicle axis and branches densely and soft pubescent. Spikelets ovate, 2–4 mm long.

Found in South America (Colombia and Venezuela). In Venezuela, evidently restricted to the Andes (Mérida, Táchira, and Trujillo; Map 275). In the park, found in cloud forest on the north slope and exposed areas of subpáramo and páramo; (2,500–)3,000–3,100 m.

Dorr et al. (2000) recognized two species in this complex as occurring in Guaramacal, but reexamination of the available collections leads us to believe that there is only one species collected at different stages of flowering. The inflorescences on most of the fertile collections from Guaramacal are either immature or not fully expanded and appear to be narrow, lanceolate or spikelike panicles. The inflorescence on one collection (*Dorr et al. 7404*), however, appears to be fully expanded, the primary

MAP 275. *Chusquea mollis* occurrence in Venezuela.

MAP 276. *Chusquea multiramea* occurrence in Venezuela.

panicle branches are ascending, and the inflorescence is ± ovate. Spikelets in both inflorescence forms appear to be identical. None of these Guaramacal collections is a good match for *Chusquea glomerata* (Swallen) Dorr, which was described from the Venezuelan Guayana. *Chusquea glomerata* has a well-developed pulvinus at the base of each panicle branch, but our Guaramacal material has inconspicuous and scarcely developed pulvini. Our material best matches the Andean *C. mollis*, which has spreading panicle branches and puberulent sterile lemmas. The inflorescence on the type specimen of *C. mollis* is immature and matches the narrow, lanceolate or spikelike panicles in our immature material. A third member of this complex, *C. magnifolia* L. G. Clark described from the Cordillera de la Costa, differs from *C. mollis* in that the sterile lemmas are not short-pubescent toward the summit. Clearly, all three of these species deserve closer taxonomic scrutiny.

In Guaramacal it is almost impossible to distinguish sterile *Chusquea mollis* from sterile *C. spectabilis*; foliage leaf blades are generally narrower in the former (3–5.5 vs. 4.5–15 cm wide), and sometimes hairs can be seen on the upper foliage leaf surface of the former (the surface of the latter is always glabrous).

Briceño in Morillo et al. (2010) confounded fertile material of *Chusquea mollis* (cited as *Neurolepis mollis*) with *C. spectabilis*; the photographs (fotos 12–14) that they published of spikelets and inflorescences of *C. mollis* are, in fact, images of *C. spectabilis*.

Chusquea multiramea L. G. Clark & F. Ely, Syst. Bot. 38: 1091, fig. 1D–H. 2013.

Chusquea purdieana auct., non Munro; Dorr et al., Contr. U.S. Natl. Herb. 40: 57. 2000 [2001].

Woody bamboos; forming colonies. Culms 4–8 m × 1–3 cm, scandent, long arching; internodes 10–30 cm long, solid; nodes without adventitious roots. Branch complement: many (100–150), dense subequal branches, 0.5–1 mm in diameter (thinner than stems). Culm leaves: sheaths persistent, bright brown at the base, scabrous; blades (5–)17–30 cm long, acuminate or apiculate, sparsely hispid or scabrous below. Foliage leaves: 8–12 per branch, pendent; sheath apices glabrous, occasionally with a few ciliate hairs, surface glabrous; blades linear to linear-lanceolate, 3–11.5 cm × 3–6(–12) mm, bases attenuate, margins scabrous, apices long-acuminate, glabrous above, scaberulous below; pseudopetiolate. Panicles open, pyramidal, 3–8 cm long; rachis scaberulous. Spikelets lanceolate, 7–9 mm long.

Evidently restricted to the Andes of Venezuela, where it is found in Lara, Mérida, Táchira, and Trujillo; Map 276). In the park, common in open areas of cloud forest on both slopes of Guaramacal; 2,100–2,900 m.

Chusquea multiramea L. G. Clark & F. Ely is part of a complex of species that includes *C. purdieana* Munro. As noted by Clark and Ely (2013), the former can easily be distinguished from the latter when flowering because it has open, pyramidal synflorescences, shorter spikelets, and apically mucronate (never awned) lemmas. In vegetative specimens the differences are more subtle, *C. multiramea* differs from *C. purdieana* by its longer, sparsely hispid culm leaf sheaths, which have the margins basally fused for a shorter distance from the girdle (0.5–2.5 vs. 3–6.5 cm).

Chusquea multiramea is a dominant element of light gaps in cloud forest and in the transition from cloud forest to secondary forest, especially in heavily disturbed areas. In contrast, *C. purdieana* is most often found in upper montane forest and

subpáramo. Although *C. purdieana* occurs in Venezuela (Mérida and Zulia states), it is more commonly encountered in the Andes of Colombia.

Chusquea serpens L. G. Clark, Ann. Missouri Bot. Gard. 72: 870, fig. 4. 1985.

Woody bamboos. Culms 10–20 m × 0.5–1 cm, scandent, often trailing, stoloniferous; internodes 6–30(–40) cm long, solid, green to green mottled with purple, retrorsely scabrous. Branching infravaginal. Culm leaves: sheaths ± rectangular, 6–10 cm long, glabrous or hispid; blades triangular, 10–20 cm long, bases cordate, margins ciliate, apices setose, glabrous above and below, deciduous. Foliage leaves: 3–7 per complement; sheaths keeled, outer margins hairy, glabrous above and below; blades ovate to narrowly ovate, 10–30 × 2–5 cm, bases rounded-truncate, margins scaberulous, apices tapering to a long bristle-like tip, glabrous above and below, sometimes pilose at base; pseudopetiolate. Panicles narrow, ± secund, 30–55(–60) cm long, rachis glabrous; primary branches appressed, 5–9 cm long at base of panicle, progressively shorter toward apex. Spikelets lanceolate or ovate, 11–15 mm long, awned.

Found in Central America (Costa Rica and Panama) and South America (Colombia, Venezuela, and Ecuador). In Venezuela, recorded from the Andes (Lara, Mérida, Táchira, and Trujillo) and the Cordillera de la Costa (Guárico; Map 277). In the park, collected in Qda. Jirajara on the south slope; 2,500 m.

This species is easily distinguished from the other bamboos in the park by its stoloniferous habit and ovate to narrowly ovate foliage leaf blades tapering to long bristle-like tips.

Chusquea spectabilis L. G. Clark, in Fisher et al., Syst. Bot. 34: 681. 2009, nom. nov. *Planotia aperta* Munro, Trans. Linn. Soc. London 26(1): 73. 1868, non *Chusquea aperta* L. G. Clark, Ann. Missouri Bot. Gard. 74: 426, fig. 1E–H. 1987. *Neurolepis aperta* (Munro) Pilg., in Engler and Prantl, Nat. Pflanzenfam. Nachtr. 3: 21. 1906; Dorr et al., Contr. U.S. Natl. Herb. 40: 57. 2000 [2001].

Woody bamboos. Culms 4–8 m tall, erect, unbranched above the base. Sheaths pubescent; auricles erect; ligules membranous, bilobed, scarious, ~4 cm long; blades lanceolate, (0.7–) 2–3 m × 4.5–15 cm, erect, bases attenuate, margins minutely strigose, apices attenuate, glabrous above, glaucous below; pseudopetiolate. Panicles ovate, lax, 70–90 cm long, purple; primary branches 20–35 cm long; panicle axis and branches glabrous. Spikelets oblong, (6–)10–15 mm long.

Found in South America (Colombia, Venezuela, and Ecuador). In Venezuela, known only from the Cordillera de Mérida (Mérida and Trujillo; Map 278). In the park, collected in cloud forest and subpáramo in Qda. Jirajara on the south slope; ~2,500–3,000 m.

Among the bamboos found in Guaramacal this species is distinguished by the very large size and diffuse aspect of its inflorescence. In addition, the species is remarkable in having short, obtuse glumes; long, delicate pedicels much longer than the spikelets; and an elongated internode between the glumes and first sterile lemma. *Chusquea spectabilis* was long thought to be an isolated species, but it shows relationships to two species endemic to the Andes of Colombia: *C. petiolata* (Davidse & L. G. Clark) L. G. Clark and *C. silverstonei* (Davidse & L. G. Clark) L. G. Clark.

MAP 277. *Chusquea serpens* occurrence in Venezuela.

MAP 278. *Chusquea spectabilis* occurrence in Venezuela.

MAP 279. *Chusquea spencei* occurrence in Venezuela.

MAP 280. *Chusquea tessellata* occurrence in Venezuela.

Chusquea spencei Ernst, J. Bot. 10: 262. 1872; Briceño, in Morillo et al., Bot. Ecol. Monocot. Páramos Venez. 2: 599–600, fig. 46. 2010.

Shrubby, fastigiate bamboos; forming dense colonies. Culms 2–6 m × 0.5–4 cm, erect, tips pendulous; internodes 5–15 cm long, solid, becoming fistulose, yellow to reddish-brown, smooth, waxy. Culm leaves: sheaths ± triangular, 5–20 cm long, hispid below; blades narrowly triangular to triangular, 2–6 cm long, erect, apices subulate, pubescent above, hispid below. Branching intravaginal; central branch robust, all branches erect and rebranching vigorously. Foliage leaves: 3–5 per complement; sheaths glabrous, margins sometimes ciliate near apex; blades linear to linear-lanceolate, 5–15 cm × 2–6 mm, arched or erect, bases attenuate, margins slightly cartilaginous, sometimes scabrous, serrated toward the apex, apices setose, glabrous above and below; pseudopetiolate. Panicles narrow, congested, 2–12 cm long; branches appressed, pubescent. Spikelets 4.6–7.3 mm long, glabrous.

Found in South America (Colombia and Venezuela). In Venezuela, found in the Andes (Lara, Mérida, Táchira, and Trujillo), the Sierra de Perijá (Zulia), and the Cordillera de la Costa (Anzoátegui, Distrito Federal, and Miranda; Map 279). In the park, collected in cloud forest and dwarf forest on the south slope and in the Páramo de Guaramacal; 2,800–3,100 m.

As noted above, *Chusquea spencei* and *C. angustifolia* are similar in their foliage leaf blades and spikelets, and discriminating between the two species can be difficult.

Chusquea tessellata Munro, Trans. Linn. Soc. London 26(1): 60. 1868. *Swallenochloa tessellata* (Munro) McClure, Smithsonian Contr. Knowl. 9: 113. 1973.

Woody bamboos; forming dense colonies. Culms 2–3 m × 4–10 mm, erect; internodes 4–8(–10) cm long, solid, becoming fistulose, yellow, smooth, mealy below and sometimes above the leaf scar. Culm leaves: sheaths ± rectangular, 5–8.5 cm long, glabrous below, persistent; blades triangular, 5–11.5(–18.5) cm long, erect, bases slightly cordate, margins ciliate, apices acuminate to shortly subulate, glabrous, caducous. Branching intravaginal; branches erect and rebranching from base. Foliage leaves: 4–10 per complement; sheaths apical margins pubescent, persistent; ligules internal and external, almost always ciliate; blades lanceolate, 5.8–23 × 0.6–2.6 cm, erect, bases rounded or truncate, margins short-ciliate below and ± scaberulous above, apices acuminate-subulate, not tessellate (i.e., checkered) above, usually tessellate below, glabrous; pseudopetiolate. Panicles contracted, often interrupted near the base, 6–30 cm long, dark purple or light brown; primary panicle branches appressed, 1–3 cm long; panicle axis and branches pubescent. Spikelets oblong, compressed, 3.9–9 mm long.

Found in South America (Colombia, Venezuela, Ecuador, Peru, and Bolivia). Venezuelan collections are from the Andes (Apure, Lara, Táchira, and Trujillo) and the Sierra de Perijá (Zulia; Map 280). Our record is based on a sterile collection made in shrubby páramo in the Fila de Agua Fría; 2,700–2,800 m.

This species is characterized by culms that are mealy below and sometimes also above the leaf scar, and culm leaf sheaths that ± equal the slightly cordate sheath blades in length.

Cinna L.

Cinna L., Sp. Pl. 5. 1753.

Perennial plants; caespitose. Culms unbranched, erect. Sheaths open, glabrous; ligules eciliate, membranous; blades

linear, flat, margins scabrous, scabrous or smooth above and below. Inflorescences terminal panicles, spreading or ascending. Spikelets elliptic, laterally compressed, ± obtuse or acute, 1(2)-flowered, bisexual. Disarticulation below the glumes. Rachilla prolonged beyond palea as a minute stub or bristle or absent. Glumes equal or subequal, acute, membranous, 1–3-nerved, sometimes minutely awn-tipped. Lemmas membranous, faintly 3–5-nerved, awned or not (our species); awn short, straight. Palea mostly smooth, 1- or 2-nerved. Stamens 1 or 2. Styles 2. Caryopses oblong, often beaked; beak formed by the persistent style. [Pooideae.]

Four species in temperate regions of North America (Canada and USA), Central America, South America (Colombia, Venezuela, Ecuador, Peru, and Bolivia), Europe, and Asia. One species occurs in Venezuela.

References. Brandenburg et al. (1991); Gillespie et al. (2008, 2010); Tucker (1996).

Brandenburg et al. (1991) define the genus by the following combination of morphological characters: 1-flowered spikelets, disarticulation below the glumes, awn (when present) subterminal, rachilla typically prolonged behind the palea as a small glabrous or scaberulous stub or bristle, and paleas 1- or 2-nerved with the nerves very close together.

In molecular analyses Soreng and Davis (2000) resolved *Cinna* as a close relative of *Sphenopholis* Scribn. and *Trisetum* Pers., but that result is now considered to be a laboratory error (Gillespie et al., 2008). Quintanar et al. (2007), also using DNA, found that *Cinna* was closely related to a morphologically diverse assemblage of Aveneae that formed a well-supported group with *Poa* L. and relatives. Support for the monophyly of *Cinna*, however, is poor (Gillespie et al., 2010).

Cinna poiformis (Kunth) Scribn. & Merr., Bull. Div. Agrostol. U.S.D.A. 24: 21. 1901 ("*poæformis*"); Briceño, in Morillo et al., Bot. Ecol. Monocot. Páramos Venez. 2: 601–602, fig. 49. 2010. *Deyeuxia poiformis* Kunth, in H. B. K., Nov. Gen. Sp. [fol.] 1: 119. 1815 [1816]; ibid. [qu.] 1: 146. 1815 [1816] ("*poæformis*").

Culms 60–120(–150) cm tall. Sheaths overlapping, glabrous; ligules prominent, (1–)5–12 mm long; blades 10–20 (–30) × 0.4–0.8 cm, acuminate, glabrous. Inflorescences solitary, 15–45 cm long; branches spreading, pubescent with appressed and scattered hairs. Spikelets borne in dense clusters near the branch tips, narrowly ovate, 2–3 mm long, scabrous, 1-flowered. Glumes equal, lanceolate, 1.8–3.5 mm long, 3-nerved. Lemmas narrowly ovate, 2–3 mm long, 5-nerved, awn usually absent (0.3–0.4 mm long when present). Paleas slightly longer than lemmas, 2–3 mm long, 1-nerved. Stamens 3. Caryopses 1.5–2 mm long.

Found in Mexico, Central America, and South America (Colombia, Venezuela, Ecuador, Peru, and Bolivia) at higher elevations. In Venezuela, found in the Andes (Mérida and Trujillo) and the Cordillera de la Costa (Distrito Federal and Miranda; Map 281). Páramo del Pumar; ~2,600 m.

MAP 281. *Cinna poiformis* occurrence in Venezuela.

Cortaderia Stapf

Cortaderia Stapf, Gard. Chron., ser. 3, 22: 378. [27 Nov] 1897, nom. cons. *Lamprothyrsus* Pilg., Bot. Jahrb. Syst. 37, Beibl. 85: 58. 1906.

Perennial plants; gynodioecious, pistillate only or pistillate and apomictic; densely caespitose. Culms unbranched, erect, clumped. Sheaths open, often overlapping, glabrous or pubescent, often curling and disintegrating with age; ligule a dense rim of hairs; blades usually basal, flat or convolute, linear, sclerophyllous, margins often scabrid or serrate. Inflorescences terminal, plumose panicles, loose or contracted, green, silver, brown or pink to purple. Spikelets somewhat compressed laterally, 2–9-flowered, staminate or pistillate (unisexual), sometimes bisexual; disarticulation above the glumes and near the base of each rachilla segment. Glumes linear-lanceolate, unequal, 1–5-nerved, apices pointed, rounded or bifid, hyaline or membranous, shorter to longer than florets; lemmas ovate or lanceolate, ± equal to spikelets in length, 3–7-nerved; lemma lobes usually absent; setae absent to well developed; central awn not differentiated into a twisting column and straight apical part; occasionally lemma blade extending to the tip of the awn. Paleas lorate to linear, occasionally with tufts of hairs on margins; calli rounded to truncate, pilose. Lodicules 2, rhomboid to cuneate, ciliate. Anthers (staminate or hermaphroditic flowers) 3. Staminodes (pistillate flowers) 3. Ovary glabrous, rudimentary in staminate flowers. Styles (pistillate flowers) 2. Caryopses lorate, ellipsoid, turbinate or obovoid. [Danthonioideae.]

A neotropical genus of 20 species found in Central America and South America (Colombia, Venezuela, Guyana, Ecuador, Peru, Bolivia, Brazil, Chile, Paraguay, Argentina, and Uruguay).

Seven species are found in Venezuela, all restricted to higher elevations.

References. Barker et al. (2007); Connor and Edgar (1974); Linder et al. (2010); Pirie et al. (2009); Tucker (1990).

We follow Linder et al. (2010) in limiting *Cortaderia* to American species and segregating the closely related New Zealand species as *Austroderia* N. P. Barker & H. P. Linder and the sole New Guinea species as *Chimaerochloa* H. P. Linder. All three of these genera share the gynodioecious reproductive system, which is relatively rare in grasses.

Cortaderia selloana (Schult. & Schult. f.) Asch. & Graebn., also known as "pampas grass," is a popular ornamental in North America, Europe, Africa, Australia, and New Zealand. Several other species of *Cortaderia* also are cultivated, and a number of these have become invasive weeds.

Cortaderia hapalotricha (Pilg.) Conert, Syst. Anat. Arundineae 102. 1961; Briceño, in Morillo et al., Bot. Ecol. Monocot. Páramos Venez. 2: 603, fig. 50, foto 8. 2010. *Danthonia hapalotricha* Pilg., Bot. Jahrb. Syst. 25: 715. 1898.

FIGURE 26C

Cortaderia roraimensis auct., non N. E. Br. (Pilg.); Dorr et al., Contr. U.S. Natl. Herb. 40: 57. 2000 [2001].

Plants pistillate and apomictic. Culms to 1.5 m tall. Basal leaves numerous, stiffly erect; sheaths longer than internodes, purple-tinged above; blades linear, 20–40(–90) cm × 3–5(–10) mm, convolute, apices tapering to points, margins scabrous, densely silky above (above the ligule), glabrous below. Panicles (10–)20–35 cm long, pink to purple. Spikelets pistillate or perfect, with 2–5 florets. Glumes narrowly lanceolate, subequal to equal, ~12–18 mm long (excluding awns), lanceolate with lateral teeth and a central awn, awn geniculate or loosely twisted, 7–15 mm long, 5–7-nerved; palea 4–6 mm long, ciliate. Anthers aborted (apomictic flowers) or reduced and sterile (pistillate flowers).

MAP 282. *Cortaderia hapalotricha* occurrence in Venezuela.

Found in Central America (Costa Rica and Panama) and South America (Colombia, Venezuela, Ecuador, Peru, and Bolivia). In Venezuela, found in the Andes (Apure, Barinas, Lara, Mérida, Táchira, and Trujillo), the Sierra de Perijá (Zulia), and the Cordillera de la Costa (Distrito Federal and Miranda; Map 282). In the park, this species forms dense colonies in open areas of subpáramo and páramo; 2,800–3,150 m.

Cortaderia columbiana (Pilg.) Pilg. could be confused with *C. hapalotricha*. The two species are sometimes sympatric, but the former tends to be found at lower elevations in the Venezuelan Andes, whereas the latter is more common in páramo above 3,000 m elevation. The panicle of *C. columbiana* is brown, whereas that of *C. hapalotricha* is pink to purple. Also, hermaphroditic florets of *C. columbiana* are fully fertile, whereas those of *C. hapalotricha* are apomictic with large whitish anthers that are empty (i.e., infertile).

Danthonia DC.

Danthonia DC., in Lamarck and A. P. de Candolle, Fl. Franç., 3rd ed., 3: 32. 1805, nom. cons.

Perennial plants; caespitose, sometimes shortly rhizomatous; culms simple, erect; often with cleistogenes (i.e., reduced cleistogamic inflorescences consisting of solitary, sessile, single flowers with lemma and palea but without outer empty glumes) in the axils of upper leaves. Sheaths open to the base; auricles absent; ligules ciliate; blades flat or involute, glabrous or pubescent. Inflorescences terminal panicles, racemes or a solitary spikelet; spikelets terete or laterally compressed, with 2–12 florets, the terminal floret reduced; disarticulation usually below the florets. Glumes subequal or the lower glumes a little longer than the upper ones, shorter to longer than the florets, chartaceous, 3–9-nerved; calli rounded or truncate, villous; lemmas 5–9-nerved, apically 3-toothed to lobed; lemma lobes acute, shorter to longer than the lemma body, usually prolonged into a terminal seta; lemma central awn exceeding the lobes, geniculate and twisted below the geniculation, straight and hairlike toward the apex; paleas ligulate to linear; lodicules 2, bristly; anthers 3; ovary glabrous. Caryopses ligulate, ellipsoid to obovoid. [Danthonioideae.]

A genus of 25 species, 23 found in temperate parts of the Americas and 2 in Europe. In the Americas, *Danthonia* occurs in North America (Canada and USA), Central America, the Greater Antilles, and South America (Colombia, Venezuela, Ecuador, Peru, Bolivia, Brazil, Chile, Argentina, and Uruguay). A single species is known from páramo and subpáramo in Venezuela.

References. Baeza P. (1996); Barker et al. (2007); Dertscheny (1995); Linder et al. (2010); Pirie et al. (2009); Tucker (1990).

Although the Danthonioideae form a well-defined clade of mostly Southern Hemisphere grasses, generic limits within the

subfamily have been unstable (Linder et al., 2010). We have adopted here a narrower concept of *Danthonia* than has generally been used in the Americas and we exclude species from Africa, Australasia, and Malesia, most of which now are placed in related genera (Linder et al., 2010).

Danthonia secundiflora J. Presl, Reliq. Haenk. 1: 255. 1830; Briceño, in Morillo et al., Bot. Ecol. Monocot. Páramos Venez. 2: 607, fig. 54. 2010.

The nominate subspecies is the only one found in Guaramacal and in Venezuela.

Danthonia secundiflora subsp. ***secundiflora***

Culms 20–45(–70) cm tall, glabrous. Sheaths glabrous except for oral hairs; blades filiform, 5–25(–55) × 0.1–0.4 cm, involute, glabrous or occasionally with short hairs above. Inflorescences panicles, 5–15 cm long, ± lax. Spikelets composed of 3–7(–9) fertile florets, elliptic, 7–20 mm long, laterally compressed. Calli evident, bearded. Glumes subequal, 10–15(–20) mm long, equal to or longer than the florets, membranous, 3-nerved. Lemmas elliptic, 1.5–3 mm long, chartaceous, 5-nerved, 3-awned, central awn arising from a sinus, geniculate, 10–12 mm long, twisted, lateral awns 3–4 mm long. Paleas oblanceolate. Lodicules 2, cuneate, fleshy, glabrous. Ovary ~1 mm long. Caryopses ellipsoid, 1.5–2.5 mm long.

Found in Mexico, Central America, and South America (Colombia, Venezuela, Ecuador, Peru, Bolivia, Brazil, Argentina, and Uruguay). In Venezuela, recorded from higher elevations in the Andes (Apure, Lara, Mérida, Táchira, and Trujillo), the Sierra de Perijá (Zulia), and the Cordillera de la Costa (Distrito Federal and Miranda; Map 283). Páramo de Vicuyal; 2,700–2,800 m.

MAP 283. *Danthonia secundiflora* subsp. *secundiflora* occurrence in Venezuela.

In addition to the nominate subspecies, which has an extensive range, Baeza P. (1996) recognized *Danthonia secundiflora* subsp. *charruana* (Swallen) Roseng. et al. and *D. secundiflora* subsp. *matthei* C. M. Baeza, these latter two subspecies occurring only in southern South America (Bolivia, Brazil, and Paraguay). The three subspecies are distinguished by relatively minor characters of the lemmas (length of awns and pubescence) and calli (length of hairs).

Dichanthelium (Hitchc. & Chase) Gould

Dichanthelium (Hitchc. & Chase) Gould, Brittonia 26: 59. 1974. *Panicum* subgen. *Dichanthelium* Hitchc. & Chase, Contr. U.S. Natl. Herb. 15: 20, 142. 1910.

Perennial plants; caespitose, with or without a basal rosette of shorter, broader leaves than those found on culms. Culms erect, ascending or decumbent, herbaceous, simple or branched; internodes hollow. Cauline leaves usually longer and narrower than basal leaves; sheaths pilose or glabrous, conspicuous glands present or not; ligules a ring of hairs, membranous, membranous and ciliate, or sometimes absent; blades linear to ovate-lanceolate, densely pilose to glabrous, flat or involute. Inflorescences terminal and axillary panicles, lax or occasionally contracted; disarticulation below the glumes. Spikelets ellipsoid to obovoid, awnless; cleistogamous spikelets present or not. Glumes unequal, (1–)7–15-nerved, membranous; upper glumes and lower lemmas similar, herbaceous, nearly as long as spikelets or lower lemmas slightly shorter than spikelets; lower florets usually sterile, rarely staminate; upper florets bisexual, coriaceous, glossy, glabrous; lower lemmas similar to upper glumes; lower paleas shorter than or nearly equal to the lemmas; lodicules 2; anthers 3; styles 2. [Panicoideae.]

An American genus of 50–75 species found in North America (Canada and USA), Mexico, the West Indies, and South America (all country-level political units). Thirteen species are recorded from Venezuela.

References. Aliscioni et al. (2003); Freckmann (1981); Gould and Clark (1978); Hammer (2010); Morrone et al. (2012); Zuloaga (1987); Zuloaga et al. (1993).

Dichanthelium, originally circumscribed as a subgenus of *Panicum* L., was created to accommodate a group of species with a distinctive leaf dimorphism and breeding system. As noted by Zuloaga et al. (1993), plants of this genus overwinter with a rosette of short, broad leaves that produce simple culms with terminal, chasmogamous inflorescences in the spring. Later in the season culms bear fascicles of reduced leaves and branches together with cleistogamous inflorescences.

Dichanthelium acuminatum (Sw.) Gould & C. A. Clark, Ann. Missouri Bot. Gard. 65: 1121. 1978 [1979]. *Panicum acuminatum* Sw., Prodr. 23. 1788.

Guaramacal material can be referred to the nominate variety.

Dichanthelium acuminatum var. ***acuminatum***

Culms usually in large clumps, 10–45(–90) cm tall, branching from the middle and upper nodes; nodes glabrous to pilose;

MAP 284. *Dichanthelium acuminatum* var. *acuminatum* occurrence in Venezuela.

internodes (2–)4–7(–9) cm long, glabrous to pilose. Sheaths usually shorter than internodes, glabrous or densely pubescent, margins ciliate; ligules ciliate, hairs 2–6 mm long; blades linear-lanceolate, lanceolate to ovate, 4–11 × 0.3–1 cm, flat, bases rounded to subcordate, long-hispid (hairs ≤1.5 mm long) to glabrous above, pilose below. Inflorescences terminal panicles, 3–9 × 3–9 cm, lax; main axis flexuous, glabrous to pilose. Spikelets 1.5–2.5 mm long, apically subacute, puberulent; lower glumes ovate-acuminate, 0.5–1.1 mm long; upper glumes ovate, ~1.5 mm long, 9-nerved; lower lemmas resembling glumes, 7–9-nerved; lower paleas small; upper anthecium (i.e., fruit derived from a spikelet with 1 floret) ovoid.

Found in North America (Canada and USA), Mexico, Central America, the West Indies, and South America (Colombia, Venezuela, and Ecuador); introduced in Asia and Hawaii. In Venezuela, found in the Cordillera de Mérida (Mérida and Trujillo) and the Cordillera de la Costa (Aragua, Distrito Federal, and Miranda; Map 284). Collected in El Campamento in Qda. Jirajara on the south slope of Guaramacal; 2,000 m.

Dichanthelium acuminatum is a polymorphic and taxonomically difficult species complex (Gould and Clark, 1978; Freckmann, 1981; Zuloaga et al., 1993; Hammer, 2010). Our material keys to the nominate variety in the revision by Zuloaga et al. (1993).

Didymogonyx (L. G. Clark & Londoño) C. D. Tyrrell et al.

Didymogonyx (L. G. Clark & Londoño) C. D. Tyrrell et al., in Tyrrell et al., Molec. Phylogenet. Evol. 65: 146. 2012. *Rhipidocladum* sect. *Didymogonyx* L. G. Clark & Londoño, Amer. J. Bot. 78: 1271. 1991.

Large, woody bamboos; caespitose. Culms erect at base, arched toward apex; primary element of the branch complement at midculm nodes flat, unsegmented, appressed and adnate to the culm surface; second-order branches flabellate; internodes smooth, hollow, each long internode alternating along the length of the culm with 1 short internode. Culm leaves: coriaceous, well developed or not, glabrous, ciliate or pubescent: sheaths glabrous or hispid and glabrescent, bearing setose auricles or fimbriae at apices, as long as or longer than the blade; inner ligules truncate, ciliate or conspicuously fimbriate along the margin; blades triangular, pubescent between the nerves above, hispid-pubescent and glabrescent below, junction with the sheath almost symmetrical, ± horizontal, slightly curved at the middle. Branching intravaginal, restricted to middle and upper portions of culms; secondary branches slender, numerous, 20–30(–50) per node. Foliage leaves: sheaths glabrous, not auriculate, apically fimbriate; fimbriae free, basally straight, distally wavy to curly; blades linear, 7–17(–19) × 0.3–1.2(–2.1) cm, bases rounded-attenuate, margins serrulate or scabrous, apices attenuate-acuminate, glabrous or scabrid above, glabrous below. Inflorescences racemiform or subpaniculiform, 10–25(–40) cm long, with 10–20(–30) spikelets per synflorescence. Spikelets slightly compressed, composed of 4–9(–12) florets and 1 terminal rudimentary floret, 3(–5) glumes, and 1 sterile lemma; glumes triangular to narrowly ovate, shortly mucronate at the tip; fertile lemmas ovate or narrowly ovate, shortly mucronate, glabrous or scabrous; paleas 2-keeled, keels ciliolate; lodicules 3; anthers 3; stigmas 2. [Bambusoideae.]

A neotropical genus of 2 species found in the Andes of South America (Venezuela and Colombia). One species is present in Venezuela.

References. Clark and Londoño (1991); Tyrrell et al. (2012).

Molecular data (Tyrrell et al., 2012) support the monophyly of this small genus of arthrostylidioid bamboos, which is related to *Arthrostylidium* and *Rhipidocladum*. The two species of *Didymogonyx* were included most recently in *Rhipidocladum* s.l., albeit in a section readily distinguished from *Rhipidocladum* s. str. by having alternating long and short internodes along the culm, culm leaf fimbriae, spikelets in pairs and triads, and several other distinctive morphological and foliar anatomical characters (Clark and Londoño, 1991; Tyrrell et al., 2012).

Didymogonyx geminatum (McClure) C. D. Tyrrell et al., in Tyrrell et al., Molec. Phylogenet. Evol. 65: 146. 2012. *Arthrostylidium geminatum* McClure, J. Wash. Acad. Sci. 32: 169, fig. 2. 1942. *Rhipidocladum geminatum* (McClure) McClure, Smithsonian Contr. Bot. 9: 105. 1973; Dorr et al., Contr. U.S. Natl. Herb. 40: 58. 2000 [2001]; Briceño, in Morillo et al., Bot. Ecol. Monocot. Páramos Venez. 2: 678, fig. 108. 2010.

Culms 6–10(–15) m tall, 1–5 cm in diameter; long internodes 0.5–1 m long, short internodes 5–10 mm long. Culm leaves: sheaths (9–)11–20 × 4–9 cm, glabrous or hispid and glabrescent, apices fimbriate, margins ciliate or smooth; inner

MAP 285. *Didymogonyx geminatum* occurrence in Venezuela.

ligules 0.5–2 mm long, truncate, glabrous, marginally ciliate; blades triangular, (3–)5–12 ×1.5–6 cm, margins glabrous to strigose, pubescent between the nerves above, hispid-pubescent and glabrescent below. Foliage leaves: 3–7(–8) per branch; outer ligules 0.2–0.4 mm long, truncate, glabrous, margins ciliolate; inner ligules 0.1–0.4 mm long, truncate; blades linear to linear-lanceolate, 5–11(–17) × 0.3–1.8(–2.1) cm, bases rounded-attenuate, ± oblique, margins minutely serrulate, apices acuminate, glabrous above and below; pseudopetioles 1–4(–6) mm long, twisted. Inflorescences subpaniculiform, 8–15 cm long, with 15–25(–30) spikelets. Spikelets 0.4–1(–2.7) cm long, with 4(–5) florets and 1 terminal rudimentary floret; disarticulation between fertile florets. Glumes 3(–5); lower glumes 2–4 mm long, 1–3-nerved; upper glumes 3–5 mm long, 5–7-nerved; sterile lemmas 4–7 mm long, 7-nerved; fertile lemmas 6–10 × 3–4 mm, 7-nerved; paleas 5–7 mm long.

Endemic to South America (Colombia and Venezuela). In Venezuela, restricted to the Andes (Lara, Mérida, Táchira, and Trujillo; Map 285). In the park, found in forest on both slopes of Guaramacal; (1,500–)2,400–2,600 m.

This species was described from material collected in the nearby Páramo de la Cristalina (Trujillo state).

A report of this species occurring in Ecuador is based on misidentification of material of *Aulonemia hirtula* (Pilg.) McClure (Judziewicz in Jørgensen and León-Yánez, 1999).

Eragrostis Wolf

Eragrostis Wolf, Gen. Pl. 23. 1776.

Annual or perennial plants; caespitose, rhizomatous or stoloniferous. Culms erect, decumbent or geniculate, sometimes rooting at lower nodes; internodes solid or hollow. Sheaths open, apices with tufts of hairs; ligules membranous and ciliate or ciliate; blades filiform to linear, flat, folded or involute, narrow. Inflorescences terminal panicles, open to contracted or spikelike. Spikelets pedicellate, almost always laterally compressed, with 2–60 florets; disarticulation below fertile florets or sometimes below glumes. Glumes ± equal in size and shape, membranous or papery, hyaline, 1(–3)-nerved, usually glabrous and keeled; lemmas similar or very similar to the glumes, 3-nerved; paleas shorter than lemmas, almost always hyaline, 2-keeled, keels winged or ciliate; lodicules 2(0); anthers 2 or 3. Caryopses lenticular or subellipsoid. [Chloridoideae.]

A cosmopolitan genus of ~350 species with its greatest diversity in subtropical regions (low elevations) and in the tropical Andes (high elevations). Approximately 75 species occur in the Americas, including North America (Canada and USA), Central America, the West Indies, and South America (all upper-level political units). In Venezuela, ~29 species have been reported.

References. Giraldo-Cañas et al. (2012); Graterol et al. (1989); Peterson and Giraldo-Caños (2008); Peterson et al. (1997).

• ***Eragrostis tenuifolia*** (A. Rich.) Hochst. ex Steud., Syn. Pl. Glumac. 1: 268. 1854. *Poa tenuifolia* A. Rich., Tent. Fl. Abyss. 2: 425. 1850.

Eragrostis tenuifolia Hochst., in Schimper, Flora 24(Intell.1): 20. 1841, nom. nud.

Culms 20–50(–75) cm tall, unbranched or branched from basal nodes. Sheaths strongly compressed and keeled, glabrous, apices pilose; ligules ciliate; blades flat or folded, 5–25 cm × 1–3 mm, glabrous to scaberulous above, glabrous below.

MAP 286. *Eragrostis tenuifolia* occurrence in Venezuela.

Inflorescences solitary panicles, 15–25 × 3–10 cm, pyramidal; pulvini of the primary branches densely ciliate. Spikelets linear, 3–6 mm long, with 6–14 florets. Florets 3–10 mm long, pedicels slightly scabrous; glumes reduced, not keeled, equal or subequal, to 1 mm long; lemmas ovate to acute; paleas smaller than lemmas. Caryopses ovoid, strongly flattened laterally, ~1 mm long.

Native to Africa and Asia, this species expanded its range rapidly after being introduced into the Americas, where it is now found in Mexico, Central America, the West Indies, and South America (Colombia, Venezuela, Ecuador, Peru, Bolivia, Brazil, Chile, and Argentina). In Venezuela, presently known only from the Andes (Mérida, Táchira, and Trujillo; Map 286). In the park, found near the Laguna de Aguas Negras; 1,900 m.

Eriochrysis P. Beauv.

Eriochrysis P. Beauv., Ess. Agrostogr. 8. 1812.

Perennial plants; caespitose. Culms erect. Sheaths cylindrical, pubescent; ligules membranous, ciliate; blades flat and linear to linear-lanceolate, usually densely pubescent. Inflorescences terminal, cylindrical panicles with numerous, short, erect branches, usually densely villous-silky, yellowish to brown. Spikelets paired at each node of the rachis, subequal, dorsally compressed, lanceolate, awnless; 1 sessile and 1 short-pedicellate; sessile spikelets bisexual; disarticulation at the base of the sessile spikelets, the 2 spikelets of a pair falling together or the pedicellate one dropping from the pedicel; pedicellate spikelets pistillate; glumes equal, chartaceous, concealing the florets; lower glume flat dorsally, margins inflexed and covering upper glume; upper lemma membranous or hyaline, entire, muticous or mucronate; sterile lemmas and fertile lemmas nerveless, slightly shorter than the glumes; palea absent. Lower floret sterile, upper floret bisexual in sessile spikelets and pistillate in pedicellate spikelets. [Panicoideae.]

A cosmopolitan tropical and subtropical genus of 10 species. In the Americas, found in Mexico, Central America, the Greater Antilles, and South America (Colombia, Venezuela, the Guianas, Peru, Bolivia, Brazil, Paraguay, Argentina, and Uruguay). Two species occur in Venezuela.

Reference. Swallen (1966).

Eriochrysis cayennensis P. Beauv., Ess. Agrostogr. 8, t. 4, fig. 11. 1812 ("*Cayanensis*"); Judziewicz, in Berry et al., Fl. Venez. Guayana 8: 106. 2004.

Culms 0.5–1.5(–3) m tall. Basal leaves numerous; sheaths glabrous except auricles densely pubescent; ligules membranous; blades 1.5–4.5 × 0.1–0.8(–1.2) cm, densely villous above and below. Inflorescences (including peduncles) to 30–50 × 1.2–2.5 cm, soft to the touch, chestnut or coppery-brown. Sessile spikelets lanceolate, 2–3 mm long; pedicellate spikelets 1.5–2 mm long. Caryopses obpyriform, ~1 mm long.

Found in Mexico, Central America, the Greater Antilles, and South America (Colombia, Venezuela, Trinidad and Tobago, the Guianas, Peru, Bolivia, Brazil, Paraguay, Argentina, and Uruguay). Widely distributed in Venezuela (Amazonas, Anzoátegui, Apure, Aragua, Bolívar, Guárico, Lara, Mérida, Miranda, Monagas, Portuguesa, Sucre, and Trujillo; Map 287). In the park, found in open, disturbed sites including the track that leads to El Campamento and Qda. Honda; 1,800–2,000 m.

MAP 287. *Eriochrysis cayennensis* occurrence in Venezuela.

This distinctive grass is recognized easily by its long chestnut or coppery-brown inflorescences that superficially resemble small "cat tails" of the genus *Typha* L. (Typhaceae).

Festuca L.

Festuca L., Sp. Pl. 73. 1753.

Perennials; caespitose, rhizomatous or occasionally stoloniferous. Culms unbranched, usually glabrous, sometimes scabrous below the inflorescences. Leaves cauline or basal; sheaths with margins free or partially united, sometimes auriculate; ligules membranous, sometimes coriaceous, generally ciliate; blades flat or conduplicate to involute, linear, apices acuminate, never navicular. Inflorescences panicles, contracted or lax, sometimes reduced to racemes. Spikelets compressed laterally, 2- to many-flowered, florets bisexual, pedicellate; rachillae glabrous; disarticulation above the glumes and between the florets. Glumes 2, subequal, usually shorter than adjacent lemmas; lower glumes 1(3)-nerved, upper glumes 3(5)-nerved, entire, strongly mucronate or awned; lemmas lanceolate or acuminate, keeled to rounded dorsally, 3–7-nerved, usually awned; awn apical or subapical; paleas usually shorter than lemmas, membranous, scabrous or ciliate, awnless; lodicules 2, often bilobed apically; anthers 3; ovary glabrous or hispidulous apically; styles 2, apical. Caryopses obovoid-oblong, usually free of the lemmas and paleas. [Pooideae.]

A genus of 450–500 species found in boreal and temperate regions of America, Europe, Africa, Madagascar, Asia, Australia, and the Pacific Islands. In the Americas, found in North America (Greenland, Canada, and USA), Central America, and South America (Colombia, Venezuela, Ecuador, Peru, Bolivia, Brazil, Chile, Paraguay, Argentina, and Uruguay). Eleven species occur in Venezuela, all above 2,000 m elevation.

REFERENCES. Catalán et al. (2004); Stančík (2003, 2004); Stančík and Peterson (2007); Torrecilla and Catalán (2002); Tucker (1996).

The traditional concept of *Festuca* is likely to change because molecular data indicate that *Lolium* L. and *Vulpia* C. C. Gmel. are nested within *Festuca* s.l. (Catalán et al., 2004). Within this large clade two separate lineages have been recognized (Torrecilla and Catalán, 2002), which are informally named the "broad-leaved" and "fine-leaved" fescues. The former lineage, which includes *Lolium*, has weak support, whereas the latter, which includes *Vulpia*, is well supported.

♦ ***Festuca guaramacalana*** Stančík, Novon 14: 343, fig. 1a–e. 2004; Briceño, in Morillo et al., Bot. Ecol. Monocot. Páramos Venez. 2: 620–623, fig. 65. 2010.

Rhizomatous plants, forming small tussocks. Culms 60–90(–130) cm tall, erect, glabrous. Sheaths membranous to coriaceous, striate; auricles absent; ligules 1–1.5 mm long, membranous, sometimes coriaceous, apices acute; blades conduplicate to involute, 30–40 × 0.6–0.7 cm, glabrous below. Inflorescences panicles, 15–20 × 2–5 cm, flexuous, pendant. Spikelets narrowly lanceolate, 8–15 mm long, with 5–7 florets; rachillae pilose; glumes 3–7 mm long, narrowly lanceolate, membranous to coriaceous, sparsely scabrous, apices acute; lower glumes 3–4(–5) mm long, 1-nerved; upper glumes 7–8 mm long, 3-nerved; lemmas 7–10 mm long, membranous to coriaceous, 5-nerved, apices entire, mucronate or shortly awned; calli sparsely pilose; paleas finely pilose, almost as long as the lemmas; lodicules ovate, 2-dentate.

Endemic to Venezuela, where it is found only in the Cordillera de Mérida (Trujillo; Map 288). Evidently endemic to the park, where it has been found in the Páramo de Guaramacal and the Páramo del Pumar; 2,600–2,900 m.

Festuca dinirica Stančík, endemic to Dinira National Park in Lara to the north of Guaramacal, can be distinguished from our species by its habit. The former species is caespitose (vs. rhizomatous), and it forms large (vs. small) tussocks. *Festuca elviae* B. Briceño, which is found in Mérida state to the south and west of Guaramacal, can be distinguished from *F. guaramacalana* by its shorter lower glumes that are 0.8–2.5 mm (vs. >2.5 mm) long.

Stančík (2004) placed *Festuca guaramacalana* in *F.* sect. *Subulatae* Tzvel., a section that corresponds to the broad-leaved fescues, but this morphological classification might not coincide with a molecular one. Catalán et al. (2004) found that three Andean taxa that they sampled, including *F. elviae* (also placed in sect. *Subulatae* on the basis of morphology), were related within the fine-leaved fescue clade, and they concluded that sect. *Subulatae* represented one of several polyphyletic groups of the broad-leaved fescues.

MAP 288. *Festuca guaramacalana* occurrence in Venezuela.

Homolepis Chase

Homolepis Chase, Proc. Biol. Soc. Wash. 24: 146. 1911.

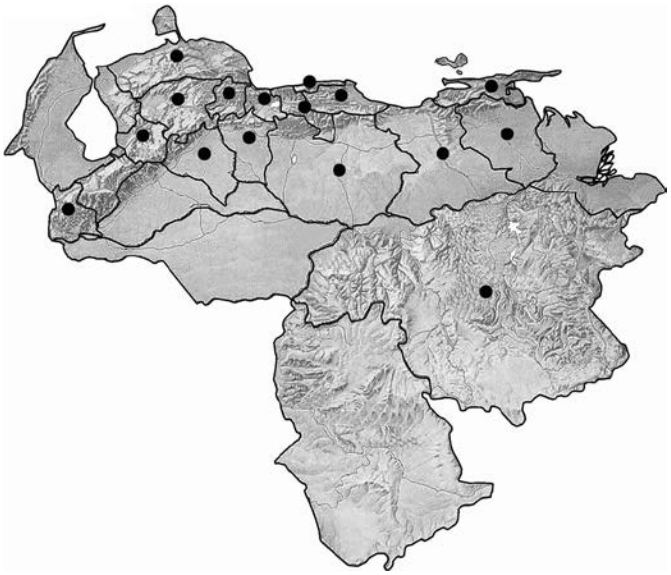
Annual or perennial plants; stoloniferous or decumbent, rarely caespitose. Culms erect, ascending or decumbent; rooting from lower nodes. Sheaths carinate, glabrous or slightly puberulent; ligules membranous, ciliate; blades linear or lanceolate. Inflorescences terminal panicles, open, lax to contracted; spikelets broadly ellipsoid, obovoid or narrowly lanceoloid, compressed, with 2 florets, disarticulating entire; glumes subequal, ± equal in length to spikelet, usually glabrous, 5–9-nerved; lower floret sterile or staminate, lemma glume-like, several-nerved, viscid or not, palea well developed; upper floret bisexual, ellipsoid, shorter than spikelet, glabrous, lemma often bearded at apex. [Panicoideae.]

A neotropical genus of 5 species found in Mexico, Central America, the West Indies, and South America (Colombia, Venezuela, the Guianas, Ecuador, Peru, Bolivia, Brazil, Paraguay, Argentina, and Uruguay). Three species occur in Venezuela.

REFERENCES. Morrone et al. (2012); Webster et al. (1989); Zuloaga and Soderstrom (1985).

Homolepis glutinosa (Sw.) Zuloaga & Soderstr., Smithsonian Contr. Bot. 59: 19. 1985; Judziewicz, in Berry et al., Fl. Venez. Guayana 8: 118, fig. 80. 2004. *Panicum glutinosum* Sw., Prodr. 24. 1788; Dorr et al., Contr. U.S. Natl. Herb. 40: 57. 2000 [2001].

Perennial plants. Culms decumbent, 0.5–1.5 m tall; internodes 5–20 cm long, hollow. Sheaths shorter than internodes,



MAP 289. *Homolepis glutinosa* occurrence in Venezuela.

papillose-pilose to glabrescent; ligules membranous with short hairs; blades oblong-linear to lanceolate, 10–35 × 0.5–2 cm, flat, apices attenuate, margins scaberulous below, bases narrowed, papillose-pilose to glabrescent above and below, glaucous. Inflorescences lax, diffuse, 15–25 × 10–25 cm; branches spreading, lower branches whorled, upper branches alternate and opposite, axils of branches densely pubescent. Spikelets obovoid to ellipsoid, 2–3 mm long, viscid at maturity; lower glume 5–9-nerved, glabrous; upper glume, 7–9-nerved, glabrous; lower lemma glume-like, 5–7-nerved, scabrous; lower palea smaller than lemmas, glabrous; staminate flower absent. Upper anthecium ellipsoid, ~2.5 mm long, apex uncinate.

Found in Mexico, Central America, the West Indies, and South America (Colombia, Venezuela, Guyana, Ecuador, Peru, Bolivia, Brazil, Paraguay, Argentina, and Uruguay). In Venezuela, reported from Anzoátegui, Aragua, Bolívar, Carabobo, Cojedes, Distrito Federal, Falcón, Guárico, Lara, Miranda, Monagas, Portuguesa, Sucre, Táchira, Trujillo, and Yaracuy (Map 289). In the park, found along trails and road cuts in montane forest near the Laguna de Aguas Negras and in Qda. Segovia; 2,000–2,350 m.

Ichnanthus P. Beauv.

Ichnanthus P. Beauv., Ess. Agrostogr. 56. 1812.

Annual or perennial plants; caespitose, rhizomatous or stoloniferous. Culms erect to decumbent, simple or branched, glabrous or pubescent. Sheaths glabrous or pilose; ligules membranous; blades flat, linear to ovate, usually lanceolate and asymmetrically narrowed at the base. Inflorescences terminal or axillary, simple to compound, panicles; branches diverging, ascending. Spikelets usually lanceoloid, laterally compressed, glabrous or pubescent, with 2 florets; glumes prominently keeled, 3–9-nerved; lower glumes >½ the length of spikelets; upper glumes and lower lemmas ± equal and exceeding in length the upper fertile florets; lemmas enclosing paleas and often staminate flowers; fertile florets hardened; margins of upper lemmas flat, rachilla subtending lemma minutely stipitate and bearing on either side membranous, winglike appendages adnate to the base of the lemma and free above, sometimes appendages reduced to swellings; lodicules 2. Caryopses ovoid to ellipsoid. [Panicoideae.]

A mostly neotropical genus of ~30 species; 1 species is pantropical. In the Americas, found in Mexico, Central America, the West Indies, and South America (Colombia, Venezuela, Trinidad and Tobago, the Guianas, Ecuador, Peru, Bolivia, Brazil, Paraguay, Argentina, and Uruguay). Sixteen species occur in Venezuela.

References. Boechat (2005); Morrone et al. (2012); Stieber (1982, 1987); Webster et al. (1989).

KEY TO THE SPECIES OF *ICHNANTHUS*

1a. Leaf blades ovate to ovate-lanceolate, 1–3 cm wide; panicles scarcely exserted from the leaf sheaths . . . . . ***I. pallens***
1b. Leaf blades lanceolate or linear-lanceolate, 0.3–0.9(–1.5) cm wide; panicles well exserted from the leaf sheaths 2
  2a. Spikelets narrowly ellipsoid or lanceoloid, sparsely to densely pilose especially on margins of glumes . . . . ***I. tenuis***
  2b. Spikelets ovoid to ovoid-acuminate, glabrous to sparingly pilose . . . . . ***I. nemorosus***

Ichnanthus nemorosus (Sw.) Döll, in Martius, Fl. Bras. 2(2): 289. 1877; Judziewicz, in Berry et al., Fl. Venez. Guayana 8: 125. 2004. *Panicum nemorosum* Sw., Prodr. 22. 1788.

Annual or perennial plants. Culms creeping, branched, rooting at the nodes, nodes often pilose; flowering shoots 30–40 cm tall. Leaf blades linear-lanceolate, 3.5–6(–8.5) × 0.4–0.6 cm, bases asymmetrically subcordate, glabrous to pilose above and below. Inflorescences terminal and axillary, well exserted from the leaf sheaths, 2–5(–10) cm long, sparsely branched. Spikelets 2–4 mm long, plump, ovoid to ovoid-acuminate, glabrous to sparingly pilose.

Found in Mexico, Central America, the West Indies, and South America (Colombia, Venezuela, Trinidad and Tobago, French Guiana, Ecuador, Peru, Bolivia, Paraguay, and Argentina). Widespread in Venezuela (Amazonas, Aragua, Carabobo, Cojedes, Distrito Federal, Falcón, Lara, Mérida, Miranda, Portuguesa, Táchira, Trujillo, Yaracuy, and Zulia; Map 290). In the park, found on road cuts and in understory vegetation on both slopes of Guaramacal; 1,800–2,100 m.

Boechat (2005) excluded this species from Brazil while noting that it was collected on Cerro de la Neblina, which straddles the Venezuelan–Brazilian frontier.

MAP 290. *Ichnanthus nemorosus* occurrence in Venezuela.

Ichnanthus pallens (Sw.) Munro ex Benth., Fl. Hongk. 414. 1861; Judziewicz, in Berry et al., Fl. Venez. Guayana 8: 125. 2004. *Panicum pallens* Sw., Prodr. 23. 1788.

Panicum pallens var. *majus* Nees, Fl. Bras. Enum. Pl. 2(1): 137. 1829. *Ichnanthus pallens* var. *majus* (Nees) Stieber, Syst. Bot. 12: 207. 1987.

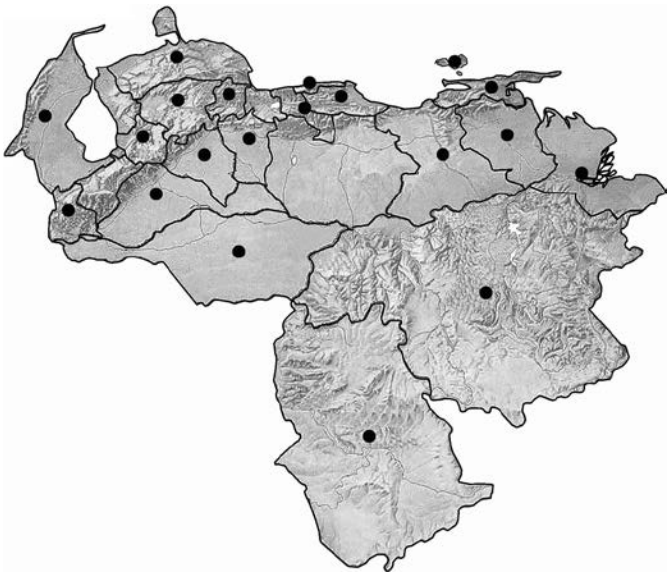
Perennial plants. Culms spreading to creeping, to 1(–3) m long, branched, rooting at the nodes, nodes glabrous to pubescent; flowering shoots 15–20 cm tall. Leaf blades ovate to ovate-lanceolate, 5–10 × 1–3 cm, bases asymmetrically cordate-clasping, sparsely pilose above and below. Inflorescences terminal and axillary, scarcely exserted from the leaf sheaths, 5–10 cm long, sparsely branched. Spikelets 3–6 mm long, ± plump, ovoid to lanceoloid, glabrous to short pubescent.

Found in Mexico, Central America, the West Indies, South America (Colombia, Venezuela, Curaçao, Trinidad and Tobago, the Guianas, Ecuador, Peru, Bolivia, Brazil, Paraguay, Argentina, and Uruguay), tropical Africa, Asia, and Australia. Widespread in Venezuela (Amazonas, Anzoátegui, Apure, Aragua, Barinas, Bolívar, Cojedes, Delta Amacuro, Distrito Federal, Falcón, Lara, Miranda, Monagas, Nueva Esparta, Portuguesa, Sucre, Táchira, Trujillo, Yaracuy, and Zulia; Map 291). In the park, found in forest understory and in open areas on the north slope of Guaramacal; 1,900 m.

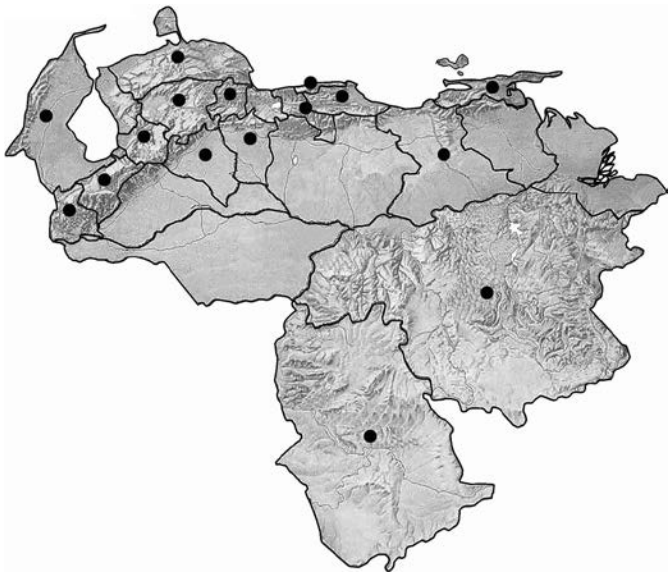
Stieber (1987) recognized two varieties of *Ichnanthus pallens* mostly on the basis of spikelet size. Our material could be referred to the nominate variety. However, given that the varieties he recognized do not segregate geographically and that he noted morphological intermediates, we prefer to recognize a single polymorphic species with a cosmopolitan distribution.

Ichnanthus tenuis (J. Presl) Hitchc. & Chase, Contr. U.S. Natl. Herb. 18: 334. 1917; Judziewicz, in Berry et al., Fl. Venez. Guayana 8: 131, fig. 88. 2004. *Oplismenus tenuis* J. Presl, in C. Presl, Reliq. Haenk. 1: 319. 1830.

Annual plants. Culms spreading to creeping, 10–40 cm long, freely branched, branches erect or ascending, rooting at lower nodes, nodes glabrous or slightly pubescent. Leaf blades lanceolate, 1–7 × 0.3–0.9(–1.5) cm, bases asymmetrically rounded or subcordate, pubescent or pilose above and below. Inflorescences



MAP 291. *Ichnanthus pallens* occurrence in Venezuela.



MAP 292. *Ichnanthus tenuis* occurrence in Venezuela.

terminal and axillary, 2–7(–15) cm long, well exserted from the leaf sheaths; branches spreading or ascending. Spikelets 3–5 mm long, narrowly lanceoloid.

Found in Mexico, Central America, and South America (Colombia, Venezuela, Trinidad and Tobago, the Guianas, Ecuador, Peru, Bolivia, Brazil, Paraguay, and Argentina); exotic in the Greater Antilles. Widely distributed in Venezuela (Amazonas, Anzoátegui, Aragua, Bolívar, Cojedes, Distrito Federal, Falcón, Lara, Mérida, Miranda, Portuguesa, Sucre, Táchira, Trujillo, Yaracuy, and Zulia; Map 292). In the park, found in sector El Mogote; 1,650–1,700 m.

This species forms large colonies in forest understory.

Isachne R. Br.

Isachne R. Br., Prodr. 196. 1810.

Annual or perennial plants; caespitose, sometimes rhizomatous or stoloniferous. Culms erect, decumbent or creeping, simple or branched. Sheaths rounded; ligules ciliate; blades flat, narrowly lanceolate to ovate. Inflorescences panicles, terminal, usually open. Spikelets obovoid to subglobose, biconvex, 2-flowered; disarticulation above or below the glumes; florets separated by a short internode and falling as a unit or glumes falling first; glumes subequal, nearly equal in length to spikelets, 5–7(–9)-nerved; lower florets staminate or bisexual, membranous to hardened, shorter than or equal to spikelets in length; paleas well-developed; upper florets pistillate or bisexual, ± equal to spikelets in length; anthers 3. Caryopses ellipsoid to subglobose. [Micraroideae.]

A tropical genus of ~100 species found in Mexico, Central America, the West Indies, South America (Colombia, Venezuela, the Guianas, Ecuador, Peru, Bolivia, and Brazil), Africa, Madagascar, Eurasia, Asia, and the Pacific Islands. Two or 3 species are found in Venezuela.

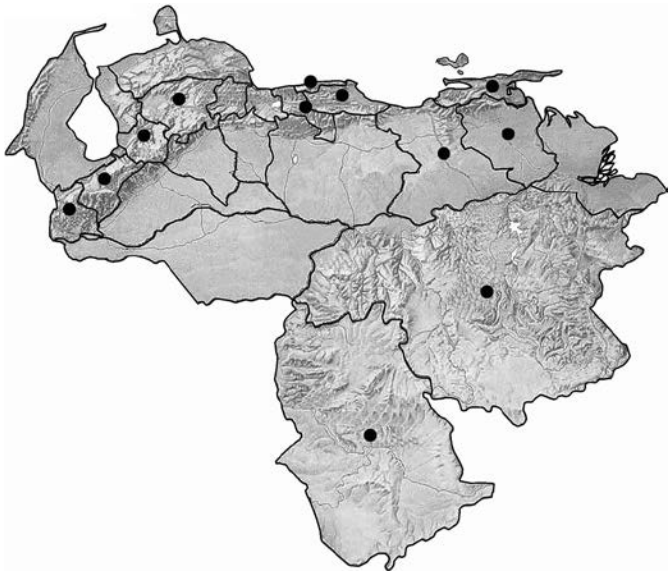
References. Hitchcock (1920); Sánchez-Ken et al. (2007); Webster et al. (1989).

Isachne is easily confused with *Lasiacis* (Griseb.) Hitchc., but the former has ciliate and the latter has membranous ligules.

Isachne rigens (Sw.) Trin., Gram. Panic. 252. 1826; Judziewicz, in Berry et al., Fl. Venez. Guayana 8: 135, fig. 92. 2004; Briceño, in Morillo et al., Bot. Ecol. Monocot. Páramos Venez. 2: 631–632, fig. 72. 2010. *Panicum rigens* Sw., Prodr. 23. 1788.

Isachne ligulata Swallen, Caldasia 2: 305. 1943.

Perennial plants. Culms 1–2(–10) m long, weak, trailing; flowering branches numerous, erect, 10–15(–30) cm tall, glabrous. Sheaths glabrous or puberulent; ligules 0.5(–2) mm long; blades narrowly oblong-lanceolate, (2–)5–6 cm × 1–5 mm, spreading, scabrous above and below. Inflorescences terminal, ovoid or oblong, 2–5(–10) cm long; branches and branchlets ascending or spreading. Spikelets 1.5–2 mm long; rachilla below the 2 florets minutely villous; glumes puberulent.



MAP 293. *Isachne rigens* occurrence in Venezuela.

Found in Central America, the West Indies, and South America (Colombia, Venezuela, Guyana, Ecuador, and Peru). Widespread in Venezuela (Amazonas, Anzoátegui, Aragua, Bolívar, Distrito Federal, Lara, Mérida, Miranda, Monagas, Sucre, Táchira, and Trujillo; Map 293). In the park, fairly common in forest understory along trails and in roadside ditches; 1,850–2,350(–3,000) m.

Lasiacis (Griseb.) Hitchc.

Lasiacis (Griseb.) Hitchc., Contr. U.S. Natl. Herb. 15: 16. 1910. *Panicum* sect. *Lasiacis* Griseb., Fl. Brit. W.I. 551. 1864.

Perennial (rarely annual) plants, often bamboo-like (i.e., woody or lignified); caespitose. Culms erect, arching or scandent, simple or branched, herbaceous to woody; internodes solid or hollow; rooting at nodes. Sheaths open, rounded, margins free and overlapping; ligules membranous; blades linear to ovate, bases slightly to strongly asymmetrical. Inflorescences panicles, open or contracted; disarticulation below the glumes. Spikelets globose, obovoid or ellipsoid, with 2 florets. Glumes membranous, apices apiculate, lanate, usually shiny black when mature; lower glume shorter than spikelet, 5–13-nerved, bases saccate; upper glume ± equal in length to upper florets, 7–15-nerved, not saccate; lower floret sterile or staminate; lower lemma(s) membranous, apiculate, apices lanate; lower palea present (sometimes reduced); upper florets bisexual; upper lemma hardened, lanate; upper palea similar to lemma(s), but saccate below. Caryopses ovoid, obovoid or ± spherical. [Panicoideae.]

An American genus of 16 species found in North America (Greenland, Canada, and USA), Mexico, Central America, the

West Indies, and South America (all country-level political units). Twelve species occur in Venezuela.

REFERENCES. Crins (1991); Davidse (1978); Morrone et al. (2012); Webster (1988); Webster et al. (1989).

KEY TO THE SPECIES OF *LASIACIS*

1a. Bases of leaf blades conspicuously cordate-auriculate; inflorescences 20–120 cm long . . . . . ***L. procerrima***
1b. Bases of leaf blades not or slightly cordate-auriculate; inflorescences 5–12(–20) cm long 2
2a. Ligules of upper leaves readily visible, 1.5–3 mm long; branches of panicles reflexed or widely spreading; spikelets 3–4 mm long . . . . . ***L. ligulata***
2b. Ligules of upper leaves not readily visible, <1.5 mm long; branches of panicles ascending to divergent; spikelets 4–5(–6) mm long . . . . . ***L. nigra***

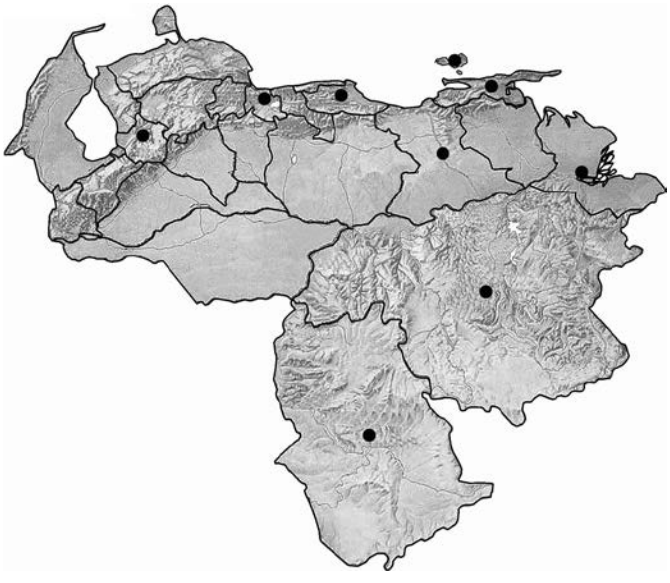
Lasiacis ligulata Hitchc. & Chase, Contr. U.S. Natl. Herb. 18(7): 337. 1917; Davidse, in Berry et al., Fl. Venez. Guayana 8: 139, fig. 96. 2004.

Perennial, bamboo-like plants. Culms erect to arching, 1–3(–10) m × 5–10 mm, woody, hollow; nodes glabrous. Sheaths glabrous to puberulent, margins ciliate; ligules 1.5–3 mm long, apices glabrous or ciliolate; blades narrowly to broadly lanceolate, 5–15 × 1–2.5 cm, bases asymmetrical, apices acuminate, glabrous or puberulent. Inflorescences 5–10(–20) cm long; branches reflexed or widely spreading; rachises glabrous or minutely scabrid. Spikelets obovoid, 3–4 mm long. Lower glume 1–2 mm long, 7–11-nerved, glabrous with ciliate margins; upper glume 9–11-nerved; lemma(s) 9–11-nerved; palea shorter than or equal in length to florets. Caryopses ~2 mm long.

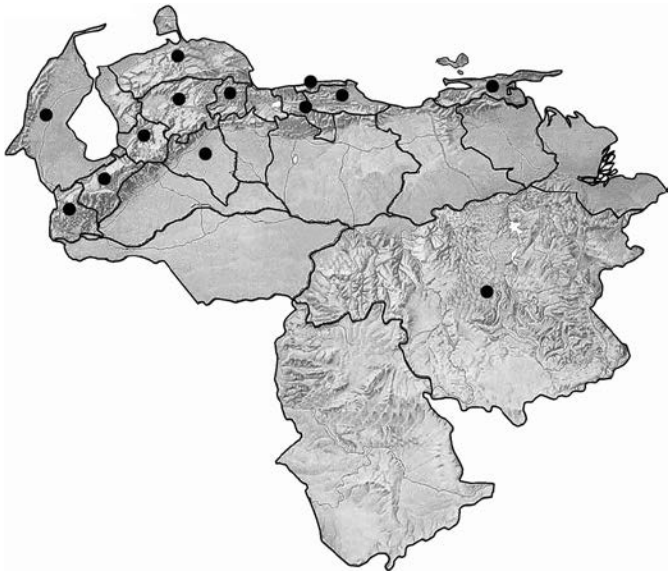
Found in Central America, the West Indies, and South America (Colombia, Venezuela, Trinidad and Tobago, the Guianas, Ecuador, Peru, Bolivia, Brazil, and Argentina). In Venezuela, recorded from Amazonas, Anzoátegui, Bolívar, Carabobo, Delta Amacuro, Miranda, Nueva Esparta, Sucre, and Trujillo (Map 294). In the park, found near the Laguna de Aguas Negras; 1,900 m.

Lasiacis nigra Davidse, Phytologia 29: 152. 1974; Davidse, in Berry et al., Fl. Venez. Guayana 8: 139, fig. 96. 2004.

Perennial, bamboo-like plants. Culms erect at base, arching above, 1–8 m × 3–5(–10) mm, woody, hollow; nodes glabrous. Sheaths pilose to glabrous, margins ciliate; ligules 0.5–1.5 mm long, glabrous or ciliate; blades linear to lanceolate, 5–10 × 0.5–1.2(–2) cm, bases asymmetrical, slightly cordate-auriculate, and clasping the culm, margins scabrid, apices acuminate, pilose or glabrous. Inflorescences 5–12 cm long; branches ascending to diverging; rachises pilose to glabrous. Spikelets obovoid, 4–5(–6) mm long, usually purple (when immature). Lower glume 2–3 mm long, 5–13-nerved; upper glume 7–13-nerved; lemma 9–11-nerved; palea shorter than or subequal in length to florets. Caryopses 2.5–3 mm long.



MAP 294. *Lasiacis ligulata* occurrence in Venezuela.



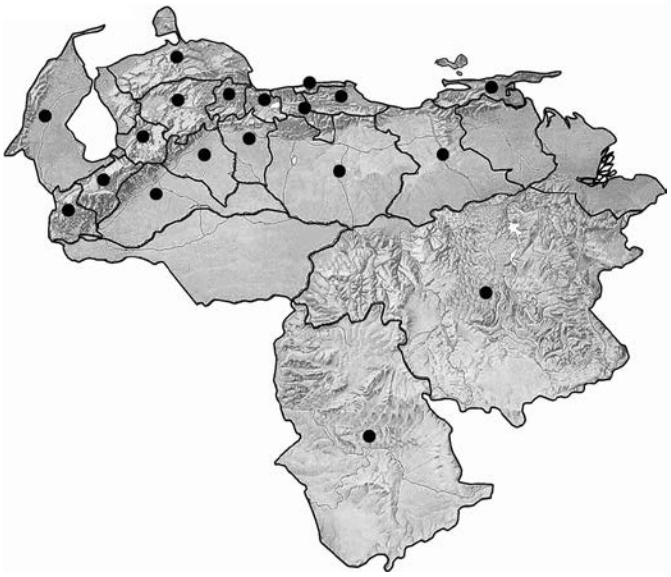
MAP 295. *Lasiacis nigra* occurrence in Venezuela.

Found in Mexico, Central America, and South America (Colombia, Venezuela, Guyana, Ecuador, Peru, and Bolivia). In Venezuela, recorded from Aragua, Bolívar, Distrito Federal, Falcón, Lara, Mérida, Miranda, Portuguesa, Sucre, Táchira, Trujillo, Yaracuy, and Zulia (Map 295). In the park, found on both slopes of Guaramacal including near the Laguna de Aguas Negras and in Qda. Honda; 1,700–2,100 m.

Lasiacis procerrima (Hack.) Hitchc., Proc. Biol. Soc. Wash. 24: 145. 1911; Davidse, in Berry et al., Fl. Venez. Guayana 8: 139, fig. 98. 2004. *Panicum procerrimum* Hack., Oesterr. Bot. Z. 51: 431. 1901.

Annual or short-lived perennial plants; colonial, rarely solitary. Culms decumbent at base, simple or sparingly branched in the upper nodes, 1–4 m × 5–10 mm, herbaceous to woody, hollow; nodes glabrous; adventitious prop roots arising from lower nodes. Sheaths glabrous to puberulent and glaucous, auricles, if present, pubescent and ciliate; ligules 0.5–1.5 mm long, glabrous and minutely ciliolate; blades lanceolate, 15–30(–40) × 3–4(–6) cm, bases conspicuously cordate-auriculate, clasping the culm, apices acuminate, glabrous or minutely velutinous. Inflorescences highly branched and diffuse, 20–120 cm long and almost as wide; branches whorled at base; rachises scabrous. Spikelets obovoid, 2–3.5(–5) cm long. Lower glume 1.8–2 mm long, 7–11-nerved; upper glume 9–11-nerved; lemma 9–11-nerved; palea shorter than florets. Caryopses ~2 mm long.

Found in Mexico, Central America, and South America (Colombia, Venezuela, Guyana, Ecuador, Peru, and Brazil). In Venezuela, recorded from Amazonas, Anzoátegui, Aragua, Barinas, Bolívar, Carabobo, Cojedes, Distrito Federal, Falcón, Guárico, Lara, Mérida, Miranda, Portuguesa, Sucre, Táchira, Trujillo, Yaracuy, and Zulia (Map 296). In the park, found near La Divisoria de la Concepción; 1,300–1,500 m.



MAP 296. *Lasiacis procerrima* occurrence in Venezuela.

• *Melinis* P. Beauv.

Melinis P. Beauv., Ess. Agrostogr. 54. 1812.

Perennial or annual plants. Culms erect, ascending or decumbent, solid, rooting from lower nodes. Sheaths open; ligules membranous and ciliate; blades flat, filiform, linear or lanceolate, pubescent, viscid or not, aromatic or not. Inflorescences terminal panicles, lax; branches numerous, slender, and flexuous; disarticulation below the glumes, sometimes also below the florets. Spikelets laterally compressed, oblong, purplish with 2 florets; lower glume present and small or absent, unawned; upper glume equaling or exceeding florets in length, sometimes gibbous basally, 5–7-nerved, awned or unawned; lower floret staminate or sterile; lower lemma almost the size of the upper glumes, not gibbous; upper floret bisexual, compressed; upper lemma glabrous, smooth, unawned; upper palea resembling upper lemma. [Panicoideae.]

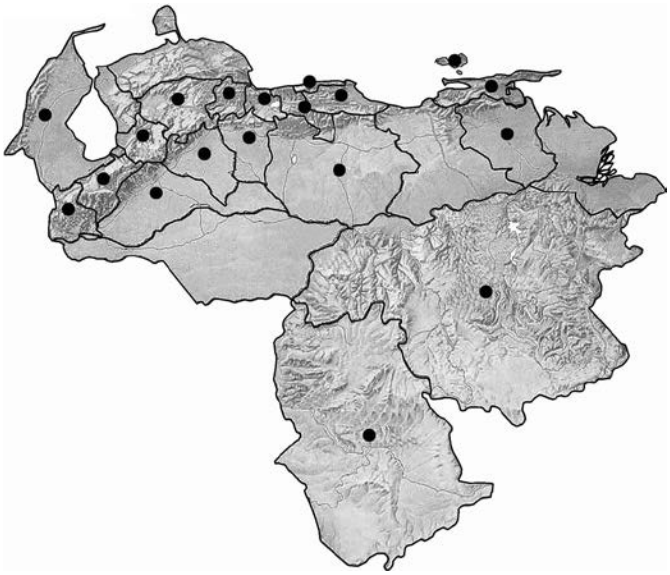
A genus of ~20 species found in Africa and Madagascar, with several species introduced and naturalized in mostly tropical regions throughout the world. In the Americas, found in North America (USA), Mexico, Central America, the West Indies, and South America (Colombia, Venezuela, Guyana, Suriname, Ecuador, Peru, Bolivia, Brazil, Paraguay, Argentina, and Uruguay). Two species occur in Venezuela.

References. Crins (1991); Morrone et al. (2012); Webster (1988); Webster et al. (1989); Zizka (1990).

• ***Melinis minutiflora*** P. Beauv., Ess. Agrostogr. 54, t. 11, fig. 4. 1812; Judziewicz, in Berry et al., Fl. Venez. Guayana 8: 151, fig. 108. 2004; Briceño, in Morillo et al., Bot. Ecol. Monocot. Páramos Venez. 2: 637–638, fig. 77. 2010.

Perennial plants; caespitose. Culms 0.4–1.9 m tall, ascending, branched, nodes bearded. Sheaths densely tomentose, viscid; ligules composed of hairs, 0.5–1.5 mm long; blades flat, linear, 5–15 × 0.3–0.9 mm, densely viscid-pilose, aromatic. Inflorescences pyramidal, 5–20 cm long; pedicels shorter than spikelets. Spikelets 1.5–2.5 mm long, glabrous, usually purplish; lower glume absent or 0.3–0.5 mm long; upper glume 1.5–2.5 mm long, unawned; lower floret sterile; lower lemma 2-lobed, unawned or awned, awns (when present) 5–15 mm long; lower palea absent; upper lemma 1.5–2 mm long; upper palea slightly longer than upper lemmas. Caryopses ~1 mm long.

Native to tropical Africa; naturalized in North America (USA), Mexico, Central America, the West Indies, South America (Colombia, Venezuela, Guyana, Suriname, Ecuador, Peru, Bolivia, Brazil, Paraguay, Argentina, and Uruguay), Asia, Australia, and the Pacific Islands. In Venezuela, found in Amazonas, Aragua, Barinas, Bolívar, Carabobo, Cojedes, Distrito Federal, Guárico, Lara, Mérida, Miranda, Monagas, Nueva Esparta, Portuguesa, Sucre, Táchira, Trujillo, Yaracuy, and Zulia (Map 297). In the park, found in disturbed areas in Qda. Segovia and below Páramo del Pumar; 1,900–2,100 m.



MAP 297. *Melinis minutiflora* occurrence in Venezuela.

Common Names. Capin melao and paja cebosa.

Although native to Africa, *Melinis minutiflora* was first described in 1812 from specimens collected in Brazil, where it certainly had arrived earlier (Parsons, 1972). In 1860, the species was brought from Brazil to Venezuela and was used for pasture in the Gran Sabana (Pittier, 1926: 402) from where it has spread. It is an aggressive invader in many parts of the world, including the Venezuelan Andes.

Ocellochloa Zuloaga & Morrone

Ocellochloa Zuloaga & Morrone, Syst. Bot. 34: 690. 2009.

Panicum sect. *Stolonifera* Hitchc. & Chase ex Pilg., in Engler, Nat. Pflanzenfam., 2nd ed., 14e: 16. 1940.

Perennial plants; stoloniferous or decumbent, rooting and branching at the lower nodes to erect or scandent. Culms hollow, rarely solid, simple or branching. Ligules membranous; blades flat, ovate-lanceolate to long-lanceolate, densely pilose to glabrous, shortly pseudopetiolate. Inflorescences panicles, pyramidal or oblong, composed of few to numerous, 1-sided racemose branches; branches arranged on either side of the axis and bearing secund, paired, short-pedicellate spikelets. Spikelets ellipsoid to lanceoloid, pilose to glabrous; shortly pedicellate. Lower glumes 3(–5)-nerved, shorter than spikelets; upper glumes shorter than or subequal to lower lemma, acute to acuminate apically, 5(–7)-nerved; lower lemmas with or without 1 or 2(occasionally 3) pairs of crateriform, ocellate glands; lower paleas hyaline, glabrous; staminate flowers present or absent (bisexual flowers rarely present); upper anthecia ellipsoid to lanceoloid, glabrous, smooth and shiny, hardened, shortly stipitate at the base; upper lemmas with margins inrolled over the paleas. [Panicoideae.]

An American genus of 12 species found in Mexico, the Lesser Antilles, Central America, and South America (Colombia, Venezuela, Ecuador, Peru, Bolivia, Brazil, and Argentina). Four species occur in Venezuela.

References. Morrone et al. (2012); Sede et al. (2009); Zuloaga and Sendulsky (1988).

Ocellochloa pulchella (Raddi) Zuloaga & Morrone, in Sede et al., Syst. Bot. 34: 690. 2009. *Panicum pulchellum* Raddi, Agrostogr. Bras. 42. 1823; Dorr et al., Contr. U.S. Natl. Herb. 40: 57. 2000 [2001]; Zuolaga, in Berry et al., Fl. Venez. Guayana 8: 188. 2004.

Perennial (?) plants. Culms decumbent, creeping and rooting at the nodes, 10–65 cm × 2–3 mm, nodes densely pilose, internodes 2–8 cm long. Sheaths shorter than internodes, pilose to glabrous, margins ciliate; ligules minute, membranous, ciliate; blades ovate-lanceolate, 1.5–7 × 0.5–2 cm, bases asymmetrical and cordate, margins long-ciliate at bases, apices acuminate, strigose to glabrous above and below. Inflorescences terminal solitary panicles, 5–10(–18) × 1–2.5(–4) cm, composed of 5–20 branches, ascending or reflexed, divergent from the axis; branches 3-angled, flattened on 1 side, densely hispid to scabrous; spikelets solitary or paired, 1 subsessile (often abortive), 1 short-pedicellate. Spikelets narrowly ellipsoid, ~2 mm long; upper glumes and lower lemmas subequal (or the upper glumes shorter); lower glumes ovate, 3-nerved; upper glumes 5-nerved; lower lemmas 5-nerved, bearing 2 crateriform or ocellate glands; lower paleas hyaline, margins short-ciliate, otherwise glabrous; staminate flowers usually absent. Caryopses ellipsoid, ~1 mm long.

Found in Mexico, Central America, the Lesser Antilles (Martinique), and South America (Colombia, Venezuela, Ecuador,

MAP 298. *Ocellochloa pulchella* occurrence in Venezuela.

Peru, Bolivia, Brazil, and Argentina). Found almost throughout Venezuela (Amazonas, Anzoátegui, Apure, Aragua, Barinas, Carabobo, Cojedes, Distrito Federal, Guárico, Lara, Mérida, Miranda, Monagas, Portuguesa, Sucre, Táchira, and Yaracuy; Map 298). In Guaramacal, recorded from the understory of and openings in forest near sector El Paramito; 1,600 m.

This species is remarkable for the presence of 1 or 2 (rarely 3) pairs of microscopic (but visible at 10× magnification) crateriform or ocellate glands on the outer surfaces of the upper lemmas.

Paspalum L.

Paspalum L., Syst. Nat., ed. 10, 846, 855, 1359. 1759.
Reimarochloa Hitchc., Contr. U.S. Natl. Herb. 12(6): 198. 1909.
Thrasyopsis Parodi, Bol. Soc. Argent. Bot. 1: 293. 1946.

Annual or perennial plants; caespitose, rhizomatous or stoloniferous. Culms erect, spreading or prostrate. Sheaths open; ligules membranous, glabrous or ciliate; blades mostly flat, linear, lanceolate or linear-lanceolate. Inflorescences terminal, sometimes also axillary, panicles, with 1 to many spikelike racemes; raceme axes flattened, usually narrowly to broadly winged, usually terminating in a spikelet; disarticulation below the glumes. Spikelets subsessile to shortly pedicellate, dorsally compressed, solitary or paired, in 2 rows along 1 side of the racemes, with 2 florets; lower florets sterile; upper florets sessile or stipitate, bisexual; lower glumes absent or rudimentary and present only in some spikelets, (0)1-nerved, unawned; upper glumes and lower lemmas subequal, membranous, unarmed; lower paleas absent or rudimentary; upper lemmas hardened, involute, clasping the paleas; upper paleas hardened. Anthers 2. Stigmas 2, plumose. Caryopses orbicular to ellipsoid, plano-convex or flattened. [Panicoideae.]

A genus of ~350 species found in the Americas, Europe, Africa, Madagascar, Asia, Australia, and the Pacific Islands. The majority of species are American, found in North America (Canada and USA), Mexico, Central America, the West Indies, and South America (all country-level political units). Approximately 100 species occur in Venezuela.

References. Chase (1929); Crins (1991); Denham (2005); Morrone et al. (1995, 2012); Rodríguez (2006); Rua et al. (2010); Webster (1988); Webster et al. (1989).

In a combined molecular and morphological study Rua et al. (2010) found *Paspalum* to be generally monophyletic, but three of the four currently recognized subgenera and many of the informal morphological groupings were polyphyletic. The only morphological synapomorphy for the genus appears to be the distinctive plano-convex spikelets.

Spikelet orientation is the only morphological character that separates *Panicum* from *Axonopus*. In the former genus fertile lemmas and upper glumes are turned toward the rachis.

KEY TO THE SPECIES OF *PASPALUM*

1a. Inflorescences with 60–200 racemes; leaf blades >50 cm long . . . . . ***P. densum***
1b. Inflorescences with <50 racemes; leaf blades <35 cm long 2
2a. Racemes 2(3) per inflorescence; spikelets solitary (rarely paired), sparingly puberulent . . . . . ***P. distichum***
2b. Racemes 2–50 per inflorescence; spikelets solitary or paired, pubescent or glabrous 3
3a. Spikelets solitary . . . . . ***P. penicillatum***
3b. Spikelets paired 4
4a. Spikelets pubescent 5
5a. Ligules 2–3 mm long; bases of leaf blades auriculate . . . . . ***P. macrophyllum***
5b. Ligules ~0.5 mm long; bases of leaf blades not auriculate . . . . . ***P. paniculatum***
4b. Spikelets glabrous or sparingly pubescent . . . . . ***P. inconstans***

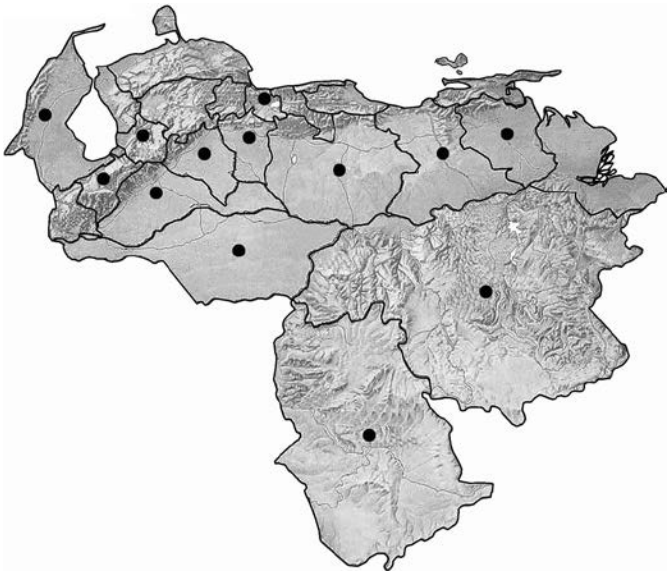
Paspalum densum Poir., in Lamarck, Encycl. 5: 32. 1804; Zuloaga and Judziewicz, in Berry et al., Fl. Venez. Guayana 8: 223, fig. 182. 2004.

Robust perennial plants; caespitose. Culms 100–300 cm tall, erect; nodes glabrous to densely pubescent. Sheaths keeled, glabrous or ciliate distally; ligules 1.5–3 mm long; blades flat or plicate, linear, 50–80(–100) × 1–2 cm, bases not auriculate, sparsely to densely long-hirsute. Inflorescences terminal, 12–30(–40) cm long, with 60–200 racemes; racemes 4–9 cm long. Spikelets orbicular to orbicular-obovoid, 1.5–2.5 mm long, paired, glabrous; upper glumes and lower lemmas membranous, 3-nerved.

Found in Mexico, Central America, the West Indies, and South America (Colombia, Venezuela, Trinidad and Tobago, the Guianas, Bolivia, and Brazil). In Venezuela, reported from Amazonas, Anzoátegui, Apure, Barinas, Bolívar, Carabobo, Cojedes, Guárico, Mérida, Monagas, Portuguesa, Trujillo, and Zulia (Map 299). Found in disturbed areas in El Campamento below Cerro El Diablo; 1,800–2,000 m.

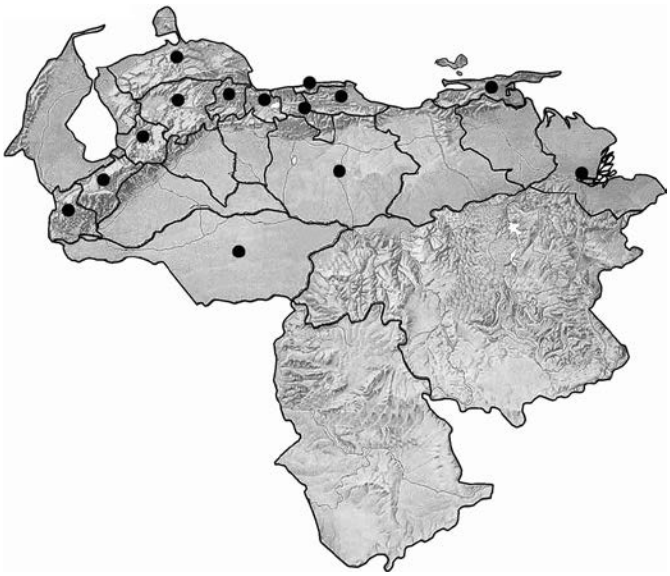
Paspalum distichum L., Syst. Nat., ed. 10, 855. 1759.

Perennial plants; rhizomatous or caespitose. Culms 30–45(–65) cm tall, erect or subdecumbent; nodes glabrous. Sheaths keeled, glabrous to sparsely long-pubescent; ligules 1–2 mm long; blades flat or involute, linear-lanceolate, 13–15 × 0.5–0.6 cm, bases not auriculate, glabrous or pubescent. Inflorescences terminal, <6.5 cm long, with 2(3) racemes; racemes 1.5–7 cm long. Spikelets ellipsoid, ~2.5–3 mm long, solitary (rarely paired), sparingly puberulent; lower glumes absent or, if present, ~1 mm long; upper glumes 3-nerved, sparsely pubescent; lower lemmas 3-nerved, glabrous.



MAP 299. *Paspalum densum* occurrence in Venezuela.

A pantropical species found in North America (USA), Mexico, the West Indies, and South America (all country-level political units); adventive in Europe. In Venezuela, known from Apure, Aragua, Carabobo, Delta Amacuro, Distrito Federal, Falcón, Guárico, Lara, Mérida, Miranda, Sucre, Táchira, Trujillo, and Yaracuy (Map 300). In the park, found near the Laguna de los Cedros; 1,900 m.



MAP 300. *Paspalum distichum* occurrence in Venezuela.

MAP 301. *Paspalum inconstans* occurrence in Venezuela.

Paspalum inconstans Chase, Contr. U.S. Natl. Herb. 24(8): 446. 1927.

Perennial plants; caespitose. Culms 20–100 cm tall, ascending; nodes glabrous. Sheaths pilose; ligules 4 mm long; blades linear to linear-lanceolate, 5–25 × 0.5–1 cm, bases not auriculate, pubescent. Inflorescences terminal and axillary, 10–20 cm long, with 2 or 3(–8) racemes; racemes 5–8 cm long. Spikelets ovoid or ellipsoid, 2–2.5 mm long, paired, glabrous or sparingly pubescent; upper glumes membranous, shorter than the spikelets, 5-nerved, glabrous or sparsely pubescent; lower lemmas equaling the spikelets, 5-nerved.

Found in South America (Colombia, Venezuela, Ecuador, Peru, and Bolivia). In Venezuela, found only in the Andes (Lara, Mérida, Táchira, and Trujillo; Map 301). In the park, found in various localities on both slopes of Guaramacal; 1,900–2,150 m.

Paspalum macrophyllum Kunth, in H. B. K., Nov. Gen. Sp. [fol.] 1: 76. 1815 [1816]; ibid. [qu.] 1: 92. 1815 [1816].

Perennial plants; caespitose. Culms 20–45(–150) cm tall, ascending; nodes glabrous. Sheaths papillose-pilose or glabrous; ligules 2–3 mm long; blades flat, lanceolate, 5–15(–25) × 1–2 cm, bases auriculate, glabrous or finely pubescent below. Inflorescences terminal, 10–15 cm long, with 5–12 racemes; racemes 3–5 cm long. Spikelets ellipsoid to obovoid, 2–3 mm long, paired, puberulent; upper glumes 5-nerved, finely pubescent; lower lemmas 3–5-nerved, glabrous or appressed pubescent.

Found in South America (Colombia, Venezuela, Ecuador, Peru, and Bolivia); introduced in North America (USA), the Greater Antilles (Puerto Rico), and the Pacific Islands. In Venezuela, the species has been collected in the Andes (Lara, Mérida, Táchira, and Trujillo) and in the Cordillera de la Costa (Aragua,

MAP 302. *Paspalum macrophyllum* occurrence in Venezuela.

Falcón, and Yaracuy; Map 302). Our records are from various localities in the park on both slopes of Guaramacal; 1,850–2,000 m.

Paspalum paniculatum L., Syst. Nat., ed. 10, 855. 1759; Zuloaga and Judziewicz, in Berry et al., Fl. Venez. Guayana 8: 224. 2004.

Perennial plants; caespitose, sometimes stoloniferous. Culms 30–100 cm tall, erect; nodes glabrous to pubescent. Sheaths keeled, papillose-hispid; ligules ~0.5 mm long; blades flat, lanceolate to linear-lanceolate, 8–35 × 0.7–1(–3) cm, bases not auriculate, scabrous to glabrescent. Inflorescences terminal, 5–30 cm long, with (5–)20–50 racemes; racemes 1–5(–10) cm long. Spikelets orbicular or narrowly obovate, 1–1.5 mm long, paired, pubescent; lower glumes absent; upper glumes membranous, 3-nerved, pubescent; lower lemmas similar to glumes but subglabrous in the middle.

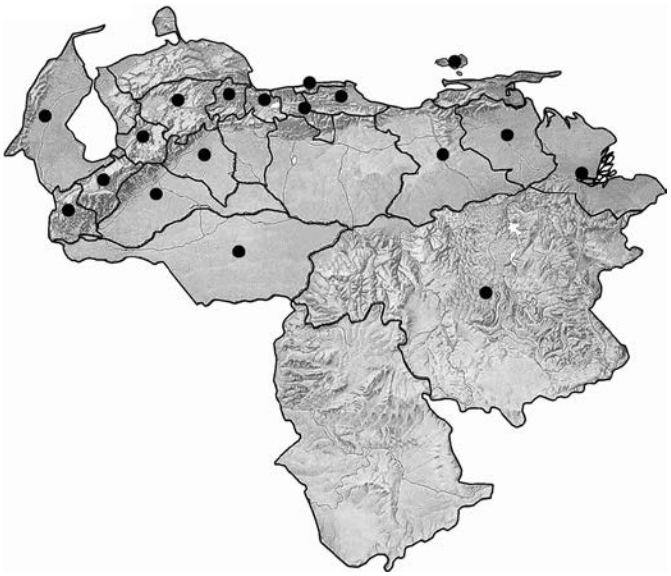
Found in Mexico, Central America, the West Indies, and South America (Colombia, Venezuela, Trinidad and Tobago, the Guianas, Ecuador, Peru, Bolivia, Brazil, Paraguay, Argentina, and Uruguay); introduced in North America (USA), Africa, Australia, and the Pacific Islands. In Venezuela, recorded from Anzoátegui, Apure, Aragua, Barinas, Bolívar, Carabobo, Delta Amacuro, Distrito Federal, Lara, Mérida, Miranda, Monagas, Nueva Esparta, Portuguesa, Táchira, Trujillo, Yaracuy, and Zulia (Map 303). Our records are from various localities in the park on both slopes of Guaramacal; 1,900–2,000 m.

This species is considered to be invasive in many parts of its range.

Paspalum penicillatum Hook. f., Trans. Linn. Soc. London 20: 171. 1847.

Paspalum prostratum Scribn. & Merr., Bull. Div. Agrostol., U.S.D.A. 24: 9. [9 Jan] 1901, non Nash, [Oct] 1901; Dorr et al., Contr. U.S. Natl. Herb. 40: 58. 2000 [2001]; Briceño, in Morillo et al., Bot. Ecol. Monocot. Páramos Venez. 2: 658, fig. 9. 2010.

Annual plants; caespitose. Culms (15–)30–40(–150) cm tall, erect or ascending; nodes glabrous to sparingly pilose. Sheaths keeled, glabrous or puberulent, margins ciliate; ligules minute, to 0.5 mm long; blades linear, lanceolate or linear-lanceolate, 4–5(–20) × 0.4–0.5(–1.5) cm, bases not auriculate, pilose. Inflorescences terminal, 5–20 cm long, with 3–9(–15) racemes;



MAP 303. *Paspalum paniculatum* occurrence in Venezuela.

MAP 304. *Paspalum penicillatum* occurrence in Venezuela.

racemes 1–4 cm long. Spikelets ellipsoid to obovoid-ellipsoid, solitary, glabrous; lower glumes absent; upper glumes and lower lemmas membranous, as long as spikelets, 3-nerved.

Found in Mexico and South America (Colombia, Venezuela, Ecuador, Peru, and Bolivia). In Venezuela, this species is recorded from the Andes (Lara, Mérida, Táchira, and Trujillo) and the Cordillera de la Costa (Aragua, Distrito Federal, and Guárico; Map 304). In the park, found in subpáramo in the Qda. Jirajara; 2,100–2,800 m.

Morrone et al. (1995) recognized *Paspalum penicillatum* and *P. prostratum* as distinct species. The two differ only slightly; there are minor size differences with respect to the width of rachises and dimensions of spikelets. We follow Rodríguez (2006) in considering these names to be synonyms.

• *Poa* L.

Poa L., Sp. Pl. 67. 1753.

Perennial or rarely annual plants; caespitose or rhizomatous. Culms unbranched. Sheaths split part of the way to base; ligules truncate, glabrous or shortly pilose; blades flat or involute, linear, apices navicular, glabrous, pubescent or scabrous. Inflorescences terminal panicles, lax or contracted; flowers bisexual or unisexual (and then the plants dioecious). Spikelets pedicellate, laterally compressed, oblong, ovate or elliptic, (1–)2–6-flowered; disarticulation above the glumes and below the florets. Glumes 2, subequal, elliptic, shorter than spikelets, acute; lower glumes 1-nerved; upper glumes 3-nerved; lemmas generally carinate, acute or blunt, awnless, usually 5(–7)-nerved, membranous; midnerve, marginal and intermediate nerves often pubescent; paleas generally shorter than lemmas; lodicules 2; anthers 3; styles 2, separate, short or obsolete. Caryopses subterete, ellipsoid. [Pooideae.]

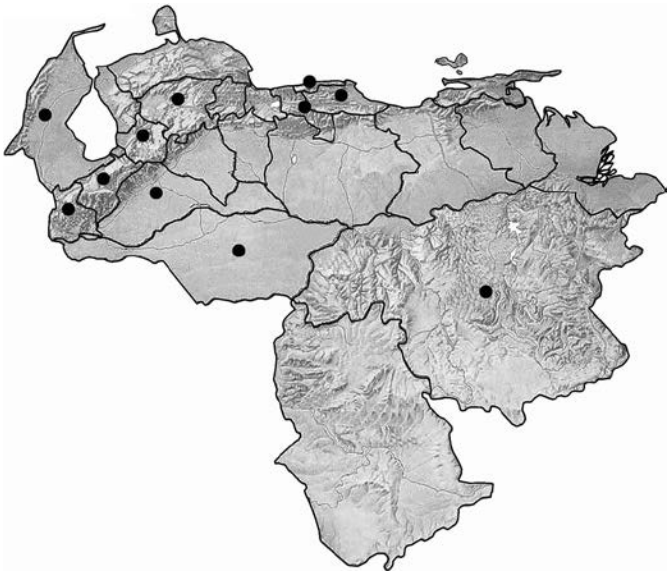
A cosmopolitan genus of ~500 species found at high elevations in the subtropics and tropics and widespread in the Americas: North America (Greenland, Canada, and USA), Mexico, Central America, the West Indies, and South America (Colombia, Venezuela, Ecuador, Peru, Bolivia, Brazil, Chile, Paraguay, Argentina, and Uruguay). Seven species occur in Venezuela, mainly in the Andes and in the Cordillera de la Costa.

References. Gillespie et al. (2007); Tucker (1996).

Poa is related to *Festuca,* from which it can be distinguished by its awnless anthers and navicular leaf apices.

• ***Poa annua*** L., Sp. Pl. 68. 1753; Briceño, in Morillo et al., Bot. Ecol. Monocot. Páramos Venez. 2: 666, fig. 98. 2010.

Annual or short-lived perennial plants; caespitose. Culms erect, spreading or prostrate, sometimes rooting at the nodes, 5–35 cm tall, glabrous. Ligules membranous, 2–5 mm long; blades flat, 5–10 × 0.1–0.3 cm, margins minutely scabrous. Inflorescences solitary, ovate to pyramidal, 1.5–12 cm tall; branches ascending to spreading, glabrous. Spikelets ovate or oblong, (1.5–)3–5(–8) mm long, laterally compressed, 3–10-flowered; rachillae often visible. Glumes persistent, unequal, keeled, glabrous; lower glumes 1.5–2(–3) mm long; upper glumes 2–2.5(–4) mm long; lemmas elliptic to oblong, 2.5–4 mm long, keeled, 5-nerved, sparingly to densely pubescent on the nerves or glabrous.



MAP 305. *Poa annua* occurrence in Venezuela.

Native to Europe and now cosmopolitan. In the Americas, found in North America (Greenland, Canada, and USA), Mexico, Central America, the West Indies, and South America (Colombia, Venezuela, Guyana, Ecuador, Peru, Bolivia, Brazil, Chile, Paraguay, Argentina, and Uruguay). In Venezuela, reported from Apure, Aragua, Barinas, Bolívar, Distrito Federal, Lara, Mérida, Miranda, Táchira, Trujillo, and Zulia (Map 305). In the park, found on both slopes and in the Páramo de Guaramacal; (1,600–)1,900–3,100 m.

This species might have the widest geographical distribution of any species of angiosperm as it is found in the Americas, Africa, Asia, Australia, and Antarctica.

Polypogon Desf.

Polypogon Desf., Fl. Atlant. 1: 66. 1798 [1800].
Chaetotropis Kunth, Énum. Gramin. 1: 72. 1829.

Perennial or annual plants; caespitose or rhizomatous. Culms erect or decumbent; rooting at lower nodes. Sheaths smooth to scabridulous; ligules membranous, erose, ciliate; blades linear, flat. Inflorescences terminal panicles or spikelike, contracted to dense; branches, rachises, and pedicels scabrous. Spikelets ellipsoid, laterally compressed, 1-flowered; disarticulation slightly below glumes (spikelets stipitate, falling intact); florets perfect; glumes 2, equal or subequal, broadly lanceolate, longer than spikelets, entire or sometimes 2-lobed, awned, 1-nerved; lemmas lanceolate, much shorter than glumes, hyaline, obscurely 1–3(–5)-nerved, 2-lobed or 2-aristate, awned apically; paleas elliptic, slightly shorter than or equaling lemmas, hyaline,

2-nerved, apices 2-dentate; lodicules 2; anthers 1–3. Caryopses slightly compressed, ellipsoid to obovoid. [Pooideae.]

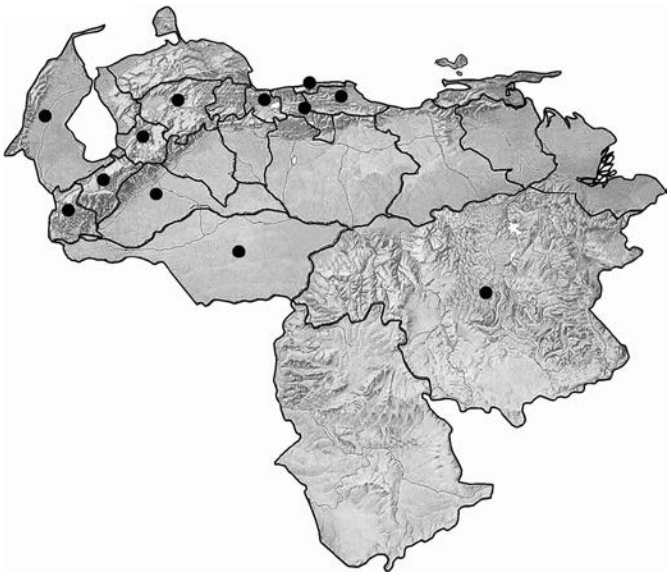
A cosmopolitan genus of ~18 species occurring in warm temperate regions and mountainous areas in the tropics. In the Americas, native and introduced species found in North America (Canada and USA), Mexico, Central America, the Greater Antilles, and South America (Colombia, Venezuela, Ecuador, Peru, Bolivia, Brazil, Chile, Paraguay, Argentina, and Uruguay). Three species occur in Venezuela.

References. Giraldo-Cañas (2004); Tucker (1996).

Polypogon is closely related to *Agrostis*, from which it can be distinguished by its spikelets that disarticulate below the glumes, often at the base of a stipe.

Polypogon elongatus Kunth, in H. B. K., Nov. Gen. Sp. [fol.] 1: 110. 1815 [29 Jan 1816]; ibid. [qu.] 1: 134. 1815 [29 Jan 1816], non Lag., [Jun-Dec] 1816 ("*elongatum*"); Briceño, in Morillo et al., Bot. Ecol. Monocot. Páramos Venez. 2: 675–676, fig. 105. 2010. *Chaetotropis elongata* (Kunth) Björkman, Symb. Bot. Upsal. 17: 14. 1960.

Perennial plants; caespitose. Culms 50–100 cm tall, erect or decumbent at base, unbranched. Sheaths glabrous; ligules nearly glabrous, 3.5–8 mm long, lacerate apically, decurrent on sheath margins; blades 10–25(–30) × 0.4–0.8(–1.5) cm, scaberulous above and along margins, glabrous or scaberulous below. Panicles 10–25(–30) cm long; branches erect or nodding, somewhat loose and interrupted, especially below; spikelets pedicellate, stipes 1.5–2.5 mm long, deciduous. Glumes subequal, lanceolate, lower and upper glumes 3–5 mm long, each with an awn 1–2(–4) mm long; lemmas glabrous, awns 1–2.5(–3) mm long; paleas shorter than lemmas.



MAP 306. *Polypogon elongatus* occurrence in Venezuela.

Found in Mexico, Central America, and South America (Colombia, Venezuela, Ecuador, Peru, Bolivia, Brazil, Chile, Argentina, and Uruguay); adventive in North America (USA). In Venezuela, found in Apure, Aragua, Barinas, Bolívar, Carabobo, Distrito Federal, Lara, Mérida, Miranda, Táchira, Trujillo, and Zulia (Map 306). In the park, found in open areas and along forest edges near the Laguna de Aguas Negras and on both slopes of Guaramacal; 1,800–3,100 m.

Rugoloa Zuloaga

Rugoloa Zuloaga, in J. M. Acosta et al., Pl. Syst. Evol. [epublished 29 Mar 2014].

Perennial plants; rhizomatous. Culms erect or decumbent, rooting and branching at the lower nodes. Sheaths open; ligules membranous, ciliate; blades ovate-lanceolate to lanceolate, flat or inrolled. Inflorescence a terminal panicle. Disarticulation below the spikelets, which fall entire from the pedicels. Spikelets 2-flowered, plump, terete, laterally compressed, pilose to glabrous. Lower glume less than ½ the length of the spikelet, membranous, 3-nerved; upper glume and lower lemma subequal, ± equal to spikelet, membranous, 5-nerved; lower palea well-developed or absent; upper (fertile) floret bisexual, lemma indurate, awnless. Lodicules 2. Anthers usually 3. Stigmas 2, plumose. Caryopses ellipsoid. [Panicoideae.]

An American genus of three species found in Mexico, Central America, the West Indies, and South America (Colombia, Venezuela, Trinidad and Tobago, the Guianas, Ecuador, Peru, Bolivia, Brazil, Paraguay, and Argentina). All three species are found in Venezuela.

References. Acosta et al. (2014); Aliscioni et al. (2003); Crins (1991); Hitchcock and Chase (1910, 1915); Morrone et al. (2012); Webster (1988); Webster et al. (1989); Zuloaga et al. (1992).

Molecular phylogenetic data led Acosta et al. (2014) to recognize this small genus of species formerly placed in *Panicum* s.l. Acosta et al. (2014) also observed that the genus is characterized by a number of morphological characters: inflorescences with lax panicles; spikelets ± crowded and unilaterally disposed on the branches or in short branchlets; spikelets narrowly ellipsoid, hispid with caducous hairs or glabrous; upper anthecium ellipsoid, indurate, with stomata, simple papillae, and prickle hairs only present toward the apex; and silica bodies occasionally present at the tip of the lemma.

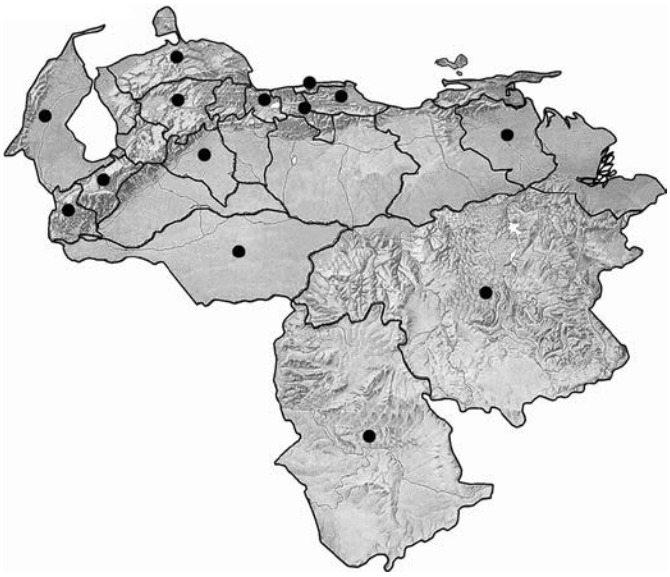
Rugoloa polygonata (Schrad.) Zuloaga, in J. M. Acosta et al., Pl. Syst. Evol. [epublished 29 Mar 2014]. *Panicum polygonatum* Schrad., in Schultes, Mant. 2: 256. 1824; Zuolaga, in Berry et al., Fl. Venez. Guayana 8: 188, fig. 154. 2004. *Dallwatsonia polygonata* (Schrad.) J. R. Grande, Phytoneuron 2014–22: 4. 2014.

Perennial plants; shortly rhizomatous. Culms 30–100 cm tall, decumbent and rooting at lower nodes, becoming erect; nodes densely pilose. Sheaths glabrous or rarely papillose-pilose;

ligules membranous, ciliate; blades lanceolate, 5–15(–20) cm × 5–15 mm, bases cordate, apices attenuate, glabrous or sparsely pilose above and below. Inflorescences lax, pyramidal panicles, 9–25 × 3–15 cm; primary branches ascending or spreading, becoming shorter toward apex. Spikelets narrowly ellipsoid, 1.3–1.6 mm long, pubescent or glabrous. Glumes similar, ovate; lower glume ~1 mm long, 3-nerved; upper glume ~1.4 mm long, 3- or 5-nerved. Lower lemma ~1.4 mm long, 3–5-nerved. Lower palea ~1 mm long, hyaline, glabrous or absent. Caryopses ~1 × 0.5 mm.

Found in Mexico, Central America, the West Indies, and South America (Colombia, Venezuela, Trinidad and Tobago, Guyana, French Guiana, Ecuador, Peru, Bolivia, Brazil, Paraguay, and Argentina). Widespread in Venezuela (Amazonas, Apure, Aragua, Bolívar, Carabobo, Distrito Federal, Falcón, Lara, Mérida, Miranda, Monagas, Portuguesa, Táchira, and Zulia; Map 307). In Guaramacal, almost always in or near coffee plantations such as those found near La Divisoria de la Concepción; ~1,500 m.

Zuloaga et al. (1992) placed this species in *Panicum* subgen. *Phanopyrum* (Raf.) Pilg., but subsequent analyses (Aliscioni et al., 2003) indicate that subgen. *Phanopyrum* is polyphyletic and that a monophyletic *Phanopyrum* (Raf.) Nash can only be recognized if it is monotypic and restricted to *Phanopyrum gymnocarpon* (Elliott) Nash. Aliscioni et al. (2003) left *Panicum polygonatum* as incertae sedis pending further investigation. Subsequently, Acosta et al. (2014), in a review of Paspaleae J. Presl subtribe Otachyriinae Butzin, placed *Panicum polygonatum* and two other species of *Panicum* in the genus *Rugoloa*, which they recognized as a strongly supported clade that had no apparent relationships to other genera in the Otachyriinae.



MAP 307. *Rugoloa polygonata* occurrence in Venezuela.

• *Setaria* P. Beauv.

Setaria P. Beauv., Ess. Agrostogr. 51, 178. 1812, nom. cons.

Annual or perennial plants; caespitose or rarely rhizomatous. Culms erect or decumbent. Sheaths rounded to carinate; ligules membranous and ciliate or composed of hairs; blades flat, folded or involute, linear to lanceolate, sometimes plicate or narrowed to a pseudopetiole. Inflorescences terminal panicles, dense and spikelike or loose and open; disarticulation usually below the glumes, spikelets falling intact, bristles persistent. Spikelets usually lanceoloid-ellipsoid, rarely globose, subsessile to short-pedicellate, in fascicles or single on short branches, some or all subtended by 1 to several bristles. Lower glumes membranous, less than ½ the length of the spikelets, 1–7-nerved; upper glumes membranous to herbaceous, ½ as long to nearly equaling the upper lemmas in length, 3–9-nerved; lower florets staminate or sterile; lower lemmas membranous, equaling the upper lemmas in length, rarely absent, 5–7-nerved; lower paleas hyaline to membranous, rarely absent or reduced; upper florets bisexual; upper lemmas and paleas indurate, transversely rugose; anthers 3; styles 2. Caryopses ellipsoid to subglobose, compressed. [Panicoideae.]

A genus of 100–125 species found in temperate and tropical areas worldwide. In the Americas, found in North America (Canada and USA), Mexico, Central America, the West Indies, and South America (Colombia, Venezuela, Curaçao, Trinidad and Tobago, the Guianas, Ecuador, Peru, Bolivia, Brazil, Chile, Paraguay, Argentina, and Uruguay). Seventeen species occur in Venezuela.

References. Crins (1991); Kellogg et al. (2009); Morrone et al. (2012); Pensiero (1999); Rominger (1962); Webster (1988); Webster et al. (1989).

The genus as currently construed apparently is not monophyletic and likely will be split into several genera (Kellogg et al., 2009). Nonetheless, the same study that refuted its monophyly identified several large, geographically coherent clades.

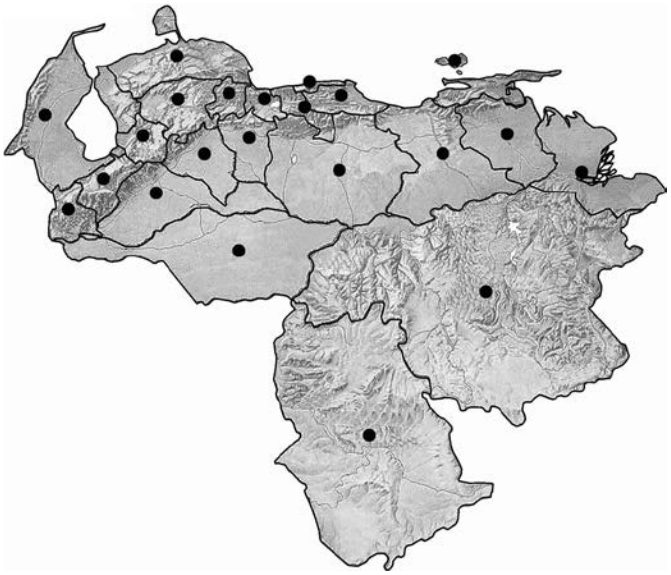
• ***Setaria parviflora*** (Poir.) Kerguélen, Lejeunia, n.s., 120: 161. 1987; Briceño, in Morillo et al., Bot. Ecol. Monocot. Páramos Venez. 2: 681–682, fig. 111. 2010. *Cenchrus parviflorus* Poir., in Lamarck, Encycl. 6: 52. 1804.

Setaria geniculata P. Beauv., Ess. Agrostogr. 51, 169, 178. 1812.

The nominate variety is the only one known from Guaramacal and Venezuela.

• ***Setaria parviflora*** var. ***parviflora***

Perennial plants; caespitose or rhizomatous, rhizomes short. Culms 30–120 cm tall, erect or sometimes decumbent, branching. Sheaths glabrous; ligules <1 mm long, composed of stiff hairs; blades linear to lanceolate 10–25 cm × 2–10 mm, glabrous or with a few long hairs above. Peduncles 5–32 cm long, glabrous, scabrid at the apex. Inflorescences dense, spikelike panicles, 1–8 × 2.5 cm, uniform width throughout their length; rachises minutely pubescent; bristles 4–12, 2–10 mm long, yellow or bronze, scabrous. Spikelets 2–3 mm long, elliptical. Lower



MAP 308. *Setaria parviflora* var. *parviflora* occurrence in Venezuela.

glumes ~1 mm long, 3(–4)-nerved; upper glumes 1–1.5 mm long, 5-nerved; lower florets often staminate; lower lemmas ± equal to spikelet, 5–7-nerved; lower paleas equaling lower lemmas; upper lemmas transversely rugose. Caryopses ellipsoid.

Evidently native to Africa; adventive in North America (Canada and USA), Mexico, Central America, the West Indies, South America (Colombia, Venezuela, Trinidad and Tobago, the Guianas, Ecuador, Peru, Bolivia, Brazil, Chile, Paraguay, Argentina, and Uruguay), Europe, Asia, Australia, and the Pacific Islands. Widespread in Venezuela (Amazonas, Anzoátegui, Apure, Aragua, Barinas, Bolívar, Carabobo, Cojedes, Delta Amacuro, Distrito Federal, Falcón, Guárico, Lara, Mérida, Miranda, Monagas, Nueva Esparta, Portuguesa, Táchira, Trujillo, Yaracuy, and Zulia; Map 308). In the park, collected on the path to La Cueva below Cerro El Diablo; 1,800–2,000 m.

This species was long thought to be indigenous to South America, but Kellogg et al. (2009) determined that it is part of a strongly supported clade of African species, and it appears to have been introduced into the Americas.

Sporobolus R. Br.

Sporobolus R. Br., Prodr. 169. 1810.

Annual or perennial plants; usually caespitose, sometimes rhizomatous, rarely stoloniferous. Culms erect, glabrous. Sheaths open, glabrous, apices ciliate or ciliolate; ligules ciliate; blades flat, folded, involute, sometimes terete, pubescent or glabrous. Inflorescences terminal panicles, open or contracted, rarely spikelike. Spikelets bisexual, rounded to laterally compressed, 1(–3)-florets per spikelet; disarticulation above the glumes or remaining intact until extrusion of the seed. Glumes equal or subequal, usually shorter than floret, 1-nerved or nerveless, membranous, or spikelet remaining intact; lemmas 1(3)-nerved, usually acute, membranous or chartaceous, unawned; paleas equal to or shorter than lemma, glabrous, 2-nerved; anthers 2(3). Caryopses utricle-like, with the mature pericarp usually gelatinous when wetted and extruding the seed, ovoid, ellipsoid, fusiform or quadrangular. [Chloridoideae.]

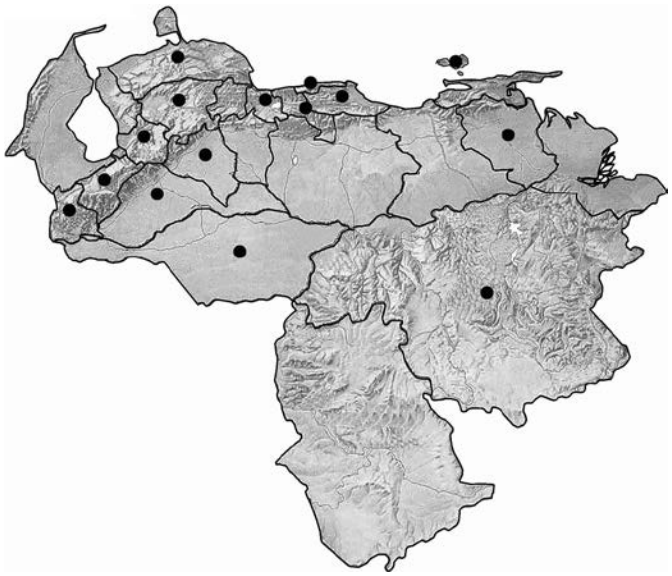
A genus of ~160 species occurring in tropical and subtropical regions worldwide. In the Americas, found in North America (Canada and USA), Mexico, Central America, the West Indies, and South America (all country-level political units). Nine species are found in Venezuela, some of which are aggressive weeds in cropland.

References. Clayton (1965); Giraldo-Cañas and Peterson (2009); Ortiz-Diaz and Culham (2000); Peterson et al. (1997); Shrestha et al. (2004).

Sporobolus indicus (L.) R. Br., Prodr. 170. 1810; Briceño, in Morillo et al., Bot. Ecol. Monocot. Páramos Venez. 2: 683–684, fig. 112. 2010. *Agrostis indica* L., Sp. Pl. 63. 1753.

Perennial plants; densely caespitose. Culms 50–90 cm tall. Sheaths keeled below, 5–15 cm long, glabrous, apices ciliolate; ligules minute, ciliolate; blades flat, lanceolate, 10–35 cm × 3–7 mm, glabrous above and below. Inflorescences solitary, dense spikelike panicles, 10–30 cm × 5–15 mm. Spikelets ~2–3 mm long. Glumes subequal; lemmas ovate, 2–2.5 mm long, acute or obtuse, 1-nerved, glabrous; paleas similar to lemmas, 1.5–2.2 mm long, faintly 2-nerved, glabrous; anthers 3. Caryopses quadrangular, laterally compressed, ~1 mm long.

Found in North America (USA), Mexico, Central America, the West Indies, and South America (Colombia, Venezuela,



MAP 309. *Sporobolus indicus* occurrence in Venezuela.

Trinidad and Tobago, Ecuador, Peru, Bolivia, Brazil, Chile, Paraguay, Argentina, and Uruguay). Widespread in Venezuela (Apure, Aragua, Barinas, Bolívar, Carabobo, Distrito Federal, Falcón, Lara, Mérida, Miranda, Monagas, Nueva Esparta, Portuguesa, Táchira, and Trujillo; Map 309). In the park, collected in open wet areas near the Laguna de Aguas Negras and between Qda. Honda and Pele El Ojo; 1,800–2,100 m.

Sporobolus indicus s.l. is polymorphic, and as currently construed, it is a complex of 11 species found throughout the tropics and subtropics (Clayton, 1965; Ortiz-Diaz and Culham, 2000; Shrestha et al., 2004). *Sporobolus indicus* s. str. could be confused with *S. jacquemontii* Kunth, which also belongs to this complex and also occurs in Venezuela, but our species has solid internodes and a ± dense inflorescence (vs. hollow internodes and a ± lax inflorescence). In addition, *S. jacquemontii* generally is found at lower elevations.

SMILACACEAE

L. J. DORR AND B. STERGIOS

Lianas (our species), shrubs or herbs; herbaceous or suffruticose; perennial or annual; rhizomatous; rhizomes tuberculate or elongate; roots filiform. Stems terete or angular, unarmed or armed with prickles; terminal branches straight, flexuous or zigzag; lateral shoots with 1 or 2 adaxial scales. Leaves simple, alternate, distichous or decussate; leaf blades linear, oblong, ovate or lanceolate (sometimes reduced to scales), apices acuminate to acute, margins entire or armed with prickles, bases acute or cordate, 3–9-veined from the base, secondary veins reticulate; petiolate, petioles typically forming a sheath that terminates in a pair of tendrils. Inflorescences umbellate (a pseudoumbellate cyme), solitary or aggregated in racemes, axillary, pedunculate; peduncles ending in a thickened receptacle. Flowers actinomorphic, unisexual (the plants dioecious), 3-merous, pedicellate; tepals 6, free or connate; staminate flowers: 6 free stamens in 2(3) whorls, anthers 1- or 2-thecal, basifixed, pistillode sometimes present; pistillate flowers: 0–6 staminodes; ovary superior, globose, 3-locular; ovules 1 or 2 per locule; styles short or absent; stigmas 3. Fruit a globose berry, orange, red, blue or black; seeds 1–3, rounded to ovoid, reddish, orange, brown or black.

As construed here the family includes only *Smilax* L., a large pantropical and temperate genus of 200–300 species. The family is present throughout the Americas, including North America (Canada and USA), Mexico, Central America, the West Indies, and South America (Colombia, Venezuela, Trinidad and Tobago, the Guianas, Ecuador, Peru, Bolivia, Brazil, Paraguay, Argentina, and Uruguay). Approximately 100 species of *Smilax* are found in the neotropics, including ~14 in Venezuela.

REFERENCES. Cameron and Fu (2006); Chen et al. (2006a, 2006b); Conran (1998); Judd (1998).

In Guaramacal, the family is easily recognized by its climbing habit, reticulate leaf venation, paired petiolar tendrils, unisexual flowers, and umbellate inflorescences.

Molecular, but not morphological, data generally place the Old and New World species of *Smilax* in separate clades (Cameron and Fu, 2006; Chen et al., 2006a, 2006b).

Smilax L.

Smilax L., Sp. Pl. 1028. 1753.

The characters of the genus are the same as those of the family.

REFERENCES. Andreata (1997); Ferrufino-Acosta (2010); Gaskin and Berry (1998).

There is no current revision treating all of the neotropical species of *Smilax*. Proper identification of collections continues to be hampered by poorly prepared specimens (i.e., specimens lacking lower stems and/or population samples without representatives of both sexes), use of characters in treatments that are not reliable for delimiting species, and conflicting treatments of species depending upon political boundaries.

A KEY TO THE SPECIES OF *SMILAX*

1a. Stems terete, unarmed apically; leaf blades broadly ovate or ovate-lanceolate, nitid, margin and veins without prickles; tepals 3.5–7 mm long . . . . . ***S. domingensis***

1b. Stems angular or striate, armed or unarmed apically; leaf blades lanceolate or ovate-lanceolate, dull, margin and primary veins below with or without prickles; tepals 1.5–2.5 mm long . . . . . ***S. spinosa***

Smilax domingensis Willd., Sp. Pl. 4(2): 783. 1806; Briceño, in Morillo et al., Bot. Ecol. Monocot. Páramos Venez. 2: 720–721, fig. 1 [as "2"]. 2010.

FIGURES 19, 26F

Smilax staminea Griseb., in Martius, Fl. Bras. 3(1): 11. 1842; Gaskin and Berry, in Berry et al., Fl. Venez. Guayana 9: 193, fig. 155. 2005.

Smilax floribunda Kunth, Enum. Pl. 5: 229. 1850, non Desv. ex Ham., 1825. *Smilax kunthii* Killip & C. V. Morton, Publ. Carnegie Inst. Wash. 461: 269. 1936, nom. nov.; Dorr et al., Contr. U.S. Natl. Herb. 40: 59. 2000 [2001].

Smilax staminea f. *obtusata* Steyerm., Fieldiana, Bot. 28: 156. 1951.

Stems terete, glabrous, unarmed apically; terminal branches flexuous. Leaves broadly ovate or ovate-lanceolate, 7–11.5 × (3–)5–9.5 cm, apices acuminate, margins entire or slightly sinuate, bases acute to truncate, 3–5-veined, nitid; petioles 1.5–3 cm long. Inflorescences solitary. Peduncles 5–7 mm long; pedicels 5–7(–10) mm long; tepals 3.5–7 mm long, tepals of staminate flowers slightly longer than those of pistillate ones. Berries maturing red, purple or black, ~1 cm in diameter.

Found in Mexico, Central America, the West Indies, and South America (Colombia, Venezuela, the Guianas, Ecuador,

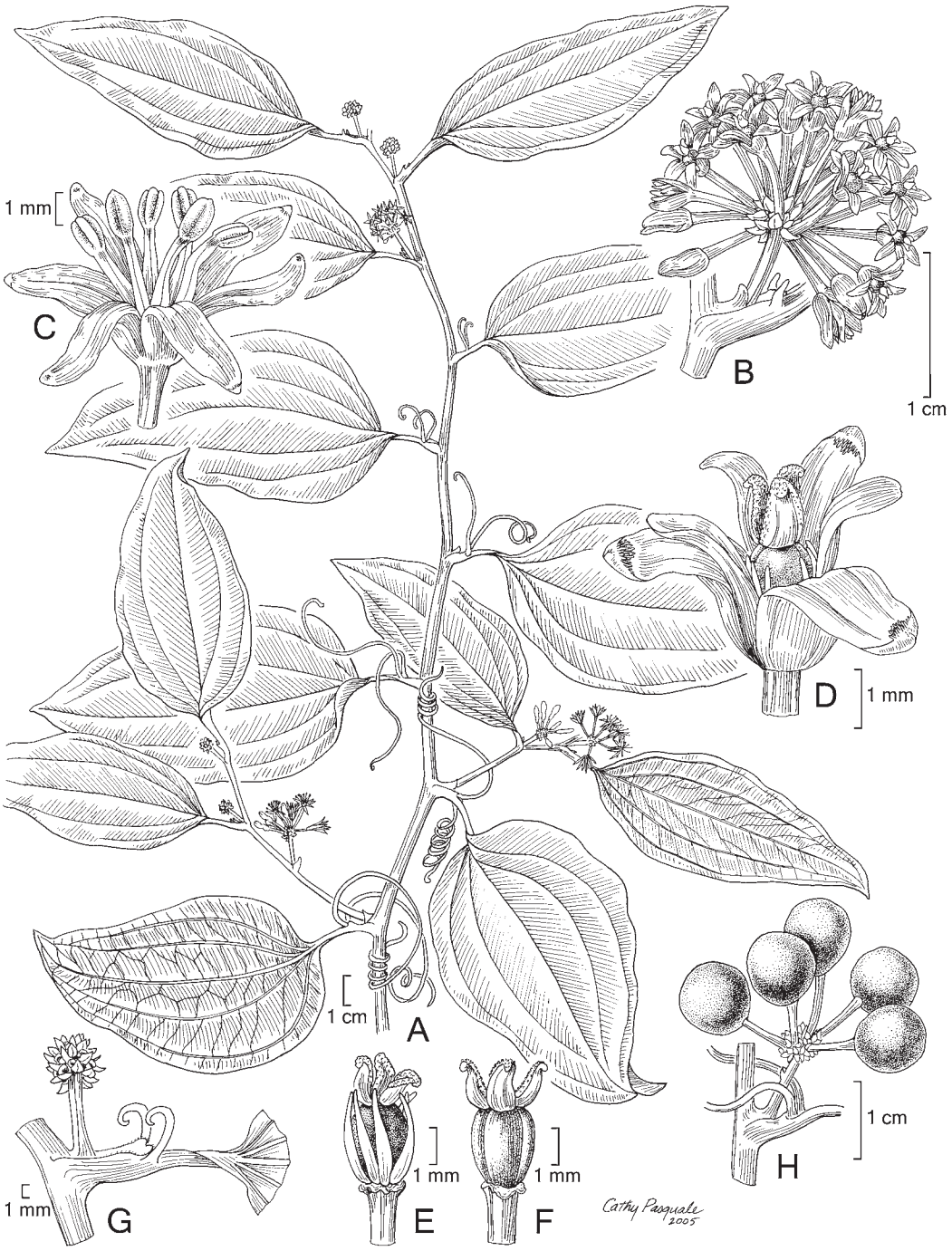
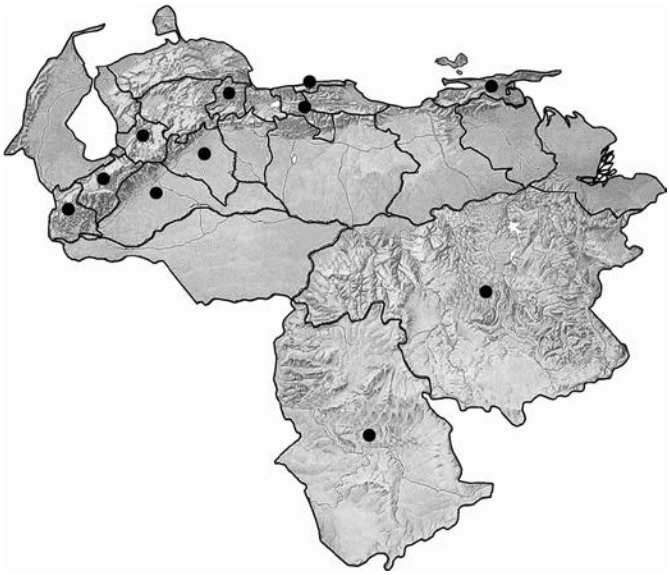
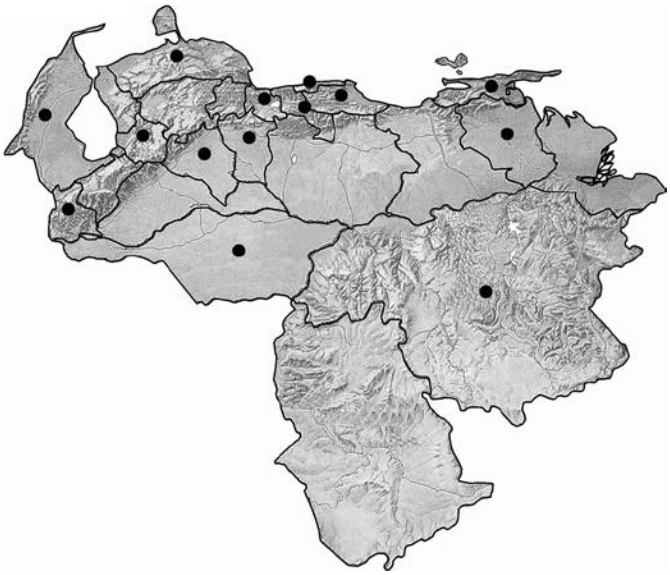


FIGURE 19. Smilacaceae, *Smilax domingensis* Willd. **A.** Habit. **B.** Inflorescence (pistillate). **C.** Flower (staminate). **D.** Flower (pistillate). **E.** Flower (pistillate), tepals removed and staminodes visible. **F.** Flower (pistillate), tepals and staminodes removed, stigmas visible. **G.** Leaf base with paired tendrils. **H.** Infructescence. (A, C, G, *Dorr et al. 8916*; B, D–F, *Dorr et al. 9029*; H, *Dorr et al. 8900*.)



MAP 310. *Smilax domingensis* occurrence in Venezuela.



MAP 311. *Smilax spinosa* occurrence in Venezuela.

Peru, Bolivia, and Brazil). In Venezuela, known from Amazonas, Aragua, Barinas, Bolívar, Distrito Federal, Mérida, Portuguesa, Sucre, Táchira, Trujillo, and Yaracuy (Map 310). Found in cloud forest on both slopes of Guaramacal; 1,800–2,500(–2,900) m.

COMMON NAME. Bejuco chino.

USE. The stems are used to weave baskets (R. Caracas, pers. comm.).

Guaramacal collections of this species are consistently unarmed, but it is possible that these herbarium specimens are not complete and that prickles would be found at the base of the stems of plants in the flora.

Smilax spinosa Mill., Gard. Dict., ed. 8: [Smilax no. 8]. 1768.

Smilax scabriuscula Humb. & Bonpl. ex Willd., Sp. Pl. 4(2): 783. 1806.

Smilax mexicana Griseb. ex Kunth, Enum. Pl. 5: 167. 1850.

Smilax scabriuscula var. *fendleri* A. DC., in Candolle and Candolle, Monogr. Phan. 1: 143. 1878.

Smilax sp. B; Dorr et al., Contr. U.S. Natl. Herb. 40: 59. 2000 [2001].

Smilax kunthii auct., non Killip & C. V. Morton; Dorr et al., Contr. U.S. Natl. Herb. 40: 59. 2000 [2001], pro parte (as to *Steyermark & Rabe 97375*).

Stems slightly angled, striate, glabrous, armed with recurved prickles or unarmed apically; terminal branches zigzag. Leaves lanceolate or ovate-lanceolate, (7–)10–19 × 3–7(–9.5) cm, apices acute, margins entire or armed with prickles, bases rounded or subcordate, 5–7-veined, veins below often armed with recurved prickles, dull; petioles 0.7–1.3 cm long. Inflorescences solitary. Peduncles 2–3 mm long; pedicels ~1 mm long; tepals 1.5–2.5 mm long, tepals of staminate flowers slightly longer than those of pistillate ones. Berries maturing purple to black, 5–7 mm in diameter.

Found in Mexico, Central America, and South America (Colombia, Venezuela, Trinidad and Tobago, the Guianas, Ecuador, Peru, and Bolivia). Widespread in Venezuela (Apure, Aragua, Bolívar, Carabobo, Cojedes, Distrito Federal, Falcón, Miranda, Monagas, Portuguesa, Sucre, Táchira, Trujillo, and Zulia; Map 311). In the park, found on both slopes of Guaramacal; 1,900–2,200(–2,900) m.

The name *Smilax spinosa* is applied to plants with relatively small tepals, peduncles shorter than petioles, and zigzag terminal branches. The type was collected in Mexico, and there is little agreement in the literature with respect to its range: Mexican and Central American floras generally omit South America, whereas Ferrufino-Acosta (2010) in her treatment of the West Indian species of *Smilax* includes northern South America and the northern Andes. In South America, especially in Venezuela and the Guianas, material that is very similar morphologically to *S. spinosa* has been annotated as *S. cumanensis* Humb. & Bonpl. ex Willd., which Ferrufino-Acosta (2010), however, considers synonymous with the West Indian *S. oblongata* Sw. She separates *S. spinosa* from *S. oblongata* on the relative lengths of peduncles and petioles; peduncles are shorter than petioles in the former species and equal to or sometimes longer than petioles in the latter. We believe this synonymy needs to be reexamined especially because the ranges of *S. spinosa* and *S. oblongata* overlap in the Cordillera de la Costa and in the Andes of Venezuela, and determinations of herbarium specimens by Ferrufino-Acosta (pers. obs.) suggest that *S. oblongata* also is found in the northern Andes.

Tofieldiaceae

L. J. DORR AND S. MIGUEL NIÑO

Perennial, rhizomatous herbs. Leaves simple, mostly basal, usually reduced upward on the stems and becoming bracts, linear, unifacial, entire or occasionally serrate, glabrous or inconspicuously tomentose, venation parallel, sometimes striate with a prominent central nerve and ribs. Inflorescences terminal, racemose or flowers solitary; usually bracteate. Flowers perfect, 3-merous, subtended by a calyculus (involucre) of (0)2 or 3(4) free to connate bracteoles; tepals 6, in 2 whorls, petaloid, free or basally connate. Stamens 6(9 or more), in 2 whorls; anthers basifixed or dorsifixed, 2-thecate, introrse to latrorse, dehiscing by longitudinal slits; filaments free, flattened. Gynoecium of 3(4–6) carpels, nearly apocarpous or syncarpous below and apocarpous above, rarely totally syncarpous; ovary superior, 1-locular (apocarpous gynoecium) or 3-locular (partially or totally syncarpous gynoecium); ovules few to many per locule; placentation parietal/marginal (apocarpous gynoecium) or axile (partially or totally syncarpous gynoecium); often with septal nectaries. Fruit a septicidal (or ventricidal) capsule or follicle-like. Seeds ellipsoid to fusiform with stipitate appendages, appendages sometimes reduced or absent.

A principally north temperate and circumboreal family of 3 or 4 genera and ~30 species found in North America (Canada and USA), South America, Europe, and Asia. One genus, *Harperocallis* McDaniel, is found in the tropics and has an unusual disjunction occurring in the USA (Florida) and high elevations in South America.

References. Azuma and Tobe (2011); Remizowa and Sokoloff (2003); Remizowa et al. (2011); Tamura (1998); Tamura et al. (2004); Zomlefer (1997).

The genera of Tofieldiaceae have been placed in a number of different families, including Liliaceae s.l., Nartheciaceae, and Melanthiaceae, but molecular and morphological data now favor recognition of Tofieldiaceae as a distinct family. A morphological apomorphy is the presence of a calyculus, a structure not found in the other families mentioned. (The calyculus is sometimes secondarily lost in *Tofieldia* Huds.). Tofieldiaceae also can be distinguished from Nartheciaceae by fruit dehiscence (septicidal or ventricidal vs. loculicidal) and from Melanthiaceae by leaf orientation and shape (unifacial and equitant vs. bifacial and spiral).

Harperocallis McDaniel

Harperocallis McDaniel, J. Arnold Arbor. 49: 36. 1968.

Perennial herbs. Basal leaves distichous, equitant and unifacial, strongly ribbed, margins tomentose or rarely glabrous. Scape glabrous or rarely with eglandular hairs, 3–19 cauline leaves present, lowermost 1 or 2 well developed and others small and bract-like. Inflorescences a raceme, elongating in fruit. Flowers pedicellate, each pedicel subtended by a bract; each flower subtended by a calyculus of 3 free bracteoles. Tepals narrowly elliptic to narrowly obovate, persistent, connate basally, 5–9-ribbed. Stamens 6, free; anthers latrorse, basifixed; filaments free at base. Ovary ± oblong, 2–3 mm tall, 3-locular; ovules numerous; styles fused almost to apex, apex usually truncate; stigmas 3, capitate. Capsules septicidal, 3–9-ribbed. Seeds fusiform, dark red with a white appendage at the chalazal end, decurrent along the seed body.

A genus of 10–12 species found in North America (USA) and South America. The South American species are found in the Andes (Colombia, Venezuela, Ecuador, Peru, and Bolivia) and the Guayana Highlands (Venezuela, Guyana, and Brazil). Eight or 9 species of *Harperocallis* occur in Venezuela.

References. Campbell and Dorr (2013); Cruden (1991).

Harperocallis is distinguished from other genera of Tofieldiaceae by its connate styles, pubescent leaf margins, and seed appendage that is decurrent along the seed body. The genus is known in recent literature as *Isidrogalvia* Ruiz & Pav., but that generic name is superfluous and illegitimate because it included the type species of *Tofieldia* when it was published. A nomenclatural proposal (Sokoloff et al., 2011) to conserve *Isidrogalvia* with a conserved type was rejected (see Applequist, 2012: 1113).

Harperocallis robustior (Steyerm.) L. M. Campb. & Dorr, PhytoKeys 21: 47. 2013. *Tofieldia sessiliflora* var. *robustior* Steyerm., Fieldiana, Bot. 28: 157. 1951. *Isidrogalvia robustior* (Steyerm.) Cruden, Syst. Bot. 16: 279. 1991; Dorr et al., Contr. U.S. Natl. Herb. 40: 59. 2000 [2001]; Morillo, in Morillo et al., Bot. Ecol. Monocot. Páramos Venez. 2: 534–535. 2010.

FIGURE 20

Tofieldia sessiliflora auct., non Hook.; Ortega et al., BioLlania 5: 44. 1987.

Perennial herbs. Basal leaves sometimes falcate, 10–35 × 0.5–0.85 cm, margins tomentose. Scape glabrous, 15–65 cm tall, with 0 or 1 well-developed cauline leaf and 7–17 bracts above

MAP 312. *Harperocallis robustior* occurrence in Venezuela.

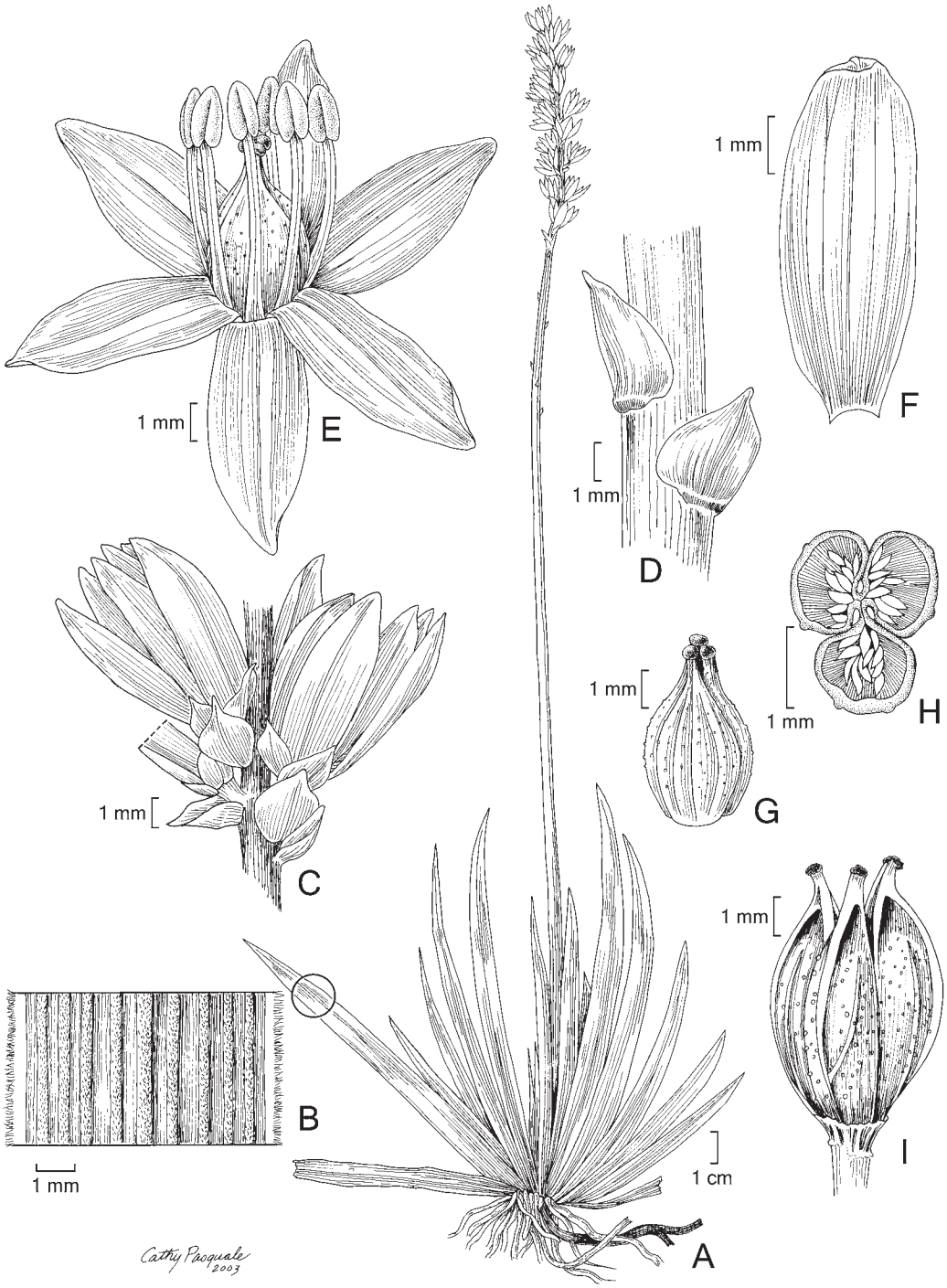


FIGURE 20. Tofieldiaceae, *Harperocallis robustior* (Steyerm.) L. M. Campb. & Dorr **A.** Habit. **B.** Leaf (detail of parallel veins and tomentose margins). **C.** Inflorescence (detail showing scape bracts and calyculus subtending flowers). **D.** Scape bracts (detail). **E.** Flower. **F.** Tepal. **G.** Ovary. **H.** Ovary (cross section showing axile placentation and ovules). **I.** Capsule. (A, I, *Dorr et al. 4967*; B–H, *Stergios et al. 17327*.)

the middle. Inflorescences generally elongated in fruit. Flowers few to several, greenish-yellow; pedicels 0.5–1 mm long (5–6 mm long in fruit). Tepals 7–10 × 1–1.5 mm. Stamens slightly shorter than tepals. Styles separating at dehiscence. Capsules incompletely 9-ribbed.

Endemic to the Andes of Venezuela (Lara and Trujillo; Map 312). In the park, found in the Páramo de Guaramacal, near the Laguna del Pumar, and on the summit of Cerro El Diablo; (1,950–)2,350–3,100 m.

Harperocallis sessiliflora (Hook.) L. M. Campb. & Dorr can be distinguished from *H. robustior* by the presence of eglandular hairs on the scape. Although the two species do not appear to be sympatric, the northernmost populations of the former, which is known from Colombia and Venezuela, approach the southernmost populations of the latter.

XANTHORRHOEACEAE

L. J. DORR

Perennial herbs, rarely vines or nonwoody subshrubs, caespitose or rhizomatous. Roots fibrous and/or tuberous. Leaves mostly basal (rarely clustered at stem apex), distichous, unifacial, strictly bifacial or with an occluded region (i.e., bifacial both at the basal and distal ends of the leaf blade but in between just after diverging from the leaf sheath semiensiform and unifacial). Inflorescences variously branched panicles (or helicoid cymes), terminal, or flowers solitary; bracteate. Flowers actinomorphic or slightly zygomorphic, perfect, pedicellate, pedicels usually articulated. Perianth wholly or partially marcescent. Tepals 6, distinct or shortly connate into a tube, whorls subequal or inner slightly longer than the outer, variously colored. Stamens 6, free or slightly connate at base; filaments distinct, ornamented or not; anthers 2-loculed, basifixed, dorsifixed or centrifixed. Ovary superior or ½-inferior, 3-locular (sometimes 3-locular below, 1-locular above); ovules few to many per locule; placentation axial or apical; style simple (rarely 3-parted apically), filiform; stigma terminal, punctiform to capitate. Septal nectaries present or not. Fruit a berry or capsule with complete or partial loculicidal dehiscence. Seeds ovoid; testa black, without appendages; endosperm copious.

A family of 35 genera and ~900 species found in South America, Europe, Africa, Madagascar, Asia, Australia, and the Pacific Islands. One genus is native to Venezuela, and several species-rich Old World genera are cultivated. At present, only 1 species of these cultivated Old World genera is known to be naturalized in Venezuela.

REFERENCES. Clifford (1998); Clifford et al. (1998); Smith and Van Wyk (1998); Wurdack and Dorr (2009); Zomlefer (1998).

Xanthorrhoeaceae comprises three well-defined subfamilies, including the Hemerocallidoideae to which the American genera belong and to which our family description applies. *Eccremis* Willd. ex Baker and *Pasithea* D. Don are the only Hemerocallidoideae native to South America, and despite their geographic proximity and the partial overlap of their respective ranges in southern Peru (at different elevations and apparently not sympatric), they are not closely related and clearly represent two separate introductions into the Americas. *Eccremis*, the genus found in this flora, is more closely related to *Dianella* Lam. ex Juss., which is native to Australia, Papua New Guinea, New Zealand, and other islands in the Pacific Ocean, than it is to its South American congener *Pasithea* (Wurdack and Dorr, 2009).

Hemerocallis L., an Asian genus of Hemerocallidoideae, is cultivated in Venezuelan parks and gardens but does not appear to escape. Species of subfamily Asphodeloideae, which are native to Africa, also are cultivated in Venezuela, and *Aloe vera* (L.) Burm. f., at least, is naturalized. This xerophytic species is found at elevations below 600 m and can be distinguished easily from *Eccremis* by its large rosette of succulent leaves and red flowers.

Eccremis Willd. ex Baker

Eccremis Willd. ex Baker, J. Linn. Soc., Bot. 15: 319. 1876.

Perennial herbs, to 2 m tall, rhizomatous or with short stems (not tuberous). Leaves clustered at the base, sheath flattened and flabellate, usually with an occluded region (appearing equitant), gradually reduced in size toward the apex; leaf blades linear-lanceolate, glabrous. Inflorescences lax corymbiform panicles; bracts leafy, conspicuous. Flowers showy, pendulous, pedicel articulated immediately below the flower; tepals prominently 5-nerved, to 10 mm long, blue (rarely white); stamens 6, minutely epitepalous, anthers centrifixed, filaments with a central swelling, minutely papillose, equal in length. Ovary superior; ovules numerous per locule. Stigma capitate. Capsule somewhat fleshy, loculicidal but only apically and not completely loculicidal, narrowly oblong, glabrous, pendulous; seeds ovoid.

A monotypic genus confined to South America, where it is found at high elevations in the Andes (Colombia, Venezuela, Ecuador, Peru, and Bolivia), the Cordillera de la Costa (Venezuela), and the Guayana Highlands (Venezuela and Brazil).

REFERENCES. Ely and Luque Arias (2006); Schlittler (1940).

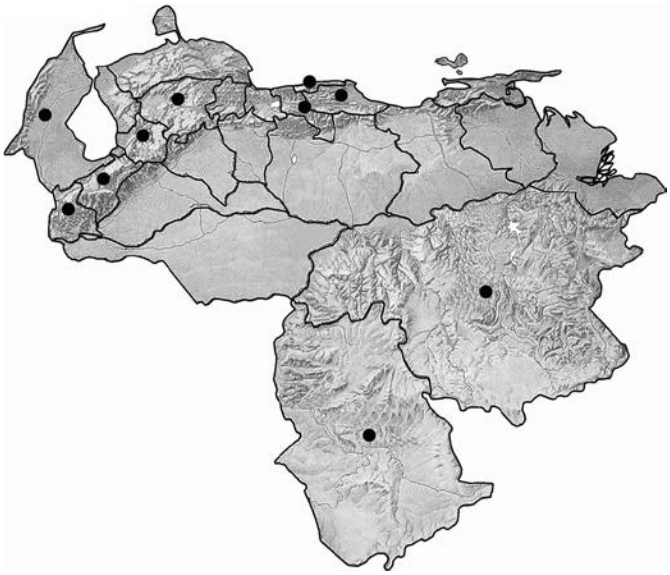
In the park, *Eccremis* can only be confused with *Orthrosanthus* (Iridaceae), from which it differs in having pendulous (vs. erect) flowers, 6 (vs. 3) stamens, glabrous (vs. pubescent) capsules, and ovoid (vs. flat) seeds.

Eccremis coarctata (Ruiz & Pav.) Baker, J. Linn. Soc., Bot. 15: 320. 1876; Cruden, in Berry et al., Fl. Venez. Guayana 6: 7–8, fig. 5. 2001; Morillo, in Morillo et al., Bot. Ecol. Monocot. Páramos Venez. 2: 506–508, fig. 1, foto 1. 2010. *Anthericum coarctatum* Ruiz & Pav., Fl. Peruv. 3: 67, t. 299, fig. a. 1802.

FIGURE 26E

Dianella dubia Kunth, in H. B. K., Nov. Gen. Sp. [fol.] 1: 214. 1815 [1816]; ibid. [qu.] 1: 270. 1815 [1816]; ibid. [qu.] 7: t. 675. 1825.

Eccremis coarctata f. *alba* Steyerm., Fieldiana, Bot. 28: 153. 1951 ("*Excremis*").



MAP 313. *Eccremis coarctata* occurrence in Venezuela.

The characters of this species are the same as those of the genus.

The distribution of this species is the same as that of the genus. In Venezuela, *Eccremis coarctata* is found only at high elevations (1,800–3,900 m) in the Andes (Lara, Mérida, Táchira, and Trujillo), the Sierra de Perijá (Zulia), the Cordillera de la Costa (Aragua, Distrito Federal, and Miranda), and the Venezuelan Guayana (Amazonas and Bolívar; Map 313). Páramo del Pumar; ~2,600 m.

The label on a specimen of *Eccremis coarctata* from Venezuela (*Pittier 7578*, US) suggested that the species was collected at 200–400 m, an elevation well below those recorded for this species and in an unlikely locality (viz., Carabobo). Knuth (1928: 199), however, indicated that the mislabeled specimen in question was in fact from Galipán (Distrito Federal) and collected at 1,600–1,700 m.

Xyridaceae

L. J. DORR AND S. MIGUEL NIÑO

Perennial or rarely annual herbs, rosulate to caulescent, usually terrestrial, rarely aquatic (rooted never floating); caudex usually short; roots fibrous. Leaves alternate, simple, distichous or spiral; ligulate or not, bases broad; sheaths open, often equitant and keeled; blades laterally to dorsiventrally compressed, terete, angular or canaliculate. Inflorescences lateral or terminal, scapose; scapes 1 to few, arising from axils of scape sheaths or inner leaves, usually naked, each scape bearing at the apex 1(–2) imbricate-bracted spike or head or a panicle of spikes. Flowers perfect, 1 to many, subsessile to pedicellate in axils of chaffy, leathery or scarious bracts; perianth heterochlamydeous. Sepals (2) 3, unequal, anterior (inner) sepal rarely absent or weakly developed (*Abolboda* Bonpl. or *Xyris* L.), membranous and enveloping the corolla, usually caducous at anthesis (*Abolboda* and *Xyris*), the other 2 sepals subopposite, connivent to connate, chaffy to indurate, navicular, often keeled, clasping the mature capsule. Petals 3, equal or subequal, usually clawed, distinct or basally connate and tubular, salverform or porrect, yellow, blue, purple or white. Stamens 3(6), usually epipetalous, oppositipetalous; anthers basifixed, 2-thecate, 4-sporangiate, introrsely or laterally dehiscent, dehiscing longitudinally; staminodes (1–)3, clawed, distally 2-armed, plumose with moniliform or filiform hairs. Ovary superior, 1- or 3-locular, at least basally; ovules numerous, orthotropous or anatropous; placentation free-central/basal or parietal (1-locular ovary); style 1, appendaged or not; stigmas 3-branched to U-shaped stigmas. Fruit a capsule, loculicidally dehiscent; seeds usually numerous, ellipsoid to globose, longitudinally striate to ridged.

An essentially pantropical family of 5 genera and ~400 species; 4 of the 5 genera, however, are restricted to South America, and the largest and most widely distributed genus *Xyris* also occurs in temperate regions of North America, Asia, and Australia. In the Americas, Xyridaceae are found in North America (Canada and USA), Mexico, Central America, the West Indies, and South America (Colombia, Venezuela, the Guianas, Ecuador, Peru, Bolivia, Brazil, Paraguay, Argentina, and Uruguay). All 5 genera and ~100 species occur in Venezuela; approximately half of these species are endemic.

References. Campbell (2012); Idrobo (1954); Kral (1983, 1992, 1998); Rudall and Sajo (1999).

Molecular phylogenetic analyses of Xyridaceae do not resolve the family as monophyletic (Michelangeli et al., 2003; Davis et al., 2004), and if Xyridaceae s.l. is recognized (as is done here), there are clearly two major lineages. Morphology and palynology also tend to support this division (Kral, 1992, 1998). The lineage comprising *Xyris* and *Achlyphila* Maguire & Wurdack (Xyridaceae s. str.) is marked by having usually distinct petals, distichous leaves, unappendaged styles, and pollen without spines or protuberances. The lineage comprising *Abolboda*, *Aratitiyopea* Steyerm. & P. E. Berry, and *Orectanthe* Maguire is united by having gamopetalous petals, polystichous leaves, styles with appendages, and pollen with spines or clavae. The latter lineage has been recognized at family rank as Abolbodaceae.

Xyris L.

Xyris L., Sp. Pl. 42. 1753.

Perennial or annual herbs; usually rosulate, solitary or caespitose. Leaves mostly equitant, distichous; ligulate; leaf blades usually laterally compressed, linear or sometimes terete or canaliculate. Scapes 1 to few per shoot, naked, terminating in 1 spike or head; bracts sometimes involucral, mostly chaffy. Flowers subsessile, solitary in bract axils. Sepals 3, 1 anterior (inner) sepal membranous, enveloping the corolla in bud, caducous at

anthesis, 2 lateral sepals navicular, free or connate with a variously margined keel. Petals 3, free (rarely connate), long-clawed, yellow. Stamens 3; filaments flattened and narrow; staminodes 3 or 0, usually 2-branched, branches bearded. Ovary 1- or 3-locular; placentation basal, central, or sometimes marginal, parietal or transitional; style elongate, 3-branched, each branch terminating in a U-shaped or semi-infundibuliform stigma; stylar appendages absent. Capsules membranous; seeds ovoid or fusiform, few to many.

Xyris with ~390 species is the most species-rich genus in the family, and it is found throughout the tropics and in temperate regions worldwide. Approximately 80 species occur in Venezuela, the majority confined to the Venezuelan Guayana.

REFERENCE. Kral (1988).

Xyris subulata Ruiz & Pav., Fl. Peruv. 1: 46, t. 71, fig. b. 1798; Briceño and Campbell, in Morillo et al., Bot. Ecol. Monocot. Páramos Venez. 2: 728–730, fig. 2. 2010.

This species is composed of at least five varieties; the following is the most widely distributed variety and the only one known to occur in Venezuela.

Xyris subulata var. ***acutifolia*** Heimerl, Ann. K.K. Naturhist. Hofmus. 21: 63. 1906. *Xyris acutifolia* (Heimerl) Malme, Ark. Bot. 13(3): 40. 1913.

FIGURE 21

Perennial herbs, densely caespitose; stems contracted to slightly elongate. Leaves 10–14(–20) cm × (0.5–)1–2 mm, glabrous; sheaths entire, to 2–5 cm long, bases often shiny, pale to dark brown; ligules to 2 mm long or absent; leaf blades filiform to narrowly linear, flattened, margins smooth to papillate or scaberulous, apices narrowly acute. Scapes usually longer than the leaves, to 40 cm long, terete or oval in cross section. Spikes narrowly oblong to ovoid, 0.5–1 cm long. Petals mostly ovate, 3–5 mm long, yellow, apices rounded, coarsely erose. Staminodes 2-branched, branches flat, penicillate. Capsules ellipsoid, ~2.5–4 mm long.

MAP 314. *Xyris subulata* var. *acutifolia* occurrence in Venezuela.

Found in Central America (Costa Rica and Panama) and South America (Colombia, Venezuela, Guyana, Ecuador, and Peru). In Venezuela, recorded from the Andes (Lara, Mérida, Táchira, and Trujillo) and the Cordillera de la Costa (Anzoátegui and Sucre; Map 314). In the park, found in open, humid, and wet areas of the páramos of Guaramacal and Pumar, the Fila de Agua Fría, and other subpáramo areas; (2,350–)2,800–3,100 m.

Xyris subulata var. *acutifolia* is distinguished from the nominate variety by having entire (vs. ciliate) leaf sheath edges and contracted (vs. elongate) stems. *Xyris subulata* var. *subulata* is also Andean, but it does not occur in Venezuela and is known only from Colombia, Ecuador, and Peru.

ZINGIBERACEAE

L. J. DORR AND B. STERGIOS

Perennial or rarely annual herbs; terrestrial (our species) or epiphytic; rhizomatous; aromatic. Aerial stems short, poorly developed or absent, unbranched; pseudostems (formed by overlapping sheaths) tall, generally conspicuous. Leaves distichous; sheaths usually open; ligule present or absent. Leaf blade entire; petiole present or absent; pulvinus usually absent (present in *Zingiber* Mill.). Inflorescences terminal on pseudostems or at the apex of short scapes arising from the rhizome and independent of pseudostems, lax or compact, few- to many-flowered monochasial cymes (cincinni); bracts of main axis enclosing or subtending flowers or cincinni. Flowers bisexual, epigynous, zygomorphic, heterochlamydeous. Calyx tubular, turbinate or urceolate, usually 3-lobed or 3-toothed, sometimes split down 1 side. Petals 3, adnate basally to the androecium to form a narrow tube, the dorsal lobe larger than the other 2 lobes. Androecium highly modified, consisting of 1 fertile stamen (not petaloid), a 2-lobed petaloid labellum, and sometimes 2 petaloid or toothlike, lateral staminodes, ± free or fused to the labellum; fertile stamen with a long or short filament; anther 2-thecate. Gynoecium 3-carpellate; ovary inferior, 3-locular and placentation axile, or 1-locular and placentation parietal or basal; ovules many, ± anatropous. Style terminal, in a furrow of the filament and held between the 2 thecae; stigma funnelform, sometimes slightly 2-lobed, slightly exserted from the thecae. Nectaries 2, epigynous. Fruit usually a capsule, loculicidally dehiscent from apex to base, 3-valved, irregularly dehiscent or indehiscent. Seeds few to many, ovoid to ellipsoid or subglobose, usually arillate.

A family of ~50 genera and 1,200–1,300 species found in the tropics and subtropics worldwide; centers of species diversity occur in East Asia and the Pacific Islands. In the neotropics, only the genus *Renealmia* L. f. is native. In Venezuela, species of the Asiatic genera *Alpinia* Roxb. and *Hedychium* J. Koenig are introduced and naturalized, and species of other paleotropical

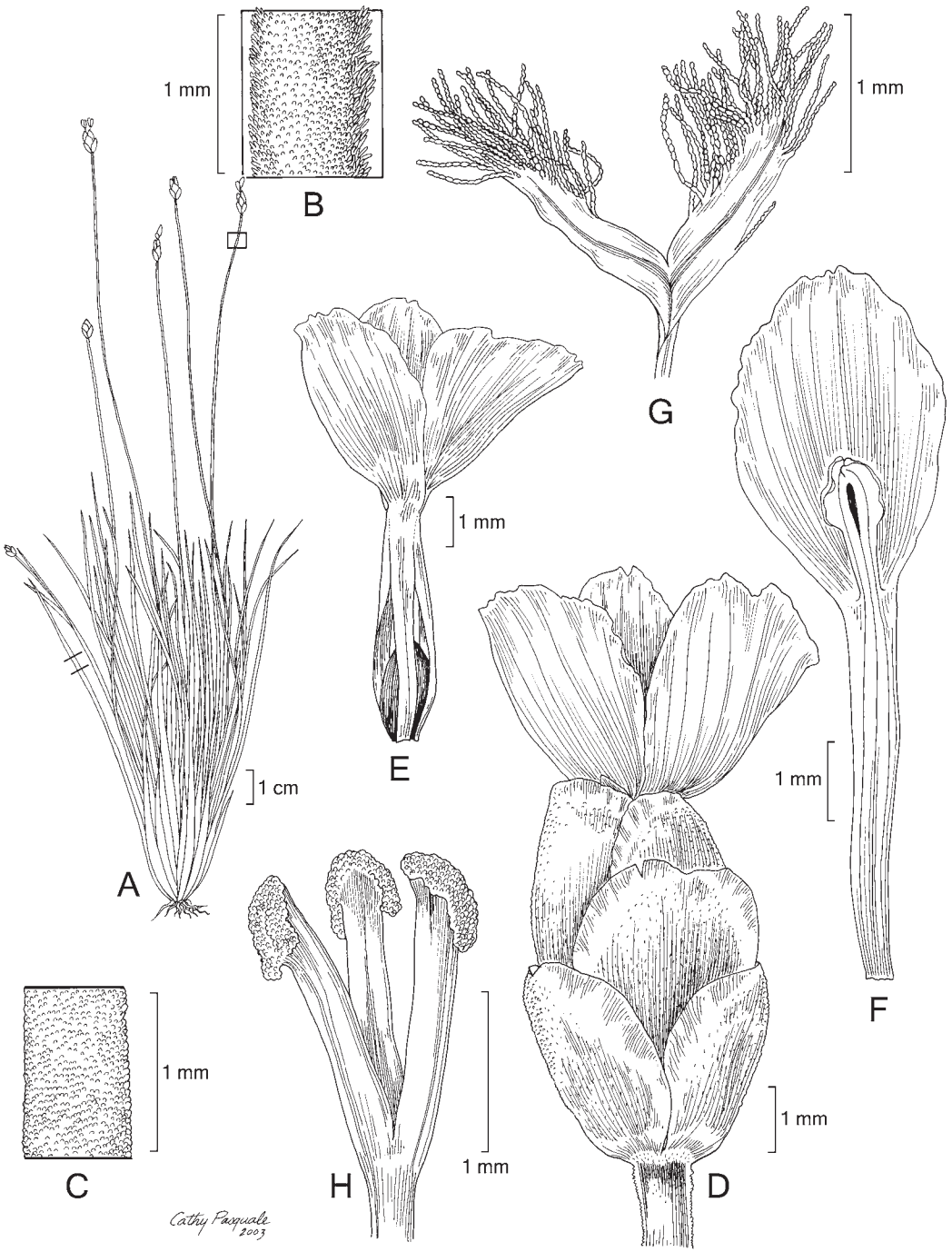


FIGURE 21. Xyridaceae, *Xyris subulata* var. *acutifolia* Heimerl. **A.** Habit. **B.** Scape (detail of surface). **C.** Leaf (detail of surface). **D.** Spike showing bracts and exserted apices of petals. **E.** Flower. **F.** Petal with adnate stamen. **G.** Plumose staminode. **H.** Apex of gynoecium. (A–C, *Dorr et al. 8037*; D–H, *Dorr et al. 4950*.)

genera such as *Aframomum* K. Schum., *Curcuma* L., *Etlingera* Giseke, and *Zingiber* are cultivated in gardens.

REFERENCES. Kress et al. (2002); Larsen et al. (1998); Rogers (1984).

The family is important as a source of commercial spices, including ginger (*Zingiber officinale* Roscoe), turmeric (*Curcuma longa* L.), and cardamom (*Elettaria cardamom* (L.) Maton and *Amomum* spp.).

KEY TO THE GENERA OF ZINGIBERACEAE

1a. Inflorescences terminal on pseudostems; bracts green; corolla white; lateral staminodes 3.5–4.5 cm long . . . . . ***Hedychium***
1b. Inflorescences at base of plant on a short scape; bracts pink to bright red; corolla yellow to yellow-orange or orange; lateral staminodes 1–2(–3) mm long . . . . . ***Renealmia***

• *Hedychium* J. Koenig

Hedychium J. Koenig, in Retzius, Observ. Bot. 3: 61 [as "73"]. 1783.

Terrestrial (our species) or epiphytic herbs. Pseudostems well developed. Leaves sessile or petiolate; blades oblong or lanceolate; sheaths open; ligules conspicuous. Inflorescences terminal spikes; cincinni (1-) several-flowered; bracts broad and densely imbricate or narrow and exposing the inflorescence axis; bracteoles small, inconspicuous, usually tubular. Flowers white (our species), yellow or red. Calyx tube short, usually split on 1 side. Corolla tube usually much longer than calyx and bracts; labellum large and showy, emarginate to 2-cleft; lateral staminodes 2, ± as long as the petal lobes, petaloid, and showy. Filament ± equal in length to labellum, usually much longer than the anther. Capsules 3-valved, globose or ellipsoid. Seeds numerous; aril lacerate.

Approximately 50–65 species native to Madagascar and Asia, with the greatest species diversity in tropical parts of the Himalayas and in Malaysia. At least 2 species have been introduced into Venezuela as ornamental plants, the following one now completely naturalized.

REFERENCE. Wood et al. (2000).

MAP 315. *Hedychium coronarium* occurrence in Venezuela.

• ***Hedychium coronarium*** J. Koenig, in Retzius, Observ. Bot. 3: 61 [as "73"]. 1783.

FIGURE 22H,I

Erect herbs, 1–3 m tall, forming dense colonies. Leaf blades narrowly elliptic to oblong-lanceolate or lanceolate, (10–)20–60 × 3–10 cm, glabrous above, finely pubescent below, sessile; ligules 1–4 cm long. Inflorescences dense, ellipsoid spikes, 5–20 × 3–8 cm; cincinni (1) 2–6-flowered; bracts ovate to oblong, 4–5 × 2–3 cm; bracteoles tubular, 30–35 mm long. Calyx tube 3–4 cm long, split on 1 side. Corolla tube very narrow, 10–12 cm long, white, but bright yellow in the center of the lobes, lobes linear-reflexed; lateral staminodes 3.5–4.5 cm long, petaloid, white, fragrant. Capsules ovoid. Seeds black; aril red turning yellow.

Native to Asia. In the Americas, naturalized in North America (USA), Mexico, Central America, the West Indies, and South America (almost all country-level political units). Widespread in Venezuela (Amazonas, Aragua, Carabobo, Cojedes, Distrito Federal, Mérida, Miranda, Nueva Esparta, Portuguesa, Sucre, Trujillo, and Yaracuy; Map 315). Found near the lower boundaries of the park in Qda. Chanda on the north slope and near La Divisoria de la Concepción on the south slope; ~1,350 m.

Renealmia L. f.

Renealmia L. f., Suppl. Pl. 7, 79. 1781 [1782], nom. cons.

Terrestrial herbs. Leaves short-petiolate or sessile; sheaths open; ligules small; leaf blades ± narrowly elliptic. Inflorescence a raceme, terminating a separate, leafless shoot (our species) or sometimes terminal on a pseudostem; bracts herbaceous to membranous, striate, persistent, but then deciduous, enclosing a single flower (our species) or cincinni of 2–10 flowers; bracteoles herbaceous, tubular, and closed, or cyathiform and opening before anthesis (our species). Calyx tubular, turbinate or urceolate, 3-lobed, green, yellow, orange or red. Corolla tubular at base, exceeding the calyx, white or red, lobes imbricate in bud, 1 upper lobe larger than 2 lateral lobes; labellum clawed, often pubescent, with 2 very small, toothlike lateral staminodes; limb (apical portion of labellum) composed of 2 rounded lateral lobes

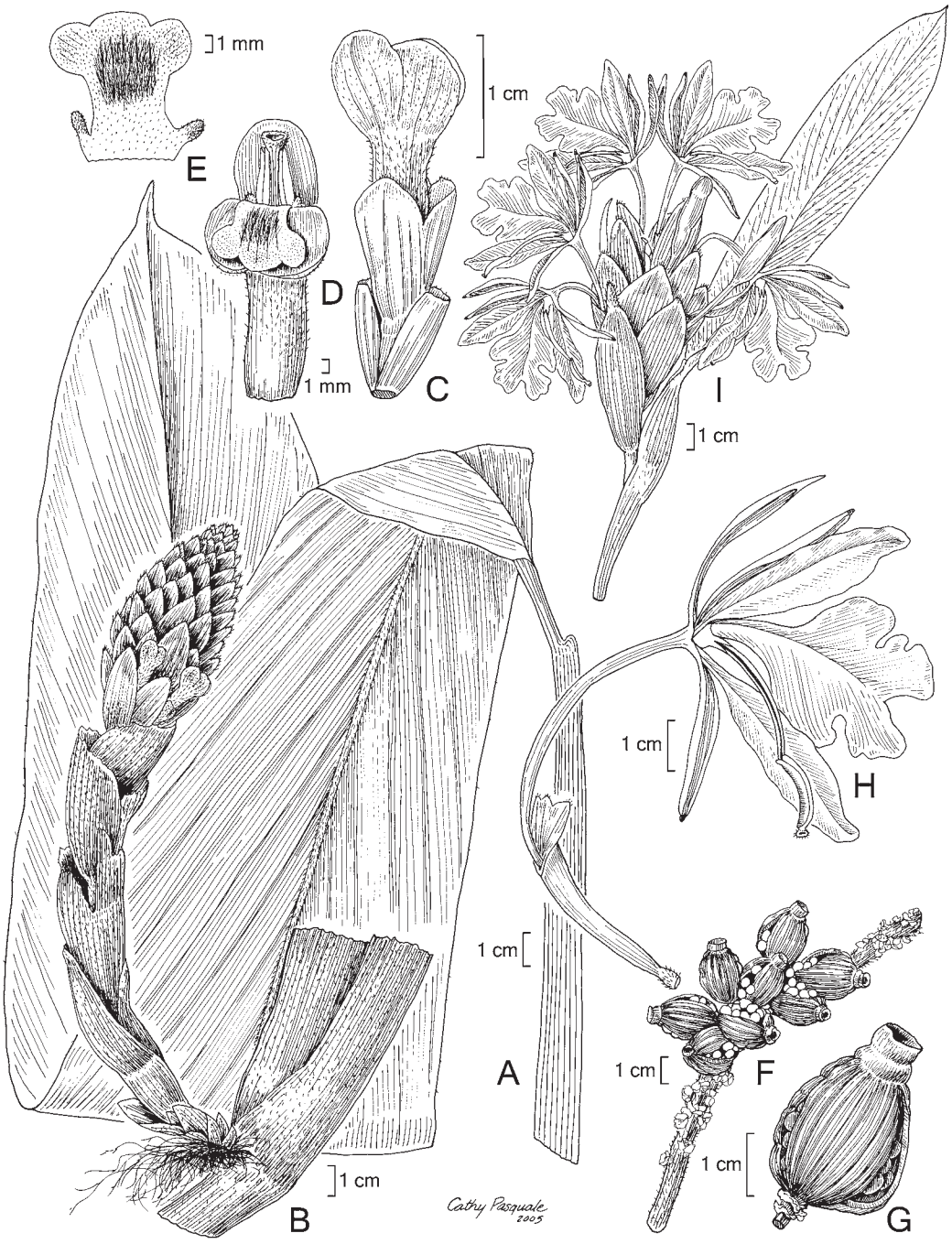


FIGURE 22. Zingiberaceae. **A–G.** *Renealmia thyrsoidea* (Ruiz & Pav.) Poepp. & Endl. subsp. *thyrsoidea*. **A.** Habit. **B.** Inflorescence. **C.** Flower. **D.** Flower (detail). **E.** Petal. **F.** Infructescence. **G.** Capsule. **H, I.** *Hedychium coronarium* J. Koenig. **H.** Flower. **I.** Inflorescence. (A, G, *Dorr & Stergios 8851*; B, *Dorr & Yustiz 8547*; C–F, *Dorr et al. 8619*; H, I, *Angulo & Jeferson 15*.)

and an entire or 2-lobed middle one. Stamen 1; filament shorter than labellum, ± equal to or shorter than anther. Ovary 3-locular, ellipsoid to globose; ovules few to many, 2-seriate. Capsules often black or red, 3-locular, ellipsoid to globose, ± fleshy, loculicidally dehiscent from base to apex, typically crowned by the persistent calyx. Seeds few to many; arillate.

A tropical American and African genus of ~100 species, of which ~75 are neotropical. In the Americas, found in Mexico, Central America, the West Indies, and South America (Colombia, Venezuela, Trinidad and Tobago, the Guianas, Ecuador, Peru, Bolivia, and Brazil). A dozen species are known from Venezuela.

References. Maas (1977); Särkinen et al. (2007).

The amphi-Atlantic distribution of *Renealmia* is remarkable as few angiosperm genera have significant numbers of species in both Africa and the neotropics. Molecular evidence indicates that *Renealmia* migrated from Africa to the Americas by the Miocene or Pliocene (15.8–2.7 mya; Särkinen et al., 2007).

Renealmia thyrsoidea (Ruiz & Pav.) Poepp. & Endl., Nov. Gen. Sp. Pl. 2: 26. 1838. *Amomum thyrsoideum* Ruiz & Pav., Fl. Peruv. 1: 2, t. 2. 1798.

Only the nominate subspecies has been collected in Venezuela and Guaramacal.

Renealmia thyrsoidea subsp. ***thyrsoidea***

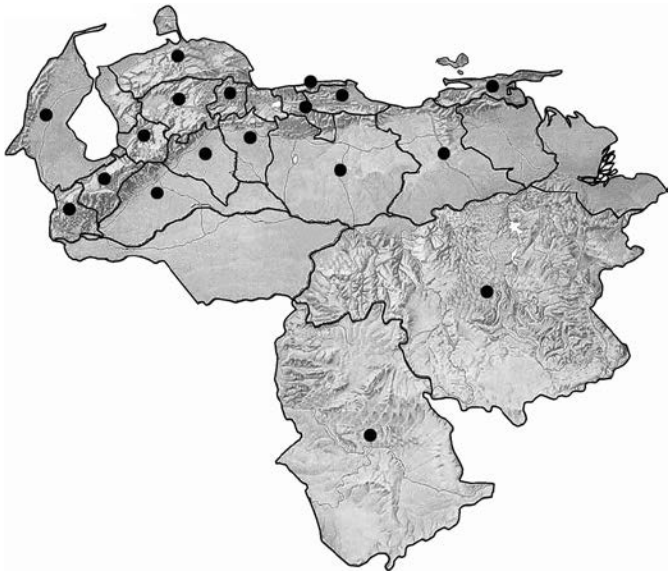
Maas, in Lasser, Fl. Venez. 11(2): 215–218, fig. 2. 1982.

FIGURE 22A–G

Erect herbs, 1–4(–5) m tall, forming colonies; rhizomes, crushed leaves, and floral parts all sweetly scented. Leaf blades narrowly elliptic, 35–55(–90) × 10–20 cm, bases cuneate, apices acuminate, midrib (when dry) darker than the blade, glabrous to sparsely covered with minute, bifid hairs above and below; petioles to 2.5–3 cm long; ligules 1–2 mm long. Inflorescences racemes, ~5–10 × ~3–5 cm, terminal on scapes arising from the rhizome and independent of the leafy stems; all parts of the inflorescence moderately to sparsely covered with small simple, forked or branched hairs; bracts ovate-obovate or obovate-triangular, 10–50 × 5–35 mm, pink to bright red; bracteoles cyathiform, 5–15(–20) mm long, open before anthesis. Calyx tubular, 10–25 mm long, yellow to red. Corolla tubular, 20–35 mm long, yellow to yellowish-orange or orange, lateral lobes involute; lateral staminodes 1–2 mm long. Capsules 1.5–4 × 1–2.5 cm. Seeds black; arils yellow to red.

Found in Central America (Costa Rica and Panama) and South America (Colombia, Venezuela, Trinidad and Tobago, Ecuador, Peru, Bolivia, and Brazil). Widespread in Venezuela (Amazonas, Anzoátegui, Aragua, Barinas, Bolívar, Cojedes, Distrito Federal, Falcón, Guárico, Lara, Mérida, Miranda, Portuguesa, Sucre, Táchira, Trujillo, Yaracuy, and Zulia; Map 316). In the park, found in various localities on both slopes of Guaramacal; 1,600–2,100 m.

Common Name. Conópia.



MAP 316. *Renealmia thyrsoidea* subsp. *thyrsoidea* occurrence in Venezuela.

Renealmia thyrsoidea subsp. *chrysantha* Maas, endemic to Guyana and Suriname, is distinguished from our subspecies mainly by the color of the bract and the calyx (golden-yellow vs. red), and also by its longer peduncles, pedicels, and calyces.

LIST OF NEW COMBINATIONS

Cyperaceae

Cyperus hortensis (Salzm. ex Steud.) Dorr, comb. nov.

Orchidaceae

Acronia archidiaconi (Ames) Carnevali & G. A. Romero, comb. nov.

Crocodeilanthe gelida (Lindl.) Carnevali & I. Ramírez, comb. nov.

Fernandezia schultesii (L. O. Williams) Carnevali & Dorr, comb. nov.

NOTE ADDED IN PROOF

Recently a narrower concept of *Anathallis* (Orchidaceae) than the one we adopted was proposed and the two species we recognized transferred to *Stelis*. While the author of this proposal argues that this creates a monophyletic *Anathallis*, the implications for *Stelis* are less clear and await further study. Karremans, A. P. 2014. *Lankesteriana*, a New Genus in the Pleurothallidinae (Orchidaceae). *Lankesteriana* 13: 219–332.

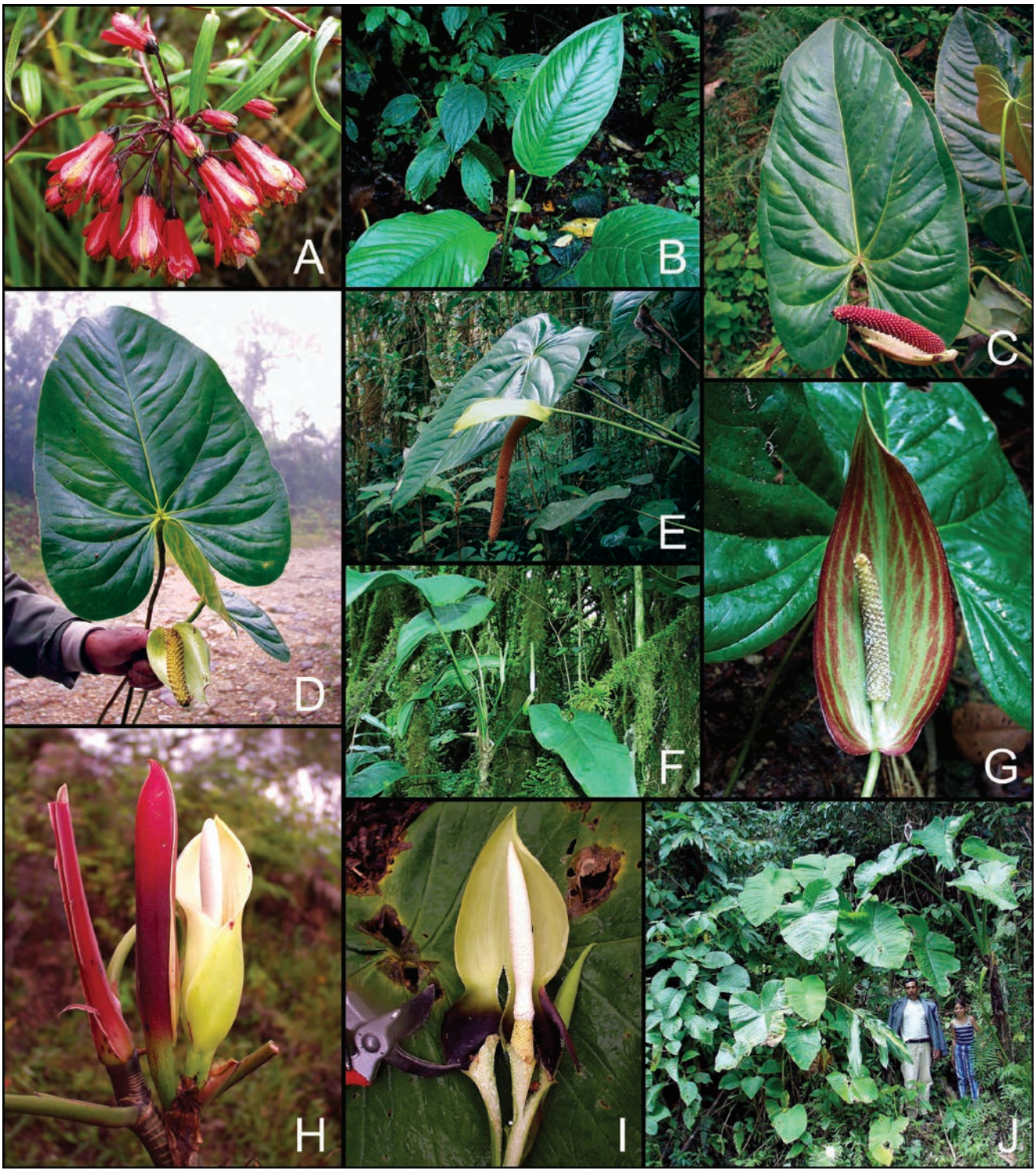


FIGURE 23. A. Alstroemeriaceae. *Bomarea amilcariana* Stergios & Dorr. Inflorescence. **B–J.** Araceae. **B.** *Anthurium amoenum* Kunth & C. D. Bouché. Habit. **C, D.** *A. nymphaeifolium* K. Koch & C. D. Bouché. **C.** Leaf and inflorescence; note white spathe and red spadix. **D.** Leaf and inflorescence; note greenish-white spathe and yellow spadix. **E.** *A. ramoncaracasii* Stergios & Dorr. Leaf and inflorescence; note length of spadix relative to spathe. **F.** *A. smaragdinum* G. S. Bunting. Habit. **G.** *A. ginesii* Croat. Leaf base and inflorescence. **H.** *Philodendron fraternum* Schott. Inflorescence. **I, J.** *Xanthosoma sagittifolium* (L.) Schott. **I.** Inflorescence. **J.** Habit. (A–J, photographer B. Stergios).

FIGURE 24. A–C. Arecaceae. *Wettinia praemorsa* (Willd.) Wess. Boer. **A.** Habit and habitat (Qda. Segovia). **B.** Inflorescence. **C.** Infructescence. **D–J.** Bromeliaceae. **D, E.** *Puya aristeguietae* L. B. Sm. **D.** Habit and habitat (Páramo de Guaramacal). **E.** Inflorescence. **F.** *Tillandsia fendleri* Griseb. Habit and habitat (slope forests of El Pumar). **G.** *T. complanata* Benth. Habit. **H.** *P. venezuelana* L. B. Sm. Habit and habitat (Páramo del Pumar). **I.** *Mezobromelia capituligera* (Griseb.) J. R. Grant. Inflorescence. **J.** *Vriesea incurva* (Griseb.) Read. Habit. (A, C–F, photographer L. J. Dorr; B, G, H, photographer S. M. Niño; I, J, photographer B. Stergios).

FIGURE 25. A. Cannaceae. *Canna jaegeriana* Urb. Inflorescence (detail). **B.** Cyclanthaceae. *Sphaeradenia laucheana* (Sander ex Mast.) Harling subsp. *laucheana*. Habit; note infructescence at base of plant (center left). **C.** Cyperaceae. *Carex jamesonii* Boott. Inflorescence. **D.** Eriocaulaceae. *Paepalanthus pilosus* (Kunth) Kunth. Habit. **E.** Heliconiaceae. *Heliconia meridensis* Klotzsch. Fruit. **F.** Orchidaceae. *Elleanthus wageneri* (Rchb. f.) Rchb. f. Inflorescence. **G.** Iridaceae. *Sisyrinchium tinctorium* Kunth. Flower and fruit. **H–K.** Orchidaceae. **H.** *Anathallis sclerophylla* (Lindl.) Pridgeon & M. W. Chase. Inflorescence. **I.** *Epidendrum secundum* Jacq. Inflorescence. **J.** *Habenaria gollmeri* Schltr. Inflorescence. **K.** *Maxillaria triloris* E. Morren. Flower. (A, C–E, G, H, photographer S. M. Niño; B, photographer L. C. Barnett; F, I–K, photographer B. Stergios).

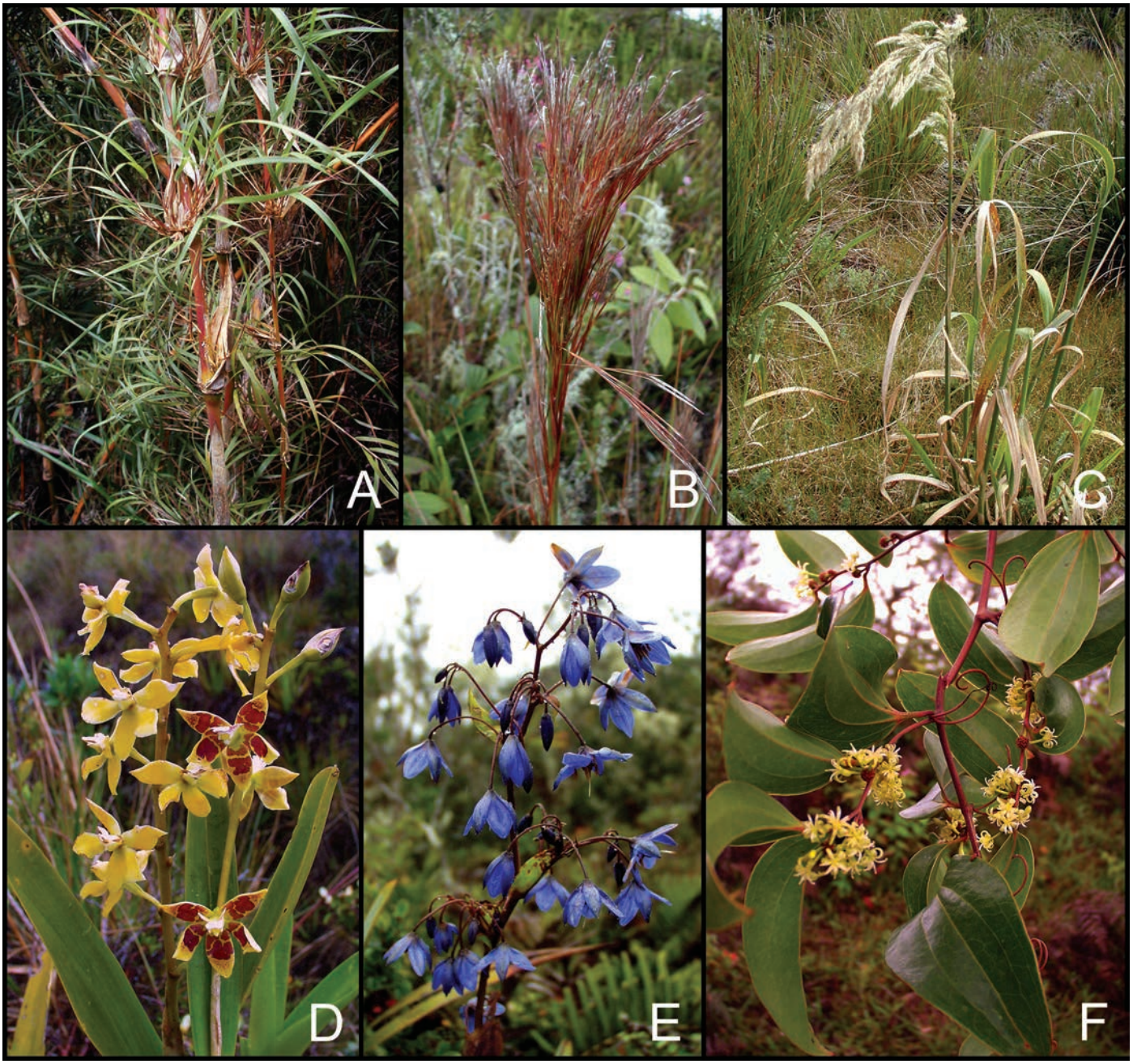


FIGURE 26. A–C. Poaceae. **A.** *Chusquea fendleri* Munro. Branch. **B.** *Andropogon bicornis* L. Inflorescence. **C.** *Cortaderia hapalotricha* (Pilg.) Conert. Inflorescence. **D.** Orchidaceae. *Prosthechea brachychila* (Lindl.) W. E. Higgins. Inflorescence. **E.** Xanthorrhoeaceae. *Eccremis coarctata* (Ruiz & Pav.) Baker. Inflorescence. **F.** Smilacaceae. *Smilax domingensis* Willd. Habit and inflorescences. (A, C, photographer S. M. Niño; B, E, F, photographer B. Stergios; D, photographer L. J. Dorr).

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In addition to the Herbario Universitario PORT and the U.S. National Herbarium (US), which have the most extensive collections of vascular plant specimens from Guaramacal National Park, we also consulted collections deposited in the Herbario Nacional de Venezuela (VEN), the Missouri Botanical Garden (MO), the New York Botanical Garden

(NY), and the Orchid Herbarium of Oakes Ames (AMES). We are grateful to the curators of these herbaria for granting us access to Guaramacal and type material in their care.

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References

Aagesen, L., and A. M. Sanso. 2003. The Phylogeny of the Alstroemeriaceae, based on Morphology, *rps*16 Intron, and *rbc*L Sequence Data. *Syst. Bot.* 28: 47–69.

Abele, A. D. 2007. Phylogeny of the Genus *Masdevallia* Ruiz et Pav. (Orchidaceae) based on Morphological and Molecular Data. Ph.D. diss., Universität Hamburg, Hamburg, Germany.

Acosta, J. M., M. A. Scataglini, R. Reinheimer, and F. O. Zuloaga. 2014. A Phylogenetic Study of Subtribe Otachyriinae (Poaceae, Panicoideae, Paspaleae). *Pl. Syst. Evol.* [epublished 29 Mar 2014]. http://dx.doi.org/10.1007/s00606-014-1034-8.

Aguirre-Santoro, J., and J. Betancur. 2008. Sinopsis del género *Aechmea* (Bromeliaceae) para Colombia. *Caldasia* 30: 265–288.

Aliscioni, S. S., L. M. Giussani, F. O. Zuloaga, and E. A. Kellogg. 2003. A Molecular Phylogeny of *Panicum* (Poaceae: Paniceae): Tests of Monophyly and Phylogenetic Placement within the Panicoideae. *Amer. J. Bot.* 90: 796–821. http://dx.doi.org/10.3732/ajb.90.5.796.

Al-Shehbaz, I. A., and B. G. Schubert. 1989. The Dioscoreaceae in the Southeastern United States. *J. Arnold Arbor.* 70: 57–95.

Alvarez, A. 2005. Phylogenetics of Prescottiinae Dressler and Systematics of *Gomphichis* Lindl. (Orchidaceae). Ph.D. diss., The City University of New York, New York.

Álvarez-Molina, A., and K. M. Cameron. 2009. Molecular Phylogenetics of Prescottiinae s.l. and Their Close Allies (Orchidaceae, Cranichideae) Inferred from Plastid and Nuclear Ribosomal DNA Sequences. *Amer. J. Bot.* 96: 1020–1040. http://dx.doi.org/10.3732/ajb.0800219.

Alzate, F., M. E. Mort, and M. Ramirez. 2008a. Phylogenetic Analyses of *Bomarea* (Alstroemeriaceae) based on Combined Analyses of nrDNA ITS, *psbA-trnH*, *rpoB-trnC* and *matK* Sequences. *Taxon* 57: 853–862.

Alzate, F., M. A. Quijano-Abril, and J. J. Morrone. 2008b. Panbiogeographical Analysis of the Genus *Bomarea* (Alstroemeriaceae). *J. Biogeogr.* 35: 1250–1257. http://dx.doi.org/10.1111/j.1365-2699.2008.01896.x.

Andersson, L. 1976. The Synflorescence of the Marantaceae. Organization and Descriptive Terminology. *Bot. Not.* 129: 39–48.

Andersson, L. 1981a. The Neotropical Genera of Marantaceae. Circumscription and Relationships. *Nordic J. Bot.* 1: 218–245. http://dx.doi.org/10.1111/j.1756-1051.1981.tb00692.x.

Andersson, L. 1981b. Revision of *Heliconia* sect. *Heliconia* (Musaceae). *Nordic J. Bot.* 1: 759–784. http://dx.doi.org/10.1111/j.1756-1051.1981.tb01163.x.

Andersson, L. 1985. Revision of *Heliconia* subgen. *Stenochlamys* (Musaceae-Heliconioideae). *Opera Bot.* 82: 1–124.

Andersson, L. 1998a. Heliconiaceae. In *Volume 4: Flowering Plants, Monocotyledons: Alismatanae and Commelinanae (except Gramineae)*, K. Kubitzki, ed., pp. 226–230, *The Families and Genera of Vascular Plants*. Springer-Verlag, New York.

Andersson, L. 1998b. Marantaceae. In *Volume 4: Flowering Plants, Monocotyledons: Alismatanae and Commelinanae (except Gramineae)*, K. Kubitzki, ed., pp. 278–293, *The Families and Genera of Vascular Plants*. Springer-Verlag, New York.

Andersson, L., and M. W. Chase. 2001. Phylogeny and Classification of Marantaceae. *Bot. J. Linn. Soc.* 135: 275–287. http://dx.doi.org/10.1111/j.1095-8339.2001.tb01097.x.

Andrade, M. J. G. de, A. M. Giulietti, A. Rapini, L. P. de Queiroz, A. de S. Conceição, P. R. M. de Almeida, and C. van den Berg. 2010. A Comprehensive Phylogenetic Analysis of Eriocaulaceae: Evidence from Nuclear (ITS) and Plastid (*psbA-trnH* and *trnL-F*) DNA Sequences. *Taxon* 59: 379–388.

Andreata, R. H. P. 1997. Revisão das espécies brasileiras do gênero *Smilax* Linnaeus (Smilacaceae). *Pesquisas, Bot.* 47: 7–244.

Angiosperm Phylogeny Group. 2009. An Update of the Angiosperm Phylogeny Group Classification for the Orders and Families of Flowering Plants: APG III. *Bot. J. Linn. Soc.* 161: 105–121. http://dx.doi.org/10.1111/j.1095-8339.2009.00996.x.

Aona, L. Y. S. 2008. Revisão Taxonômica e Análise Cladística do Gênero *Dichorisandra* J. C. Mikan (Commelinaceae). Ph.D. diss., Instituto de Biologia, Universidade Estadual de Campinas, Campinas, Brazil.

Applequist, W. L. 2012. Report of the Nomenclature Committee for Vascular Plants: 64. *Taxon* 61: 1108–1117.

Aristeguieta, L. 1961. *El Género Heliconia en Venezuela*. Instituto Botánico, Caracas.

Aristeguieta, L. 1965. Notas sobre la familia Commelinaceae en Venezuela. *Bol. Acad. Ci. Fís.* 25(69): 94–142.

Atwood, J. T. 1993. A Revision of the *Maxillaria neglecta* Complex (Orchidaceae) in Mesoamerica. *Lindleyana* 8: 25–31.

Azuma, H., and H. Tobe. 2011. Molecular Phylogenetic Analyses of Tofieldiaceae (Alismatales): Family Circumscription and Intergeneric Relationships. *J. Plant Res.* 124: 349–357. http://dx.doi.org/10.1007/s10265-010-0387-5.

Baeza P., C. M. 1996. Los géneros *Danthonia* DC. y *Rytidosperma* Steud. (Poaceae) en América—Una revisión. *Sendtnera* 3: 11–93.

Baker, J. G. 1888. *Handbook of the Amaryllideæ, Including the Alstrœmerieæ and Agaveæ*. George Bell and Sons, London.

Baker, W. J., and T. L. P. Couvreur. 2013. Global Biogeography and Diversification of Palms Sheds Light on the Evolution of Tropical Lineages. II. Diversification History and Origin of Regional Assemblages. *J. Biogeogr.* 40: 286–298. http://dx.doi.org/10.1111/j.1365-2699.2012.02794.x.

Baker, W. J., M. V. Norup, J. J. Clarkson, T. L. P. Couvreur, J. L. Dowe, C. E. Lewis, J. C. Pintaud, V. Savolainen, T. Wilmot, and M. W. Chase. 2011. Phylogenetic Relationships among Arecoid Palms (Arecaceae: Arecoideae). *Ann. Bot. (Oxford)*, n.s., 108: 1417–1432.

Baker, W. J., V. Savolainen, C. B. Asmussen-Lange, M. W. Chase, J. Dransfield, F. Forest, M. M. Harley, N. W. Uhl, and M. Wilkinson. 2009. Complete Generic-Level Phylogenetic Analysis of Palms (Arecaceae) with Comparisons of Supertree and Supermatrix Approaches. *Syst. Biol.* 58: 240–256. http://dx.doi.org/10.1093/sysbio/syp021.

Balslev, H. 1996. Juncaceae. *Fl. Neotrop. Monogr.* 68: 1–167.

Balslev, H. 1998. Juncaceae. In *Volume 4: Flowering Plants, Monocotyledons: Alismatanae and Commelinanae (except Gramineae)*, K. Kubitzki, ed., pp. 252–260, *The Families and Genera of Vascular Plants*. Springer-Verlag, New York.

Barfuss, M. H. J., R. Samuel, W. Till, and T. F. Stuessy. 2005. Phylogenetic Relationships in Subfamily Tillandsioideae (Bromeliaceae) based on DNA Sequence Data from Seven Plastid Regions. *Amer. J. Bot.* 92: 337–351. http://dx.doi.org/10.3732/ajb.92.2.337.

Barfuss, M. H. J., W. Till, and R. Samuel. 2011. Systematics, Evolution and Phylogeography of *Tillandsia* (Bromeliaceae) and Related Genera. In *Abstract Book: IBC2011, XVIII International Botanical Congress: Melbourne, Australia, 23–30 July 2011*, p. 189. [IBC2011 Congress Secretariat, Melbourne].

Barker, N. P., C. Galley, G. A. Verboom, P. Mafa, M. Gilbert, and H. P. Linder. 2007. The Phylogeny of the Austral Grass Subfamily Danthonioideae: Evidence from Multiple Data Sets. *Pl. Syst. Evol.* 264: 135–156. http://dx.doi.org/10.1007/s00606-006-0479-9.

Batista, J. A. N., L. de Bem Bianchetti, R. González-Tamayo, X. M. C. Figueroa, and P. J. Cribb. 2011. A Synopsis of New World *Habenaria* (Orchidaceae) I. *Harvard Pap. Bot.* 16: 1–47.

Batista, J. A. N., K. S. Borges, M. W. F. de Faria, K. Proite, A. J. Ramalho, G. A. Salazar, and C. van den Berg. 2013. Molecular Phylogenetics of the Species-Rich Genus *Habenaria* (Orchidaceae) in the New World based on Nuclear and Plastid DNA Sequences. *Molec. Phylogenet. Evol.* 67: 95–109. http://dx.doi.org/10.1016/j.ympev.2013.01.008.

Bauters, K., I. Larridon, M. Reynders, P. Asselman, A. Vrijdaghs, A. M. Muasya, D. A. Simpson, and P. Goetghebeur. 2014. A New Classification for *Lipocarpha* and *Volkiella* as Infrageneric Taxa of *Cyperus* s.l. (Cypereae, Cyperoideae, Cyperaceae): Insights from Species Tree Reconstruction Supplemented with Morphological and Floral Developmental Data. *Phytotaxa* 166: 1–32. http://dx.doi.org/10.11646/phytotaxa.166.1.1.

Bayer, E. 1998. Alstroemeriaceae. In *Volume 3: Flowering Plants, Monocotyledons: Lilianae (except Orchidaceae)*, K. Kubitzki, ed., pp. 79–83, *The Families and Genera of Vascular Plants*. Springer-Verlag, New York.

Bennett, D. E., Jr., and E. A. Christenson. 1995. *Icones Orchidacearum Peruvianum* (Plates 201–400). Privately published by A. Pastorelli de Bennett, n.p.

Berg, C. van den, and M. W. Chase. 2004. A Reappraisal of Laeliinae: Taxonomic History, Phylogeny and New Generic Alliances. *Orchid Digest* 68: 221–226.

Berg, C. van den, W. E. Higgins, R. L. Dressler, W. M. Whitten, M. A. Soto-Arenas, and M. W. Chase. 2009. A Phylogenetic Study of Laeliinae (Orchidaceae) based on Combined Nuclear and Plastid DNA Sequences. *Ann. Bot. (Oxford)*, n.s., 104: 417–430.

Bergamo, S. 2003. A Phylogenetic Evaluation of *Callisia* Loefl. (Commelinaceae) based on Molecular Data. Ph.D. diss., University of Georgia, Athens.

Bernal, R., and F. Borchsenius. 2010. Taxonomic Novelties in *Aiphanes* (Palmae) from Colombia and Venezuela. *Caldasia* 32: 117–127.

Berry, F., and W. J. Kress. 1991. *Heliconia: An Identification Guide*, Smithsonian Institution Press, Washington, D.C.

Berry, P. E., K. Yatskievych, and B. K. Holst, eds. 1995. *Flora of the Venezuelan Guayana. Vol. 2: Acanthaceae–Araceae*. Missouri Botanical Garden Press, St. Louis.

Berry, P. E., K. Yatskievych, and B. K. Holst, eds. 1997. *Flora of the Venezuelan Guayana. Vol. 3: Araliaceae–Cactaceae*. Missouri Botanical Garden Press, St. Louis.

Berry, P. E., K. Yatskievych, and B. K. Holst, eds. 1998. *Flora of the Venezuelan Guayana. Vol. 4: Caesalpiniaceae–Ericaceae.* Missouri Botanical Garden Press, St. Louis.

Berry, P. E., K. Yatskievych, and B. K. Holst, eds. 1999. *Flora of the Venezuelan Guayana. Vol. 5: Eriocaulaceae–Lentibulariaceae.* Missouri Botanical Garden Press, St. Louis.

Berry, P. E., K. Yatskievych, and B. K. Holst, eds. 2001. *Flora of the Venezuelan Guayana. Vol. 6: Liliaceae–Myrsinaceae.* Missouri Botanical Garden Press, St. Louis.

Berry, P. E., K. Yatskievych, and B. K. Holst, eds. 2003. *Flora of the Venezuelan Guayana. Vol 7: Myrtaceae–Plumbaginaceae.* Missouri Botanical Garden Press, St. Louis.

Berry, P. E., K. Yatskievych, and B. K. Holst, eds. 2004. *Flora of the Venezuelan Guayana. Vol. 8: Poaceae–Rubiaceae*. Missouri Botanical Garden Press, St. Louis.

Berry, P. E., K. Yatskievych, and B. K. Holst, eds. 2005. *Flora of the Venezuelan Guayana. Vol. 9: Rutaceae–Zygophyllaceae*. Missouri Botanical Garden Press, St. Louis.

Blanco, M. A., and G. Barboza. 2005. Pseudocopulatory Pollination in *Lepanthes* (Orchidaceae: Pleurothallidinae) by Fungus Gnats. *Ann. Bot. (Oxford)*, n.s., 95: 763–772.

Blanco, M. A., G. Carnevali, W. M. Whitten, R. Singer, S. Koehler, N. H. Williams, I. Ojeda, K. Neubig, and L. Endara. 2007. Generic Realignments in Maxillariinae (Orchidaceae). *Lankesteriana* 7: 515–537.

Bock, I. 1986. Revision der Gattung *Comparettia* Poepp. and Endl. (Teil 1). *Orchidee (Hamburg)* 37: 192–196.

Bockemühl, L. 1989. *Odontoglossum: Monographie und Ikonographie*. Brücke-Verlag Kurt Schmersow, Hildesheim.

Bockemühl, L., and K. Senghas. 1985. *Comparettia falcata* Poepp. and Endl. 1836. *Orchidee (Hamburg)* 36, Orchideenkartei: 379–380.

Boechat, S. de C. 2005. O gênero *Ichnanthus* (Poaceae–Panicoideae–Paniceae) no Brasil. *Iheringia, Bot.* 60: 189–248.

Bono, G. 2010. *Catálogo de la Flora y Vegetación de los Valles de la Vertiente Occidental de los Andes de la Cordillera de Mérida (Estados Mérida y Trujillo)*. Centro Studi Erbario Tropicale, Florence, Italy.

Borchsenius, F., and R. Bernal, 1996. *Aiphanes* (Palmae). *Fl. Neotrop. Monogr.* 70: 1–95.

Brackett, A. 1923. Contributions from the Gray Herbarium of Harvard University. New Series.—No. LXIX. I. Revision of the American Species of *Hypoxis*. *Rhodora* 25: 120–147, 151–155. [Reprinted in *Contr. Gray Herb.* 69: 120–147. 1923.]

Brandenburg, D. M., W. H. Blackwell, and J. W. Thieret. 1991. Revision of the Genus *Cinna* (Poaceae). *Sida* 14: 581–596.

Braun, A., and F. Delascio. 1987. *Palmas Autóctonas de Venezuela y de los Países Adyacentes*. Litopar, Caracas.

Bruhl, J. J. 1995. Sedge Genera of the World: Relationships and a New Classification of the Cyperaceae. *Austral. Syst. Bot.* 8: 125–305. http://dx.doi.org/10.1071/SB9950125.

Bunting, G. S. 1979. Sinopsis de las Araceae de Venezuela. *Revista Fac. Agron. (Maracay)* 10: 139–290.

Burns, J. H., R. B. Faden, and S. J. Steppan. 2011. Phylogenetic Studies in the Commelinaceae Subfamily Commelinoideae Inferred from Nuclear Ribosomal and Chloroplast DNA Sequences. *Syst. Bot.* 36: 268–276. http://dx.doi.org/10.1600/036364411X569471.

Cabrera, L. I., G. A. Salazar, M. W. Chase, S. J. Mayo, J. Bogner, and P. Dávila. 2008. Phylogenetic Relationships of Aroids and Duckweeds (Araceae) Inferred from Coding and Noncoding Plastid DNA. *Amer. J. Bot.* 95: 1153–1165. http://dx.doi.org/10.3732/ajb.0800073.

Caddick, L. R., P. J. Rudall, P. Wilkin, T. A. J. Hedderson, and M. W. Chase. 2002a. Phylogenetics of Dioscoreales based on Combined Analyses of

Morphological and Molecular Data. *Bot. J. Linn. Soc.* 138: 123–144. http://dx.doi.org/10.1046/j.1095-8339.2002.138002123.x.

Caddick, L. R., P. Wilkin, P. J. Rudall, T. A. J. Hedderson, and M. W. Chase. 2002b. Yams Reclassified: A Recircumscription of Dioscoreaceae and Dioscoreales. *Taxon* 51: 103–114. http://dx.doi.org/10.2307/1554967.

Caldéron, C. E., and T. R. Soderstrom. 1980. The Genera of Bambusoideae (Poaceae) of the American Continent: Keys and Comments. *Smithsonian Contr. Bot.* 44: 1–27. http://dx.doi.org/10.5479/si.0081024X.44.

Camelbeke, K., and P. Goetghebeur. 2002. The Genus *Scleria* (Poaceae) in Colombia. An Updated Checklist. *Caldasia* 24: 259–268.

Cameron, K. M. 2005. Leave It to the Leaves: A Molecular Phylogenetic Study of Malaxideae (Epidendroideae, Orchidaceae). *Amer. J. Bot.* 92: 1025–1032. http://dx.doi.org/10.3732/ajb.92.6.1025.

Cameron, K. M., and C. Fu. 2006. A Nuclear rDNA Phylogeny of *Smilax* (Smilacaceae). *Aliso* 22: 598–605.

Campbell, C. S. 1983. Systematics of the *Andropogon virginicus* Complex (Gramineae). *J. Arnold Arbor.* 64: 171–254.

Campbell, C. S. 1985. The Subfamilies and Tribes of Gramineae (Poaceae) in the Southeastern United States. *J. Arnold Arbor.* 66: 123–199.

Campbell, L. M. 2012. Pollen Morphology of Xyridaceae (Poales) and Its Systematic Potential. *Bot. Rev.* 78: 428–439. http://dx.doi.org/10.1007/s12229-012-9110-7.

Campbell, L. M., and L. J. Dorr. 2013. A Synopsis of *Harperocallis* (Tofieldiaceae, Alismatales) with Ten New Combinations. *PhytoKeys* 21: 27–52. http://dx.doi.org/10.3897/phytokeys.21.4859.

Carlsen, M. M. 2011. Understanding the Origin and Rapid Diversification of the Genus *Anthurium* Schott (Araceae), Integrating Molecular Phylogenetics, Morphology and Fossils. Ph.D. diss., University of Missouri–St. Louis.

Catalán, P., P. Torrecilla, J. A. López Rodríguez, and R. G. Olmstead. 2004. Phylogeny of the Festucoid Grasses of subtribe Loliinae and Allies (Poeae, Pooideae) Inferred from ITS and *trn*L–F Sequences. *Molec. Phylogenet. Evol.* 31: 517–541. http://dx.doi.org/10.1016/j.ympev.2003.08.025.

Cavestro, W. 2000. The Genus *Trichopilia*. *Orchid Rev.* 108: 111–115.

Chacón, J., M. C. de Assis, A. W. Meerow, and S. S. Renner. 2012. From East Gondwana to Central America: Historical Biogeography of the Alstroemeriaceae. *J. Biogeogr.* 39: 1806–1818. http://dx.doi.org/10.1111/j.1365-2699.2012.02749.x.

Chacón, J., S. Madriñán, M. W. Chase, and J. J. Bruhl. 2006. Molecular Phylogenetics of *Oreobolus* (Cyperaceae) and the Origin and Diversification of the American Species. *Taxon* 55: 359–366. http://dx.doi.org/10.2307/25065583.

Chase, A. 1920. The North American Species of *Cenchrus*. *Contr. U.S. Natl. Herb.* 22(1): 45–72.

Chase, A. 1921. The North American Species of *Pennisetum*. *Contr. U.S. Natl. Herb.* 22(4): 209–234.

Chase, A. 1929. The North American Species of *Paspalum*. *Contr. U.S. Natl. Herb.* 28(1): 1–310.

Chase, M. W. 1986. A Reappraisal of the Oncidioid Orchids. *Syst. Bot.* 11: 477–491. http://dx.doi.org/10.2307/2419085.

Chase, M. W., ed. 1997. *The Pictorial Encyclopedia of Oncidium*. ZAI Publications, New York.

Chase, M. W., ed. 2002. *Orchids: The Pictorial Encyclopedia of Oncidium*. ZAI Publications, Quito.

Chase, M. W., and J. E. Palmer. 1992. Floral Morphology and Chromosome Number in Subtribe Oncidiinae (Orchidaceae): Evolutionary Insights from a Phylogenetic Analysis of Chloroplast DNA Restriction Site Variation. In *Molecular Systematics of Plants*, P. S. Soltis, D. E. Soltis, and J. J. Doyle, eds., pp. 324–339. Chapman and Hall, New York. http://dx.doi.org/10.1007/978-1-4615-3276-7_14.

Chase, M. W., and M. Whitten. 2011. Further Taxonomic Transfers in Oncidiinae (Orchidaceae). *Phytotaxa* 20: 26–32.

Chase, M. W., N. H. Williams, A. Donisete de Faria, K. M. Neubig, M. do Carmo, E. Amaral, and W. M. Whitten. 2009. Floral Convergence in Oncidiinae (Cymbidieae; Orchidaceae): An Expanded Concept of *Gomesa* and a New Genus *Nohawilliamsia*. *Ann. Bot. (Oxford)*, n.s., 104: 387–402.

Chase, M. W., N. H. Williams, K. M. Neubig, and W. M. Whitten. 2008. Taxonomic Transfers in Oncidiinae to Accord with *Genera Orchidacearum, Vol. 5*. *Lindleyana* 21: 20–31.

Chauveau, O., L. Eggers, C. Raquin, A. Silvério, S. Brown, A. Couloux, C. Cruaud, E. Kaltchuk-Santos, R. Yockteng, T. T. Souza-Chies, and S. Nadot. 2011. Evolution of Oil-Producing Trichomes in *Sisyrinchium* (Iridaceae): Insights from the First Comprehensive Phylogenetic Analysis of the Genus. *Ann. Bot. (Oxford)*, n.s., 107: 1287–1312.

Chemisquy, M. A., L. M. Giussani, M. A. Scataglini, E. A. Kellogg, and O. Morrone. 2010. Phylogenetic Studies Favour the Unification of *Pennisetum*, *Cenchrus* and *Odontelytrum* (Poaceae): A Combined Nuclear, Plastid and Morphological Analysis, and Nomenclatural Combinations in *Cenchrus*. *Ann. Bot. (Oxford)*, n.s., 106: 107–130.

Chen, S.-C., Y.-X. Qiu, A.-L. Wang, K. M. Cameron, and C.-X. Fu. 2006a. A Phylogenetic Analysis of the Smilacaceae based on Morphological Data. *Acta Phytotax. Sin.* 44: 113–125. http://dx.doi.org/10.1360/aps050065.

Chen, S.-C., X.-P. Zhang, S.-F. Ni, C.-X. Fu, and K. M. Cameron. 2006b. The Systematic Value of Pollen Morphology in Smilacaceae. *Pl. Syst. Evol.* 259: 19–37. http://dx.doi.org/10.1007/s00606-006-0424-y.

Chiron, G. 2003. An Introduction to the Genus *Prosthechea*. *Orchid Rev.* 111: 92–97.

Chiron, G. R., and V. P. Castro Neto. 2003. Révision du genre *Prosthechea* Knowles, and Wescott et nouveau genre dans la tribu Laeliinae (Orchidaceae). *Richardiana* 4(1): 9–35.

Chiron, G. R., J. Guiard, and C. van den Berg. 2012. Phylogenetic Relationships in Brazilian *Pleurothallis* sensu lato (Pleurothallidinae): Evidence from Nuclear ITS rDNA Sequences. *Phytotaxa* 46: 34–58.

Christenson, E. A. 2002a. *Maxillaria*, an Overview. In *Proceedings of the 16th World Orchid Conference, April 1999*, J. Clark, W. M. Elliot, G. Tingley, and J. Biro, eds., pp. 279–290. Vancouver Orchid Society, Richmond, British Columbia, Canada.

Christenson, E. A. 2002b. Vue d'ensemble du genre *Maxillaria*. *Richardiana* 2(2): 41–62.

Christenson, E. A. 2004. *Maxillaria luteo-grandiflora*: A South American Species Long Mistaken for *Maxillaria triloris*. *Orchids* 73: 458–461.

Christenson, E. A. 2006. The Genus *Acineta*. *Orchid Digest* 70: 232–251.

Christenson, E. A. 2008. A Synopsis of *Pachyphyllum* (Orchidaceae). *J. Bot. Res. Inst. Texas* 2: 285–289.

Clark, L. G. 1989. Systematics of *Chusquea* Section *Swallenochloa*, Section *Verticillatae*, Section *Serpentes*, and Section *Longifoliae* (Poaceae-Bambusoideae). *Syst. Bot. Monogr.* 27: 1–127. http://dx.doi.org/10.2307/25027724.

Clark, L. G. 1997. Diversity, Biogeography and Evolution of *Chusquea*. In *The Bamboos*, G. P. Chapman, ed., pp. 33–44. Published for the Linnean Society of London by Academic Press, San Diego.

Clark, L. G., and F. U. Ely. 2011. Géneros de bambúes leñosos (Poaceae: Bambusoideae: Arundinarieae, Bambuseae) de Venezuela. *Acta Bot. Venez.* 34: 79–103.

Clark, L. G., and F. Ely. 2013. Two New Species of *Chusquea* (Poaceae: Bambusoideae: Bambuseae) from Venezuela and a Redescription of *Chusquea purdieana*. *Syst. Bot.* 38: 1087–1095. http://dx.doi.org/10.1600/036364413X674922.

Clark, L. G., and X. Londoño. 1991. A New Species and New Sections of *Rhipidocladum* (Poaceae: Bambusoideae). *Amer. J. Bot.* 78: 1260–1279. http://dx.doi.org/10.2307/2444930.

Clark, L. G., W. Zhang, and J. F. Wendel. 1995. A Phylogeny of the Grass Family (Poaceae) based on *ndhF* Sequence Data. *Syst. Bot.* 20: 436–460. http://dx.doi.org/10.2307/2419803.

Clayton, W. D. 1965. Studies in the Gramineae: VI. *Kew Bull.* 19: 287–296. http://dx.doi.org/10.2307/4108070.

Clayton, W. D., and S. A. Renvoize. 1986. *Genera Graminum: Grasses of the World*. Her Majesty's Stationery Office, London.

Clifford, H. T. 1998. Xanthorrhoeaceae. In *Volume 3: Flowering Plants, Monocotyledons: Lilianae (except Orchidaceae)*, K. Kubitzki, ed., pp. 467–470, *The Families and Genera of Vascular Plants*. Springer-Verlag, New York.

Clifford, H. T., R. J. F. Henderson, and J. G. Conran. 1998. Hemerocallidaceae. In *Volume 3: Flowering Plants, Monocotyledons: Lilianae (except Orchidaceae)*, K. Kubitzki, ed., pp. 245–253, *The Families and Genera of Vascular Plants*. Springer-Verlag, New York.

Connor, H. E., and E. Edgar. 1974. Names and Types in *Cortaderia* Stapf (Gramineae). *Taxon* 23: 595–605. http://dx.doi.org/10.2307/1218786.

Conran, J. G. 1998. Smilacaceae. In *Volume 3: Flowering Plants, Monocotyledons: Lilianae (except Orchidaceae)*, K. Kubitzki, ed., pp. 417–422, *The Families and Genera of Vascular Plants*. Springer-Verlag, New York.

Conran, J. G., and H. T. Clifford. 1998. Luzuriagaceae. In *Volume 3: Flowering Plants, Monocotyledons: Lilianae (except Orchidaceae)*, K. Kubitzki, ed., pp. 365–369, *The Families and Genera of Vascular Plants*. Springer-Verlag, New York.

Corcoran, M. L. 1941. A Revision of the Subgenus *Pycreus* in North and South America. *Catholic Univ. Amer. Biol. Ser.* 37: i–xvi, 1–68.

Core, E. L. 1936. The American Species of *Scleria*. *Brittonia* 2: 1–105. http://dx.doi.org/10.2307/2804936.

Core, E. L. 1948. The Genus *Scleria* in Colombia. *Caldasia* 5(21): 17–32.
Costa, F. N., and P. T. Sano. 2013. New Circumscription of the Endemic Brazilian Genus *Actinocephalus* (Eriocaulaceae). *Novon* 22: 281–287. http://dx.doi.org/10.3417/2011001.
Crins, W. J. 1991. The Genera of Paniceae (Gramineae: Panicoideae) in the Southeastern United States. *J. Arnold Arbor.*, Suppl. Ser. 1: 171–312.
Croat, T. B. 1985 [1986]. The *Anthurium bredemeyeri* Complex (Araceae) of Venezuela and Colombia. *Aroideana* 8: 118–137.
Croat, T. B. 1991. A Revision of *Anthurium* Section *Pachyneurium* (Araceae). *Ann. Missouri Bot. Gard.* 78: 539–855. http://dx.doi.org/10.2307/2399801.
Croat, T. B., and G. S. Bunting. 1979. Standardization of *Anthurium* Descriptions. *Aroideana* 2: 15–25.
Croat, T. B., and M. M. Carlsen. 2013. A Reassessment of *Anthurium* Species with Palmately Divided Leaves, and a Reinterpretation of *Anthurium* Section *Dactylophyllium* (Araceae). *PhytoKeys* 23: 41–54. http://dx.doi.org/10.3897/phytokeys.23.4754.
Croat, T. B., and N. Lambert. 1986. The Araceae of Venezuela. *Aroideana* 9: 3–213.
Croat, T. B., and R. D. Sheffer. 1983. The Sectional Groupings of *Anthurium* (Araceae). *Aroideana* 6: 85–123.
Cruden, R. W. 1991. A Revision of *Isidrogalvia* (Liliaceae): Recognition for Ruíz and Pavón's Genus. *Syst. Bot.* 16: 270–282. http://dx.doi.org/10.2307/2419279.
Cuello A., N. L., ed. 1999. *Parque Nacional Guaramacal*. UNELLEZ and Fundación Polar, Caracas.
Cuello A., N. L. 2002. Altitudinal Changes of Forest Diversity and Composition in the Ramal de Guaramacal in the Venezuelan Andes. *Ecotropicos* 15: 160–176.
Cuello A., N. L. 2010. Flora, Vegetation and Ecology in the Venezuelan Andes: A Case Study of Ramal de Guaramacal. Ph.D. diss., Universiteit van Amsterdam, Amsterdam.
Cuello A., N. L., and A. M. Cleef. 2009a. The Forest Vegetation of Ramal de Guaramacal in the Venezuelan Andes. *Phytocoenologia* 39: 109–156. http://dx.doi.org/10.1127/0340-269X/2009/0039-0109.
Cuello A., N. L., and A. M. Cleef. 2009b. The Páramo Vegetation of Ramal de Guaramacal, Trujillo State, Venezuela. 1. Zonal Communities. *Phytocoenologia* 39: 295–329. http://dx.doi.org/10.1127/0340-269X/2009/0039-0295.
Cuello A., N. L., and A. M. Cleef. 2009c. The Páramo Vegetation of Ramal de Guaramacal, Trujillo State, Venezuela. 2. Azonal Communities. *Phytocoenologia* 39: 389–409. http://dx.doi.org/10.1127/0340-269X/2009/0039-0389.
Cuello A., N. L., and A. M. Cleef. 2011. Bosques de Los Andes de Venezuela: Caso El Ramal de Guaramacal. *BioLlania*, Ed. Espec. 10: 74–105.
Cuenca, A., and C. B. Asmussen-Lange. 2007. Phylogeny of the Palm Tribe Chamaedoreeae (Arecaceae) based on Plastid DNA Sequences. *Syst. Bot.* 32: 250–263. http://dx.doi.org/10.1600/036364407781179644.
Cuenca, A., C. B. Asmussen-Lange, and F. Borchsenius. 2008. A Dated Phylogeny of the Palm Tribe Chamaedoreeae Supports Eocene Dispersal between Africa, North and South America. *Molec. Phylogenet. Evol.* 46: 760–775. http://dx.doi.org/10.1016/j.ympev.2007.10.010.
Cuenca, A., J. Dransfield, and C. B. Asmussen-Lange. 2009. Phylogeny and Evolution of Morphological Characters in Tribe Chamaedoreeae (Arecaceae). *Taxon* 58: 1092–1108.
Cusimano, N., J. Bogner, S. J. Mayo, P. C. Boyce, S. Y. Wong, M. Hesse, W. L. A. Hetterscheid, R. C. Keating, and J. C. French. 2011. Relationships within the Araceae: Comparison of Morphological Patterns with Molecular Phylogenies. *Amer. J. Bot.* 98: 654–668. http://dx.doi.org/10.3732/ajb.1000158.
Dalström, S. 2001. A Synopsis of the Genus *Cyrtochilum* (Orchidaceae; Oncidiinae): Taxonomic Reevaluation and New Combinations. *Lindleyana* 16: 56–80.
Davidse, G. 1978 [1979]. A Systematic Study of the Genus *Lasiacis* (Gramineae: Paniceae). *Ann. Missouri Bot. Gard.* 65: 1133–1254. http://dx.doi.org/10.2307/2398784.
Davis, J. I., D. W. Stevenson, G. Petersen, O. Seberg, L. M. Campbell, J. V. Freudenstein, D. H. Goldman, C. R. Hardy, F. A. Michelangeli, M. P. Simmons, C. D. Specht, F. Vergara-Silva, and M. Gandolfo. 2004. A Phylogeny of the Monocots, as Inferred from *rbc*L and *atp*A Sequence Variation, and a Comparison of Methods for Calculating Jackknife and Bootstrap Values. *Syst. Bot.* 29: 467–510. http://dx.doi.org/10.1600/0363644041744365.
Denham, S. S. 2005. Revisión sistemática del subgénero *Harpostachys* de *Paspalum* (Poaceae: Panicoideae: Paniceae). *Ann. Missouri Bot. Gard.* 92: 463–532.
Dertscheny, P. 1995. Beiträge zur Kenntnis der südamerikanische Arten der Gattung *Danthonia* (Poaceae). *Courier Forschungsinst. Senckenberg* 186: 69–103.
Dorr, L. J., and S. M. Nino. 2001. *Arthraxon* (Poaceae: Andropogoneae) New to South America. *Sida* 19: 1191–1193.
Dorr, L. J., B. Stergios, A. R. Smith, and N. L. Cuello A. 2000 [2001]. Catalogue of the Vascular Plants of Guaramacal National Park, Portuguesa and Trujillo States, Venezuela. *Contr. U.S. Natl. Herb.* 40: 1–155.
Drábková, L., J. Kirschner, O. Seberg, G. Petersen, and Č. Vlček. 2003. Phylogeny of the Juncaceae based on *rbc*L Sequences, with Special Emphasis on *Luzula* DC. and *Juncus* L. *Pl. Syst. Evol.* 240: 133–147. http://dx.doi.org/10.1007/s00606-003-0001-6.
Dransfield, J., and N. W. Uhl. 1998. Palmae. In *Volume 4: Flowering Plants, Monocotyledons: Alismatanae and Commelinanae (except Gramineae)*, K. Kubitzki, ed., pp. 306–389, *The Families and Genera of Vascular Plants*. Springer-Verlag, New York.
Dransfield, J., N. W. Uhl, C. B. Asmussen, W. J. Baker, M. M. Harley, and C. E. Lewis. 2005. A New Phylogenetic Classification of the Palm Family, Arecaceae. *Kew Bull.* 60: 559–569.
Dransfield, J., N. W. Uhl, C. B. Asmussen, W. J. Baker, M. M. Harley, and C. E. Lewis. 2008. *Genera Palmarum: The Evolution and Classification of Palms*. Royal Botanic Gardens, Kew, Richmond, UK.
Dressler, R. L. 1981. *The Orchids: Natural History and Classification*. Harvard University Press, Cambridge, Mass.
Dressler, R. L. 1982. Die Abgrenzung der Gattungen im *Epidendrum*-Komplex. *Orchidee (Hamburg)* 33: 177–185.
Dressler, R. L. 1984a. La delimitación de géneros en el complejo *Epidendrum*. *Orquídea (Mexico City)* 9: 277–290.
Dressler, R. L. 1984b. The Delineation of Genera in the *Epidendrum* Complex. *Orquídea (Mexico City)* 9: 291–298.
Dressler, R. L. 1993. *Phylogeny and Classification of the Orchid Family*. Dioscorides Press, Portland, Oreg.
Dressler, R. L. 1999. A Reconsideration of *Stellilabium* and *Dipterostele*. *Harvard Pap. Bot.* 4: 469–473.
Dressler, R. L. 2002. The Major Sections or Groups within *Sobralia*, with Four New Species from Panama and Costa Rica, *S. crispissima*, *S. gloriana*, *S. mariannae* and *S. nutans*. *Lankesteriana* 5: 9–15.
Dressler, R. L., M. A. Blanco, F. Pupulin, and K. M. Neubig. 2011. (2019) Proposal to Conserve the Name *Sobralia* (Orchidaceae) with a Conserved Type. *Taxon* 60: 907–908.
Dressler, R. L., W. M. Whitten, and N. H. Williams. 2004. Phylogenetic Relationships of *Scaphyglottis* and Related Genera (Laeliinae: Orchidaceae) based on nrDNA ITS Sequence Data. *Brittonia* 56: 58–66. http://dx.doi.org/10.1663/0007-196X(2004)056[0058:PROSAR]2.0.CO;2.
Dunsterville, G. C. K. 1986. Descriptions of Orchids Not Included in *Venezuelan Orchids Illustrated*. *Lindleyana* 1: 221–343.
Dunsterville, G. C. K., and L. A. Garay. 1959. *Venezuelan Orchids Illustrated*. Vol. 1. Andre Deutsch, London.
Dunsterville, G. C. K., and L. A. Garay. 1961. *Venezuelan Orchids Illustrated*. Vol. 2. Andre Deutsch, London.
Dunsterville, G. C. K., and L. A. Garay. 1965. *Venezuelan Orchids Illustrated*. Vol. 3. Andre Deutsch, London.
Dunsterville, G. C. K., and L. A. Garay. 1966. *Venezuelan Orchids Illustrated*. Vol. 4. Andre Deutsch, London.
Dunsterville, G. C. K., and L. A. Garay. 1972. *Venezuelan Orchids Illustrated*. Vol. 5. Andre Deutsch, London.
Dunsterville, G. C. K., and L. A. Garay. 1976. *Venezuelan Orchids Illustrated*. Vol. 6. Andre Deutsch, London.
Dunsterville, G. C. K., and L. A. Garay. 1979a. *Orchids of Venezuela: An Illustrated Field Guide. Vol. 1: A–G*. Botanical Museum of Harvard University, Cambridge, Massachusetts.
Dunsterville, G. C. K., and L. A. Garay. 1979b. *Orchids of Venezuela: An Illustrated Field Guide. Vol. 2: H–O*. Botanical Museum of Harvard University, Cambridge, Mass.
Dunsterville, G. C. K., and L. A. Garay. 1979c. *Orchids of Venezuela: An Illustrated Field Guide. Vol. 3: P–Z*. Botanical Museum of Harvard University, Cambridge, Mass.
Duque, Ó. 2003a. Orchidaceae: Consideraciones taxonómicas sobre *Stelis argentata* Lindley. *Orquideología* 22: 291–299.
Duque, Ó. 2003b. Orchidaceae: Taxonomic Considerations on *Stelis argentata* Lindley. *Orquideología* 22: 300–305.
Duque, Ó. 2008. *Orchidaceae Stelis Swartz: Compendium*. Editorial Universidad de Antioquia, Medellín, Colombia.
Ely, F., and R. Luque Arias. 2006. Estudio morfoanatómico comparado de *Eccremis coarctata* (Ruiz and Pav.) Baker (Phormiaceae) en diferentes altitudes de la Cordillera de Mérida. *PlantULA* 4: 23–37.

Engler, A. 1898. Beiträge zur Kenntnis der Araceae. VIII. 15. Revision der Gattung *Anthurium* Schott. *Bot. Jahrb. Syst.* 25: 352–476.

Engler, A. 1905. Araceae-Pothoideae. In *Das Pflanzenreich, IV,* 23B (Heft 21), A. Engler, ed., pp. 1–330. Wilhelm Engelmann, Leipzig.

Engler, A., and K. Krause. 1908. Araceae-Monsteroideae. In *Das Pflanzenreich, IV,* 23B (Heft 37), A. Engler, ed., pp. 4–139. Wilhelm Engelmann, Leipzig.

Engler, A., and K. Krause. 1920. Araceae-Colocasioideae. In *Das Pflanzenreich, IV,* 23E (Heft 71), A. Engler, ed., pp. 3–139. Wilhelm Engelmann, Leipzig.

Eriksson, R. 1994. Phylogeny of the Cyclanthaceae. *Pl. Syst. Evol.* 190: 31–47. http://dx.doi.org/10.1007/BF00937857.

Eriksson, R. 1995. The Genus *Sphaeradenia* (Cyclanthaceae). *Opera Bot.* 126: 1–106.

Evans, T. M., R. B. Faden, M. G. Simpson, and K. J. Sytsma. 2000. Phylogenetic Relationships in the Commelinaceae: I. A Cladistic Analysis of Morphological Data. *Syst. Bot.* 25: 668–691. http://dx.doi.org/10.2307/2666727.

Evans, T. M., K. J. Sytsma, R. B. Faden, and T. J. Givnish. 2003. Phylogenetic Relationships in the Commelinaceae: II. A Cladistic Analysis of *rbcL* Sequences and Morphology. *Syst. Bot.* 28: 270–292.

Faden, R. B. 1998. Commelinaceae. In *Volume 4: Flowering Plants, Monocotyledons: Alismatanae and Commelinanae (except Gramineae)*, K. Kubitzki, ed., pp. 109–128, *The Families and Genera of Vascular Plants*. Springer-Verlag, New York.

Faden, R. B., and D. R. Hunt. 1987. Reunion of *Phaeosphaerion* and *Commelinopsis* with *Commelina* (Commelinaceae). *Ann. Missouri Bot. Gard.* 74: 121–122. http://dx.doi.org/10.2307/2399267.

Faden, R. B., and D. R. Hunt. 1991. The Classification of the Commelinaceae. *Taxon* 40: 19–31. http://dx.doi.org/10.2307/1222918.

Faria, A. P. G. de, T. Wendt, and G. K. Brown. 2004. Cladistic Relationships of *Aechmea* (Bromeliaceae, Bromelioideae) and Allied Genera. *Ann. Missouri Bot. Gard.* 91: 303–319.

Fernández, C. [2003]. *Orquídeas Nativas del Táchira: Tachira and Its Natives* [*sic*] *Orchids*. Loteria del Táchira, n.p.

Ferrufino-Acosta, L. 2010. Taxonomic Revision of the Genus *Smilax* (Smilacaceae) in Central America and the Caribbean Islands. *Willdenowia* 40: 227–280. http://dx.doi.org/10.3372/wi.40.40208.

Fisher, A. E., J. K. Triplett, C.-S. Ho, A. D. Schiller, K. A. Oltrogge, E. S. Schroder, S. A. Kelchner, and L. G. Clark. 2009. Paraphyly in the Bamboo Subtribe Chusqueinae (Poaceae: Bambusoideae) and a Revised Infrageneric Classification for *Chusquea*. *Syst. Bot.* 34: 673–683. http://dx.doi.org/10.1600/036364409790139790.

Foldats, E. 1969. Orchidaceae. In *Flora de Venezuela*. Vol. 15, pt. 1, T. Lasser, ed., pp. 2–502. Instituto Botánico, Caracas.

Foldats, E. 1970a. Orchidaceae. In *Flora de Venezuela*. Vol. 15, pt. 2, T. Lasser, ed., pp. 1–523. Instituto Botánico, Caracas.

Foldats, E. 1970b. Orchidaceae. In *Flora de Venezuela*. Vol. 15, pt. 3, T. Lasser, ed., pp. 1–522. Instituto Botánico, Caracas.

Foldats, E. 1970c. Orchidaceae. In *Flora de Venezuela*. Vol. 15, pt. 4, T. Lasser, ed., pp. 1–558. Instituto Botánico, Caracas.

Foldats, E. 1970d. Orchidaceae. In *Flora de Venezuela*. Vol. 15, pt. 5, T. Lasser, ed., pp. 1–598. Instituto Botánico, Caracas.

Folsom, J. P. 1996. An Introduction to the Genus *Dichaea* and a Synopsis of Section *Dichaea*. *Orchid Digest* 60: 148–155.

Freckmann, R. W. 1981. Realignments in the *Dichanthelium acuminatum* Complex (Poaceae). *Phytologia* 48: 99–110.

Garay, L. A. 1970. A Reappraisal of the Genus *Oncidium* Sw. *Taxon* 19: 443–467. http://dx.doi.org/10.2307/1219085.

Garay, L. A. 1978. Orchidaceae: Cypripedioideae, Orchidoideae, Neottioideae. In *Flora of Ecuador.* Vol. 9, pt. 225, no. 1, G. Harling and B. Sparre, eds., pp. 1–305. Botanical Institute, Goteborg University, Goteborg.

Garay, L. A. 1979. Systematics of the Genus *Stelis* Sw. *Bot. Mus. Leafl.* 27: 167–259.

Garay, L. A., and J. E. Stacy. 1974. Synopsis of the Genus *Oncidium*. *Bradea* 1(40): 393–428.

Garbiso, C., and J. Estrada. 2001. Sinopsis taxonómica de *Bomarea* Mirb. subgénero *Bomarea* (Alstroemeriaceae) para Venezuela. *PlantULA* 3: 11–39.

Gaskin, J. F., and P. E. Berry. 1998. New Synonymy and Useful Taxonomic Characters in *Smilax* (Smilacaceae) from the Venezuelan Guayana. *Novon* 8: 364–370. http://dx.doi.org/10.2307/3391857.

Gauthier, M.-P. L., D. Barabé, and A. Bruneau. 2008. Molecular Phylogeny of the Genus *Philodendron* (Araceae): Delimitation and Infrageneric Classification. *Bot. J. Linn. Soc.* 156: 13–27. http://dx.doi.org/10.1111/j.1095-8339.2007.00733.x.

Gehrke, B., S. Martín-Bravo, M. Muasya, and M. Luceño. 2010. Monophyly, Phylogenetic Position and the Role of Hybridization in *Schoenoxiphium* Nees (Cariceae, Cyperaceae). *Molec. Phylogenet. Evol.* 56: 380–392. http://dx.doi.org/10.1016/j.ympev.2010.03.036.

Gerlach, G. 1999a [2000]. 862. *Schlimmia* Planch., and Linden. In *Die Orchideen*, 3rd ed., R. Schlechter, ed., Band I/C, 37/38 Lieferung, pp. 2414–2417. Paul Parey, Berlin.

Gerlach, G. 1999b [2000]. 864. *Acineta* Lindl. In *Die Orchideen*, 3rd ed., R. Schlechter, ed., Band I/C, 37/38 Lieferung, pp. 2421–2427. Paul Parey, Berlin.

Gillespie, L. J., A. Archambault, and R. J. Soreng. 2007. Phylogeny of *Poa* (Poaceae) based on *trn*T–*trn*F Sequence Data: Major Clades and Basal Relationships. *Aliso* 23: 420–434.

Gillespie, L. J., R. J. Soreng, R. D. Bull, S. W. L. Jacobs, and N. F. Refulio-Rodriguez. 2008. Phylogenetic Relationships in Subtribe Poinae (Poaceae, Poeae) based on Nuclear ITS and Plastid *trn*T–*trn*L–*trn*F Sequences. *Botany* 86: 938–967. http://www.nrcresearchpress.com/doi/pdf/10.1139/B08-076.

Gillespie, L. J., R. J. Soreng, M. Paradis, and R. D. Bull. 2010. Phylogeny and Reticulation in Subtribe Poinae and Related Subtribes (Poaceae) based on nrITS, ETS, and *trnTLF* Data. In *Diversity, Phylogeny, and Evolution in the Monocotyledons: Proceedings of the Fourth International Conference on the Comparative Biology of the Monocotyledons and the Fifth International Symposium on Grass Systematics and Evolution*, O. Seberg, G. Petersen, A. S. Barfod, and J. I. Davis, eds., pp. 589–617. Aarhus University Press, Århus, Denmark.

Giraldo-Cañas, D. 2004. El género *Polypogon* (Poaceae: Pooideae) en Colombia. *Caldasia* 26: 417–422.

Giraldo-Cañas, D. 2007. Análisis filogenético del género neotropical *Axonopus* (Poaceae: Panicoideae: Paniceae) con base en caracteres morfológicos y anatómicos. *Rev. Instit. Univ. Tecnol. Chocó D.L.C.* 26: 9–27.

Giraldo-Cañas, D. 2008. Revisión del género *Axonopus* (Poaceae: Paniceae): Primer registro del género en Europa y novedades taxonómicas. *Caldasia* 30: 301–314.

Giraldo-Cañas, D., and P. M. Peterson. 2009. Revisión de las especies del género *Sporobolus* (Poaceae: Chloridoideae: Sporobolinae) del Noroeste de Sudamérica: Perú, Ecuador, Colombia y Venezuela. *Caldasia* 31: 41–76.

Giraldo-Cañas, D., P. M. Peterson, and I. Sánchez Vega. 2012. The Genus *Eragrostis* (Poaceae: Chloridoideae) in Northwestern South America (Colombia, Ecuador, and Peru): Morphological and Taxonomic Studies. *Bibliot. José Jerónimo Triana* 24: 1–195.

Giulietti, A. M., M. J. G. Andrade, V. L. Scatena, M. Trovó, A. I. Coan, P. T. Sano, F. A. R. Santos, R. L. B. Borges, and C. van den Berg. 2012. Molecular Phylogeny, Morphology and their Implications for the Taxonomy of Eriocaulaceae. *Rodriguésia* 63: 1–19.

Givnish, T. J., M. H. J. Barfuss, B. van Ee, R. Riina, K. Schulte, R. Horres, P. A. Gonsiska, R. S. Jabaily, D. M. Crayn, A. C. Smith, K. Winter, G. K. Brown, T. M. Evans, B. K. Holst, H. Luther, W. Till, G. Zizka, P. E. Berry, and K. J. Sytsma. 2011. Phylogeny, Adaptive Radiation, and Historical Biogeography in Bromeliaceae: Insights from an Eight-Locus Plastid Phylogeny. *Amer. J. Bot.* 98: 872–895. http://dx.doi.org/10.3732/ajb.1000059.

Givnish, T. J., K. C. Millam, P. E. Berry, and K. J. Sytsma. 2007. Phylogeny, Adaptive Radiation, and Historical Biogeography of Bromeliaceae Inferred from *ndh*F Sequence Data. *Aliso* 23: 3–26.

Givnish, T. J., K. C. Millam, T. M. Evans, J. C. Hall, J. C. Pires, P. E. Berry, and K. J. Sytsma. 2004. Ancient Vicariance or Recent Long-Distance Dispersal? Inferences about Phylogeny and South American–African Disjunctions in Rapateaceae and Bromeliaceae based on *ndh*F Sequence Data. *Int. J. Pl. Sci.* 165: S35–S54. http://dx.doi.org/10.1086/421067.

Goetghebeur, P. 1998. Cyperaceae. In *Volume 4: Flowering Plants, Monocotyledons: Alismatanae and Commelinanae (except Gramineae)*, K. Kubitzki, ed., pp. 141–190, *The Families and Genera of Vascular Plants*. Springer-Verlag, New York.

Goldblatt, P., and J. C. Manning. 2008. *The Iris Family: Natural History and Classification*. Timber Press, Portland, Oreg.

Goldblatt, P., J. C. Manning, and P. Rudall. 1998. Iridaceae. In *Volume 3: Flowering Plants, Monocotyledons: Lilianae (except Orchidaceae)*, K. Kubitzki, ed., pp. 295–333, *The Families and Genera of Vascular Plants*. Springer-Verlag, New York.

Goldblatt, P., A. Rodriguez, M. P. Powell, T. J. Davies, J. C. Manning, M. van der Bank, and V. Savolainen. 2008. Iridaceae 'Out of Australasia'? Phylogeny, Biogeography, and Divergence Time based on Plastid DNA Sequences. *Syst. Bot.* 33:495–508. http://dx.doi.org/10.1600/036364408785679806.

Goldblatt, P., P. Rudall, and J. E. Henrich. 1990. The Genera of the *Sisyrinchium* Alliance (Iridaceae: Iridoideae): Phylogeny and Relationships. *Syst. Bot.* 15: 497–510. http://dx.doi.org/10.2307/2419365.

Goldstein, I. R. 2004. Andean Bear Use of the Epiphytic Bromeliad *Tillandsia fendleri* at Quebrada el Molino, Venezuela. *Ursus* 15: 54–56. http://dx.doi.org/10.2192/1537-6176(2004)015<0054:ABUOTE>2.0.CO;2.

Gomes-da-Silva, J., F. A. da Costa Vargens, R. do C. de Oliveira Arruda, and A. F. da Costa. 2012. A Morphological Cladistic Analysis of the *Vriesea corcovadensis* Group (Bromeliaceae: Tillandsioideae [*sic*]), with Anatomical Descriptions: New Evidence of the Non-monophyly of the Genus. *Syst. Bot.* 37: 641–654. http://dx.doi.org/10.1600/036364412X648599.

Gonçalves, E. G. 2011. The Commonly Cultivated Species of *Xanthosoma* Schott (Araceae), Including Four New Species. *Aroideana* 34: 3–23.

Gould, F. W., and C. A. Clark. 1978 [1979]. *Dichanthelium* (Poaceae) in the United States and Canada. *Ann. Missouri Bot. Gard.* 65: 1088–1132. http://dx.doi.org/10.2307/2398783.

Grant, J. R. 1993. True Tillandsias Misplaced in *Vriesea* (Bromeliaceae: Tillandsioideae). *Phytologia* 75: 170–185.

Grass Phylogeny Working Group. 2001. Phylogeny and Subfamilial Classification of the Grasses (Poaceae). *Ann. Missouri Bot. Gard.* 88: 373–457. http://dx.doi.org/10.2307/3298585.

Grass Phylogeny Working Group II. 2012. New Grass Phylogeny Resolves Deep Evolutionary Relationships and Discovers C_4 Origins. *New Phytol.* 193: 304–312. http://dx.doi.org/10.1111/j.1469-8137.2011.03972.x.

Graterol, A., P. Torrecilla, and B. Trujillo. 1989. Comentarios críticos sobre el género *Ergarostis* Wolf en Venezuela y clave para la identificación de sus especies. *Ernstia*, ser. 1, 51: 16–28.

Grayum, M. H. 1996. Revision of *Philodendron* Subgenus *Pteromischum* (Araceae) for Pacific and Caribbean Tropical America. *Syst. Bot. Monogr.* 47: 1–233. http://dx.doi.org/10.2307/25027858.

Gutiérrez, H. F. 2014. (2259) Proposal to conserve the name *Pennisetum clandestinum* (*Cenchrus clandestinus*) against *P. longistylum* (Poaceae). *Taxon* 63: 189–190. http://dx.doi.org/10.12705/631.20.

Hágsater, E., and E. Santiago. 2007. *Epidendrum caesaris* Hágsater et E. Santiago, sp. nov. *Icon. Orchid. (Mexico)* 9(6): t. 915.

Hamelin, B. G. 1958. A New Classification of *Uncinia* (Cyperaceae-Caricoideae). *Rec. Domin. Mus.* 3: 85–88.

Hammel, B. E., M. H. Grayum, C. Herrera, and N. Zamora, eds. 2003a. Manual de plantas de Costa Rica, Volumen II. Gimnospermas y monocotiledóneas (Agavaceae–Musaceae). *Monogr. Syst. Bot. Missouri Bot. Gard.* 92: i–xviii, 1–694.

Hammel, B. E., M. H. Grayum, C. Herrera, and N. Zamora, eds. 2003b. Manual de plantas de Costa Rica, Volumen III. Monocotiledóneas (Orchidaceae–Zingiberaceae). *Monogr. Syst. Bot. Missouri Bot. Gard.* 93: i–xvi, 1–884.

Hammer, R. L. 2010. Systematic and Evolutionary Studies in the *Dichanthelium acuminatum* (Poaceae: Paniceae) Complex. Ph.D. diss., Texas A&M University, College Station.

Harling, G. 1954. *Sphaeradenia*: A New Genus of the Cyclanthaceae. *Acta Horti Berg.* 17: 1–6.

Harling, G. 1958. Monograph of the Cyclanthaceae. *Acta Horti Berg.* 18: 1–428, tt. 1–110.

Harling, G., G. J. Wilder, and R. Eriksson. 1998. Cyclanthaceae. In *Volume 3: Flowering Plants, Monocotyledons: Lilianae (except Orchidaceae)*, K. Kubitzki, ed., pp. 202–215, *The Families and Genera of Vascular Plants*. Springer-Verlag, New York.

Henderson, A. 1999. A Phylogenetic Analysis of the Euterpeinae (Palmae; Arecoideae; Areceae) based on Morphology and Anatomy. *Brittonia* 51: 106–113. http://dx.doi.org/10.2307/2666565.

Henderson, A. 2011. A Revision of *Geonoma* (Arecaceae). *Phytotaxa* 17: 1–271.

Henderson, A., and G. de Nevers. 1988. *Prestoea* (Palmae) in Central America. *Ann. Missouri Bot. Gard.* 75: 203–217. http://dx.doi.org/10.2307/2399474.

Henderson, A., and G. Galeano. 1996. *Euterpe*, *Prestoea*, and *Neonicholsonia* (Palmae). *Fl. Neotrop. Monogr.* 72: 1–90.

Henderson, A., G. Galeano, and R. Bernal. 1995. *Field Guide to the Palms of the Americas*. Princeton University Press, Princeton, NJ.

Henrich, J. E., and P. Goldblatt. 1987. A Review of the New World Species of *Orthrosanthus* Sweet (Iridaceae). *Ann. Missouri Bot. Gard.* 74: 577–582. http://dx.doi.org/10.2307/2399325.

Higgins, W. E. 1997. A Reconsideration of the Genus *Prosthechea* (Orchidaceae). *Phytologia* 82: 370–383.

Higgins, W. E. 1999. The Genus *Prosthechea*: An Old Name Resurrected. *Orchids* 68: 1114–1125.

Higgins, W. E., C. van den Berg, and W. M. Whitten. 2003. A Combined Molecular Phylogeny of *Encyclia* (Orchidaceae) and Relationships within Laeliinae. *Selbyana* 24: 165–179.

Hinchliff, C. E., A. E. Lliully A., T. Carey, and E. H. Roalson. 2010. The Origins of *Eleocharis* (Cyperaceae) and the Status of *Websteria*, *Egleria*, and *Chillania*. *Taxon* 59: 709–719.

Hipp, A. L., A. A. Reznicek, P. E. Rothrock, and J. A. Weber. 2006. Phylogeny and Classification of *Carex* Section *Ovales* (Cyperaceae). *Int. J. Pl. Sci.* 167: 1029–1048. http://dx.doi.org/10.1086/505538.

Hitchcock, A. S. 1920. The North American Species of *Isachne*. *Contr. U.S. Natl. Herb.* 22(3): 115–121.

Hitchcock, A. S., and A. Chase. 1910. The North American Species of *Panicum*. *Contr. U.S. Natl. Herb.* 15: i–xiv, 1–396.

Hitchcock, A. S., and A. Chase. 1915. Tropical North American Species of *Panicum*. *Contr. U.S. Natl. Herb.* 17(6): 459–539.

Hodel, D. R. 1992. *Chamaedorea Palms: The Species and Their Cultivation*. The International Palm Society, Lawrence, Kans.

Hofreiter, A. 2006. *Bomarea edulis* (Tussac) Herb. a Nearly Forgotten Pre-Columbian Cultivated Plant and Its Closest Relatives (Alstroemeriaceae). *Feddes Repert.* 117: 85–95. http://dx.doi.org/10.1002/fedr.200511083.

Hofreiter, A. 2007. Biogeography and Ecology of the Alstroemeriaceae–Luzuriagaceae Clade in the High-Mountain Regions of Central and South America. *Harvard Pap. Bot.* 12: 259–284. http://dx.doi.org/10.3100/1043-4534(2007)12[259:BAEOTA]2.0.CO;2.

Hofreiter, A., and T. J. Tillich. 2002. The Delimitation, Infrageneric Subdivision, Ecology and Distribution of *Bomarea* Mirbel (Alstroemeriaceae). *Feddes Repert.* 113: 538–544. http://dx.doi.org/10.1002/fedr.200290005.

Hokche, O., P. E. Berry, and O. Huber, eds. 2008. *Nuevo Catálogo de la Flora Vascular de Venezuela*. Fundación Instituto Botánico de Venezuela, Caracas.

Holst, B. K. 1994. Checklist of Venezuelan Bromeliaceae with Notes on Species Distribution by State and Levels of Endemism. *Selbyana* 15: 132–149.

Hornung, C., and J. Gaviria. 1999. Clave y glosario ilustrado para la determinación de las Bromeliaceae del Estado Mérida, Venezuela. *PlantULA* 2: 119–140.

Hornung-Leoni, C. T. and J. Gaviria. 2013. Sinopsis del género *Pitcairnia* (Bromeliaceae) para el estado Mérida, Venezuela. *Acta Bot. Venez.* 36: 61–80.

Hornung-Leoni, C. T., and V. Sosa. 2006. Morphological Variation in *Puya* (Bromeliaceae): An Allometric Study. *Pl. Syst. Evol.* 256: 35–53. http://dx.doi.org/10.1007/s00606-005-0302-z.

Hornung-Leoni, C. T., and V. Sosa. 2008. Morphological Phylogenetics of *Puya* Subgenus *Puya* (Bromeliaceae). *Bot. J. Linn. Soc.* 156: 93–110. http://dx.doi.org/10.1111/j.1095-8339.2007.00740.x.

Horres, R., K. Schulte, K. Weising, and G. Zizka. 2007. Systematics of Bromelioideae (Bromeliaceae)—Evidence from Molecular and Anatomical Studies. *Aliso* 23: 27–43.

Horres, R., G. Zizka, G. Kahl, and K. Weising. 2000. Molecular Phylogenetics of Bromeliaceae: Evidence from *trn*L (UAA) Intron Sequences of the Chloroplast Genome. *Plant Biol.* 2: 306–315. http://dx.doi.org/10.1055/s-2000-3700.

Huber, H. 1998. Dioscoreaceae. In *Volume 3: Flowering Plants, Monocotyledons: Lilianae (except Orchidaceae)*, K. Kubitzki, ed., pp. 216–235, *The Families and Genera of Vascular Plants*. Springer-Verlag, New York.

Hunt, D. R. 1975. The Reunion of *Setcreasea* and *Separotheca* with *Tradescantia*: American Commelinaceae: I. *Kew Bull.* 30: 443–458. http://dx.doi.org/10.2307/4103068.

Hunt, D. R. 1986a. *Campelia*, *Rhoeo* and *Zebrina* United with *Tradescantia*: American Commelinaceae: XIII. *Kew Bull.* 41: 401–405. http://dx.doi.org/10.2307/4102948.

Hunt, D. R. 1986b. Amplification of *Callisia* Loefl.: American Commelinaceae: XV. *Kew Bull.* 41: 407–412. http://dx.doi.org/10.2307/4102950.

Idrobo, J. M. 1954. Xiridáceas de Colombia. *Caldasia* 6: 184–260.

Jabaily, R. S., and K. J. Sytsma. 2013. Historical Biogeography and Life-History Evolution of Andean *Puya* (Bromeliaceae). *Bot. J. Linn. Soc.* 171: 201–224. http://dx.doi.org/10.1111/j.1095-8339.2012.01307.x.

Jonker, F. P. 1938. *A Monograph of the Burmanniaceae*. Kemink en Zoon, Utrecht.

Jørgensen, P. M., and S. León-Yánez, eds. 1999. Catalogue of the Vascular Plants of Ecuador. *Monogr. Syst. Bot. Missouri Bot. Gard.* 75: i–viii, 1–1181.

Judd, W. S. 1998. The Smilacaceae in the Southeastern United States. *Harvard Pap. Bot.* 3: 147–169.

Judd, W. S. 2000. The Hypoxidaceae in the Southeastern United States. *Harvard Pap. Bot.* 5: 79–98.

Judziewicz, E. J, and L. G. Clark. 1993. The South American Species of *Arthrostylidium* (Poaceae: Bambusoideae: Bambuseae). *Syst. Bot.* 18: 80–99. http://dx.doi.org/10.2307/2419790.

Judziewicz, E. J., L. G. Clark, X. Londoño, and M. J. Stern. 1999. *American Bamboos*. Smithsonian Institution Press, Washington, D.C.

Karremans, A. P., F. T. Bakker, F. Pupulin, R. Solano-Gómez, and M. J. M. Smulders. 2013. Phylogenetics of *Stelis* and Closely Related Genera (Orchidaceae: Pleurothallidinae). *Pl. Syst. Evol.* 299: 151–176. http://dx.doi.org/10.1007/s00606-012-0712-7.

Karst, L., and C. A. Wilson. 2012. Phylogeny of the New World Genus *Sisyrinchium* (Iridaceae) based on Analyses of Plastid and Nuclear DNA Sequence Data. *Syst. Bot.* 37: 87–95. http://dx.doi.org/10.1600/036364412X616666.

Kellogg, E. A., S. S. Aliscioni, O. Morrone, J. Pensiero, and F. Zuloaga. 2009. A Phylogeny of *Setaria* (Poaceae, Panicoideae, Paniceae) and Related Genera based on the Chloroplast Gene *ndhF*. *Int. J. Pl. Sci.* 170: 117–131. http://dx.doi.org/10.1086/593043.

Killip, E. P. 1936. *Bomarea*, a Genus of Showy Andean Plants. *Natl. Hort. Mag.* 15: 115–128.

Kirschner, J., compiler. 2002a. *Species Plantarum: Flora of the World, Part 6. Juncaceae 1: Rostkovia to Luzula*. Australian Biological Resources Study, Canberra.

Kirschner, J., compiler. 2002b. *Species Plantarum: Flora of the World, Part 7. Juncaceae 2: Juncus Subgenus Juncus*. Australian Biological Resources Study, Canberra.

Kirschner, J., compiler. 2002c. *Species Plantarum: Flora of the World, Part 8. Juncaceae 3: Juncus Subgenus Agathryon*. Australian Biological Resources Study, Canberra.

Knuth, R. 1924. Dioscoreaceae. In *Das Pflanzenreich, IV*, 43 (Heft 87), A. Engler, ed., pp. 1–387. Wilhelm Engelmann, Leipzig.

Knuth, R. 1928. Initia Florae venezuelensis. *Repert. Spec. Nov. Regni Veg. Beih.* 43: 1–768.

Kocyan, A., D. A. Snijman, F. Forest, D. S. Devey, J. V. Freudenstein, J. Wiland-Szymańska, M. W. Chase, and P. J. Rudall. 2011. Molecular Phylogenetics of Hypoxidaceae—Evidence from Plastid DNA Data and Inferences on Morphology and Biogeography. *Molec. Phylogenet. Evol.* 60: 122–136. http://dx.doi.org/10.1016/j.ympev.2011.02.021.

Kral, R. 1971. A Treatment of *Abildgaardia*, *Bulbostylis*, and *Fimbristylis* (Cyperaceae) for North America. *Sida* 4: 57–227.

Kral, R. 1983. The Xyridaceae in the Southeastern United States. *J. Arnold Arbor.* 64: 421–429.

Kral, R. 1988. The Genus *Xyris* (Xyridaceae) in Venezuela and Contiguous Northern South America. *Ann. Missouri Bot. Gard.* 75: 522–722. http://dx.doi.org/10.2307/2399434.

Kral, R. 1989. The Genera of Eriocaulaceae in the Southeastern United States. *J. Arnold Arbor.* 70: 131–142.

Kral, R. 1992. A Treatment of American Xyridaceae Exclusive of *Xyris*. *Ann. Missouri Bot. Gard.* 79: 819–885. http://dx.doi.org/10.2307/2399721.

Kral, R. 1998. Xyridaceae. In *Volume 4: Flowering Plants, Monocotyledons: Alismatanae and Commelinanae (except Gramineae)*, K. Kubitzki, ed., pp. 461–469, *The Families and Genera of Vascular Plants*. Springer-Verlag, New York.

Kränzlin, F. 1893. Beiträge zu einer Monographie der Gattung *Habenaria* Willd. *Bot. Jahrb. Syst.* 16: 52–223.

Kränzlin, F. 1919 [1920]. Beiträge zur Kenntnis der Gattung *Telipogon* H.B.K. *Ann. Naturhist. Mus. Wien* 33: 9–38.

Krause, K. 1913. Philodendrinae. In *Das Pflanzenreich, IV,* 23Db (Heft 60), A. Engler, ed., pp. 1–143. Wilhelm Engelmann, Leipzig.

Kress, W. J. 1997. A Synopsis of the Genus *Heliconia* (Heliconiaceae) in Venezuela, with One New Variety. *BioLlania*, Ed. Espec. 6: 407–430.

Kress, W. J., J. Betancur, and B. Echeverry. 1999. *Heliconias: Llamaradas de la Selva Colombiana*. Cristina Uribe Editores, Santa Fé de Bogotá, Colombia.

Kress, W. J., L. M. Prince, and K. J. Williams. 2002. The Phylogeny and a New Classification of the Gingers (Zingiberaceae): Evidence from Molecular Data. *Amer. J. Bot.* 89: 1682–1696. http://dx.doi.org/10.3732/ajb.89.10.1682.

Kubitzki, K. 1998a. Agapanthaceae. In *Volume 3: Flowering Plants, Monocotyledons: Lilianae (except Orchidaceae)*, K. Kubitzki, ed., pp. 58–60, *The Families and Genera of Vascular Plants*. Springer-Verlag, New York.

Kubitzki, K. 1998b. Cannaceae. In *Volume 4: Flowering Plants, Monocotyledons: Alismatanae and Commelinanae (except Gramineae)*, K. Kubitzki, ed., pp. 103–106, *The Families and Genera of Vascular Plants*. Springer-Verlag, New York.

Kükenthal, G. 1909. Cyperaceae–Caricoideae. In *Das Pflanzenreich, IV,* 20 (Heft 38), A. Engler, ed., pp. 1–824. Wilhelm Englemann, Leipzig.

Kükenthal, G. 1935–1936. Cyperaceae–Scirpoideae–Cypereae. In *Das Pflanzenreich, IV*, 20 (Heft 101), A. Engler, ed., pp. 1–671. Wilhelm Engelmann, Leipzig.

Kükenthal, G. 1949. Vorabeiten zu einer Monographie der Rhynchosporideae. *Bot. Jahrb. Syst.* 74: 375–509.

Lambert, F. 1977. *Lockhartia*—The Genus of Braided Orchids: A Study Group Report. *Orchidata* 16(2): 9–13.

Larridon, I., K. Bauters, M. Reynders, W. Huygh, and P. Goetghebeur. 2014. Taxonomic Changes in C_4 *Cyperus* (Cypereae, Cyperoideae, Cyperaceae): Combining the Sedge Genera *Ascolepis*, *Kyllinga* and *Pycreus* into *Cyperus* s.l. *Phytotaxa* 166: 33–48. http://dx.doi.org/10.11646/phytotaxa.166.1.2.

Larridon, I., K. Bauters, M. Reynders, W. Huygh, A. M. Muasya, D. A. Simpson, and P. Goetghebeur. 2013. Towards a New Classification of the Giant Paraphyletic Genus *Cyperus* (Cyperaceae): Phylogenetic Relationships and Generic Delimitation in C_4 *Cyperus*. *Bot. J. Linn. Soc.* 172: 106–126. http://dx.doi.org/10.1111/boj.12020.

Larridon, I., M. Reynders, W. Huygh, K. Bauters, K. Van de Putte, A. M. Muasya, P. Boeckx, D. A. Simpson, A. Vrijdaghs, and P. Goetghebeur. 2011. Affinities in C_3 *Cyperus* Lineages (Cyperaceae) Revealed Using Molecular Phylogenetic Data and Carbon Isotope Analysis. *Bot. J. Linn. Soc.* 167: 19–46. http://dx.doi.org/10.1111/j.1095-8339.2011.01160.x.

Larsen, K. 1998. Costaceae. In *Volume 4: Flowering Plants, Monocotyledons: Alismatanae and Commelinanae (except Gramineae)*, K. Kubitzki, ed., pp. 128–132, *The Families and Genera of Vascular Plants*. Springer-Verlag, New York.

Larsen, K., J. M. Lock, H. Maas, and P. J. M. Maas. 1998. Zingiberaceae. In *Volume 4: Flowering Plants, Monocotyledons: Alismatanae and Commelinanae (except Gramineae)*, K. Kubitzki, ed., pp. 474–495, *The Families and Genera of Vascular Plants*. Springer-Verlag, New York.

Leake, J. R. 1994. Tansley Review no. 69. The Biology of Myco-heterotrophic ('Saprophytic') Plants. *New Phytol.* 127: 171–216. http://dx.doi.org/10.1111/j.1469-8137.1994.tb04272.x.

Linder, H. P., M. Baeza, N. P. Barker, C. Galley, A. M. Humphreys, K. M. Lloyd, D. A. Orlovich, M. D. Pirie, B. K. Simon, N. Walsh, and G. A. Verboom. 2010. A Generic Classification of the Danthonioideae (Poaceae). *Ann. Missouri Bot. Gard.* 97: 306–364. http://dx.doi.org/10.3417/2009006.

Llamozas, S., R. Duno de Stefano, W. Meier, R. Riina, F. Stauffer, G. Aymard, O. Huber, and R. Ortiz. 2003. *Libro Rojo de la Flora Venezolana*. PROVITA, Caracas.

Løjtnant, B. 1977. Observations on the *Elleanthus linifolius* Alliance (Orchidaceae) in S [*sic*] America. *Bot. Not.* 129: 445–453.

López, A., and O. Morrone. 2012. Phylogenetic Studies in *Axonopus* (Poaceae, Panicoideae, Paniceae) and Related Genera: Morphology and Molecular (Nuclear and Plastid) Combined Analyses. *Syst. Bot.* 37: 671–676. http://dx.doi.org/10.1600/036364412X648625.

Luces de Febres, Z. 1963. Las gramíneas del Distrito Federal. *Bol. Acad. Ci. Fís.* 23(63): 1–234.

Luer, C. A. 1982. A Reevaluation of the Genus *Myoxanthus* (Orchidaceae). *Selbyana* 7: 34–54.

Luer, C. A. 1983. *Trichosalpinx*, a New Genus in the Pleurothallidinae. *Phytologia* 54: 393–398.

Luer, C. A. 1986a. Icones Pleurothallidinarum I: Systematics of the Subtribe Pleurothallidinae (Orchidaceae). *Monogr. Syst. Bot. Missouri Bot. Gard.* 15: 1–81.

Luer, C. A. 1986b. A Review of Some of the Species of *Lepanthes* from Venezuela (Orchidaceae). *Phytologia* 59: 443–450.

Luer, C. A. 1986c. Icones Pleurothallidinarum II: Systematics of the Genus *Masdevallia* (Orchidaceae). *Monogr. Syst. Bot. Missouri Bot. Gard.* 16: 1–63.

Luer, C. A. 1986d. Icones Pleurothallidinarum III: Systematics of the Genus *Pleurothallis* (Orchidaceae). *Monogr. Syst. Bot. Missouri Bot. Gard.* 20: 1–109.

Luer, C. A. 1990. Icones Pleurothallidinarum VII: Systematics of *Platystele* (Orchidaceae). *Monogr. Syst. Bot. Missouri Bot. Gard.* 38: 1–135.

Luer, C. A. 1991. Icones Pleurothallidinarum VIII: Systematics of *Lepanthopsis*, *Octomeria* Subgenus *Pleurothallopsis*, *Restrepiella*, *Restrepiopsis*, *Salpistele*, and *Teagueia*; Addenda to *Platystele*, *Porroglossum*, and *Scaphosepalum*. *Monogr. Syst. Bot. Missouri Bot. Gard.* 39: 1–161.

Luer, C. A. 1992. Icones Pleurothallidinarum IX: Systematics of *Myoxanthus*; Addenda to *Platystele*, *Pleurothallus* Subgenus *Scopula* and *Scaphosepalum* (Orchidaceae). *Monogr. Syst. Bot. Missouri Bot. Gard.* 44: 1–128.

Luer, C. A. 1995. Icones Pleurothallidinarum XII: Systematics of the Genus *Brachionidium* (Orchidaceae); Addenda to *Dresslerella*, *Platystele*, and *Porroglossum* (Orchidaceae); A Re-evaluation of the Pleurothallid Subgenera *Satyria* and *Silenia* (Orchidaceae). *Monogr. Syst. Bot. Missouri Bot. Gard.* 57: 1–146.

Luer, C. A. 1996. Icones Pleurothallidinarum XIV: The Genus *Lepanthes* Subgenus *Lepanthes* in Ecuador (Orchidaceae). *Monogr. Syst. Bot. Missouri Bot. Gard.* 61: 1–255.

Luer, C. A. 1997. Icones Pleurothallidinarum XV: Systematics of *Trichosalpinx*; Addenda to *Dracula*, *Masdevallia*, *Myoxanthus* and *Scaphosepalum*; Corrigenda to *Lepanthes* of Ecuador. *Monogr. Syst. Bot. Missouri Bot. Gard.* 64: 1–136.

Luer, C. A. 1998. Icones Pleurothallidinarum XVI: Systematics of *Pleurothallis* Subgenera *Crocodeilanthe*, *Rhynchopera*, *Talpinaria*; Addenda to *Lepanthes* of Ecuador, *Masdevallia*, *Platystele*, *Pleurothallis*, *Restrepia* and *Scaphosepalum* (Orchidaceae). *Monogr. Syst. Bot. Missouri Bot. Gard.* 65: 1–122.

Luer, C. A. 1999. Icones Pleurothallidinarum XVIII: Systematics of *Pleurothallis* subgen. *Pleurothallis* sect. *Pleurothallis*, subsect. *Longiracemosae*, subsect. *Macrophyllae-Racemosae*, subsect. *Perplexae*, subgen. *Pseudostelis*, subgen. *Acuminatia*; Addenda to *Dracula*, *Lepanthes*, *Masdevallia* and *Pleurothallis*; Miscellaneous New Species of *Dryadella*, *Lepanthes* and *Pleurothallis*. *Monogr. Syst. Bot. Missouri Bot. Gard.* 76: 1–182.

Luer, C. A. 2000a. Icones Pleurothallidinarum XIX: Systematics of *Masdevallia*, Part One. *Monogr. Syst. Bot. Missouri Bot. Gard.* 77: 1–264.

Luer, C. A. 2000b. Icones Pleurothallidinarum XXI: Systematics of *Masdevallia*, Part Two; *M.* Subgenus *Masdevallia* sect. *Coriaceae*, sect. *Dentatae*, sect. *Durae*, sect. *Reichenbachianae*, *M.* Subgenus *Pygmaeia*. *Monogr. Syst. Bot. Missouri Bot. Gard.* 82: [i]–[iv], 265–518, 227a, 228a, 105a, 106a, 115a, 116a, 155a, 156a, 207a, 208a.

Luer, C. A. 2002a. Icones Pleurothallidinarum XXIII: Systematics of *Masdevallia*, Part Four; *M.* Subgenus *Masdevallia* sect. *Masdevallia*, subsect. *Caudatae*, subsect. *Oscilantes*, subsect. *Saltatrices*. *Monogr. Syst. Bot. Missouri Bot. Gard.* 87: i–[iv], 781–1047, 33a, 34a, 263a, 264a, 319a, 320a, 367a, 368a, 505a, 506a, 505b, 506b, 533a, 534a, 659a, 660a.

Luer, C. A. 2002b. A Systematic Method of Classification of the Pleurothallidinae versus a Strictly Phylogenetic Method. *Selbyana* 23: 57–110.

Luer, C. A. 2004. Icones Pleurothallidinarum XXVI: *Pleurothallis* Subgenus *Acianthera* and Three Allied Subgenera; A Second Century of New Species of *Stelis* of Ecuador; *Epibator*, *Ophidion*, *Zootrophion*; Addenda to *Brachionidium*, *Dracula*, *Lepanthes*, *Platystele*, *Pleurothallis*, *Porroglossum*, and *Masdevallia*; New Genera and Combinations. *Monogr. Syst. Bot. Missouri Bot. Gard.* 95: 1–265.

Luer, C. A. 2005. Icones Pleurothallidinarum XXVII: *Dryadella* and *Acronia* sect. *Macrophyllae-Fasciculatae*; Addenda to *Acianthera*, *Andinia*, *Dracula*, *Dresslerella*, *Lepanthes* and *Masdevallia*; New Taxa, Validation of Taxa, Errata. *Monogr. Syst. Bot. Missouri Bot. Gard.* 103: 1–310.

Luer, C. A. 2006. Icones Pleurothallidinarum XXVIII: A Reconsideration of *Masdevallia*; Systematics of *Specklinia* and Vegetatively Similar Taxa (Orchidaceae); Miscellaneous New Taxa in the Pleurothallid Genera *Acianthera*, *Acronia*, *Arthrosia*, *Colombiana*, *Crocodeilanthe*, *Dracula*, *Dryadella*, *Loddigesia*, *Masdevallia*, *Myoxanthus*, *Ogygia*, *Platystele*, *Porroglossum*, *Restrepia* and *Trichosalpinx*. *Monogr. Syst. Bot. Missouri Bot. Gard.* 105: 1–274.

Luer, C. A. 2007. Icones Pleurothallidinarum XXIX: A Third Century of *Stelis* of Ecuador; Systematics of *Apoda–Prorepentia*; Systematics of Miscellaneous Small Genera; Addenda: New Genera, Species, and Combinations (Orchidaceae). *Monogr. Syst. Bot. Missouri Bot.* Gard. 112: 1–130.

Luer, C. A. 2009. Icones Pleurothallidinarum XXX: *Lepanthes* of Jamaica; Systematics of *Stelis*, *Stelis* of Ecuador, Part Four; Addenda: Systenatics [*sic*] of *Masdevallia*, New Species of *Lepanthes* from Ecuador, and Miscellaneous New Combinations. *Monogr. Syst. Bot. Missouri Bot. Gard.* 115: 1–265.

Luer, C. A. 2010. Icones Pleurothallidinarum XXXI: *Lepanthes* of Bolivia; Systematics of *Octomeria* Species North and West of Brazil; Addenda: New Species of *Brachionidium*, *Lepanthes*, *Masdevallia*, *Octomeria*, *Platystele*, *Pleurothallopsis*, and *Porroglossum*; Corrigenda. *Monogr. Syst. Bot. Missouri Bot. Gard.* 120: 1–154.

Luer, C. A. 2011. Miscellaneous New Species in the Pleurothallidinae (Orchidaceae) Excluding Species from Brazil. *Harvard Pap. Bot.* 16: 311–360. http://dx.doi.org/10.3100/0.25.016.0206.

Luther, H. E. 1995. Notas sobre o gênero *Mezobromelia*. [Notes on the Genus *Mezobromelia*.] *Bromélia* 2: 3–5.

Maas, P. J. M. 1972. Costoideae (Zingiberaceae). *Fl. Neotrop. Monogr.* 8: 1–139.

Maas, P. J. M. 1977. *Renealmia* (Zingiberaceae–Zingiberoideae): Costoideae (Additions) (Zingiberaceae). *Fl. Neotrop. Monogr.* 18: 1–218.

Maas, P. J. M. 1982. Zingiberaceae. In *Flora de Venezuela*. Vol. 11, pt. 2, T. Lasser, ed., pp. 205–256. Instituto Botánico, Caracas.

Maas, P. J. M., and H. Maas-van der Kamer. 1988. Burmanniaceae. *Fl. Colomb.* 7: 33–124.

Maas, P. J. M., H. Maas-van der Kamer, J. van Benthem, H. C. M. Snelders, and T. Rübsamen. 1986. Burmanniaceae. *Fl. Neotrop. Monogr.* 42: 1–189.

Maas-van de Kamer, H. 1998. Burmanniaceae. In *Volume 3: Flowering Plants, Monocotyledons: Lilianae (except Orchidaceae)*, K. Kubitzki, ed., pp. 154–164, *The Families and Genera of Vascular Plants*. Springer-Verlag, New York.

Maas-van der Kamer, H., and P. J. M. Maas. 2008. The Cannaceae of the World. *Blumea* 53: 247–318. http://dx.doi.org/10.3767/000651908X607945.

Mabberley, D. J. 1980. Generic Names Published in Salisbury's Reviews of Robert Brown's Works. *Taxon* 29: 597–606. http://dx.doi.org/10.2307/1220331. Madison, M. 1977. A Revision of *Monstera* (Araceae). *Contr. Gray Herb.* 207: 3–100.

Madison, M. 1978a. The Species of *Anthurium* with Palmately Divided Leaves. *Selbyana* 2: 239–282.

Madison, M. 1978b. The Genera of Araceae in the Northern Andes. *Aroideana* 1: 31–53.

Mathews, S., R. E. Spangler, R. J. Mason-Gamer, and E. A. Kellogg. 2002. Phylogeny of Andropogoneae Inferred from Phytochrome B, GBSSI, and *NDH*. *Int. J. Pl. Sci.* 163: 441–450. http://dx.doi.org/10.1086/339155.

Mayo, S. J. 1982. *Anthurium acaule* (Jacq.) Schott (Araceae) and West Indian 'Bird's Nest' Anthuriums. *Kew Bull.* 36: 691–719. http://dx.doi.org/10.2307/4117912.

Mayo, S. J., J. Bogner, and P. C. Boyce. 1997. *The Genera of Araceae*. Royal Botanic Gardens, Kew, Richmond, UK.

Mayo, S. J., J. Bogner, and P. C. Boyce. 1998. Araceae. In *Volume 4: Flowering Plants, Monocotyledons: Alismatanae and Commelinanae (except Gramineae)*, K. Kubitzki, ed., pp. 26–74, *The Families and Genera of Vascular Plants*. Springer-Verlag, New York.

McClure, F. A. 1973. Genera of Bamboos Native to the New World (Gramineae: Bambusoideae). *Smithsonian Contr. Bot.* 9: 1–148. http://dx.doi.org/10.5479/si.0081024X.9.

McNeill, J., F. R. Barrie, W. R. Buck, V. Demoulin, W. Greuter, D. L. Hawksworth, P. S. Herendeen, S. Knapp, K. Marhold, J. Prado, W. F. Prud'homme van Reine, G. F. Smith, J. H. Wiersema, and N. J. Turland, eds. 2012. International Code of Nomenclature for Algae, Fungi, and Plants (Melbourne Code): Adopted by the Eighteenth International Botanical Congress Melbourne, Australia, July 2011. *Regnum Veg.* 154: i–xxx, 1–208.

Meerow, A. W. 1989. Systematics of the Amazon Lilies, *Eucharis* and *Caliphruria* (Amaryllidaceae). *Ann. Missouri Bot. Gard.* 76: 136–220. http://dx.doi.org/10.2307/2399347.

Meerow, A. W., and B. Deghan. 1984. Re-establishment and Lectotypification of *Eucharis amazonica* Linden ex Planchon (Amaryllidaceae). *Taxon* 33: 416–422. http://dx.doi.org/10.2307/1220981.

Meerow, A. W., M. F. Fay, M. W. Chase, C. L. Guy, Q.-B. Li, D. A. Snijman, and S.-L. Yang. 2000. Phylogeny of the Amaryllidaceae: Molecules and Morphology. In *Monocots: Systematics and Evolution*, K. L. Wilson and D. A. Morrison, eds., pp. 372–386. CSIRO, Collingwood, Victoria, Australia.

Meerow, A. W., M. F. Fay, C. L. Guy, Q.-B. Li, F. Q. Zaman, and M. W. Chase. 1999. Systematics of Amaryllidaceae based on Cladistic Analysis of Plastid *rbcL* and *trnL-F* Sequence Data. *Amer. J. Bot.* 86: 1325–1345. http://dx.doi.org/10.2307/2656780.

Meerow, A. W., and D. A. Snijman. 1998. Amaryllidaceae. In *Volume 3: Flowering Plants, Monocotyledons: Lilianae (except Orchidaceae)*, K. Kubitzki, ed., pp. 83–110, *The Families and Genera of Vascular Plants*. Springer-Verlag, New York.

Meier, W. 2005. Aspectos de la flora y vegetación del Monumento Natural Cerro Platillón (Juan Germán Roscio), Edo. Guárico, Venezuela. *Acta Bot. Venez.* 28: 39–62.

Merckx, V., F. T. Bakker, S. Huysmans, and E. Smets. 2009. Bias and Conflict in Phylogenetic Inference of Myco-heterotrophic Plants: A Case Study in Thismiaceae. *Cladistics* 25: 64–77. http://dx.doi.org/10.1111/j.1096-0031.2008.00241.x.

Merckx, V., L. W. Chatrou, B. Lemaire, M. N. Sainge, S. Huysmans, and E. F. Smets. 2008. Diversification of Myco-heterotrophic Angiosperms: Evidence from Burmanniaceae. *BMC Evol. Biol.* 8: 178. http://dx.doi.org/10.1186/1471-2148-8-178.

Merckx, V., S. Huysmans, and E. Smets. 2010. Cretaceous Origins of Myco-heterotrophic Lineages in Dioscoreales. In *Diversity, Phylogeny, and Evolution in the Monocotyledons: Proceedings of the Fourth International Conference on the Comparative Biology of the Monocotyledons and the Fifth International Symposium on Grass Systematics and Evolution,* O. Seberg, G. Petersen, A. S. Barfod, and J. I. Davis, eds., pp. 39–53. Aarhus University Press, Århus, Denmark.

Merckx, V., P. Schols, H. Maas-van de Kamer, P. Maas, S. Huysmans, and E. Smets. 2006. Phylogeny and Evolution of Burmanniaceae (Dioscoreales) based on Nuclear and Mitochondrial Data. *Amer. J. Bot.* 93: 1684–1698. http://dx.doi.org/10.3732/ajb.93.11.1684.

Michelangeli, F. A., J. I. Davis, and D. W. Stevenson. 2003. Phylogenetic Relationships among Poaceae and Related Families as Inferred from Morphology,

Inversions in the Plastid Genome, and Sequence Data from the Mitochondrial and Plastid Genomes. *Amer. J. Bot.* 90: 93–106. http://dx.doi.org/10.3732/ajb.90.1.93.

Moore, H. E., Jr., and J. Dransfield. 1978. A New Species of *Wettinia* and Notes on the Genus. *Notes Roy. Bot. Gard. Edinburgh* 36: 259–267.

Morales, L. 1986. El género *Pterichis* en Colombia. *Orquideología* 16: 53–79.

Morillo, G., B. Briceño, and J. F. Silva, eds., 2010. *Botánica y Ecología de las Monocotiledóneas de los Páramos en Venezuela*. Vol. 2. Instituto de Ciencias Ambientales y Ecológicas, Universidad de Los Andes, Mérida, Venezuela.

Morillo, G., B. Briceño, and J. F. Silva, eds., 2011. *Botánica y Ecología de las Monocotiledóneas de los Páramos en Venezuela*. Vol. 1. Instituto de Ciencias Ambientales y Ecológicas, Universidad de Los Andes, Mérida, Venezuela.

Morrone, O., L. Aagesen, M. A. Scataglini, D. L. Salariato, S. S. Denham, M. A. Chemisquy, S. M. Sede, L. M. Giussani, E. A. Kellogg, and F. O. Zuloaga. 2012. Phylogeny of the Paniceae (Poaceae: Panicoideae): Integrating Plastid DNA Sequences and Morphology into a New Classification. *Cladistics* 28: 333–356. http://dx.doi.org/10.1111/j.1096-0031.2011.00384.x.

Morrone, O., F. O. Zuloaga, and E. Carbonó. 1995. Revisión del grupo *Racemosa* del género *Paspalum* (Poaceae: Panicoideae: Paniceae). *Ann. Missouri Bot. Gard.* 82: 82–116. http://dx.doi.org/10.2307/2399982.

Muasya, A. M., J. J. Bruhl, D. A. Simpson, A. Culham, and M. W. Chase. 2000. Suprageneric Phylogeny of Cyperaceae: A Combined Analysis. In *Monocots: Systematics and Evolution*, K. L. Wilson and D. A. Morrison, eds., pp. 593–601. CSIRO, Collingwood, Victoria, Australia.

Muasya, A. M., D. A. Simpson, and M. W. Chase. 2001 [2002]. Generic Relationships and Character Evolution in *Cyperus* s.l. (Cyperaceae). *Syst. Geogr. Pl.* 71: 539–544. http://dx.doi.org/10.2307/3668698.

Muasya, A. M., D. A. Simpson, and M. W. Chase. 2002. Phylogenetic Relationships in *Cyperus* s.l. (Cyperaceae) Inferred from Plastid DNA Sequence Data. *Bot. J. Linn. Soc.* 138: 145–153. http://dx.doi.org/10.1046/j.1095-8339.2002.138002145.x.

Muasya, A. M., D. A. Simpson, M. W. Chase, and A. Culham. 1998. An Assessment of Suprageneric Phylogeny in Cyperaceae Using *rbc*L DNA Sequences. *Pl. Syst. Evol.* 211: 257–271. http://dx.doi.org/10.1007/BF00985363.

Muasya, A. M., D. A. Simpson, G. A. Verboom, P. Goetghebeur, R. F. C. Naczi, M. W. Chase, and E. Smets. 2009a. Phylogeny of Cyperaceae based on DNA Sequence Data: Current Progress and Future Prospects. *Bot. Rev.* 75: 2–21. http://dx.doi.org/10.1007/s12229-008-9019-3.

Muasya, A. M., A. Vrijdaghs, D. A. Simpson, M. W. Chase, P. Goetghebeur, and E. Smets. 2009b. What is a Genus in Cypereae: Phylogeny, Character Homology Assessment and Generic Circumscription in Cypereae. *Bot. Rev.* 75: 52–66. http://dx.doi.org/10.1007/s12229-008-9018-4.

Munro, S. L., and H. P. Linder. 1998. The Phylogenetic Position of *Prionium* (Juncaceae) within the Order Juncales based on Morphological and *rbcL* Sequence Data. *Syst. Bot.* 23: 43–55. http://dx.doi.org/10.2307/2419573.

Nauheimer, L., D. Metzler, and S. S. Renner. 2012. Global History of the Ancient Monocot Family Araceae Inferred with Models Accounting for Past Continental Positions and Previous Ranges based on Fossils. *New Phytol.* 195: 938–950. http://dx.doi.org/10.1111/j.1469-8137.2012.04220.x.

Neubig, K. M., W. M. Whitten, M. A. Blanco, L. Endara, N. H. Williams, S. Koehle, and M. W. Chase. 2011. Preliminary Molecular Phylogenetics of *Sobralia* and Relatives (Orchidaceae: Sobralieae). *Lankesteriana* 11: 307–317.

Neubig, K. M., W. M. Whitten, N. H. Williams, M. A. Blanco, L. Endara, J. G. Burleigh, K. Silvera, and J. C. Cushman. 2012. Generic Recircumscriptions of Oncidiinae (Orchidaceae: Cymbidieae) based on Maximum Likelihood Analysis of Combined DNA Datasets. *Bot. J. Linn. Soc.*168: 117–146. http://dx.doi.org/10.1111/j.1095-8339.2011.01194.x.

Neubig, K. M., N. H. Williams, W. M. Whitten, and F. Pupulin. 2009. Molecular Phylogenetics and the Evolution of Fruit and Leaf Morphology of *Dichaea* (Orchidaceae: Zygopetalinae). *Ann. Bot. (Oxford)*, n.s., 104: 457–467.

Nicolson, D. H. 1982. Schott's New Taxa Published in the *Wiener Zeitschrift für Kunst* etc. (1829–1830). *Taxon* 31: 549–551. http://dx.doi.org/10.2307/1220691.

Niño, S. M., L. G. Clark, and L. J. Dorr. 2006. Una nueva especie de *Chusquea* (Poaceae: Bambusoideae) de la Cordillera de Mérida, Venezuela. *Brittonia* 58: 46–51. http://dx.doi.org/10.1663/0007-196X(2006)58[46:UNEDCP]2.0.CO;2.

Nordal, I. 1998. Hypoxidaceae. In *Volume 3: Flowering Plants, Monocotyledons: Lilianae (except Orchidaceae)*, K. Kubitzki, ed., pp. 286–295, *The Families and Genera of Vascular Plants*. Springer-Verlag, New York.

Oliva-Esteva, F., and J. A. Steyermark. 1987. *Bromeliaceas* [*sic*] *of Venezuela: Native and Cultived* [*sic*]. Armitano, Caracas.

Ormerod, P. 2002. Taxonomic Changes in Goodyerinae (Orchidaceae: Orchidoideae). *Lindleyana* 17: 189–238.

Ortega, F., G. Aymard C., and B. Stergios. 1987. Aproximación al conocimiento de la flora de las montañas de Guaramacal, Estado Trujillo, Venezuela. *Bio-Llania* 5: 1–63, tt. 1–17.

Ortiz-Diaz, J.-J., and A. Culham. 2000. Phylogenetic Relationships of the Genus *Sporobolus* (Poaceae: Eragrostideae) based on Nuclear Ribosomal DNA ITS Sequences. In *Grasses: Systematics and Evolution*, S. W. L. Jacobs and J. Everett, eds., pp. 184–188. CSIRO, Collingwood, Victoria, Australia.

Pansarin, E. R., and M. C. E. Amaral. 2008. Reproductive Biology and Pollination Mechanisms of *Epidendrum secundum* (Orchidaceae) Floral Variation: A Consequence of Natural Hybridization? *Pl. Biol.* 10: 211–219. http://dx.doi.org/10.1111/j.1438-8677.2007.00025.x.

Pansarin, E. R., and F. de Barros. 2008. Taxonomic Notes on Pogonieae (Orchidaceae): *Cleistesiopsis*, a New Genus Segregated from *Cleistes*, and Description of Two New South American Species, *Cleistes batistana* and *C. elongata*. *Kew Bull.* 63: 441–448. http://dx.doi.org/10.1007/s12225-008-9047-5.

Pansarin, E. R., A. Salatino, and M. L. F. Salatino. 2008. Phylogeny of South American Pogonieae (Orchidaceae, Vanilloideae) based on Sequences of Nuclear Ribosomal (ITS) and Chloroplast (*psaB*, *rbcL*, *rps16*, and *trnL-F*) DNA, with Emphasis on *Cleistes* and Discussion of Biogeographic Implications. *Organisms Diversity Evol.* 8: 171–181. http://dx.doi.org/10.1016/j.ode.2007.09.003.

Parra, L. R., A. M. Giulietti, M. J. G. de Andrade, and C. van den Berg. 2010. Reestablishment and New Circumscription of *Comanthera* (Eriocaulaceae). *Taxon* 59: 1135–1146.

Parsons, J. J. 1972. Spread of African Pasture Grasses to the American Tropics. *J. Range Managem.* 25: 12–17. http://dx.doi.org/10.2307/3896654.

Pensiero, J. F. 1999. Las especies sudamericanas del género *Setaria* (Poaceae, Paniceae). *Darwiniana* 37: 37–151.

Peterson, P. M., and D. Giraldo-Caños. 2008. *Eragrostis* (Poaceae: Chloroideae: Eragrostideae) in Colombia. *J. Bot. Res. Inst. Texas* 2: 875–916.

Peterson, P. M., and A. M. Planchuelo. 1998. *Bromus catharticus* in South America (Poaceae: Bromeae). *Novon* 8: 53–60. http://dx.doi.org/10.2307/3391893.

Peterson, P. M., R. D. Webster, and J. Valdes-Reyna. 1997. Genera of the New World Eragrostideae (Poaceae: Chloridoideae). *Smithsonian Contr. Bot.* 87: 1–50. http://dx.doi.org/10.5479/si.0081024X.87.

Phillips, S. M., and W.-L. Chen. 2003. Notes on Grasses (Poaceae) for the *Flora of China*, I: *Deyeuxia*. *Novon* 13: 318–321. http://dx.doi.org/10.2307/3393266.

Pinheiro, F., and S. Cozzolino. 2013. *Epidendrum* (Orchidaceae) as a Model System for Ecological and Evolutionary Studies in the Neotropics. *Taxon* 62: 77–88.

Pinto-Escobar, P. 1981. The Genus *Bromus* in Northern South America. *Bot. Jahrb. Syst.* 102: 445–457.

Pirie, M. D., A. M. Humphreys, N. P. Barker, and H. P. Linder. 2009. Reticulation, Data Combination, and Inferring Evolutionary History: An Example from Danthonioideae (Poaceae). *Syst. Biol.* 58: 612–628. http://dx.doi.org/10.1093/sysbio/syp068.

Pittier, H. 1926. *Manual de las Plantas Usuales de Venezuela*. Litografía del Comercio, Caracas.

Pittier, H., T. Lasser, L. Schnee, Z. Luces de Febres, and V. Badillo. 1945. *Catálogo de la Flora Venezolana*. 3 vols. Vargas, Caracas.

Planchuelo, A. M., and P. M. Peterson. 2000. The Species of *Bromus* (Poaceae: Bromeae) in South America. In *Grasses: Systematics and Evolution*, S. W. L. Jacobs and J. Everett, eds., pp. 89–101. CSIRO, Collingwood, Victoria, Australia.

Pohl, R. W. 1980. Family #15, Gramineae. In *Flora Costaricensis*, W. Burger, ed. *Fieldiana, Bot.*, n.s., 4: 1–608.

Pridgeon, A. M., and M. W. Chase. 2001. A Phylogenetic Reclassification of the Pleurothallidinae (Orchidaceae). *Lindleyana* 16: 235–271.

Pridgeon, A. M., P. J. Cribb, M. W. Chase, and F. N. Rasmussen, eds. 2001a. *Genera Orchidacearum. Vol. 2: Orchidoideae (Part 1)*. Oxford University Press, Oxford.

Pridgeon, A. M., P. J. Cribb, M. W. Chase, and F. N. Rasmussen, eds. 2003. *Genera Orchidacearum. Vol. 3: Vanilloideae (Part 2)*. Oxford University Press, Oxford.

Pridgeon, A. M., P. J. Cribb, M. W. Chase, and F. N. Rasmussen, eds. 2005. *Genera Orchidacearum. Vol. 4: Epidendroideae (Part One)*. Oxford University Press, Oxford.

Pridgeon, A. M., P. J. Cribb, M. W. Chase, and F. N. Rasmussen, eds. 2009. *Genera Orchidacearum. Vol. 5: Epidendroideae (Part Two)*. Oxford University Press, Oxford.

Pridgeon, A. M., R. Solano, and M. W. Chase. 2001b. Phylogenetic Relationships in Pleurothallidinae (Orchidaceae): Combined Evidence from Nuclear and

Plastid DNA Sequences. *Amer. J. Bot.* 88: 2286–2308. http://dx.doi.org/10.2307/3558390.

Prince, L. M. 2010. Phylogenetic Relationships and Species Delimitation in *Canna* (Cannaceae). In *Diversity, Phylogeny, and Evolution in the Monocotyledons: Proceedings of the Fourth International Conference on the Comparative Biology of the Monocotyledons and the Fifth International Symposium on Grass Systematics and Evolution*, O. Seberg, G. Petersen, A. S. Barfod, and J. I. Davis, eds., pp. 307–331. Aarhus University Press, Århus, Denmark.

Prince, L. M., and W. J. Kress. 2006. Phylogenetic Relationships and Classification in Marantaceae: Insights from Plastid DNA Sequence Data. *Taxon* 55: 281–296. http://dx.doi.org/10.2307/25065578.

Pupulin, F. 1995. A Revision of the Genus *Trichocentrum* (Orchidaceae: Oncidiinae). *Lindleyana* 10: 183–210.

Pupulin, F. 2000. *Trichocentrum*: A Forgotten Genus of Spurred Jewels. *Orchids* 69: 226–237.

Quintanar, A., S. Castroviejo, and P. Catalán. 2007. Phylogeny of the Tribe Aveneae (Pooideae, Poaceae) Inferred from Plastid *trnT*-F and Nuclear ITS Sequences. *Amer. J. Bot.* 94: 1554–1569. http://dx.doi.org/10.3732/ajb.94.9.1554.

Rahn, K. 1998. Alliaceae. In *Volume 3: Flowering Plants, Monocotyledons: Lilianae (except Orchidaceae)*, K. Kubitzki, ed., pp. 70–78, *The Families and Genera of Vascular Plants*. Springer-Verlag, New York.

Rasmussen, F. N. 1977. The Genus *Corymborkis* Thou. (Orchidaceae): A Taxonomic Revision. *Bot. Tidsskr.* 71: 161–192.

Rauh, W. 1992. The Genus *Mezobromelia*. *J. Bromeliad Soc.* 42: 20–26.

Reeves, G., M. W. Chase, P. Goldblatt, P. Rudall, M. F. Fay, A. V. Cox, B. Lejeune, and T. Souza-Chies. 2001a. Molecular Systematics of Iridaceae: Evidence from Four Plastid DNA Regions. *Amer. J. Bot.* 88: 2074–2087. http://dx.doi.org/10.2307/3558433.

Reeves, G., P. Goldblatt, P. J. Rudall, and M. W. Chase. 2001b. Molecular Systematics of Iridaceae: A Combined Analysis of Four Plastid DNA Sequence Matrices. *Ann. Bot. (Rome)*, n.s., 1(2): 29–42.

Remizova, M., and D. Sokoloff. 2003. Inflorescence and Floral Morphology in *Tofieldia* (Tofieldiaceae) Compared with Araceae, Acoraceae and Alismatalaes s. str. *Bot. Jahrb. Syst.* 124: 255–271. http://dx.doi.org/10.1127/0006-8152/2003/0124-0255.

Remizowa, M. V., D. D. Sokoloff, L. M. Campbell, D. W. Stevenson, and P. J. Rudall. 2011. *Harperocallis* is Congeneric with *Isidrogalvia* (Tofieldiaceae, Alismatales): Evidence from Comparative Floral Morphology. *Taxon* 60: 1076–1094.

Renz, J. 1992. The Genus *Habenaria* (Orchidaceae) in the Guianas. *Candollea* 47: 483–512.

Reznicek, A. A. 1990. Evolution in Sedges (*Carex*, Cyperaceae). *Canad. J. Bot.* 68: 1409–1432. http://dx.doi.org/10.1139/b90-180.

Richard, L. C. 1817. *De Orchideis Europaeis Annotationes*. Typographia A. Belin, Paris.

Roalson, E. H., and E. A. Friar. 2000. Infrageneric Classification of *Eleocharis* (Cyperaceae) Revisited: Evidence from the Internal Transcribed Spacer (ITS) Region of Nuclear Ribosomal DNA. *Syst. Bot.* 25: 323–336. http://dx.doi.org/10.2307/2666645.

Roalson, E. H., C. E. Hinchliff, R. Trevisan, and C. R. M. da Silva. 2010. Phylogenetic Relationships in *Eleocharis* (Cyperaceae): C_4 Photosynthesis Origins and Patterns of Diversification in the Spikerushes. *Syst. Bot.* 35: 257–271. http://dx.doi.org/10.1600/036364410791638270.

Rodríguez, G. 1954. Revisión del género *Heliconia* en Venezuela. *Bol. Soc. Venez. Ci. Nat.* 15: 117–130.

Rodríguez, H. 2006. Catálogo de las especies del género *Paspalum* (Poaceae) para Venezuela. *Revista Fac. Agron. (Maracay)* 32: 87–130.

Rodríguez-Robles, J. A., E. J. Meléndez, and J. D. Ackerman. 1992. Effects of Display Size, Flowering Phenology, and Nectar Availability on Effective Visitation Frequency in *Comparettia falcata* (Orchidaceae). *Amer. J. Bot.* 79: 1009–1017. http://dx.doi.org/10.2307/2444910.

Rogers, G. K. 1984. The Zingiberales (Cannaceae, Marantaceae, and Zingiberaceae) in the Southeastern United States. *J. Arnold Arbor.* 65: 5–55.

Romero-González, G. A., and G. Carnevali Fernández-Concha. 2000. *Orchids of Venezuela: An Illustrated Field Guide*. 2nd ed. 3 vols. Armitano Editores, Caracas.

Rominger, J. M. 1962. Taxonomy of *Setaria* (Gramineae) in North America. *Illinois Biol. Monogr.* 29: 1–132.

Roncal, J., A. Blach-Overgaard, F. Borchsenius, H. Balslev, and J.-C. Svenning. 2011. A Dated Phylogeny Complements Macroecological Analysis to Explain the Diversity Patterns in *Geonoma* (Arecaceae). *Biotropica* 43: 324–334. http://dx.doi.org/10.1111/j.1744-7429.2010.00696.x.

Rosa, M. M., and V. L. Scatena. 2007. Floral Anatomy of Paepalanthoideae (Eriocaulaceae, Poales) and Their Nectariferous Structures. *Ann. Bot. (Oxford)*, n.s., 99: 131–139.

Rothacker, E. P. 2007. The Primitive Epidendroideae (Orchidaceae): Phylogeny, Character Evolution and the Systematics of *Psilochilus* (Triphoreae). Ph.D. diss., Ohio State University, Columbus.

Rothwell, G. W., M. R. Van Atta, H. E. Ballard Jr., and R. A. Stockey. 2004. Molecular Phylogenetic Relationships among Lemnaceae and Araceae Using the Chloroplast *trn*L-*trn*F Intergenic Spacer. *Molec. Phylogenet. Evol.* 30: 378–385. http://dx.doi.org/10.1016/S1055-7903(03)00205-7.

Rua, G. H., P. R. Spiranza, M. Vaio, and M. Arakai. 2010. A Phylogenetic Analysis of *Paspalum* (Poaceae) based on cpDNA and Morphology. *Pl. Syst. Evol.* 288: 227–243. http://dx.doi.org/10.1007/s00606-010-0327-9.

Rudall, P. J., and R. M. Bateman. 2006. Morphological Phylogenetic Analysis of Pandanales: Testing Contrasting Hypotheses of Floral Evolution. *Syst. Bot.* 31: 223–238. http://dx.doi.org/10.1600/036364406777585766.

Rudall, P. J., M. W. Chase, D. F. Cutler, J. Rusby, and A. Y. de Bruijn. 1998. Anatomical and Molecular Systematics of Asteliaceae and Hypoxidaceae. *Bot. J. Linn. Soc.* 127: 1–42. http://dx.doi.org/10.1111/j.1095-8339.1998.tb02086.x.

Rudall, P. J., and M. G. Sajo. 1999. Systematic Position of *Xyris*: Flower and Seed Anatomy. *Int. J. Pl. Sci.* 160: 795–808. http://dx.doi.org/10.1086/314162.

Rúgolo de Agrasar, Z. E. 1978. Las especies australes del género *Deyeuxia* Clar. (Gramineae) de la Argentina y de Chile. *Darwiniana* 21: 417–453.

Rúgolo de Agrasar, Z. E., and A. M. Molina. 1992. Las especies del género *Agrostis* (Gramineae: Agrosteae) de la Argentina. *Parodiana* 7: 179–255.

Rúgolo de Agrasar, Z. E., and A. M. Molina. 1993. Sinopsis taxonómica del género *Agrostis* (Gramineae: Agrosteae) de Bolivia. *Parodiana* 8: 129–151.

Rúgolo de Agrasar, Z. E., and A. M. Molina. 1997. The Species of the Genus *Agrostis* L. (Gramineae: Agrostideae) from Chile. *Gayana, Bot.* 54: 91–156.

Ruhland, W. 1903. Eriocaulaceae. In *Das Pflanzenreich, IV*, 30 (Heft 13), A. Engler, ed., pp. 1–294. Wilhelm Engelmann, Leipzig.

Saarela, J. M., Q. Liu, P. M. Peterson, R. J. Soreng, and B. Paszko. 2010. Phylogenetics of the Grass 'Aveneae-Type Plastid DNA Clade' (Poaceae: Pooideae, Poeae) based on Plastid and Nuclear Ribosomal DNA Sequence Data. In *Diversity, Phylogeny, and Evolution in the Monocotyledons: Proceedings of the Fourth International Conference on the Comparative Biology of the Monocotyledons and the Fifth International Symposium on Grass Systematics and Evolution*, O. Seberg, G. Petersen, A. S. Barfod, and J. I. Davis, eds., pp. 557–586. Aarhus University Press, Århus, Denmark.

Saarela, J. M., P. M. Peterson, R. M. Keane, J. Cayouette, and S. W. Graham. 2007. Molecular Phylogenetics of *Bromus* (Poaceae: Pooideae) based on Chloroplast and Nuclear DNA Sequence Data. *Aliso* 23: 450–467.

Salazar Chávez, G. A., L. I. Cabrera, S. Madriñán, and M. W. Chase. 2009. Phylogenetic Relationships of Cranichidinae and Prescottiinae (Orchidaceae, Cranichideae) Inferred from Plastid and Nuclear DNA Sequences. *Ann. Bot. (Oxford)*, n.s., 104: 403–416.

Salisbury, R. A. 1812. On the Cultivation of Rare Plants, Especially Such as Have Been Introduced Since the Death of Mr. Philip Miller. *Trans. Hort. Soc. London* 1: 261–366.

Sánchez, E. 2002. Telipogons and Their Allies. *Orchid Digest* 66: 6–12.

Sánchez-Ken, J. G., L. G. Clark, E. A. Kellogg, and E. E. Kay. 2007. Reinstatement and Emendation of Subfamily Micrairoideae (Poaceae). *Syst. Bot.* 32: 71–80. http://dx.doi.org/10.1600/036364407780360102.

Sanso, A. M., and J. H. Hunziker. 1998. Karyological Studies in *Alstroemeria* and *Bomarea* (Alstroemeriaceae). *Hereditas* 129: 67–74. http://dx.doi.org/10.1111/j.1601-5223.1998.t01-1-00067.x.

Sanso, A. M., and C. C. Xifreda. 2001. Generic Delimitation between *Alstroemeria* and *Bomarea* (Alstroemeriaceae). *Ann. Bot.* 88: 1057–1069. http://dx.doi.org/10.1006/anbo.2001.1548.

Särkinen, T., M. F. Newman, P. J. M. Maas, H. Maas, A. D. Poulsen, D. J. Harris, J. E. Richardson, A. Clark, M. Hollingsworth, and R. T. Pennington. 2007. Recent Oceanic Long-Distance Dispersal and Divergence in the Amphi-Atlantic Rain Forest Genus *Renealmia* L. f. (Zingiberaceae). *Molec. Phylogenet. Evol.* 44: 968–980. http://dx.doi.org/10.1016/j.ympev.2007.06.007.

Sass, C., and C. D. Specht. 2010. Phylogenetic Estimation of the Core Bromelioids with an Emphasis on the Genus *Aechmea*. *Molec. Phylogenet. Evol.* 55: 559–571. http://dx.doi.org/10.1016/j.ympev.2010.01.005.

Schlittler, J. 1940. Monographie der Liliaceengattung *Dianella* Lam. *Mitt. Bot. Mus. Univ. Zurich* 163: 5–283.

Schott, H. G. 1860. *Prodromus Systematis Aroidearum*. Congregationis Mechitharisticae, Vienna.

Seberg, O. 1988. Taxonomy, Phylogeny, and Biogeography of the Genus *Oreobolus* R. Br. (Cyperaceae), with Comments on the Biogeography of the South Pacific Continents. *Bot. J. Linn. Soc.* 96: 119–195. http://dx.doi.org/10.1111/j.1095-8339.1988.tb00632.x.

Sede, S. M., F. O. Zuloaga, and O. Morrone. 2009. Phylogenetic Studies in the Paniceae (Poaceae–Panicoideae): *Ocellochloa*, a New Genus from the New World. *Syst. Bot.* 34: 684–692. http://dx.doi.org/10.1600/036364409790139655.

Segeren, W., and P. J. M. Maas. 1971. The Genus *Canna* in Northern South America. *Acta Bot. Neerl.* 20: 663–680.

Senghas, K. 1974. Moos oder Orchidee? (*Pachyphyllum schultesii* L. O. Wms.). *Orchidee (Hamburg)* 25(2): 60–62.

Senghas, K. 1987. Die Gattung *Scelochilus*, mit einer neuen Art, *Scelochilus rubriflora*, aus Peru. *Orchidee (Hamburg)* 38(3): 114–123.

Senghas, K. 1993a. 704. *Warreella* Schltr. In *Die Orchideen*, 3rd ed., R. Schlechter, ed., Band I/C, 37/38 Lieferung, pp. 1699–1701. Paul Parey, Berlin.

Senghas, K. 1993b. 714. *Ornithidium* Salisb. In *Die Orchideen*, 3rd ed., R. Schlechter, ed., Band I/C, 37/38 Lieferung, pp. 1735–1743. Paul Parey, Berlin.

Senghas, K. 1994a. 736. *Dichaea* Lindl. In *Die Orchideen*, 3rd ed., R. Schlechter, ed., Band I/C, 37/38 Lieferung, pp. 1854–1861. Paul Parey, Berlin.

Senghas, K. 1994b. 738. *Telipogon* H. B. K. In *Die Orchideen*, 3rd ed., R. Schlechter, ed., Band I/C, 37/38 Lieferung, pp. 1868–1874. Paul Parey, Berlin.

Senghas, K. 1994c. 739. *Stellilabium* Schltr. In *Die Orchideen*, 3rd ed., R. Schlechter, ed., Band I/C, 37/38 Lieferung, pp. 1874–1877. Paul Parey, Berlin.

Senghas, K. 1994d. *Gomphichis merzii* Sengh. spec. nov. Die Gattung *Gomphichis* mit einer neuen Art aus Costa Rica. [The Genus *Gomphichis* with a New Species from Costa Rica.] *Orchidee (Hamburg)*, Suppl. 2: 25–42.

Senghas, K. 1995a. 754. *Pachyphyllum* H. B. K. In *Die Orchideen*, 3rd ed., R. Schlechter, ed., Band I/C, 37/38 Lieferung, pp. 1922–1924. Paul Parey, Berlin.

Senghas, K. 1995b. 759. *Lockhartia* Hook. In *Die Orchideen*, 3rd ed., R. Schlechter, ed., Band I/C, 37/38 Lieferung, pp. 1930–1937. Paul Parey, Berlin.

Senghas, K. 1995c. 760. *Trichocentrum* Poepp. and Endl. In *Die Orchideen*, 3rd ed., R. Schlechter, ed., Band I/C, 37/38 Lieferung, pp. 1937–1943. Paul Parey, Berlin.

Senghas, K. 1995d. 763. *Comparettia* Poepp. and Endl. In *Die Orchideen*, 3rd ed., R. Schlechter, ed., Band I/C, 37/38 Lieferung, pp. 1958–1961. Paul Parey, Berlin.

Senghas, K. 1995e. 767. *Scelochilus* Klotzsch. In *Die Orchideen*, 3rd ed., R. Schlechter, ed., Band I/C, 37/38 Lieferung, pp. 1970–1973. Paul Parey, Berlin.

Senghas, K. 1996. 791. *Trichopila* Lindl. In *Die Orchideen*, 3rd ed., R. Schlechter, ed., Band I/C, 37/38 Lieferung, pp. 2029–2035. Paul Parey, Berlin.

Senghas, K. 1997a. 817. *Oncidium* Sw. In *Die Orchideen*, 3rd ed., R. Schlechter, ed., Band I/C, 37/38 Lieferung, pp. 2132–2196. Paul Parey, Berlin.

Senghas, K. 1997b. 820. *Cyrtochilum* H. B. K. 1815 (s. str.). In *Die Orchideen*, 3rd ed., R. Schlechter, ed., Band I/C, 37/38 Lieferung, pp. 2200–2210. Paul Parey, Berlin.

Senghas, K. 1997c. 825. *Odontoglossum* H. B. K. 1815 emend. Bockem. 1984. In *Die Orchideen*, 3rd ed., R. Schlechter, ed., Band I/C, 37/38 Lieferung, pp. 2225–2247. Paul Parey, Berlin.

Senghas, K. 1997d. 831. *Otoglossum* (Schltr.) Garay, and Dunst. 1976. In *Die Orchideen*, 3rd ed., R. Schlechter, ed., Band I/C, 37/38 Lieferung, pp. 2262–2265. Paul Parey, Berlin.

Senghas, K. 1999. 864. *Brachtia* Rchb. f. In *Die Orchideen*, 3rd ed., R. Schlechter, ed., Band I/C, 37/38 Lieferung, pp. 2309–2312. Paul Parey, Berlin.

Senghas, K. 2001 [2002]. Die Gattung *Scelochilus* mit einer neuen Art, *Scelochilus palatinus,* aus Kolumbien. *J. Orchideenfreund* 9(1): 22–30.

Senghas, K. 2002. *Maxillaria*, un genre chaotique. *Richardiana* 2(1): 29–38.

Sheffer, R. D., W. L. Theobald, and H. Kamemoto. 1980. Taxonomy of *Anthurium scandens* (Araceae). *Aroideana* 3: 86–93.

Shrestha, S., S. W. Adkins, G. C. Graham, and D. S. Loch. 2004. Phylogeny of the *Sporobolus indicus* Complex, based on Internal Transcribed Spacer (ITS) Sequences. *Austral. Syst. Bot.* 16: 165–176. http://dx.doi.org/10.1071/SB02009.

Simpson, D. A., A. M. Muasya, M. V. Alves, J. J. Bruhl, S. Dhooge, M. W. Chase, C. A. Furness, K. Ghamkhar, P. Goetghebeur, T. R. Hodkinson, A. D. Marchant, A. A. Reznicek, R. Nieuwborg, E. H. Roalson, E. Smets, J. R. Starr, W. W. Thomas, K. L. Wilson, and X. Zhang. 2007. Phylogeny of Cyperaceae based on DNA Sequence Data—A New *rbc*L Analysis. *Aliso* 23: 72–83.

Skendzic, E. M., J. T. Columbus, and R. Cerros-Tlatilpa. 2007. Phylogenetics of Andropogoneae (Poaceae: Panicoideae) based on Nuclear Ribosomal Internal Transcribed Spacer and Chloroplast *trn*L–F Sequences. *Aliso* 23: 530–544.

Smith, G. F., and B.-E. Van Wyk, 1998. Asphodelaceae. In *Volume 3: Flowering Plants, Monocotyledons: Lilianae (except Orchidaceae)*, K. Kubitzki, ed., pp. 130–140, *The Families and Genera of Vascular Plants*. Springer-Verlag, New York.

Smith, L. B. 1957. The Bromeliaceae of Colombia. *Contr. U.S. Natl. Herb.* 33: 1–311.

Smith, L. B. 1971. Bromeliaceae. In *Flora de Venezuela*. Vol. 12, pt. 1, T. Lasser, ed., pp. 1–361. Instituto Botánico, Caracas.

Smith, L. B., and R. J. Downs. 1974. Pitcairnioideae (Bromeliaceae). *Fl. Neotrop. Monogr.* 14(1): 1–658.

Smith, L. B., and R. J. Downs. 1977. Tillandsioideae (Bromeliaceae). *Fl. Neotrop. Monogr.* 14(2): 663–1492.

Smith, L. B., and R. J. Downs. 1979. Bromelioideae (Bromeliaceae). *Fl. Neotrop. Monogr.* 14(3): 1493–2142.

Smith, L. B., and W. Till. 1998. Bromeliaceae. In *Volume 4: Flowering Plants, Monocotyledons: Alismatanae and Commelinanae (except Gramineae)*, K. Kubitzki, ed., pp. 74–99, *The Families and Genera of Vascular Plants*. Springer-Verlag, New York.

Smith, L. B., and C. E. Wood Jr. 1975. The Genera of Bromeliaceae in the Southeastern United States. *J. Arnold Arbor.* 56: 375–397.

Soderstrom, T. R. 1969. Gramineae. In *The Botany of the Guayana Highland: Part VIII*, B. Maguire and collaborators. *Mem. New York Bot. Gard.* 18(2): 11–22.

Sokoloff, D. D., M. V. Remizowa, L. M. Campbell, D. W. Stevenson, P. J. Rudall, and K. Gandhi. 2011. (2020) Proposal to Conserve the Name *Isidrogalvia* (Tofieldiaceae) with a Conserved Type. *Taxon* 60: 909.

Soreng, R. J., and J. I. Davis. 2000. Phylogenetic Structure in Poaceae Subfamily Pooideae as Inferred from Molecular and Morphological Characters: Misclassification versus Reticulation. In *Grasses: Systematics and Evolution,* S. W. L. Jacobs and J. Everett, eds., pp. 61–74. CSIRO, Collingwood, Victoria, Australia.

Soreng, R. J., and C. W. Greene. 2003. *Calamagrostis*. In *Catalogue of New World Grasses (Poaceae): IV. Subfamily Pooideae*, R. J. Soreng, P. M. Peterson, G. Davidse, E. J. Judziewicz, F. O. Zuloaga, T. S. Filgueiras, and O. Morrone, eds. *Contr. U.S. Natl. Herb.* 48: 101–227.

Specht, C. D. 2006. Systematics and Evolution of the Tropical Monocot Family Costaceae (Zingiberales): A Multiple Dataset Approach. *Syst. Bot.* 31: 89–106. http://dx.doi.org/10.1600/036364406775971840.

Specht, C. D., W. J. Kress, D. W. Stevenson, and R. DeSalle. 2001. A Molecular Phylogeny of Costaceae (Zingiberales). *Molec. Phylogenet. Evol.* 21: 333–345. http://dx.doi.org/10.1006/mpev.2001.1029.

Specht, C. D., and D. W. Stevenson. 2006. A New Phylogeny-Based Generic Taxonomy for the Monocot Family Costaceae (Zingiberales). *Taxon* 55: 153–163. http://dx.doi.org/10.2307/25065537.

Spencer, M. A., and L. B. Smith. 1993. *Racinaea*, a New Genus of Bromeliaceae (Tillandsioideae). *Phytologia* 74: 151–160.

Stančík, D. 2003. The Genus *Festuca* (Poaceae: Loliinae) in Venezuela. *Nordic J. Bot.* 23: 191–205. http://dx.doi.org/10.1111/j.1756-1051.2003.tb00382.x.

Stančík, D. 2004. Las especies del género *Festuca* (Poaceae) en Colombia. *Darwiniana* 41: 93–153.

Stančík, D., and P. M. Peterson. 2007. A Revision of *Festuca* (Poaceae: Loliinae) in South American Paramos. *Contr. U.S. Natl. Herb.* 56: 1–184.

Starr, J. R., and B. A. Ford. 2009. Phylogeny and Evolution in Cariceae (Cyperaceae): Current Knowledge and Future Directions. *Bot. Rev.* 75: 110–137. http://dx.doi.org/10.1007/s12229-008-9020-x.

Starr, J. R., S. A. Harris, and D. A. Simpson. 2004. Phylogeny of the Unispicate Taxa in Cyperaceae Tribe Cariceae I: Generic Relationships and Evolutionary Scenarios. *Syst. Bot.* 29: 528–544. http://dx.doi.org/10.1600/0363644041744455.

Starr, J. R., S. A. Harris, and D. A. Simpson. 2008. Phylogeny of the Unispicate Taxa in Cyperaceae Tribe Cariceae II: The Limits of *Uncinia* Pers. In *Sedges: Uses, Diversity, and Systematics of the Cyperaceae*, R. F. C. Naczi and B. A. Ford, eds. *Monogr. Syst. Bot. Missouri Bot. Gard.* 108: 243–267.

Stauffer, F. W. 1999. Datos preliminares para la actualización de la flora de palmas (Arecaceae) de Venezuela. *Acta Bot. Venez.* 22: 77–107.

Stevens, P. F. 2013. Angiosperm Phylogeny Website, Version 13. http://www.mobot.org/MOBOT/research/APweb/. [Continuously updated.]

Steyermark, J. A. 1948. *Orthrosanthus chimboracensis* and Its Varieties (Iridaceae). *Lloydia* 11: 14–20.

Stieber, M. T. 1982. Revision of *Ichnanthus* sect. *Ichnanthus* (Gramineae, Panicoideae). *Syst. Bot.* 7: 85–115. http://dx.doi.org/10.2307/2418655.

Stieber, M. T. 1987. Revision of *Ichnanthus* sect. *Foveolatus* (Gramineae: Panicoideae). *Syst. Bot.* 12: 187–216. http://dx.doi.org/10.2307/2419316.

Stützel, T. 1998. Eriocaulaceae. In *Volume 4: Flowering Plants, Monocotyledons: Alismatanae and Commelinanae (except Gramineae)*, K. Kubitzki, ed., pp.

197–207, *The Families and Genera of Vascular Plants*. Springer-Verlag, New York.

Svenson, H. K. 1929. Monographic Studies in the Genus *Eleocharis*. *Rhodora* 31: 224–242.

Svenson, H. K. 1939. Monographic Studies in the Genus *Eleocharis*. *Rhodora* 41: 1–77, 93–110.

Swallen, J. R. 1966. Notes on Grasses. *Phytologia* 14: 65–98.

Sweet, H. R. 1973. Orquídeas andinas poco conocidas VII *Schlimia* [*sic*] Planchon & Linden ex Lindley. *Orquideología* 8: 3–14.

Sweet, H. R. 1974. El género *Brachtia*, Rchb. f. *Orquideología* 9: 3–21.

Szlachetko, D. L., M. Sitko, P. Tukałło, and J. Mytnik-Ejsmont. 2012. Taxonomy of the Subtribe Maxillariinae (Orchidaceae, Vandoideae) Revised. *Biodivers. Res. Conservation* 25: 13–38. http://dx.doi.org/10.2478/v10119-012-0017-2.

Tacuatiá, L. O., T. T. Souza-Chies, A. M. Flores, L. Eggers, S. Siljak-Yakovlev, and E. Kaltchuk-Santos. 2012. Cytogenetic and Molecular Characterization of Morphologically Variable *Sisyrinchium micranthum* (Iridaceae) in Southern Brazil. *Bot. J. Linn. Soc.* 169: 250–364. http://dx.doi.org/10.1111/j.1095-8339.2012.01229.x.

Tam, S.-M., P. C. Boyce, T. M. Upson, D. Barabé, A. Bruneau, F. Forest, and J. S. Parker. 2004. Intergeneric and Infrafamilial Phylogeny of Subfamily Monsteroideae (Araceae) Revealed by Chloroplast *trnL–F* Sequences. *Amer. J. Bot.* 91: 490–498. http://dx.doi.org/10.3732/ajb.91.3.490.

Tamura, M. N. 1998. Nartheciaceae. In *Volume 3: Flowering Plants, Monocotyledons: Lilianae (except Orchidaceae)*, K. Kubitzki, ed., pp. 381–392, *The Families and Genera of Vascular Plants*. Springer-Verlag, New York.

Tamura, M. N., S. Fuse, H. Azuma, and M. Hasebe. 2004. Biosystematic Studies on the Family Tofieldiaceae I. Phylogeny and Circumscription of the Family Inferred from DNA Sequences of *mat*K and *rbc*L. *Pl. Biol. (Germany)* 6: 562–567. http://dx.doi.org/10.1055/s-2004-821278.

Tanaka, N. 2001. Taxonomic Revision of the Family Cannaceae in the New World and Asia. *Makinoa*, n.s., 1: 1–74.

Thomas, M. M., N. C. Garwood, W. J. Baker, S. A. Henderson, S. J. Russell, D. R. Hodel, and R. M. Bateman. 2006. Molecular Phylogeny of the Palm Genus *Chamaedorea*, based on the Low Copy Nuclear Genes PRK and RPB2. *Molec. Phylogenet. Evol.* 38: 398–415. http://dx.doi.org/10.1016/j.ympev.2005.08.019.

Thomas, W. W., A. C. Araújo, and M. V. Alves. 2009. A Preliminary Molecular Phylogeny of the Rhynchosporeae (Cyperaceae). *Bot. Rev.* 75: 22–29. http://dx.doi.org/10.1007/s12229-008-9023-7.

Tomlinson, P. B., J. W. Horn, and J. B. Fisher. 2011. *The Anatomy of Palms: Arecaceae-Palmae*. Oxford University Press, Oxford.

Torrecilla, P., and P. Catalán. 2002. Phylogeny of Broad-Leaved and Fine-Leaved *Festuca* Lineages (Poaceae) based on Nuclear ITS Sequences. *Syst. Bot.* 27: 241–251.

Trovó, M., M. J. G. de Andrade, P. T. Sano, P. L. Ribeiro, and C. van den Berg. 2013. Molecular Phylogenetics and Biogeography of Neotropical Paepalanthoideae with Emphasis on Brazilian *Paepalanthus* (Eriocaulaceae). *Bot. J. Linn. Soc.* 171: 225–243. http://dx.doi.org/10.1111/j.1095-8339.2012.01310.x.

Tucker, G. C. 1984. A Revision of the Genus *Kyllinga* Rottb. (Cyperaceae) in Mexico and Central America. *Rhodora* 86: 507–538.

Tucker, G. C. 1987. The Genera of Cyperaceae in the Southeastern United States. *J. Arnold Arbor.* 68: 361–445.

Tucker, G. C. 1989. The Genera of Commelinaceae in the Southeastern United States. *J. Arnold Arbor.* 70: 97–130.

Tucker, G. C. 1990. The Genera of Arundinoideae (Gramineae) in the Southeastern United States. *J. Arnold. Arbor.* 71: 145–177.

Tucker, G. C. 1994. Revision of the Mexican Species of *Cyperus* (Cyperaceae). *Syst. Bot. Monogr.* 43: 1–213. http://dx.doi.org/10.2307/25027842.

Tucker, G. C. 1996. The Genera of Poöideae (Gramineae) in the Southeastern United States. *Harvard Pap. Bot.* 1(9): 11–90.

Türpe, A. M. 1983. Las especies sudamericanas del género *Pennisetum* L. C. Richard (Gramineae). *Lilloa* 36: 105–129.

Tuskes, P., and A. Tuskes. 1999. A Review of the Genus *Comparettia*. *Orchid Digest* 63: 164–171.

Tyrrell, C. D., A. P. Santos-Gonçalves, X. Londoño, and L. G. Clark. 2012. Molecular Phylogeny of the Arthrostylidioid Bamboos (Poaceae: Bambusoideae: Bambuseae: Arthrostylidiinae) and New Genus *Didymogonyx*. *Molec. Phylogenet. Evol.* 65: 136–148. http://dx.doi.org/10.1016/j.ympev.2012.05.033.

Unwin, M. M. 2004. Molecular Systematics of the Eriocaulaceae Martinov. Ph.D. diss., Miami University, Oxford, Ohio.

van Welzen, P. C. 1981. A Taxonomic Revision of the Genus *Arthraxon* Beauv. (Gramineae). *Blumea* 27: 255–300.

van Welzen, P. C. 1993. The Phylogeny of *Arthraxon* P. Beauv. (Gramineae). *Rheedea* 3: 101–106.

Wade, D. J., T. M. Evans, and R. B. Faden. 2006. Subtribal Relationships in Tribe Tradescantieae (Commelinaceae) based on Molecular and Morphological Data. *Aliso* 22: 520–526.

Wasiljew, W. N. 1960. Das System der Gattung *Calamagrostis* Roth. *Feddes Repert. Spec. Nov. Regni Veg.* 63: 229–251.

Waterway, M. J., T. Hoshino, and T. Masaki. 2009. Phylogeny, Species Richness, and Ecological Specialization in Cyperaceae Tribe Cariceae. *Bot. Rev.* 75: 138–159. http://dx.doi.org/10.1007/s12229-008-9024-6.

Waterway, M. J., and J. R. Starr. 2007. Phylogenetic Relationships in Tribe Cariceae (Cyperaceae) based on Nested Analyses of Four Molecular Data Sets. *Aliso* 23: 165–192.

Webster, R. D., J. H. Kirkbride, and J. Valdes-Reyna. 1989. New World Genera of the Paniceae (Poaceae: Panicoideae). *Sida* 13: 393–417.

Webster, R. G. 1988. Genera of the North American Paniceae (Poaceae: Panicioideae). *Syst. Bot.* 13: 576–609. http://dx.doi.org/10.2307/2419204.

Wessels Boer, J. G. 1968. The Geonomoid Palms. *Verh. Kon. Ned. Akad. Wetensch., Afd. Natuurk., Tweede Sect.*, ser. 2, 58: 1–202.

Wessels Boer, J. G. 1971. Clave descriptiva de las palmas de Venezuela. *Acta Bot. Venez.* 6: 297–362.

Whitten, W. M., M. A. Blanco, N. H. Williams, S. Koehler, G. Carnevali, R. B. Singer, L. Endara, and K. M. Neubig. 2007. Molecular Phylogenetics of *Maxillaria* and Related Genera (Orchidaceae: Cymbidieae) based on Combined Molecular Data Sets. *Amer. J. Bot.* 94: 1860–1889. http://dx.doi.org/10.3732/ajb.94.11.1860.

Whitten, W. M., N. H. Williams, and M. W. Chase. 2000. Subtribal and Generic Relationships of Maxillarieae (Orchidaceae) with Emphasis on Stanhopeinae: Combined Molecular Evidence. *Amer. J. Bot.* 87: 1842–1856. http://dx.doi.org/10.2307/2656837.

Wilkin, P., P. Schols, M. W. Chase, K. Chayamarit, C. A. Furness, S. Huysmans, F. Rakotonasolo, E. Smets, and C. Thapyai. 2005. A Plastid Gene Phylogeny of the Yam Genus, *Dioscorea*: Roots, Fruits and Madagascar. *Syst. Bot.* 30: 736–749. http://dx.doi.org/10.1600/036364405775097879.

Williams, N. H., M. W. Chase, T. Fulcher, and W. M. Whitten. 2001. Molecular Systematics of the Oncidiinae based on Evidence from Four DNA Sequence Regions: Expanded Circumscriptions of *Cyrtochilum*, *Erycina*, *Otoglossum,* and *Trichocentrum* and a New Genus (Orchidaceae). *Lindleyana* 16: 113–139.

Williams, N. H., W. M. Whitten, and R. L. Dressler. 2005. Molecular Systematics of *Telipogon* (Orchidaceae: Oncidiinae) and Its Allies: Nuclear and Plastid DNA Sequence Data. *Lankesteriana* 5: 163–184.

Wilson, K. A. 1960. The Genera of the Arales in the Southeastern United States. *J. Arnold Arbor.* 41: 47–72.

Wilson, M., C. Belle, A. Dang, P. Hannan, C. Kenyon, H. Low, T. Stayton, and M. Woolley. 2011. A Phylogenetic Analysis of the Genus *Pleurothallis*, with Emphasis on *Pleurothallis* Subsection *Macrophyllae-Fasciculatae*, Using Nuclear ITS and Chloroplast DNA Sequencing. *Lankesteriana* 11: 369.

Wood, C. E., Jr. 1983. The Genera of Burmanniaceae in the Southeastern United States. *J. Arnold Arbor.* 64: 293–307.

Wood, T. H., W. M. Whitten, and N. H. Williams. 2000. Phylogeny of *Hedychium* and Related Genera (Zingiberaceae) based on ITS Sequence Data. *Edinburgh J. Bot.* 57: 261–270. http://dx.doi.org/10.1017/S0960428600000196.

Wurdack, K. J., and L. J. Dorr. 2009. The South American Genera of Hemerocallidaceae (*Eccremis* and *Pasithea*): Two Introductions to the New World. *Taxon* 58: 1122–1132.

Záveská Drábková, L. 2010. Phylogenetic Relationships within Juncaceae: Evidence from Five Regions of Plastid, Mitochondrial and Nuclear Ribosomal DNA, with Notes on Morphology. In *Diversity, Phylogeny, and Evolution in the Monocotyledons: Proceedings of the Fourth International Conference on the Comparative Biology of the Monocotyledons and the Fifth International Symposium on Grass Systematics and Evolution*, O. Seberg, G. Petersen, A. S. Barfod, and J. I. Davis, eds., pp. 389–416. Aarhus University Press, Århus, Denmark.

Záveská Drábková, L., and Č. Vlček. 2009. DNA Variation within Juncaceae: Comparison of Impact of Organelle Regions on Phylogeny. *Pl. Syst. Evol.* 278: 169–186. http://dx.doi.org/10.1007/s00606-008-0135-7.

Zizka, G. 1990. Taxonomy of the Melinideae (Poaceae, Panicoideae). *Mitt. Inst. Allg. Bot. Hamburg* 23b: 563–572.

Zomlefer, W. B. 1997. The Genera of Tofieldiaceae in the Southeastern United States. *Harvard Pap. Bot.* 2: 179–194.

Zomlefer, W. B. 1998. The Genera of Hemerocallidaceae in the Southeastern United States. *Harvard Pap. Bot.* 3: 113–145.

Zuloaga, F. O. 1987. Systematics of New World Species of *Panicum* (Poaceae: Paniceae). In *Grass Systematics and Evolution*, T. R. Soderstrom, K. W. Hilu, C. S. Campbell, and M. E. Barkworth, eds., pp. 287–306. Smithsonian Institution Press, Washington, D.C.

Zuloaga, F. O., R. P. Ellis, and O. Morrone. 1992. A Revision of *Panicum* Subgenus *Phanopyrum* Section *Laxa* (Poaceae: Panicioideae). *Ann. Missouri Bot. Gard.* 79: 770–818. http://dx.doi.org/10.2307/2399720.

Zuloaga, F. O., R. P. Ellis, and O. Morrone. 1993. A Revision of *Panicum* subg. *Dichanthelium* sect. *Dichanthelium* (Poaceae: Panicoideae: Paniceae) in Mesoamerica, the West Indies, and South America. *Ann. Missouri Bot. Gard.* 80: 119–190. http://dx.doi.org/10.2307/2399822.

Zuloaga, F. O., and T. Sendulsky. 1988. A Revision of *Panicum* Subgenus *Phanopyrum* Section *Stolonifera* (Poaceae: Paniceae). *Ann. Missouri Bot. Gard.* 75: 420–455. http://dx.doi.org/10.2307/2399432.

Zuolaga, F. O., and T. R. Soderstrom. 1985. Classification of the Outlying Species of New World *Panicum* (Poaceae: Paniceae). *Smithsonian Contr. Bot.* 59: 1–63. http://dx.doi.org/10.5479/si.0081024X.59.

Index of Scientific Names

Names of taxa recognized as occurring in the flora of Guaramacal are in bold type. All others are either synonyms or refer to taxa not present in the flora of Guaramacal. Page numbers in bold italic type indicate the start of the taxonomic account.

Index of Common Names

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