

# Harvard Papers in Botany

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A Publication of the Harvard University Herbaria Including  
The Journal of the Arnold Arboretum

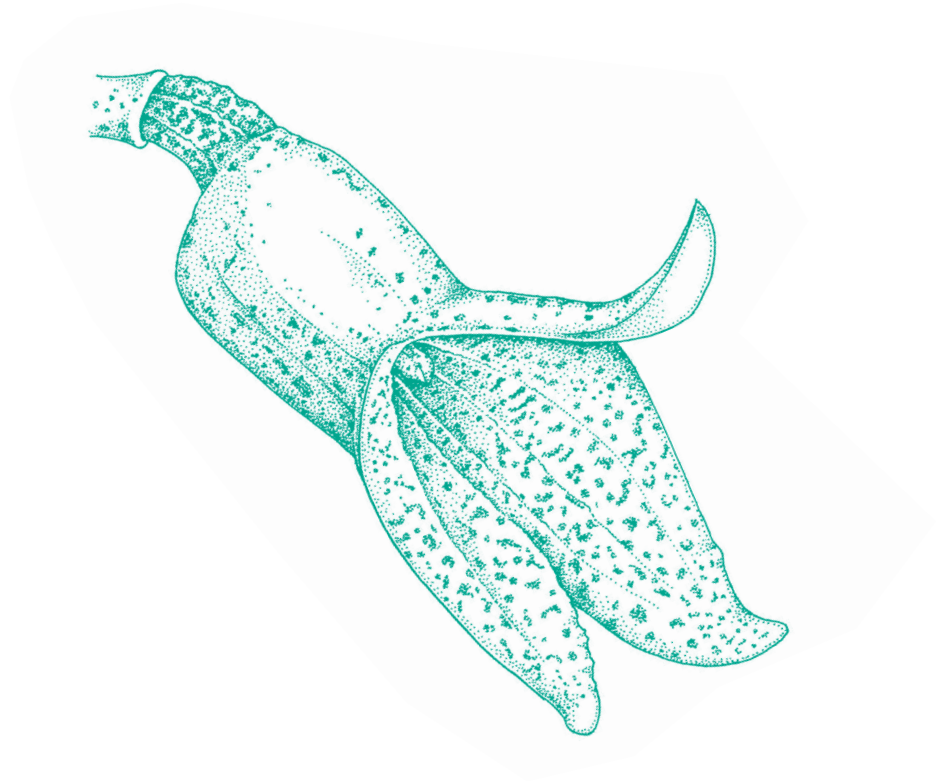
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# LEPIDIUM SEYDELI (BRASSICACEAE), A NEW SPECIES FROM NAMIBIA

IHSAN A. AL-SHEHBAZ<sup>1</sup>

**Abstract.** *Lepidium seydelii* (Brassicaceae), a new species from Namibia, is described and illustrated. It is easily distinguished from the closely related to *L. divaricatum* and all other southern African species of *Lepidium* by having pubescent, elliptic to elliptic-ovate fruit 1.3–1.6 × 1–1.2 mm and fruiting pedicels densely hirsutulous all around. A key distinguishing the four species of *Lepidium* native to Namibia is presented.

**Keywords:** Brassicaceae, Cruciferae, *Lepidium*, Namibia.

*Lepidium* L., the second largest genus in the family Brassicaceae (Cruciferae) after *Draba* L., includes at least 250 species (Al-Shehbaz, 2012) represented by native species on all continents except Antarctica (Al-Shehbaz, 1986). The limits of *Lepidium* have expanded a great deal based on extensive molecular, developmental, and morphological studies, and the interested reader should consult Al-Shehbaz & Mummenhoff (2011) for leads.

During work on a worldwide monograph of *Lepidium*, an unusual, Namibian, densely hirsutulous specimen of the genus was found among the undetermined South African material at the Missouri Botanical Garden. An attempt to identify it following Thellung (1906 a, b) and Marais (1970) clearly showed that it did not fit in any of the known native species in that part of the continent, and it is described below.

***Lepidium seydelii*** Al-Shehbaz, *sp. nov.* Type: Namibia, Windhuk Bergland Avis, 20 April 1965, 1600 m, *B. Seydel* 4365 (Holotype: MO 2008117; Isotypes: B\_10-0699398, B\_10-0699399). Fig. 1.

*Herbs*, perhaps perennial, densely hirsutulous throughout. *Trichomes* slender, straight, spreading. *Stems* 20–30 cm, ascending, slender, few from base, much branched above the middle, hirsutulous with spreading trichomes 0.05–0.12 mm. *Basal leaves* not seen; middle cauline leaves oblanceolate, 1.5–2.5 cm × 3–6 mm, densely hirsutulous with spreading trichomes 0.05–0.22 mm, attenuate to petiole-like base, not auriculate, margin serrulate with up to 6 minute teeth on each side; upper leaves gradually reduced in size upwards, uppermost apically 3-toothed. *Racemes* ebracteate, corymbose, dense, much elongated in fruit but not so towards end of season, main branches up to 12 cm or more and with 100 or more fruit; rachis straight, densely hirsutulous as stem; fruiting pedicels 1.4–2 mm, densely hirsutulous all around, terete, wingless, ascending along proximal half, arcuate-recurved along distal half, persistent. *Sepals* ovate, ca. 0.4 mm, caducous, ascending, equal; petals white, erect, much shorter than sepals, ca. 0.1 × 0.05 mm, blade oblong, apex obtuse, claw absent; stamens 2, equal in

length, median; filaments 0.3–0.4 mm, glabrous, slender at base; anthers ovate, ca. 0.1 mm; nectar glands 4, toothlike. *Fruit* dehiscent, elliptic to elliptic-ovate, 1.3–1.6 × 1–1.2 mm, strongly angustiseptate, not inflated; valves papery, veinless, pubescent with spreading trichomes to 0.05 mm, smooth, strongly keeled, apically minutely winged; apical notch V-shaped, 0.05–0.12 mm deep; septum complete; style 0.05–0.12 mm, subequaling apical notch of fruit; stigma capitate, entire. *Seeds* 1 per locule, oblong, 0.7–0.85 × 0.4–0.5 mm, wingless, light brown, minutely reticulate; cotyledons incumbent.

**Eponymy:** This novelty is named in honor of R. Seydel who collected the type material.

**Habitat:** rocky, steep slopes.

**IUCN Red List Category:** *Lepidium seydelii* is known only from the type collections above. A full conservation assessment cannot be determined at this point and, therefore, according to the IUCN (2001) classification, I prefer to give it a Data Deficient (DD) criterion.

*Lepidium seydelii* is easily distinguished from all of its congeners in southern Africa by having pubescent fruit and fruiting pedicels densely hirsutulous all around. The other species always have glabrous fruit and fruiting pedicels either puberulent adaxially or glabrous. It is most closely related to *L. divaricatum* Ait., a species restricted to South Africa and Namibia. In addition to the differences above, it can also be distinguished from the latter species by having shorter fruiting pedicels (1.4–2 vs. 2–3.5 mm) and sepals (ca. 0.4 vs. 0.6–1 mm), style subequaling (vs. shorter than) the apical notch of fruit, and smaller petals (ca. 0.1 × 0.05 vs. 0.3–0.9 × ca. 0.1 mm), fruit (1.3–1.6 × 1–1.2 vs. 2.3–3.7 × 1.8–2.3 mm), and seeds (0.7–0.85 × 0.4–0.5 vs 1–1.3 × 0.5–0.7 mm).

Based on Marais (1970), Namibia (as Southwest Africa) has only three native species of *Lepidium*, including *L. desertorum* Eckl. & Zeyh., *L. divaricatum*, and *Coronopus integrifolius* (DC.) Spreng. (herein as *L. englerianum* (Muschl.) Al-Shehbaz. These and *L. seydelii* can easily be distinguished by the following key.

I am grateful to Sarah Bollendorff for locating the isotype sheets at the Botanisches Museum Berlin-Dahlem (B). I also thank Gustavo A. Romero and Deborah Smiley for their editorial advice. Partial funding for this research was supported by the United States National Science Foundation grant DEB-1252905, for which I am profoundly grateful.

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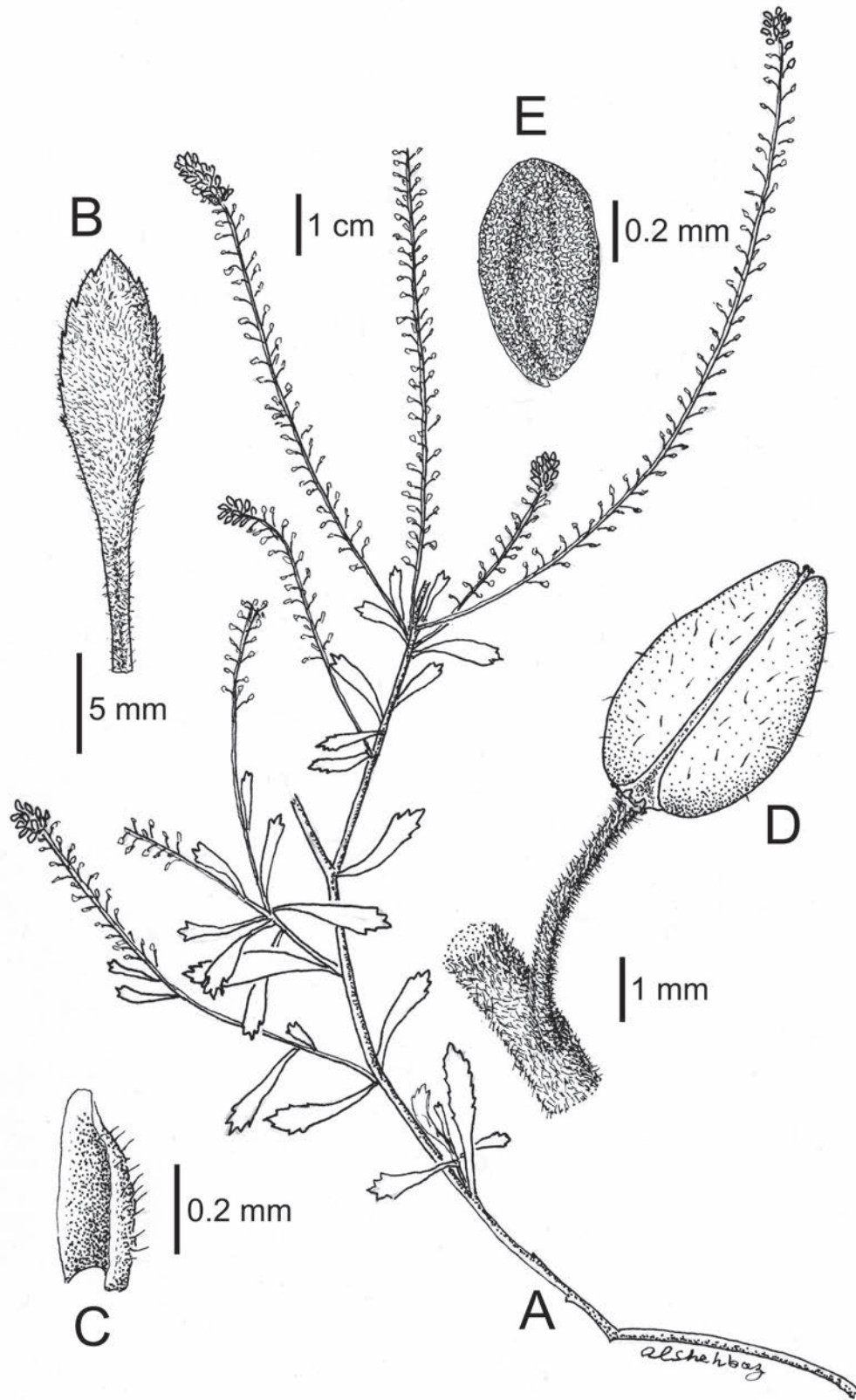


FIGURE 1. *Lepidium seydelii* Al-Shehbaz. A, plant; B, middle cauline leaf; C, sepal; D, fruit and fruiting pedicel with part of rachis; E, seed. Drawn by Al-Shehbaz from the holotype (MO 2008117).

KEY TO THE NATIVE NAMIBIAN SPECIES OF *LEPIDIUM*

- 1a. Fruit didymous, breaking at maturity into two, indehiscent segments not releasing seeds ..... *L. englerianum*  
 1b. Fruit elliptic, elliptic-ovate, obcordate, or obcordate-ovate, dehiscent, readily releasing seeds ..... 2  
 2a. Plants densely hirsutulous; fruiting pedicels densely hirsutulous all around; fruit pubescent ..... *L. seydelii*  
 2b. Plants puberulent; fruiting pedicels puberulent adaxially, glabrous abaxially; fruit glabrous ..... 3  
 3a. Fruit obcordate to obcordate-ovate, 1.6–2.1 × 1.4–1.8 mm; nectar glands filiform; petals absent; style exerted beyond apical  
 fruit notch ..... *L. desertorum*  
 3b. Fruit elliptic to elliptic-ovate, 2.3–3.7 × 1.8–2.3 mm; nectar glands toothlike; petals 0.3–0.9 mm; style included in apical  
 fruit notch ..... *L. divaricatum*

## LITERATURE CITED

- AL-SHEHBAZ, I. A. 1986. The genera of Lepidieae (Cruciferae; Brassicaceae) in the southeastern United States. *J. Arnold Arbor.* 67: 265–311.  
 ———. 2012. A generic and tribal synopsis of the Brassicaceae (Cruciferae). *Taxon* 61: 931–954.  
 ——— AND K. MUMMENHOFF. 2011. *Stubendorffia* and *Winklera* belong to the expanded *Lepidium* (Brassicaceae). *Edinburgh J. Bot.* 68: 165–171.  
 IUCN. 2001. IUCN Red List Categories and Criteria, Version 3.1. Second edition. Prepared by the IUCN Species Survival Commission. IUCN, Gland, Switzerland, and Cambridge, United Kingdom. <http://www.iucnredlist.org/technicaldocuments/categories-and-criteria/2001-categories-criteria> (accessed September 27, 2016).  
 MARIS, W. 1970. Cruciferae. Pages 1–118 in L. E. CODD, B. DE WINTER, D. J. B. KILLICK AND H. B. RYCROFT, EDS. *Flora of Southern Africa*. Government Printer, Pretoria.  
 THELLUNG, A. 1906a. Die afrikanischen *Lepidium*-Arten. *Vierteljahrsschr. Naturf. Ges. Zürich* 51: 221–225.  
 ———. 1906b. Die Gattung *Lepidium* (L.) R.Br. Eine monographische Studie. *Neue Denkschr. Allg. Schwiz. Naturf. Ges.* 41(1): 1–340.

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# CLUSIA SCARIOSEPALA (CLUSIACEAE), A DISTINCT SPECIES OF CLUSIA SECT. ANANDROGYNE ENDEMIC TO THE VENEZUELAN ANDES

MANUEL LUJÁN<sup>1</sup>

**Abstract.** *Clusia* sect. *Anandrogyne* is the most species-rich section in the genus and it includes approximately 70 species. Taxonomic boundaries within the group have been difficult to establish due to high degree of homoplasy in morphological characters. In order to make informed taxonomic decisions, an evaluation of both morphological (fruit morphology) and molecular (nrDNA ITS) data was made among species included in *Clusia* sect. *Anandrogyne*. It was found that *Clusia multiflora* subsp. *scariosepala* has strikingly distinctive fruit morphology and, furthermore, it is phylogenetically more closely related to other species of *Clusia* than to *Clusia multiflora*. Therefore, raising this taxon to the rank of species is proposed herein. Conservation status assessment for the species is also provided.

**Resumen.** *Clusia* sect. *Anandrogyne* es la sección con mayor número de especies en el género e incluye aproximadamente 70 especies. Límites taxonómicos dentro del grupo han sido difíciles de establecer debido a alto grado de homoplasia en caracteres morfológicos. Con el fin de realizar decisiones taxonómicas fundamentadas, se evaluaron caracteres morfológicos (forma de fruto) y moleculares (nrDNA ITS) entre especies incluidas dentro de *Clusia* sect. *Anandrogyne*. Se encontró que *Clusia multiflora* subsp. *scariosepala* posee una forma de fruto notablemente distintiva y que además, está filogenéticamente más relacionada con otras especies de *Clusia* que con *Clusia multiflora*. Por lo tanto, se propone elevar este taxon al rango de especie. Se provee una evaluación del estado de conservación de la especie.

**Keywords:** *Clusia* sect. *Anandrogyne*, Andes, Venezuela

The Neotropical genus *Clusia* L. (ca. 300 spp., Clusiaceae) comprises woody hemiepiphytes, shrubs, and trees with remarkable physiological and morphological plasticity. The genus includes species known to use the C3, CAM and facultative C3/CAM photosynthetic pathways (Lüttge, 2006). *Clusia* is the only genus of trees in which some species produce floral resins as a reward for pollinators (Bittrich and Amaral, 1996). Nearly all species are dioecious and some are apomictic (Maguire, 1976; Pipoly and Graff, 1995). The center of diversity of the genus is northern South America, specifically the montane forests of the Northern Andes, the Guyana Highlands, and the Amazonian lowlands (Gustafsson et al., 2007). Taxonomic work on *Clusia* began with Planchon and Triana (1860), Baillon (1877: 392–425), Vesque (1893), and Engler (1925); all of these authors based their infra-generic groupings mainly on the highly variable androecial characteristics. *Clusia* sect. *Anandrogyne* Planch. & Triana was defined to include species with 4–5-merous calyx, 5–6-merous corolla, staminate flowers with multiple free stamens inserted in a prominent receptacle, anthers linear with longitudinal dehiscence, and pistillate flowers with 5–10 anantherous staminodia.

Herbarium specimens of taxa included in *Clusia* sect. *Anandrogyne* were studied from collections housed at F, HUH, MO, NY, US, and VEN (acronyms following Thiers, continuously updated). In order to assess phylogenetic relationships, plant material from representatives of *Clusia* sect. *Anandrogyne* was collected in the field, including

This section is considered the largest within the genus and includes approximately 70 species (Pipoly, 1995). Modern phylogenetic inferences based on molecular data have confirmed the monophyly of *Clusia* sect. *Anandrogyne*, although evolutionary relationships among closely related taxa are still unresolved (Gehrig et al., 2003; Gustafsson et al., 2007).

Within *Clusia* sect. *Anandrogyne*, authors have recognized the “multiflora complex,” an informal group that includes the widely polymorphic species *Clusia multiflora* Kunth and its closely related taxa (Maguire, 1979; E. Medina, pers. comm.). In this group, taxonomic boundaries are difficult to establish due to a high degree of intergradation among morphological characters (Hammel, 1986).

As part of an in-depth systematic analysis of *Clusia*, extensive sampling of taxa across the genus is currently being undertaken. A number of species from *Clusia* sect. *Anandrogyne*, including taxa from the *C. multiflora* complex, have been sampled. Preliminary phylogenetic analysis was performed in order to assess evolutionary relationships among taxa and to make informed taxonomic decisions.

## MATERIAL AND METHODS

collections from the type localities of *C. multiflora* and *Clusia multiflora* subsp. *scariosepala* Maguire. DNA extraction was performed using standard CTAB protocol (Doyle and Doyle, 1987). The entire internal transcribed spacer (ITS) of nuclear ribosomal repeat was amplified via polymerase chain reaction (PCR) using primers N-nc18S10

I would like to acknowledge the assistance provided by the directors, curators, and collection managers of the following herbaria: F, HUH, MO, NY, US and VEN, for kindly giving me access to their collections. Visits to herbarium collections were supported by the American Society of Plant Taxonomists Graduate Research Award, the Missouri Botanical Garden Alwyn H. Gentry Fellowships for Latin American Botanists, the Smithsonian Institution Lyman B. & Ruth C. Smith Fellowship Award, and the Rancho Santa Ana Botanic Garden Research Award, for which I am profoundly grateful. I also would like to thank Melissa A. Johnson and Carrie A. Kiel (RSABG) for providing fundamental laboratory training.

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and C26A (Wen and Zimmer, 1996). PCR products were sequenced on the ABIxl sequencer facility at Rancho Santa Ana Botanic Garden following the BigDye® terminator protocol. Additional ITS sequences from taxa included in *Clusia* sect. *Anandrogyne*, as well as outgroups taxa, were downloaded from GenBank. All sequences were edited, assembled and aligned using MUSCLE algorithm as implemented in Geneious® 8.1.8 (Biomatters Ltd., Auckland, New Zealand). Model of evolution was estimated using ModelTest in Phangorn package (Schleip and

Paradis, 2013) in R statistics environment. The Akaike Information Criterion (AIC; Akaike et al., 1974) was used to choose among substitution models. Maximum likelihood (ML) analyses was conducted using PhyML (Guindon and Gasquel 2003) with 1000 nonparametric bootstrap replicates to estimate support values. Bayesian inference (BI) analyses was performed in MrBayes 3.2.6 (2001) using 10,000,000 cycles of MCMC algorithm with four heated chains, 1000 burn-in samples and a sampling frequency of 10,000 generations.

## RESULTS

Observation of qualitative morphological characters of taxa included in *Clusia* sect. *Anandrogyne* showed extensive homogeneity, particularly in vegetative characters. Nonetheless, fruit morphology of *C. multiflora* subsp. *scariosepala* exhibited remarkable distinct characteristics. Capsules of *C. multiflora* subsp. *scariosepala* have 6–8 deep longitudinal grooves or slits and distally-free style vestiges. Capsules in other taxa from *Clusia* sect. *Anandrogyne*, including *C. multiflora*, have smooth surface and connate style vestiges (Fig. 1).

The alignment of the ITS sequence resulted in a matrix of 39 accessions and 674 bp of which 459 are variable and 293 and potentially parsimony informative. Maximum likelihood and Bayesian analyses resulted in similar reconstructions of phylogenetic relationships. Moreover, phylogenetic

reconstructions based on 207 terminals, including representatives of all sections within *Clusia* (data not shown) results in the same tree topology for section *Anandrogyne*. Monophyly of this section is strongly supported (0.98 posterior probability, 100% bootstrap support). Within the section, two main clades are resolved; one formed by *C. salvinii* Donn. Sm. and *C. alata* Planch. & Triana; and a second clade formed by all the remaining species in the section. Evolutionary relationships among taxa included in this second clade are not well resolved, particularly among species closely related to *C. multiflora* (the multiflora complex). Phylogenetic position of *C. multiflora* subsp. *scariosepala* was resolved with strong support in a clade that includes *C. ducu* Benth, *C. elliptica* Kunth, *C. trochiformis* Vesque, and *C. melchiorii* Gleason (Fig. 1).

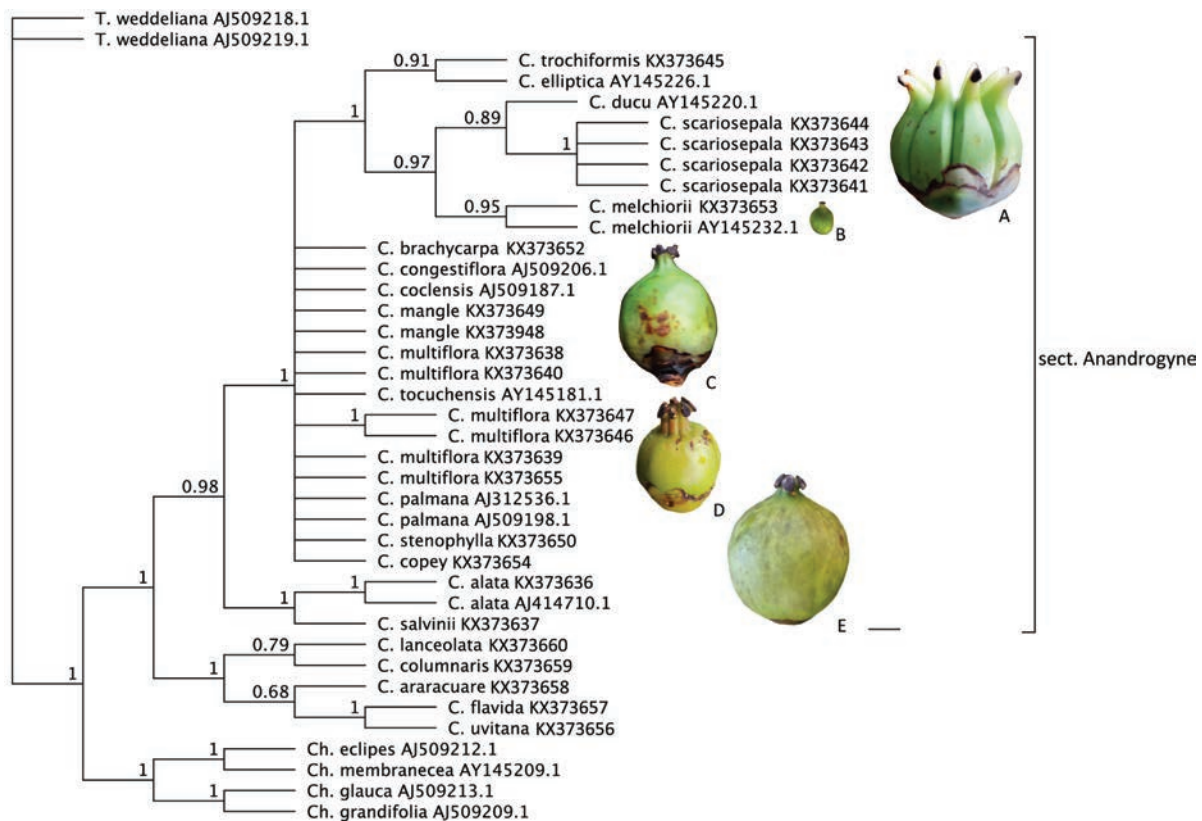


FIGURE 1. Bayesian analysis consensus tree of ITS region from *Clusia* sect. *Anandrogyne*. Numbers above branches indicate Bayesian posterior probabilities. Terminals are taxa with corresponding GenBank accession codes. Pictures of fresh mature capsules are shown. A, *C. scariosepala* (KX373642); B, *C. melchiorii* (KX373653); C, *C. multiflora* (KX373638); D, *C. stenophylla* (KX373650); E, *C. salvinii* (KX373637). Scale bar = 1 cm.

## DISCUSSION

Observation of qualitative morphological characters of taxa in *Clusia* sect. *Anandroyne* showed that fruit morphology in *C. multiflora* subsp. *scariosepala* is remarkably distinctive in the group, and that it is different from the fruits of *C. multiflora*. Moreover, phylogenetic analyses of ITS sequences provide evidence that *C. multiflora* subsp. *scariosepala* is phylogenetically more closely related to *C. ducu*, *C. elliptica*, *C. trochiformis*, and *C. melchiorii* than to *C. multiflora*.

Based on a morphological species concept wherein “species are the smallest group that are consistently and persistently distinct and distinguishable by ordinary means” (Cronquist 1978), *C. multiflora* subsp. *scariosepala* should be considered a distinct species within *Clusia*

sect. *Anandroyne*, since it represents a biological entity morphologically different from *C. multiflora*. Furthermore, analysis of molecular data suggests that *C. multiflora* subsp. *scariosepala* is more closely related to other species within sect. *Anandroyne* than to *C. multiflora*, which indicate that *C. multiflora* subsp. *scariosepala* belongs in a lineage apart from *C. multiflora*. In order to make taxonomic classification to reflect the evolutionary relationships in *Clusia*, a taxonomic status change is here proposed.

Although ITS data have shown to be useful to estimate the phylogenetic position of *Clusia* species, additional molecular data including more variable markers, as well as more extensive taxon sampling, are needed to better resolve evolutionary relationships within *Clusia* sect. *Anandroyne*.

## TAXONOMIC TREATMENT

***Clusia scariosepala*** (Maguire) Luján *stat. nov.* TYPE: VENEZUELA. Mérida: frequent small tree, in temperate forest at 2200–2400 m, La Carbonera, 25 km NW [from] Ejido, 19 October 1953, *B. Maguire 39446* ♂ (holotype: NY [LAPI 00842426]).

**Etymology:** Following ICN recommendation from Article 41.2 (McNeill et al. 2012), the specific epithet is

based on the former infraspecific taxon name, which refers to the shriveled appearance of the sepal margins.

**Conservation status:** *Clusia scariosepala* is endemic to the Venezuelan Andes, and it is found in montane forests in the Cordillera de Mérida at 1850–2700 m (Fig. 2). *Clusia scariosepala* have been collected in two areas: Sierra de La Culata and Sierra Nevada. Collections from the

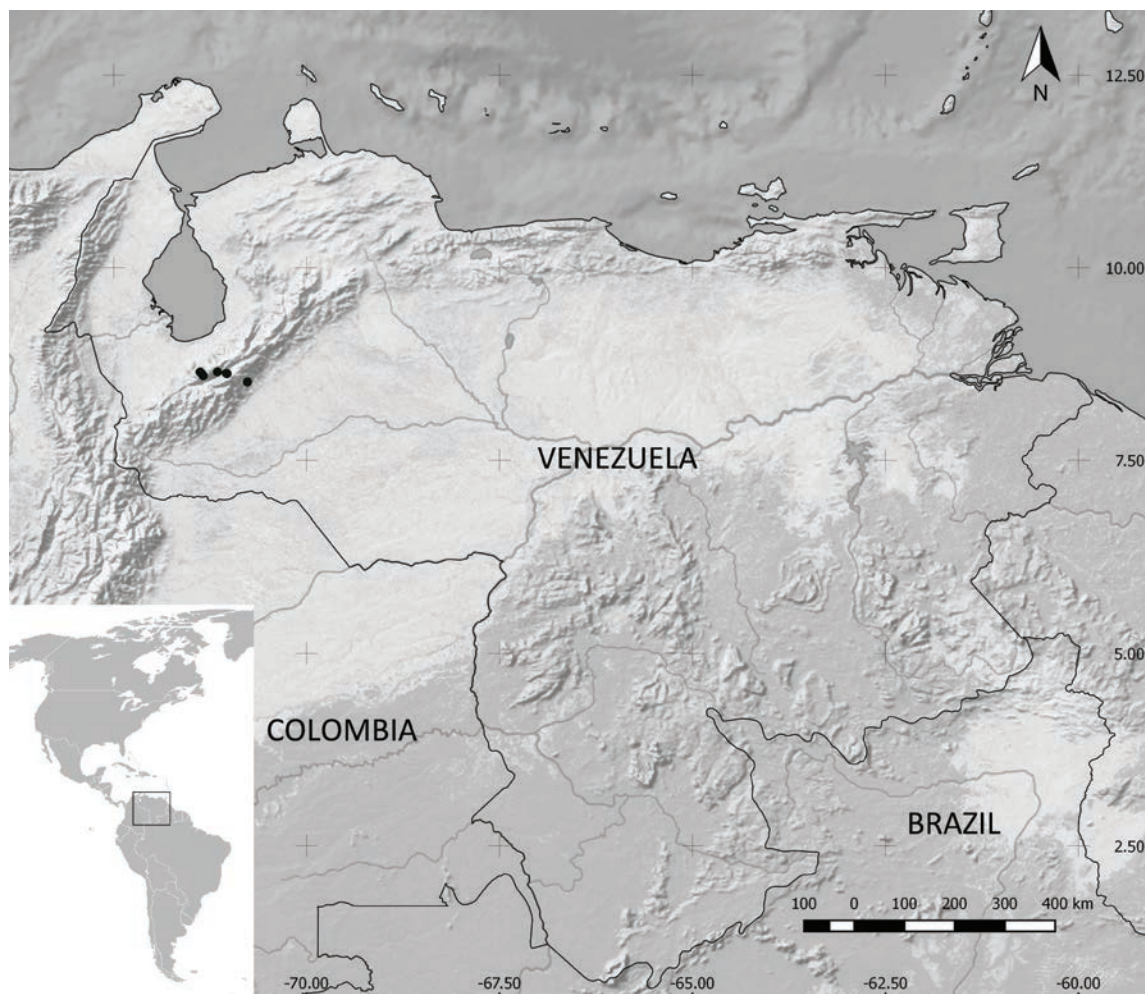


FIGURE 2. Geographical distribution of *C. scariosepala* (Maguire) Luján based on the collections cited in the text.

latter have been made in Sierra Nevada National Park, therefore, conservation of the species in the area should be assured. Nonetheless, montane forests in the Sierra de la Culata area have been severely affected by deforestation and habitat transformation due agricultural activities (Rodríguez-Morales et al. 2009). Moreover, extensive fieldwork was done in the Sierra de La Culata area on 2013 and only two populations of *Clusia scariosepala* were found. Therefore, conservation status of *Clusia scariosepala* is here assessed as Vulnerable under criterion B1 a, b (iii) of IUCN (2014) with an estimated extent of occurrence less than 20,000 km<sup>2</sup>, severely fragmented habitat and decline of habitat quality.

**Additional specimens examined:** VENEZUELA. Mérida: La Carbonera, 25 km NW of Ejido, 2200–2400 m, 19 October 1953, *B. Maguire* 39445 ♂, 39447 ♀, (MO, NY); VENEZUELA. Barinas: Ditto. Pedraza, W of El Carrizal, La Escaza, N of río Canagua, in área locally known as La Reynosa, Los Laureles and Los Granates, P. N.

Sierra Nevada, 8°31'N, 70°46'W, 27 June 1988, *L. J. Dorr*, *L. C. Barnett* and *M. Guerrero* 5726 (NY, PORT [not seen], VEN); Mérida: La Mucuy, 2600 m elev., August 1958, *L. Aristiguieta* 3318 (F, NY, VEN); Cerro Las Flores, 2000–2100 m, 26 April 1953, *L. Bernardi* 444 (NY); Bosque nublado San Eusebio, La Carbonera, 2250–2600 m, 1971, *J. P. Veillon* 18 (NY, VEN); 38 km W of Mérida, low forest near Las Cruces, 1850 m, 16 November 1966, *J. De Bruijn* 1288 (VEN); Selva de musgos, prope Mérida, April 1957, *V. Vareschi* 4442 (VEN); Camino a Sierra Nevada, 10 km E de Mérida, 2700 m elev., 30 August 1953, *E. L. Little Jr.* 15492 (VEN); La Carbonera, 20 km NW de Ejido, 2000 m, 19 October 1953, *E. L. Little Jr.* 15775 (VEN); La Carbonera, 15 km NW de Ejido, 2200 m, 4 July 1953, *E. L. Little Jr.* 15276 (VEN); Ditto. Libertador, Mepo. Tabay, P. N. Sierra Nevada, La Mucuy, vía a la laguna La Coromoto, 9°54'N, 71°03'W, 2125 m, 2 February 1986, *A. Castillo* 1905 (VEN); P. N. Sierra Nevada, La Mucuy, 9°54'N, 71°03'W, 2150 m, 6 December 1980, *A. Castillo* 1030 (VEN).

## LITERATURE CITED

- AKAIKE, H. 1974. A new look at the statistical model identification. *Automatic Control, IEEE Transactions on*, 19(6): 716–723.
- BAILLON, H. E. 1877. Pages 392–425 in *Histoire des plantes. Monographie des Myrtacées, Hypéracacées, Clusiacées, Lythariacées, Onagrariacées Balanophoracées*. t. 6. Librairie Hachette, Paris.
- BITTRICH, V. AND M. C. E. AMARAL. 1996. Flower morphology and pollination biology of some *Clusia* species from the Gran Sabana (Venezuela). *Kew Bull.* 51: 681–694.
- CRONQUIST, A. 1978. Once again, what is a species? Pages 3–20 in L. V. KNUTSON, ED. *Biosystematics in Agriculture*. Allenheld, Osman and Company: Montclair, New Jersey.
- DOYLE, J. J. AND J. L. DOYLE. 1987. A rapid DNA isolation procedure for small quantities of fresh leaf tissue. *Phytochem bull.* 19: 11–15.
- ENGLER, A. 1925. Guttiferae. Pages 154–237 in A. ENGLER AND K. PRANTL, EDS. *Die natürlichen Pflanzenfamilien*. Ed. 2, Vol. 21A. Wilhelm Engelmann, Leipzig.
- GEHRIG, H. H., J. ARANDA, M. A. CUSHMAN, A. VIRGO, J. C. CUSHMAN, B. E. HAMMEL, AND K. WINTER. 2003. Cladogram of Panamanian *Clusia* based on nuclear DNA: implications for the origins of crassulacean acid metabolism. *Plant Biology* 5: 59–70.
- GUSTAFSSON, M. H. G., K. WINTER, AND V. BITTRICH. 2007. Diversity, Phylogeny and Classification of *Clusia*. Pages 95–116 in U. LÜTTGE, ED. *Clusia A woody Neotropical genus of remarkable plasticity and diversity*. Springer, New York.
- HAMMEL, B. E. 1986. New species of Clusiaceae from Central America with notes on *Clusia* and synonymy in the tribe Clusiaceae. *Selbyana* 9: 112–120.
- IUCN STANDARDS AND PETITIONS SUBCOMMITTEE. 2014. Guidelines for Using the IUCN Red List Categories and Criteria. Version 11. Prepared by the Standards and Petitions Subcommittee. Downloadable from <http://www.iucnredlist.org/documents/RedListGuidelines.pdf> (accessed May 19, 2016).
- LÜTTGE, U. 2006. Photosynthetic flexibility and ecophysiological plasticity: questions and lessons from *Clusia*, the only CAM tree, in the neotropics. *New Phytol.* 171: 7–25.
- MAGUIRE, B. 1976. Apomixis in the genus *Clusia* (Clusiaceae). A preliminary report. *Taxon* 25: 241–244.
- . 1979. On the genus *Clusia* (Clusiaceae) in Mexico. *Taxon* 28: 13–18.
- 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, AND J. H. WIERSEMA. 2012. International Code of Nomenclature for Algae, Fungi, and Plants (Melbourne 3251 Code). *Regnum Vegetabile*. Koeltz Scientific Books. 154: 1–240.
- PIPOLY, J. J. 1995. *Clusia fabiolae*, a new species, with a synopsis of *Clusia* section *Anandrogynae* (Clusiaceae) in Guayana. *Sida*. 737–755.
- AND A. GRAFF. 1995. A synopsis of the genus *Clusia* sections *Criuvopsis* and *Brachystemon* (Clusiaceae) in northern South America. *Sida*. 505–528.
- PLANCHON, J. E. AND J. TRIANA. 1860. Mémoire sur la famille de Guttifères. *Annales des Sciences Naturelles. Botanique Serie IV.* 14: 226–367.
- RODRÍGUEZ-MORALES M., E. CHACÓN-MORENO, AND M. ATAROFF. 2009. Transformación del paisaje de selvas de montaña en la cuenca del Río Capaz, Andes Venezolanos. *Ecotrópicos*. 22(2):64–82.
- SCHLIEP K. AND E. PARADIS. 2013. Phangorn: Phylogenetic analysis in R. <http://cran.r-project.org/web/packages/phangorn/index.html>. R package version 1.99-1. Page 112.
- THIERS, B. [continuously updated]. Index Herbariorum: A global directory of public herbaria and associated staff. New York Botanical Garden's Virtual Herbarium. <http://sweetgum.nybg.org/science/ih/>.
- VESQUE, J. 1893. Guttiferae. Pages 1–669 in A. DE CANDOLLE, ED. *Monographie Phanerogamarum* 8. Paris.
- WEN, J. AND E. A. ZIMMER. 1996. Phylogeny and biogeography of *Panax* L. (the ginseng genus, Araliaceae): inferences from ITS sequences of nuclear ribosomal DNA. *Molecular phylogenetics and evolution*, 6(2): 167–177.



## SYNOPSIS OF THE *TRICHOCENTRUM*-CLADE (ORCHIDACEAE, ONCIDIINAE)

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**Abstract:** We present a synopsis of the *Trichocentrum*-clade of Oncidiinae. In this revision, we recognize 85 taxa assigned to four genera: *Cohniella* with 23 species in five complexes and two natural hybrids; *Lophiaris* with 27 species and eight natural hybrids, six of which are yet to be named; *Trichocentrum* with 27 species and two subspecies; and *Lophiarella* with three species. *Cohniella yuroraensis* is referred to the synonymy of *C. ultrajectina*, *C. allenii* and *C. christensoniana* to the synonymy of *C. nuda*, and *C. croatii* to *C. lacera*. *Trichocentrum perezii* is referred to the synonymy of *Lophiaris andreana*. A key to the genera of the *Trichocentrum*-clade is presented as well as keys to the complexes or groups of species and, when applicable, natural hybrids of *Cohniella*, *Lophiarella*, *Lophiaris*, and *Trichocentrum*.

**Keywords:** *Cohniella*, geographic distribution, *Lophiarella*, *Lophiaris*, nomenclature, *Trichocentrum*

The *Trichocentrum* Poeppig & Endlicher clade of Oncidiinae, as circumscribed here, includes four genera: *Cohniella* Pfitzer, *Lophiarella* Szlachetko, Mytnik-Ejmsmott & Romowicz, *Lophiaris* Rafinesque, and *Trichocentrum* (Carnevali et al., 2013). Some authors recognize this clade as a single genus using a broad definition for *Trichocentrum* (Williams et al., 2001; Sosa et al., 2001; Chase, 2009; Neubig et al., 2012).

The taxa of *Trichocentrum*-clade are characterized by one or rarely two leaves per sympodial module and a low chromosome number ( $2n = 26-28$ ) (Chase, 2009). They are found from southern Florida (a single species) and northern Mexico to southern Brazil and northern Argentina, including the Greater Antilles (Pupulin and Carnevali, 2005; Carnevali et al., 2010; Cetzal-Ix and Carnevali, 2010; Balam, 2011). *Lophiarella* is a genus with a more restricted distribution being confined to southwestern Mexico and northwestern Mesoamerica, hence Megamexico (Carnevali et al., 2013). The taxa of these four genera grow in a variety of tropical vegetation associations, ranging from lowlands from tropical deciduous forests and tropical rainforests to thorn scrub forests, but can also be found in pine-oak forests, from sea level up to 1700 (–2800) m elevation. Overall, the clade includes 85 taxa: 23 species in five complexes and two natural hybrids in *Cohniella*; 27 species and eight natural hybrids (six of which are yet to be named) in *Lophiaris*; 27 species and two subspecies in *Trichocentrum*; and three species in *Lophiarella*. The country with the highest species diversity is Mexico with 29 taxa, 18 of which are members of *Lophiaris* (10 endemic), seven belong in *Cohniella* (4 endemic), two (one endemic) in *Lophiarella*, and another two (one endemic) in *Trichocentrum*. Mexico is followed by Costa Rica (5 endemic), Colombia (4 endemic), Brazil (3

endemic), Venezuela (3 endemic) all with 14 taxa, Honduras with 12 taxa, and Bolivia (one endemic), Guatemala, and El Salvador all with 11 taxa. Other countries are represented by fewer than 10 taxa (Table 1).

Characters used to recognize taxa and hybrids within the genera are primarily floral, such as the size and color (especially color patterns) of the flowers, shape and ornamentation (including the calli) of the labellum, presence or absence as well as the shape and ornamentation of the lateral lobes, emargination at the apex of the central lobe of the labellum, length of the spur (as in *Trichocentrum sensu stricto*), column features (shape and size of the column base, shape and position of the column wings), and the type of indumentum of the anther (Pupulin, 1995; Cetzal-Ix and Balam, 2012; Cetzal-Ix et al., 2013a–b). The vegetative characters include the relative size of the pseudobulbs relative to the leaves, the size, shape, thickness and transversal section of the leaves, the length of the inflorescence relative to the subtending leaf, and the position, number, and arrangement of flowers in the inflorescence. Furthermore, species or species complexes can be easily identified using these characters in combination with discrete patterns of ecological and geographical distribution (Cetzal-Ix and Balam, 2012; Cetzal-Ix et al., 2013a–b).

The aim of this contribution is to provide an updated list of recognized species in the *Trichocentrum*-clade with their taxonomic status, typification, and geographical distribution by country. A key to the genera of the *Trichocentrum*-clade is presented as well as keys to the complexes or groups of species, and natural hybrids of *Cohniella*, *Lophiarella*, *Lophiaris*, and *Trichocentrum*. Furthermore, a table with distribution of species by country, endemic species by country, and iconography for some species are provided.

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TABLE 1. Number of *Trichocentrum*-clade taxa by country.<sup>5,6</sup>

	Number of taxa by clade and genera				
	<i>Trichocentrum</i> - clade	<i>Cohniella</i>	<i>Lophiarella</i>	<i>Lophiaris</i>	<i>Trichocentrum</i>
Countries	85	25	3	29	28
Mexico	29 [16*]	7 [4*]	2 [1*]	18 [10*]	2 [1*]
Costa Rica	14 [5*]	4	0	1	9 [5*]
Colombia	14 [4*]	4 [1*]	0	5	5 [3*]
Brazil	14 [3*]	5 [2*]	0	5 [1*]	4
Venezuela	14 [3*]	6 [3*]	0	5	3
Honduras	12	2	2	8	0
Bolivia	11 [1*]	5 [1*]	0	3	3
Guatemala	11	2	2	6	1
El Salvador	11	2	2	6	1
Peru	10 [2*]	2	0	2	6 [2*]
Nicaragua	10	2	0	8	0
Panama	8 [2*]	3 [1*]	0	2 [1*]	3
Ecuador	6 [1*]	0	0	0	6 [1*]
Guyana	5	1	0	2	2
Belize	4	1	0	3	0
Suriname	4	1	0	1	2
Trinidad and Tobago	4	1	0	3	0
Argentina	3	2	0	1	0
Paraguay	3	2	0	1	0
Lesser Antilles	2 [1*]	1 [1*]	0	1	0
French Guiana	1	1	0	0	0
Greater Antilles	1	0	0	1	0
USA (Florida)	1	0	0	1	0

<sup>5</sup> [\*] Endemic species;

<sup>6</sup> Compiled from Pupulin (1995, 1998, 2005), Pupulin et al. (2008), Balam (2007, 2011), Balam et al. (2010, 2011), Carnevali et al. (2010, 2013), Cetzal-Ix and Carnevali (2010), Cetzal-Ix (2012), Balam and Cetzal-Ix (2012), Cetzal-Ix and Balam (2012), Cetzal-Ix et al. (2008, 2012, 2013a, b, 2014), Bogarin and Karremans (2013).

## MATERIAL AND METHODS

The nomenclature and characters used in the keys presented here are based on Pupulin (1995, 1998, 2005), Pupulin et al. (2008), Balam (2007, 2011), Balam et al. (2010, 2011), Carnevali et al. (2010, 2013), Cetzal-Ix and Carnevali (2010), Cetzal-Ix (2012), Balam and Cetzal-Ix (2012), Cetzal-Ix and Balam (2012), Cetzal-Ix et al. (2008, 2012, 2013a–b,

2014), and Bogarin and Karremans (2013). Genera and taxa within are listed alphabetically. Distribution maps were produced by plotting the localities of the studies cited above on a DIVA-GIS base map (Hijmans et al., 2004) and outlines of biogeographic provinces from Morrone (Löwenberg-Neto, 2014) using ArcView 3.2 (ESRI, 1999).

## TAXONOMY TREATMENT

KEY TO THE GENERA OF THE *TRICHOCENTRUM*-CLADE

- 1a. Leaves terete (Fig. 1A), fleshy coriaceous; pseudobulbs relatively small and inconspicuous; unifacial leaves; cellular inclusions in the epidermis present. . . . . *Cohniella*  
 1b. Leaves conduplicate (Fig. 1B–D), either rigidly fleshy or coriaceous; pseudobulbs small, inconspicuous, to relatively large and conspicuous; bifacial leaves; cellular inclusions in the epidermis absent. . . . . 2  
 2a. Plants small (leaves rarely exceeding 10 cm long); inflorescences shorter than the subtending leaves, mature plants bearing few [1–3(–5)], successive flowers; labellum basally produced into a conspicuous spur . . . . . *Trichocentrum*  
 2b. Plants usually larger (leaves usually exceeding 12 cm long; however, they may be smaller in *Lophiaris pumila* and relatives but then flowers lacking a spur); inflorescences usually longer than subtending leaves (shorter in *Lophiaris pumila* and relatives), mature plants bearing many [(5–)10–50(–150)], more or less simultaneous, rarely successive (e.g., *Lophiaris lindenbergii*) flowers; labellum lacking a spur . . . . . 3  
 3a. Leaves rigidly and thickly fleshy coriaceous; pseudobulbs large and conspicuous, at least 2 cm long, but up to 4 cm long; inflorescences stiffly erect, peduncle and rachis glaucous, coated with a thin film of wax; plants usually lithophytic . . . . . *Lophiarella*  
 3b. Leaves coriaceous or fleshy coriaceous, rarely rigid; pseudobulbs small, rarely exceeding 1.5 cm long; inflorescences more commonly ascendent or arching to nutant, never stiffly erect; peduncle and rachis non-glaucous; plants usually epiphytic, rarely lithophytic . . . . . *Lophiaris*

**Cohniella** Pfitzer, Nat. Pflanzenfam. 2, 6: 194. 1889. *Cohnia* Rchb.f., Bot. Zeit. 10: 928. 1852, non *Cohnia* Kunth 1850 (Agavaceae). TYPE: *Cohnia quekettoides* Rchb.f. [= *Cohniella ascendens* (Lindl.) Christenson].

Synonyms: *Oncidium* sect. *Cebolletae* Lindl., Bot. Reg. 28: sub t. 4. 1842. TYPE: *Epidendrum cebolleta* Jacq. [= *Cohniella cebolleta* (Jacq.) Christenson]

*Oncidium* sect. *Teretifolia* Lindl., Bot. Reg. 32: sub t. 27. 1846. TYPE: *Epidendrum cebolleta* Jacq.

*Oncidium* sect. *Teretoncidium* Kuntze, Lex. Gen. Phan. 399. 1903. TYPE: *Epidendrum cebolleta* Jacq. *Stilifolium* Königler & Pongratz, Arcula 7: 186. 1997. TYPE: *Epidendrum cebolleta* Jacq.

*Trichocentrum* Poepp. & Endl. *sensu* Williams et al., 2001; Chase et al., 2003, 2005, 2009 *pro parte*.

**Distribution:** Northern Mexico to southern Brazil and northern Argentina (Fig. 2).

KEY TO THE COMPLEXES IN *COHNIELLA*

- 1a. Flowers > 40 mm diameter; ovaries 25–30 mm long; sepals and petals as long as the labellum; labellum white or yellow with reddish spots; lateral lobes of the labellum lacerated or lacinate; teeth of the callus in the labellum with a denticulate surface; plants of Bolivia, Paraguay, northern Argentina, and southeastern Brazil . . . . . *C. jonesiana* complex  
 1b. Flowers < 37 mm diameter; ovaries 9–23 mm long; sepals and petals much shorter than the labellum; labellum yellow or rarely yellow with reddish spots; lateral lobes of the labellum entire; teeth of the callus in the labellum with a smooth surface; plants of Mexico, Central and South America, and the Lesser Antilles . . . . . 2  
 2a. Inflorescences usually shorter than the leaves, rarely longer; sepals rounded to obovate and petals subquadrate to oblong, both with acute or subtruncate apices; disc and callus yellowish brown; lateral margins of the disc concave without conical teeth or semielliptical plates; platform of the callus semicircular; column wings subtriangular or terete with an entire outline; plants mainly from rainforests (rarely in drier forests) of the Gulf slope in Mexico, into Central and northern South America . . . . . *C. ascendens* complex  
 2b. Inflorescences usually longer than the leaves, rarely shorter; sepals and petals obovate with acute or oblique apices; disc and callus yellowish white; lateral margins of the disc convex with conical teeth or semielliptical plates; platform of the callus rectangular, subquadrate or absent; column wings oblong with bilobed or entire outline; plants mainly from dry forests (rarely in rainforests) of northern Mexico, Central, and South America . . . . . 3  
 3a. Leaves 2–17 mm (in herbarium material) or 6–25 mm (in live plants, both cultivated and wild) thick, broader at the base, then abruptly constricted (forming a “neck” just above the pseudobulb), then thickening again and from there tapering distally; the width of the central lobe of the labellum usually much shorter than the distance across the apex of the spread lateral lobes; abaxial surface of labellum yellow with red spots that usually covers most of the surface (only the central area in *C. yucatanensis*); platform of the callus subquadrate; plants from Mexico into southwestern Costa Rica . . . . . *C. brachyphylla* complex  
 3b. Leaves 3–10 mm (in herbarium material) or 4–15 mm (in live plants, both cultivated and wild) thick, basal and distal width +/- homogeneous; the width of the central lobe is usually similar to the distance across the apex of the spread lateral lobes; abaxial surface of labellum yellow with red spots that cover only the central portion of the surface; platform of the callus rectangular or absent; plants from South America . . . . . 4  
 4a. Lateral margins of the disc convex with conical teeth; column base conspicuous; callus 5-partite (3-partite in *C. croizatii*); disc covered by brown or reddish spots only at base; platform of the callus rectangular (absent in *C. croizatii*); plants from north of the Amazon River in South America and the Lesser Antilles . . . . . *C. cebolleta* complex  
 4a. Lateral margins of the disc convex with semielliptical plates (except *C. caatingaensis*); column base reduced or absent; callus 3-partite (5-partite in *C. caatingaensis*); disc with reddish spots throughout; platform of the callus absent; plants from south of the Amazon River . . . . . *C. cepula* complex



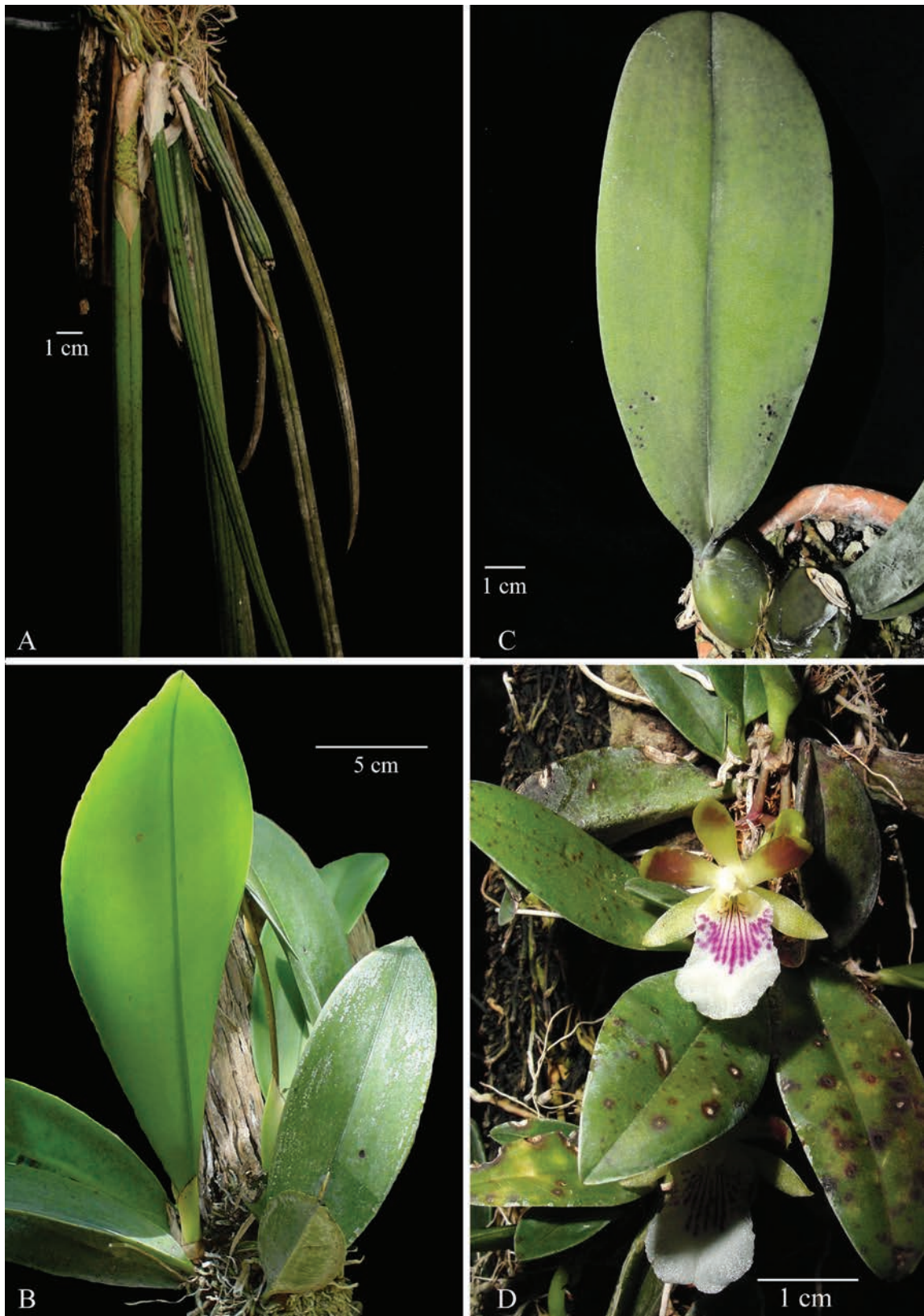


FIGURE 1. Vegetative morphology. **A**, *Cohniella pendula* Carnevali & Cetzal (based on *Carnevali & Ramírez 6897 CICY*); **B**, *Lophiaris tapiae* Balam & Carnevali (*Balam et al. 114 CICY*); **C**, *Lophiarella microchila* (Bateman ex Lindl.) Szlach., Mytnik & Romowicz (*Carnevali 7643 CICY*); **D**, *Trichocentrum candidum* Lindl. (*Carnevali s.n. CICY*). Photographs: [A–C] W. Cetzal-Ix, [D] G. Carnevali.

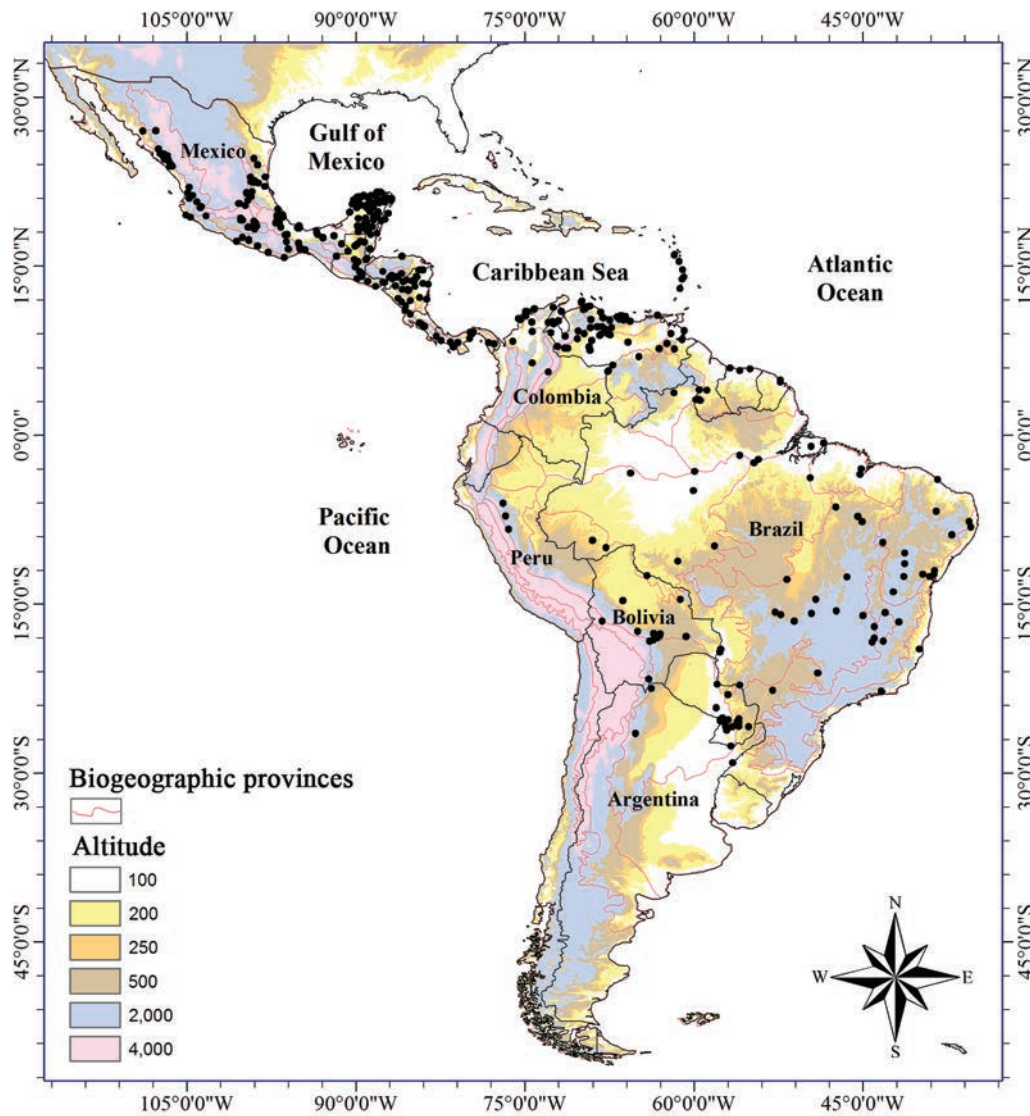


FIGURE 2. Distribution of *Cohniella* Pfister.

KEY TO THE SPECIES OF THE *COHNIELLA JONESIANA* COMPLEX

- 1a. Labellum yellow with orange-brown spots or blotches; distal portions of the lateral lobes of the labellum long lacinate . . . . . *C. stacyi*
- 1b. Labellum entirely white or rarely with a few red spots along the proximal rim of the central lobe; distal portions of the lobes of the labellum entire to lacerate . . . . . 2
- 2a. Sepals and petals pale yellow-green or chartreuse colored with a few, widely separated red-brown spots; plants from Bolivia, Paraguay, northern Argentina, and neighboring areas of Brazil . . . . . *C. jonesiana*
- 2b. Sepals and petals pale yellow-green or chartreuse, almost entirely covered by confluent dark red-brown blotches which render the perianth segments almost unicolor; plants from Minas Gerais and Espírito Santo in SE Brazil . . . . . *C. binotii*

KEY TO THE SPECIES OF THE *COHNIELLA ASCENDENS* COMPLEX

- 1a. Isthmus of the labellum much longer than broad (2–4 × 0.5–2.0 mm); callus consisting of 3 teeth or keels . . . . . 2
- 1b. Isthmus of the labellum approximately as long as broad (0.5–4.0 × 0.5–3.0 mm); callus consisting of 5 teeth or keels . . . . . 3
- 2a. Flowers 18–25 mm diameter; labellum with the lacerated margin; column wings conspicuous; callus of the labellum 1-partite; plants endemic to the central portion of Panama . . . . . *C. lacera*
- 2b. Flowers 13–16 mm diameter; labellum with the entire or slightly lacerated; column wings reduced or absent; callus of the labellum 3-partite; plants from the eastern portion of Panama and northern Colombia and Venezuela . . . . . *C. nuda*
- 3a. Central lobe of the labellum 5–6 mm wide; lateral margins of the labellum smooth; column wings bipartite; plants from Venezuela . . . . . *C. amazonica*
- 3b. Central lobe of the labellum 7–13 mm wide; lateral margins of the labellum rugose; column wings terete; plants from Mexico to Colombia . . . . . 4

KEY TO THE SPECIES OF THE *COHNIELLA JONESIANA* COMPLEX CONT.

- 4a. Flowers non resupinate; lateral lobes of the labellum triangular, short and thin (2–3 × 0.7–1.0 mm); plants from Panamá and Colombia ..... *C. helicantha*
- 4b. Flowers resupinate; lateral lobes of the labellum various (obovate, oblong or triangular), lengths and widths (3–8 × 2–4 mm); plants from Mexico to Colombia ..... 5
- 5a. Lateral lobes of the labellum erect, usually spatulate, broadly obovate; column wings terete; plants of northwestern Mexico ranging into southeastern Costa Rica ..... *C. ascendens*
- 5b. Lateral lobes of the labellum patent, not spatulate, oblong-triangular; column wings subtriangular; plants from the valleys between the Central and Eastern Andean Cordilleras from Colombia ..... *C. aguirrei*

KEY TO THE SPECIES OF THE *COHNIELLA BRACHYPHYLLA* COMPLEX

- 1a. Central lobe of the labellum approximately similar in shape and size to the lateral lobes, 5.8–8.0 mm wide; leaves pendent; plants from the western extreme of the Transmexican Volcanic Belt in coastal Jalisco and Nayarit. .... *C. pendula*
- 1b. Central lobe of the labellum different in shape and size from the lateral lobes, usually much larger, 9–21 mm wide; leaves usually erect or patent, rarely pendent; plants from other areas and not from western extreme of the Neovolcanic Transversal Axis ..... 2
- 2a. Leaves rigidly erect, 5.5–16.0 (–26.0) cm long, many on the plant simultaneously (5–15); inflorescences rigidly erect, racemose, more rarely with a single lateral branch when well-developed; plants from north of the Neovolcanic Transversal Axis in Sinaloa with outliers in Durango, Chihuahua, and Sonora ..... *C. leptotifolia*
- 2b. Leaves various, 12–52 cm long, usually few to a plant (3–5); inflorescences various but usually patent to somewhat pendent, more rarely erect, usually a panicle with 2 or more branches in well-developed plants; plants from the Gulf coast or from the Pacific coast south of the Trans-Mexican Volcanic Belt ..... 3
- 3a. Lateral lobes of the labellum as broad as long, almost as broad as the central lobe (0.85/1–1/1); plants from the Gulf states west and north of the Tehuantepec isthmus (Querétaro, San Luis Potosí, Tamaulipas, Veracruz) ..... *C. biorbicularis*
- 3b. Lateral lobes of the labellum always longer than wide; plants from the Yucatan peninsula or from the Pacific coast of Mexico southward into Costa Rica ..... 4
- 4a. Central lobe of the labellum rounded to truncate, not emarginate at all or only very shallowly so and then the emargination making an obtuse angle; labellum usually bearing spots on most of the undersurface; leaves 6–10 mm wide, conspicuously wider basally but abruptly tapering at base (forming a “neck” just above the pseudobulb) and more gradually tapering distally; plants from the Pacific drainage from Mexico into northwestern Costa Rica ..... *C. brachyphylla*
- 4b. Central lobe of the labellum deeply emarginate, the emargination making an acute angle; labellum lacking spots on the undersurface, if present only on the underside of the disk; leaves 2.5–4.0 mm wide, of homogeneous width, not tapering basally and distally; plants from the northern portion of the Yucatan peninsula. .... *C. yucatanensis*

KEY TO THE SPECIES OF THE *COHNIELLA CEBOLLETA* COMPLEX

- 1a. Callus of the labellum 3-partite; callus platform absent; plants from Amazonas State in southern Venezuela ..... *C. croizatii*
- 1b. Callus of the labellum 5-partite; callus platform rectangular; plants from northern Colombia, northern and eastern Venezuela, the Guianas (French Guiana, Guyana, and Suriname), and the Lesser Antilles ..... 2
- 2a. Flowers > 31 mm diameter; central lobe of the labellum 14–16 × 18–24 mm; central portion of the callus platform with two globose teeth; plants from Bolívar, Sucre, and Delta Amacuro states in eastern Venezuela ..... *C. macrocebolleta*
- 2b. Flowers < 25 mm diameter; central lobe of the labellum 5–10 × 8–15 mm; central portion of the callus platform smooth; plants of northern Colombia and Venezuela, the Guianas (French Guiana, Guyana, and Suriname), and the Lesser Antilles ..... 3
- 3a. Lateral lobes of the labellum narrowly elliptic (1.8–2.5 mm wide); callus with distal teeth partially separated of the central keel; plants from the Lesser Antilles ..... *C. juncifolia*
- 3b. Lateral lobes of the labellum oblong, rounded or subquadrate (3.5–5.0 (–7) mm wide); callus with distal teeth completely attached to the central keel, giving the appearance of one unit; plants from northern Colombia, Venezuela, and the Guianas (French Guiana, Guyana, and Suriname) ..... 4
- 4a. Flowers 16–19 mm diameter; lateral lobes of the labellum subquadrate (3.5–3.8 × 3.0–3.5 mm); lateral margins of the callus platform in the labellum ear shaped; callus with distal teeth about the same size as proximal teeth; plants from southern Venezuela and the Guianas (Guyana, Suriname, and French Guiana) ..... *C. ultrajectina*
- 4b. Flowers 20–25 mm diameter; lateral lobes of the labellum oblong to rounded (5–6 × 4–5 (–7) mm); lateral margins of the callus platform of the labellum entire and truncated; callus with distal teeth twice smaller than proximal teeth; plants from northern Colombia and northern Venezuela ..... *C. cebolleta*

KEY TO THE SPECIES OF THE *COHNIELLA CEPULA* COMPLEX

- 1a. Callus composed of 5 teeth or keels, provided with lateral extensions conical of the callus at each side of the labellar isthmus; proximal lobes of the column wings relatively large (3.5–5.0 × 2.0–2.5 mm); labellar isthmus relatively broad [(3–)4–6 mm wide]; base of column conspicuous, flat, subquadrate; plants from the Caatinga region of NE Brazil ..... *C. caatingaensis*
- 1b. Callus composed of 3 teeth or keels, without lateral extensions of the callus; proximal lobes of the column wing smaller (0.8–3.0 × 1.2–2.0 mm); labellar isthmus relatively narrow [1.7–3.5 mm wide]; base of column short and inconspicuous, concave; plants from elsewhere in Brazil, Peru, Bolivia, Paraguay, and Argentina ..... 2
- 2a. Flowers large, 30–37 mm long from the apex of the dorsal sepal to the apex of the central lobe of labellum; isthmus long and proportionally narrow, 2.5–6 × 2–3.5 mm; plants from the Amazonian Basin in Brazil, known also from a single locality in Amazonian Bolivia . *C. sprucei*
- 2b. Flowers small, (18–)20–24 (–26) mm long from the apex of the dorsal sepal to the apex of the central lobe of labellum; isthmus shorter and proportionally broader 2–4 × 1.7–2.0 (–3) mm; plants from elsewhere in South America mostly from the southern portion of the Amazon Basin ..... *C. cepula*



**Cohniella aguirrei** (Königer) Königer, *Arcula* 10: 280. 2000. Fig. 3A.

Basionym: *Stilifolium aguirrei* Königer, *Arcula* 9: 259. 1999. TYPE: COLOMBIA. Huila: Departamento Girardot, 1200 m, *W. Königer* 95 (Holotype: M; Isotypes: JAUM, K, Herb. Königer [none seen]).

Homotypic synonym: *Trichocentrum aguirrei* (Königer) M.W.Chase & N.H.Williams, *Lindleyana* 16: 218. 2001.

**Distribution:** Endemic to Colombia.

**Cohniella amazonica** Cetzal & Carnevali, *Lankesteriana* 13(3): 208. 2014. TYPE: VENEZUELA. Amazonas: Puerto Ayacucho, flowered in cultivation in the collection of Carlos García Esquivel in Caracas, Venezuela; leaf terete; flowers yellow, December 1991, *C. García Esquivel s.n. sub G. Carnevali* 3080 (Holotype: CICY; Isotypes: AMES, VEN). Fig. 3B.

Homotypic synonym: *Trichocentrum ayacuchense* J.M.H. Shaw, *Orchid Rev. Suppl.*, 122(1305): 17. 2014.

**Distribution:** Endemic to Venezuela.

**Cohniella ascendens** (Lindl.) Christenson, *Lindleyana* 14(4): 177. 1999.

Basionym: *Oncidium ascendens* Lindl., *Edwards's Bot. Reg.* 28: sub t. 4. 1842. TYPE: GUATEMALA. Without any other locality, Apr 1841, *K. T. Hartweg s.n.* (Holotype: K-Lindl.). Fig. 3C.

Homotypic synonyms: *Stilifolium ascendens* (Lindl.) Königer & Pongratz, *Arcula* 7: 186. 1997.

*Trichocentrum ascendens* (Lindl.) M.W.Chase & N.H.Williams, *Lindleyana* 16(2): 137. 2001.

Heterotypic synonyms: *Cohnia quekettioides* Rchb.f., *V. Schl. Bot. Zeitung (Berlin)*: 10: 928. 1852. TYPE: GUATEMALA. Chantallas, "Mons Espina," 1841, *E. R. von Friedrichsthal* 834 (Holotype: presumably at W, not seen).

*Cohniella quekettioides* (Rchb.f.) Pfitzer, *Nat. Pflanzenfam* 2(6): 194. 1889.

*Oncidium subulifolium* Schltr., *Repert. Spec. Nov. Regni Veg. Beih.* 10: 79. 1922.

Basionym: *Oncidium bolivianense* Oppenheim, *Orchis* 10: 93. 1916. (*non Oncidium boliviense* Rolfe, 1907). TYPE: BOLIVIA. Río Itenez, *O. N. Witt s.n.* (Holotype: B, destroyed; Lectotype: *Orchis* 10, No. 5, Tafel IV, Fig. 2 1916; designated by Carnevali et al. (2010)).

**Distribution:** Mexico, Belize, El Salvador, Guatemala, Honduras, Nicaragua, and Costa Rica.

**Cohniella binotii** (Pabst) G.A.Romero & Carnevali, *Brittonia* 62(2): 161. 2010.

Basionym: *Oncidium jonesianum* var. *binotii* Pabst, *Bradea* 2: 170. 1977. TYPE: Brazil. Minas Gerais: regione Montes Claros, 24 Feb 1972 (*sub* 17-2-1971), *Casa Binot s.n. sub Verboonen s.n.* (Holotype: HB).

Homotypic synonym: *Trichocentrum binotii* (Pabst) J.M.H. Shaw, *Orchid Rev. Suppl.*, 120(1297): 16. 2012.

**Distribution:** Endemic to southeast Brazil.

**Cohniella biorbicularis** Balam & Cetzal, *Brittonia* 62(2): 162 (-163; figs. 2A–G). 2010. TYPE: MEXICO. Querétaro: Municipio Landa de Matamoros, Camino de Matzacintla al Río Moctezuma, 21°20'04"N, 99°20'04" W, 1100 m, cañada orientada SE con vegetación de bosque tropical caducifolio sobre laderas de roca caliza; colectada originalmente en el año 2006 por I. M. Ramírez (#1432); floreciendo en cultivo el 10 Marzo 2008, *G. Carnevali & I. M. Ramírez* 7308 (Holotype: CICY; Isotypes: AMES, AMO, MEXU, SEL, QMEX, US). Fig. 3D.

Homotypic synonym: *Trichocentrum biorbicularis* (Balam & Cetzal) R.Jiménez & Solano, *Acta Bot. Mex.* 97: 53. 2011.

**Distribution:** Endemic to Mexico.

**Cohniella brachyphylla** (Lindl.) Cetzal & Carnevali, *Brittonia* 62(2): 163. 2010.

Basionym: *Oncidium brachyphyllum* Lindl., *Edwards's Bot. Reg.* 28: sub t. 4. 1842. TYPE: MEXICO. Without any other locality, *K. T. Hartweg s.n.* (Holotype: K-Lindl.). Fig. 3E.

Homotypic synonyms: *Trichocentrum brachyphyllum* (Lindl.) R.Jiménez, *Acta Bot. Mex.* 97: 53. 2011. *Trichocentrum brachyphyllum* (Lindl.) J.M.H.Shaw, *Orchid Rev. Suppl.*, 120(1297): 16. 2012.

**Distribution:** Mexico, Guatemala, El Salvador, Honduras, Nicaragua, and Costa Rica.

**Cohniella caatingaensis** Cetzal, V.P.Castro & Marçal, *Sys. Bot.* 37(1): 61. 2012. TYPE: BRAZIL. Ceará: Río Pacoty, 6 km north & Aquiraz, 15 Oct 1935, *F. Drouet* 2613 (Holotype: SP; Isotypes: AMES, NY, U, fragment at CICY). Fig. 3F.

Homotypic synonym: *Trichocentrum caatingaense* (Cetzal, V.P.Castro & Marçal) J.M.H.Shaw, *Orchid Rev.* 122(1305): 17. 2014.

**Distribution:** Endemic to Brazil.

**Cohniella cebolleta** (Jacq.) Christenson, *Lindleyana* 14: 177. 1999.

Basionym: *Epidendrum cebolleta* Jacq., *Enum. Syst. Pl.* 30. 1760. TYPE: COLOMBIA. [Bolívar], Cartagena [*Carthagenae*]. 1758, *N. J. von Jacquin s.n.* (Holotype: not located and most likely lost; Lectotype: *Select. Stirp. Amer. Hist.*, ed. 2, t. 217 [text on page 111], 1781, designated, albeit incorrectly, by Garay and Sweet 1974: 205; amended lectotype: *Select. Stirp. Amer. Hist.* [text on pages 230–231] t. 131, Fig. 2, 1763), designated by Carnevali et al., 2010). Fig. 3G.

Homotypic synonyms: *Oncidium cebolleta* (Jacq.) Sw., *Kongl. Vetensk. Acad. Nya Handl.* 21: 240. 1800.

*Stilifolium cebolleta* (Jacq.) Königer & Pongratz, *Arcula* 7: 186, 187. 1997.

*Trichocentrum cebolleta* (Jacq.) M.W.Chase & N.H.Williams, *Lindleyana* 16: 137. 2001.

Heterotypic synonyms: *Oncidium humboldtii* Schltr., *Repert. Spec. Nov. Regni Veg.* 23: 65. 1926.

Basionym: *Oncidium ottonis* Rchb.f. ex Kraenzl., *Pflanzenr. (Engler)* IV, Fam. 50: 92, fig. 10. 1922. (*non* Schltr., 1914). TYPE: VENEZUELA. Without

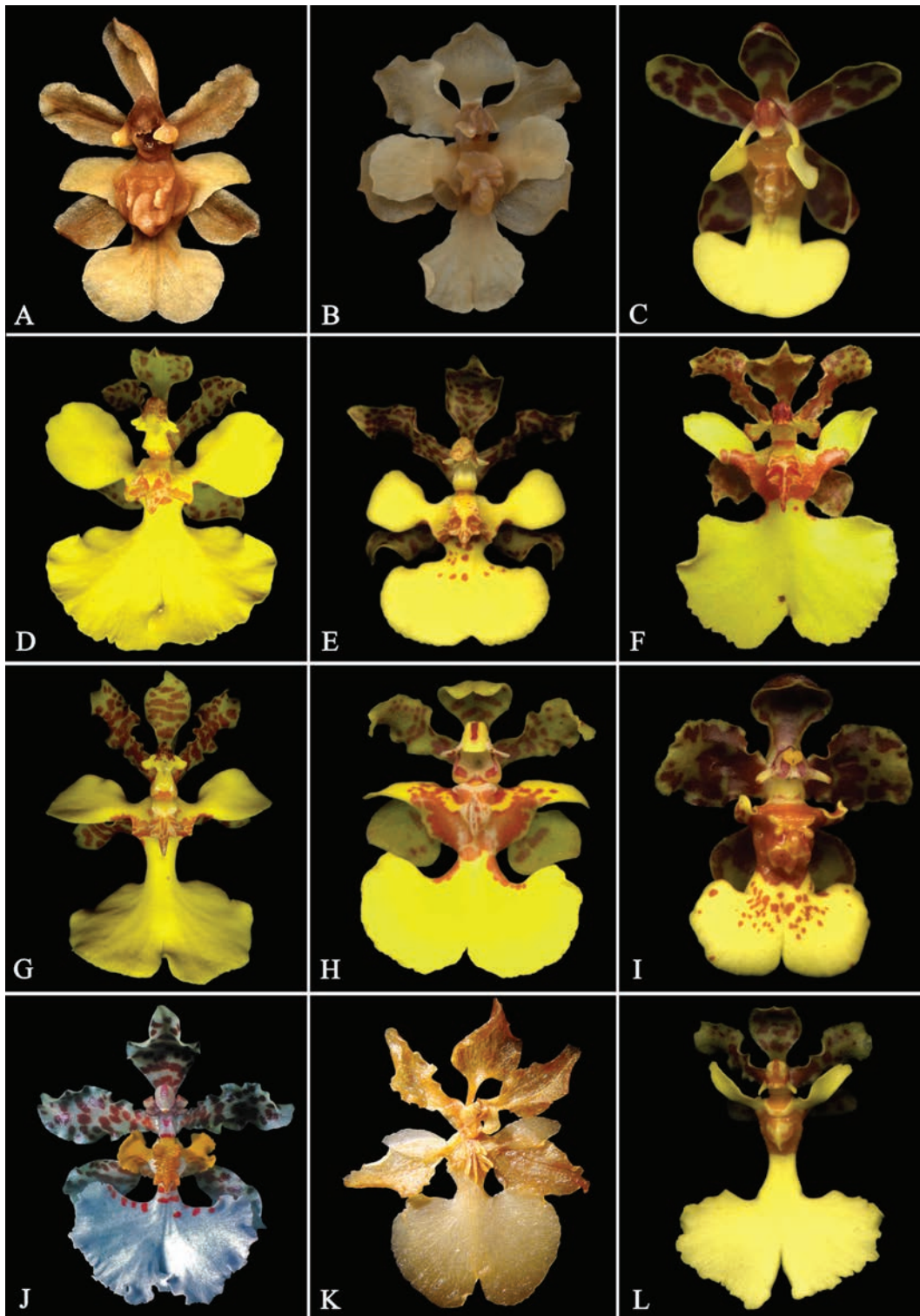


FIGURE 3. Floral morphology. **A**, *Cohniella aguirrei* (Königer) König (Königer 95 M); **B**, *Cohniella amazonica* Cetzal & Carnevali (Carnevali 3080 CICY); **C**, *Cohniella ascendens* (Lindl.) Christenson (Cetzal 3 CICY); **D**, *Cohniella biorbicularis* Balam & Cetzal (Carnevali & Ramírez 7308 CICY); **E**, *Cohniella brachyphylla* (Lindl.) Cetzal & Carnevali (Carnevali 7310 CICY); **F**, *Cohniella caatingaensis* Cetzal, V.P.Castro & Marçal (Paiva s.n. CICY); **G**, *Cohniella cebolleta* (Jacq.) Christenson (Carnevali 7222 CICY); **H**, *Cohniella cepula* (Hoffmanns.) Carnevali & G.A.Romero (Carnevali & Ramírez 7367 CICY); **I**, *Cohniella helicantha* (Kraenzl.) Cetzal & Carnevali (Carnevali 7027 CICY); **J**, *Cohniella jonesiana* (Rchb.f.) Christenson (Kennedy s.n. AMES); **K**, *Cohniella juncifolia* (L.) Cetzal & Carnevali (Duss 2078 NY); **L**, *Cohniella lacera* (Lindl.) Cetzal (Carnevali 7311 CICY). Photographs: [A–E, G–I, K–L] W. Cetzal-Ix, [F] V. Paiva-Castro, [J] G. Kennedy.



locality precise, 1840, *C. F. E. Otto 997* (Syntype: B, destroyed; Isosyntype: *W-Reichenbach 27863*); Guárico: Orituco, *Otto 541* (Syntype: B, destroyed; Isosyntypes: *W-Reichenbach 27869 & 27872*); Carabobo: Puerto Cabello, *A. von Humboldt & A. Bonpland s. n.* (Syntype: B–W); lectotype, designated by Carnevali et al. (2010), *Humboldt & Bonpland s. n.* (B–W).

**Distribution:** Northern Colombia, northern Venezuela, and Trinidad and Tobago.

**Cohniella cepula** (Hoffmanns.) Carnevali & G.A.Romero, *Brittonia* 62(2): 167. 2010. Fig. 3H.

Basionym: *Oncidium cepula* Hoffmanns., *Verz. Orchid. Ed.* 2, 56. 1843. TYPE: Brazil. Río de Janeiro: *ex icon*. ["N. Icon. ined"] (Holotype: B, destroyed; Lectotype: designated by Carnevali et al., 2010; tracing in Herbarium Reichenbach Nr. 15230, upper left corner, W).

Homotypic synonym: *Trichocentrum cepula* (Hoffmanns.) J.M.H.Shaw, *Orchid Rev. Suppl.*, 120(1297): 16. 2012.

Heterotypic synonyms: *Oncidium glaziovii* Cogn., *Fl. Bras.* 3, 6: 440. 1906. TYPE: Brazil. Goiás: *A. F. M. Glaziou 22179* (Holotype: G; Isotypes: BR, MO, P; photo: AMES, NY).

*Oncidium ostenianum* Schltr., *Repert. Spec. Nov. Regni Veg.* 21: 341. 1925. *Cohniella osteniana* (Schltr.) Christenson, *Lindleyana* 14: 177. 1999. TYPE: Paraguay. Epiphyt auf Bäumen am Río Salado, bei San Bernardino, blühend im März 1916, *T. Rojas 1671* (Holotype: Herbarium Ostenianum 8557; Isotype: AMES).

Homotypic synonym: *Trichocentrum ostenianum* (Schltr.) M.W.Chase & N.H.Williams, *Lindleyana* 16: 138. 2001.

*Stilifolium ostenianum* (Schltr.) König & Pongratz, *Arcula* 7: 189. 1997.

*Oncidium cebolleta* var. *purum* L.C.Menezes, *Schlechteriana* 2: 132. 1991. TYPE: Brazil. Minas Gerais: Arinos, 700 m, March 1991, *C. García s.n.* (Holotype: UB-14, sterile; epitype: designated by Barros and Batista (2004): photograph in *Schlechteriana* 3(4): 132. 1992).

*Oncidium cebolleta* f. *purum* (L.C.Menezes) F.Barros & J.A.N. Batista, *Orquidologia Sul-Americana: uma compilação científica*: 103. 2004.

*Trichocentrum cepula* f. *purum* (L.C.Menezes) Meneguzzo, *Harvard Pap. Bot.* 9: 74. 2014.

*Oncidium wittii* Oppenheim, *Orchis* 10: 93. 1916. TYPE: Bolivia. Río Iténez, *Ost s.n.* (Holotype: B, destroyed; lectotype: designated by Carnevali et al., 2010: plate 4, *Orchis* 10, No. 5, Tafel IV, Fig. 1. 1916; Epitype: designated by Carnevali et al., 2010: Bolivia, Santa Cruz: Provincia Andrés Babiñez, 12 km de Santa Cruz, 11 August 1987, *M. H. Nee 35623* [NY]).

*Lophiaris wittii* (Oppenheim) Braem, *Schlechteriana* 4: 21. 1993.

*Stilifolium wittii* (Oppenheim) König & Pongratz, *Arcula* 7: 190. 1997. *Trichocentrum wittii* (Oppenheim) M.W.Chase & N.H.Williams, *Lindleyana* 16: 138. 2001.

*Cohniella wittii* (Oppenheim) Senghas, *Orchideen* (Schlechter) 173–181. 2001.

*Stilifolium pongratzianum* König, *Arcula* 9: 261. 1999. TYPE: Peru. San Martín: Juanjui, ca. 300 m, from M. Arias, Lima, cultivated at Rosenheim, *W. König WK-99* (Holotype: M; Isotypes: USM, UNALM, Herb. König).

Homotypic synonyms: *Cohniella pongratziana* (König) König, *Arcula* 10: 280. 2000.

*Trichocentrum pongratzianum* (König) M.W.Chase & N.H.Williams, *Lindleyana* 16: 218. 2001.

**Distribution:** Peru, Bolivia, Brazil, Paraguay, and Argentina.

**Cohniella croizatii** Cetzal & Carnevali, *Novon* 21: 179. 2011. TYPE: VENEZUELA. Amazonas: Mpio. Alto Orinoco, 1951, *L. Croizat 984* (Holotype: NY; Isotype: CICY [fragment]).

Homotypic synonym: *Trichocentrum croizatii* (Cetzal & Carnevali) J.M.H.Shaw, *Orchid Rev.* 122(1305): 17. 2014.

**Distribution:** Endemic to Venezuela.

**Cohniella helicantha** (Kraenzl.) Cetzal & Carnevali, *J. Torrey Bot. Soc.* 137(2–3): 210. 2010. Fig. 3I.

Basionym: *Oncidium helicanthum* Kraenzl., *Pflanzenr.* (Engler) 95: 281. 1922. TYPE: COLOMBIA. Without any other locality or collector (Holotype: B, destroyed; Lectotype, designated by Carnevali et al., 2010, *Das Pflanzenreich* (A. Angler) heft 80, 4, 50: 282, Fig. 24C, a–d. 1922).

Homotypic synonym: *Trichocentrum helicanthum* (Kraenzl.) J.M.H.Shaw, *Orchid Rev. Suppl.*, 120 (1297): 16. 2012.

Heterotypic synonyms: *Cohniella teres* (Ames & C.Schweinf.) Christenson, *Lindleyana* 14: 177. 1999. *Oncidium teres* Ames & C.Schweinf., *Sched. Orch.* 8: 78. 1925. *Stilifolium teres* (Ames & C.Schweinf.) König & Pongratz, *Arcula* 7: 190. 1997. *Trichocentrum teres* (Ames & C.Schweinf.) M.W.Chase & N.H.Williams, *Lindleyana* 16: 138. 2001. TYPE: PANAMA. Veraguas: San Francisco, 1000 feet [350 m], *C. W. Powell 383* (Holotype: AMES).

**Distribution.** Costa Rica, Panama, and Colombia.

**Cohniella jonesiana** (Rchb.f.) Christenson, *Lindleyana* 14: 177. 1999. Fig. 3J.

Basionym: *Oncidium jonesianum* Rchb.f., *Gard. Chron.* N.S. 20: 781. 1883. TYPE: Paraguay. Without any other locality or collector, ex Hort., *Horsman & Company s.n.* (Holotype: W-Reichenbach 27551).

Homotypic synonyms: *Stilifolium jonesianum* (Rchb.f.) König & Pongratz, *Arcula* 7: 189. 1997.

*Trichocentrum jonesianum* (Rchb.f.) M.W.Chase & N.H.Williams, *Lindleyana* 16: 137. 2001.

Heterotypic synonyms: *Oncidium jonesianum* var. *flavens* Rehb.f., Gard. Chron. S. 3., 4: 234, V. 237, 1888. TYPE: Without locality, but presumably from Paraguay, ex Hort. B. S. Williams (Holotype: W-Reichenbach 27550 [upper left figure]).

*Oncidium jonesianum* var. *phaeanthum* Sander, Reichenbachia S. I., 1: 47, t. 21, fig. 2, 1886–1891. TYPE: Paraguay. Without further locality, Saint-Leger ex Hort. Sir Trevor Lawrence (Holotype: presumably at W-Reichenbach, not seen).

**Distribution:** Bolivia, Brazil, Paraguay, and Argentina.

**Cohniella juncifolia** (L.) Cetzal & Carnevali, Sys. Bot. 38(3): 614. 2013. Fig. 3K.

Basionym: *Epidendrum juncifolium* L., Sp. Pl. (ed. 2) 1351. 1763. TYPE: presumably collected in Haiti [“habitat in America”], Plant. Amer. fasc. 8: t. 184, f. 2. 1759; lectotype: designated by Cribb in Cafferty and Charles 1999: [Icon] “*Epidendrum foliis radicalibus subulatis*” in Burman, Pl. Amer. t. 184; epitype: designated by Carnevali et al. (2010), Martinique, A. Duss 2078 (NY).

Homotypic synonym: *Cymbidium juncifolium* (L.) Willd., Sp. Pl. 4: 102. 1805. *Oncidium juncifolium* (L.) Lindl., Coll. Bot. 27. 1821.

**Distribution:** Endemic to the Lesser Antilles.

**Cohniella lacera** (Lindl.) Cetzal, Ann. Bot. Fenn. 49(1–2): 139. 2012. Fig. 3L.

Basionym: *Oncidium lacerum* Lindl., Bot. Reg. 30. Misc. 38. 1844. TYPE: PANAMA. Without precise locality, ex Hort. Loddiges (Holotype K-Lindl., photograph seen).

Homotypic synonym: *Trichocentrum lacerum* (Lindl.) J.M.H.Shaw, Orchid Rev. Suppl., 120(1297): 16. 2012.

Heterotypic synonyms: *Oncidium stipitatum* Lindl., Bot. Voy. Sulphur 172. 1846. TYPE: PANAMA. Island of Taboga, 30 January–11 February 1837, G. W. Barclay 958 (Holotype: BM, photograph seen).

*Stilifolium stipitatum* (Lindl.) Königer & Pongratz, Arcula 7: 189. 1997.

*Cohniella stipitata* (Lindl.) Christenson, Lindleyana 14: 177. 1999.

*Trichocentrum stipitatum* (Bateman ex Lindl.) M.W.Chase & N.H.Williams, Lindleyana 16: 138. 2001.

*Trichocentrum nudum* (Bateman ex Lindl.) M.W.Chase & N.H.Williams subsp. *stipitatum* (Lindl.) Dressler & N.H.Williams, Selbyana 24: 45. 2003.

*Oncidium stipitatum* Lindl. var. *platyonyx* Rehb.f., Gard. Chron. N.S. 9: 788. 1878. TYPE: PANAMA. Without precise locality, ex Hort. W. Bull. (Holotype: W-Reichenbach 27554, flowers in envelope in the upper left, photograph seen).

Heterotypic synonym: *Cohniella croatii* Kolan. & Szlach. Phytom (Horn) 56(1): 22. 2016. *Syn nov.* TYPE: PANAMA. Canal Zone: Barro Colorado Island. Cove,

S, SE of Peña Blanca Point, 5 March 1969, T. Croat 8396 (Holotype: MO).

**Distribution:** Endemic to Panama.

The type specimen of *Cohniella croatii* can be distinguished from *C. laceras* by minor morphological variations; flowers of *C. croatii* are only slightly larger in the central lobe (“middle lobe”) of the labellum: 11.5 × 18 mm vs. 7–10 × (12–)14–16 in *C. lacera* (Cetzal-Ix et al., 2014).

**Cohniella leptotifolia** Cetzal & Carnevali, J. Torrey Bot. Soc. 137(2–3): 198 (–201; fig. 6). 2010. TYPE: México. Sonora: ca. Álamo Gordo, aprox. 27° 1' 1.56" N, 108° 55' 48" E, collected by M. Gómez, 2002, flowered in cultivation 2 May 2003, G. Carnevali & M. Gómez-Juárez 6803 (Holotype: CICY; Isotypes: AMES, AMO, MEXU, NY, US). Fig. 4A.

Homotypic synonym: *Trichocentrum leptotifolium* (Cetzal & Carnevali) R.Jiménez & Solano, Acta Bot. Mex. 97: 54. 2011.

**Distribution:** Endemic to Mexico.

**Cohniella longifolia** (Lindley) Cetzal & Carnevali, Brittonia 62(2): 169. 2010.

Basionym: *Oncidium longifolium* Lindl., Edwards’s Bot. Reg. 27: 22. 1841. TYPE: MEXICO. Without any other locality, collected by K. T. Hartweg, ex Hort. Royal Horticultural Society and Loddiges (Holotype: K-Lindl.).

Homotypic synonyms: *Trichocentrum longifolium* (Lindl.) R.Jiménez, Acta Bot. Mex. 97: 54. 2011.

*Trichocentrum longifolium* (Lindl.) J.M.H.Shaw, Orchid Rev. Suppl., 120(1297): 16. 2012, *nom. superfl.* (Homonym.)

**Distribution:** Only known from type material from Mexico.

**Cohniella macrocebolleta** Cetzal & Carnevali, Sys. Bot. 38(3): 616. 2013. TYPE: VENEZUELA. Sucre: vecindades de la ciudad de Carúpano, aprox. 10° 40' 12" N, 63° 13' 48" W, 50–100 m, epífita colectada originalmente por Agustín Prieto; flores tomadas en una exposición de orquídeas en Maracay, 22 May 2007, sub G. Carnevali 7220 (Holotype: VEN; Isotypes: AMES, CICY, MO). Fig. 4B.

**Distribution:** Endemic to Venezuela.

**Cohniella nuda** (Bateman ex Lindl.) Christenson, Lindleyana 14: 177. 1999. Fig. 4C.

Basionym: *Oncidium nudum* Bateman ex Lindl., Edwards’s Bot. Reg. 23: t. 1994. 1837. TYPE: VENEZUELA. Distrito Capital: Caracas, 1837, ex Hort. Bateman (Holotype: K-Lindl., photograph seen).

Homotypic synonyms: *Stilifolium nudum* (Bateman ex Lindl.) Königer & Pongratz, Arcula 7: 189. 1997.

*Trichocentrum nudum* (Bateman ex Lindl.) M.W.Chase & N.H.Williams, Lindleyana 16: 138. 2001.

Heterotypic synonyms: *Oncidium ebrachiatum* Ames & C.Schweinf. Sched. Orch. 2: 75. 1923. TYPE: PANAMA. Canal and vicinity, 4 Apr. 1908, R. S. Williams 975 (Holotype: AMES; Isotype: NY, photograph seen).

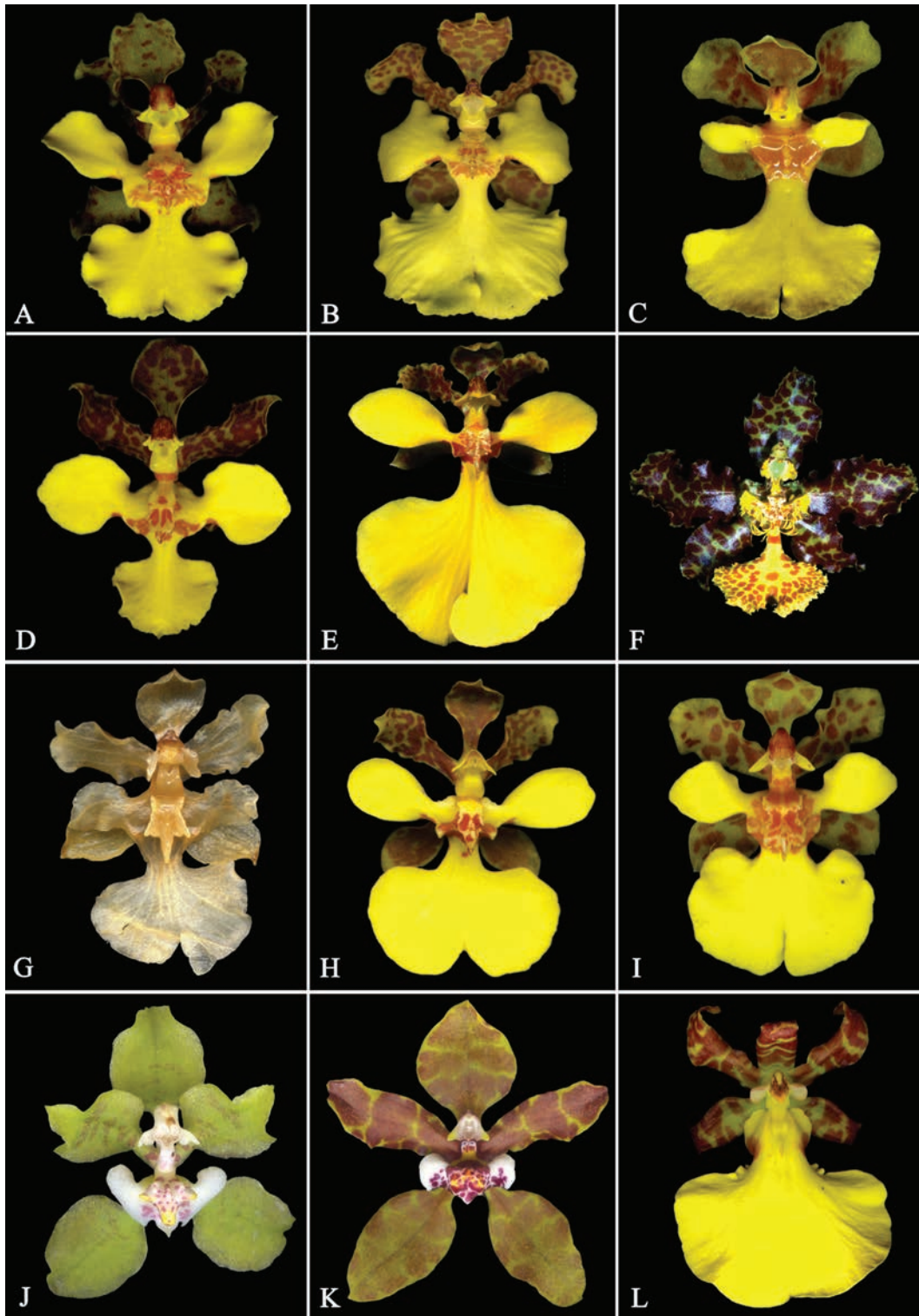


FIGURE 4. Floral morphology. **A**, *Cohniella leptotifolia* Cetzal & Carnevali (Carnevali & Gómez-Juárez 6903 CICY); **B**, *Cohniella macrocebolleta* Cetzal & Carnevali (Carnevali 7220 CICY); **C**, *Cohniella nuda* (Bateman ex Lindl.) Christenson (Carnevali 7283 CICY); **D**, *Cohniella pendula* Carnevali & Cetzal (Carnevali & Ramírez 6897 CICY); **E**, *Cohniella sprucei* (Lindl.) Königer & Pongratz (Kennedy s.n. AMES); **F**, *Cohniella stacyi* (Garay) Christenson (Kennedy s.n. AMES); **G**, *Cohniella ultrajectina* (Pulle) Cetzal & Carnevali (Prop. 575/60 NY); **H**, *Cohniella yucatanensis* Cetzal & Carnevali (Cetzal 22 AMES); **I**, *Cohniella* × *francoi* Cetzal & Carnevali (Pupulin s.n. sub Carnevali 7257 CICY); **J**, *Lophiarella flavovirens* (L.O.Williams) Carnevali & Balam (Carnevali 7269 CICY); **K**, *Lophiarella microchila* (Bateman ex Lindl.) Szlach., Mytnik & Romowicz (Carnevali 7643 CICY); **L**, *Lophiarella splendida* (A. Rich. ex Duch.) Carnevali & Cetzal (Carnevali 7232 CICY). Photographs: [A–D, G–L] W. Cetzal-Ix, [E–F] G. Kennedy.



*Cohniella allenii* Kolan. & Szlach. *Phyton* (Horn) 56(1): 21. 2016. **Syn nov.** TYPE: PANAMA. Panamá: Swamp between El [La] Jagua Hunting Club on Río Jagua and El Congor Hill, 2 m, 10 February 1935, A. A. Hunter & P. H. Allen 471 (Holotype: MO).

*Cohniella christensoniana* Kolan. & Szlach. *Phyton* (Horn) 56(1): 24. 2016. **Syn nov.** TYPE: Colombia: Bolívar: Arjona, Las Piedras, 150 m, 1 March 1983, H. Cuadros V. 1490 (Holotype: MO).

**Distribution:** Eastern Panama, northern Colombia, and Venezuela.

*Cohniella allenii* is no doubt referable to *Cohniella nuda*. The latter is characterized by its minute column wings, often almost absent. Furthermore, the morphology of the small callus is unmistakable. It consists of three low ridges flanking two depressions, which *in vivo* look not only smooth, but moist, wet. The two external ridges are close to, and parallel to the margins of the labellar disk. The labellum is characterized by its long, narrow isthmus and the relatively small lateral lobes, retrorse when flowers are flattened. All these characters are observed in the type of *Cohniella allenii*, the authors of which compared it to *C. cebolleta* (as "*C. ceboletta*"), a species here referred to the *Cohniella ascendens* complex. The "central lobe apically retuse, not bifid..." (Kolanowaska et al., 2016) is simply a morphological variation (see figures in Dunsterville and Garay, 1979: 670; Carnevali et al., 2010: 159, figure 1; Cetza-Ix, 2012: 142, figure 3).

The type of *C. christensoniana* also agrees closely with *C. nuda* (see diagnostic characters above and morphological variation shown in Dunsterville and Garay, 1979: 670).

**Cohniella pendula** Carnevali & Cetzal, *Brittonia* 62(2): 171 (-173; fig. 2H–O). 2010. TYPE: MEXICO. Jalisco: Municipio La Huerta, Loma Alta, 40 km. de La Huerta hacia Barra de Navidad, aprox. 19°22'0"N, 104°41'59"W, aprox. 350–450 m, collected by G. Carnevali and G. Salazar, 3 Nov. 1997, flowered in cultivation 10 Mar 2004, G. Carnevali & I. Ramírez 6897 (Holotype: CICY; Isotypes: AMES, AMO, MO, NY). Fig. 4D.

Homotypic synonym: *Trichocentrum pendulum* (Carnevali & Cetzal) R. Jiménez & Solano, *Acta Bot. Mex.* 97: 54. 2011.

**Distribution:** Endemic to Mexico.

**Cohniella sprucei** (Lindl.) Königer & Pongratz, *Arcula* 10: 280. 2000. Fig. 4E.

Basionym: *Oncidium sprucei* Lindl., *Fol. Orchid.* 56: 1855. TYPE: BRAZIL. Amazonas. Rio Negro and Solimões: R. Spruce 1526 (Holotype: G; Isotypes: AMES, K-Lindl., 2-sheets, P, 2-sheets, NY and F, photographs).

Homotypic synonym: *Trichocentrum sprucei* (Lindl.) M.W.Chase & N.H.Williams, *Lindleyana* 16: 218. 2001.

**Distribution:** Bolivia and Brazil.

**Cohniella stacyi** (Garay) Christenson, *Lindleyana* 14: 177. 1999. Fig. 4F.

Basionym: *Oncidium stacyi* Garay, *Bot. Mus. Leaflet* 23: 301. 1973. TYPE: BOLIVIA. Naranjillos, road to Cochabamba, 11 km south west from Santa Cruz, *J. Stacy s.n.* (Holotype: AMES).

Homotypic synonym: *Trichocentrum stacyi* (Garay) M.W.Chase & N.H.Williams, *Lindleyana* 16: 138. 2001.

**Distribution:** Peru and Bolivia.

**Cohniella ultrajectina** (Pulle) Cetzal & Carnevali, *Syst. Bot.* 38(3): 618. 2013. Fig. 4G.

Basionym: *Oncidium ultrajectinum* Pulle, *Rec. Trav. Bot. Neerl.* 4: 121. 1907. TYPE: SURINAME. "Cultivated at the Utrecht Botanical Garden from a plant coming from Suriname as a gift from v. Asch v. Wijck, the Governor of the colony, to our University" (Holotype: presumably at U, not seen).

Heterotypic Synonym: *Cohniella yuroraensis* Kolan. & Szlach., *Phyton* (Horn) 56(1): 17. 2016. **Syn nov.** TYPE: GUYANA. [Upper Takutu-upper Essequibo]: ca. 5 miles from Karasabi (4–5 hrs. walk) along Yurora River, 04°00'N, 059°21'W, 300 m, 3 January 1982, S. Knapp & J. Mallett 2811 (Holotype: MO).

**Distribution:** Venezuela, Guyana, Suriname, and French Guiana.

Isotypes of *Cohniella yuroraensis* at AMES and NY were cited under *C. ultrajectina* in Cetzal-Ix et al. (2013).

**Cohniella yucatanensis** Cetzal & Carnevali, *J. Torrey Bot. Soc.* 137(2–3): 206 (-210; fig. 9). 2010. TYPE: MEXICO. Yucatán: Municipio Mérida, Dzityá, alrededores del Cementerio del pueblo, 21°2'59.65"N, 89°40'25.54"W, collected by Gabriel Caceres Hernández, flowered in cultivation 20 Apr. 2009, W. Cetzal 22 (Holotype: CICY; Isotypes: AMES, CICY- spirit collection). Fig. 4H.

Homotypic synonym: *Trichocentrum yucatanense* (Cetzal & Carnevali) R. Jiménez & Solano, *Acta Bot. Mex.* 97: 54. 2011.

**Distribution:** Endemic to Mexico.

**Cohniella × francoi** Cetzal & Carnevali, *Phytotaxa* 144(2): 47–54, f. 1A–I, 2B1–B5, 4A–F, 5B. 2013. TYPE: COSTA RICA. Guanacaste: near Santa Rosa National Park, 19 February 2009, F. Pupulin *s.n.* sub G. Carnevali 7257 (Holotype, CICY; Isotypes: AMES, JBL). Fig. 4I.

Homotypic synonym: *Trichocentrum × francoi* (Cetzal & Carnevali) J.M.H.Shaw, *Orchid Rev.* 122(1305): 17. 2014.

**Distribution:** Costa Rica.

**Cohniella × marvraganii** (Lückel) Christenson, *Lindleyana* 14: 177. 1999.

Basionym: *Stilifolium × marvraganii* Lückel, *Orchidee* (Hamburg) 49: 90. 1998. (as "*marvraganii*"). TYPE: Bolivia. 15 km of Santa Cruz, 28 July 1979, M. E. Regan *s.n.* (Holotype: USF).

Homotypic synonym: *Trichocentrum × marvraganii* (Lückel) M.W.Chase & N.H.Williams, *Lindleyana* 16: 137. 2001.

**Distribution:** Endemic to Bolivia.

**Lophiarella** Szlach., Mytnik & Romowicz, *Polish Bot. J.* 51: 54. 2006. TYPE: *Oncidium microchilum* Lindl. [= *Lophiarella microchila* (Lindl.) Szlach., Mytnik & Romowicz].

**Distribution:** Southwestern Mexico to northwestern Nicaragua. Fig. 5.

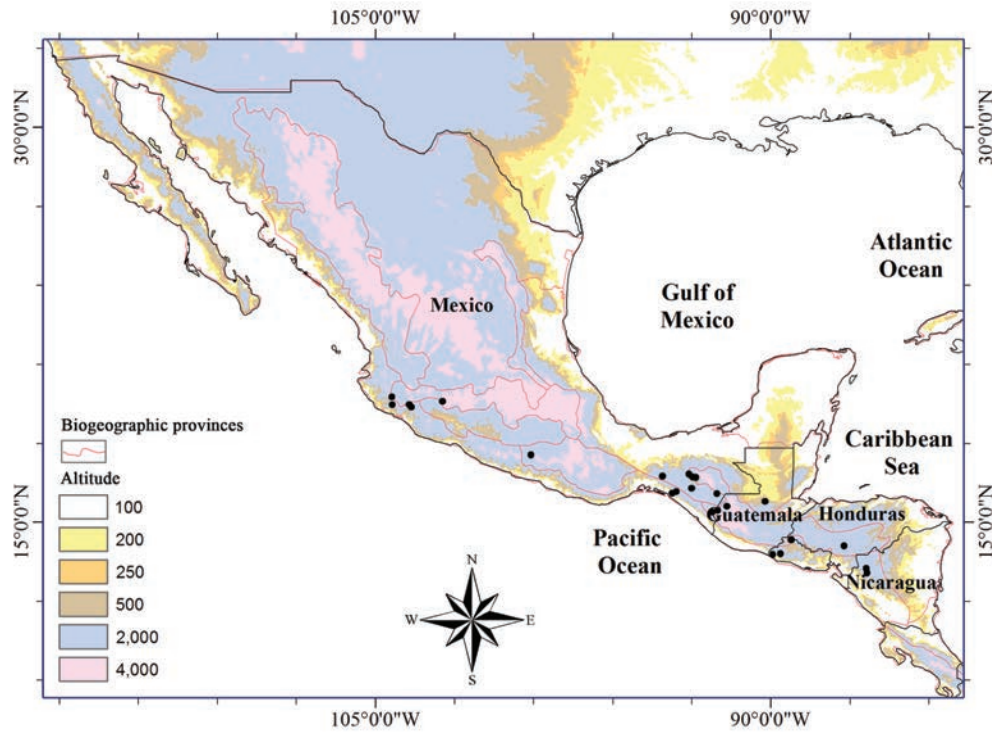


FIGURE 5. Distribution of *Lophiarella* Szlach., Mytnik & Romowicz.

KEY TO THE SPECIES OF *LOPHIARELLA*

- 1a. Pseudobulbs usually subquadrate, with the abscission layer usually straight, strongly compressed laterally even when turgid; ovary with pedicel 35–40 mm long, ovary 9–12 mm long; flowers large and very showy, 30–50(–70) mm diameter; petals and sepals subequal, oblong, not clawed basally, yellow with transversal red-brown bars; labellum yellow, exceeding 25 mm long, central lobe well-developed, suborbicular to subquadrate, truncate; callus composed of three teeth; column wings hemicircular; column sessile; pollinarium with a short, triangular tegula, which is about as long as the viscidium . . . . . *L. splendida*
- 1b. Pseudobulbs usually subspheroid, with the abscission layer always curved, slightly compressed laterally (only when dry); ovary with pedicel 15–25 mm long; ovary 3.0–5.5 mm long; flowers smaller and less showy, 20–28 mm diameter; petals and sepals different, sepals broader and with more developed claws, broadly elliptic to suborbicular, strongly clawed basally, color is green-yellow to apple green, with poorly developed transversal red-brown bars or, more commonly, blotches or spots of pale to dark reddish-brown, often the whole surface covered in the darker hue; labellum white with pink or with red-crimson speckles or blotches, when forcefully spread 6–7 mm long; central lobe strongly reduced, triangular, acute; callus more complex with several teeth; column wings triangular, acute, column elongate, clawed; pollinarium with oblong-linear tegula, much longer than the viscidium . . . . . 2
- 2a. Plants relatively small; pseudobulbs 1.5–3.0 × 1.0–2.5 cm and leaves 15–24 × 2.5–4.0 cm, coriaceous; inflorescences borne on the fully mature pseudobulb, peduncle 5–7 mm, thinly covered with a waxy layer; ovary with pedicel 20–25 mm long; perianth segments apple green with pale, matte red-brown speckles or blotches, the apices of the petals always totally green; both sepals and petals strongly clawed, the claw accounting for ca. 1/3 total length of the segments; labellum when viewed from above triangular in general profile, white with pale rose spots and blotches and some yellow on the callus; lateral lobes relatively large, reniform-dolabriform with a large, retrorse, rounded proximal lobe and a smaller, triangular porrect, distal lobe, along with the short apical lobe giving the impression of an apically 3-dentate labellar apex; disc with five, large, +/- independent, conspicuous teeth; pollinarium with linear tegula at least twice as long as the pollinia. . . . . *L. flavovirens*
- 2b. Plants relatively large; pseudobulbs 3.0–4.5 × 2.5–4.0 cm and leaves (12–)22–30 × 4–7(–10) cm, thickly fleshy-coriaceous; inflorescences borne on the immature pseudobulb, peduncle thicker, 10–15 mm diameter, densely covered with a layer of wax conveying a heavily glaucous aspect; ovary with pedicel 15–18 mm; perianth segments pale yellow green, heavily blotched with darker red-brown, often the whole segment covered in the darker hue; sepals clawed, the claw accounting for ca. 1/4 total length of the segments, petals basally cuneate, not clawed; labellum when viewed from above transversely oblong or broadly ovate in general profile; white with dark wine red or red-crimson blotches, often totally covered with the darker hue; lateral lobes proportionally smaller, reniform with a small, rounded, retrorse proximal lobe and a larger, subtriangular obtuse, porrect distal lobe; disc with a massive callus made up of three large blunt teeth, which are apically confluent on the distal portion of the disc, proximally with several much smaller verrucae on its surface, the two lateral teeth along with the small apical lobe giving the impression of an apically 3-dentate labellar apex; pollinarium with an oblong-obovate tegula about as long as the pollinia . . . . . *L. microchila*

***Lophiarella flavovirens*** (L.O.Williams) Carnevali & Balam, *Sys. Bot.* 38(1): 53. 2013. Fig. 4J.

Basionym: *Oncidium flavovirens* L.O.Williams, *Amer. Orchid Soc. Bull.* 9: 174. 1940. TYPE: MEXICO. Colima: Barranca Delgado, near Hacienda San

Antonio, Volcano Colima, 103°46'W, 23°19'N, ca. 900 m, 28 January 1935, *O. Nagel 4047* (Holotype: AMES; Isotypes: MO, S, US).

Homotypic synonyms: *Lophiaris flavovirens* (L.O.Williams) Braem, *Schlechteriana* 4: 17. 1993.

*Trichocentrum flavovirens* (L.O.Williams) M.W.Chase & N.H.Williams, *Lindleyana* 16: 137. 2001.

**Distribution:** Endemic to Mexico.

**Lophiarella microchila** (Bateman ex Lindl.) Szlach., Mytnik & Romowicz, *Polish Bot. J.* 51: 54. 2006. Fig. 4K. Basionym: *Oncidium microchilum* Bateman ex Lindl. Edwards's Bot. Reg. 26: Misc. 82. 1840. TYPE: GUATEMALA. *G. U. Skinner s.n.* (Holotype: K-Lindl.).

Homotypic synonyms: *Lophiaris microchila* (Bateman ex Lindl.) Senghas, *Schlechter Orchideen I/C* (33–36): 2130. 1997.

*Trichocentrum microchilum* (Bateman ex Lindl.) M.W.Chase & N.H.Williams, *Lindleyana* 16: 138. 2001.

**Distribution:** Mexico, Guatemala, El Salvador, and Honduras.

**Lophiarella splendida** (A. Rich. ex Duch.) Carnevali & Cetzal, *Syst. Bot.* 38(1): 58. 2013. Fig. 4L.

Basionym: *Oncidium splendidum* A.Rich. ex Duch. *J. Soc. Imp. Centr. Hort.* 8: 51. 1862. TYPE: GUATEMALA. En fleurs au mois de janvier 1862, chez MM. Thibaut et Kételeêr, rue de Charonne, 146, à Paris, qui l'ont reçu de M. [Arnaud] Herment, de Caen, *A. Herment s.n.* (Holotype: P [P00437730]).

Homotypic synonyms: *Oncidium tigrinum* var. *splendidum* (A.Rich. ex Duch.) Hook. f. *Bot. Mag.* 97: t. 5878. 1871.

*Trichocentrum splendidum* (A.Rich. ex Duch.) M.W. Chase & N.H.Williams, *Lindleyana* 16: 138. 2001.

Heterotypic synonyms: *Oncidium splendidum* A.Rich.

ex Duch. var. *holoxanthum* Hort. *Gard. Chron. Ser.* 3, 77: 136. 1925. *Lophiaris splendida* (A.Rich. ex Duch.) Christenson f. *holoxantha* (Hort.) Christenson, *Richardiana* 6: 58. 2006. TYPE: not located.

*Oncidium splendidum* var. *xanthinum* auct. *Gard. Chron.* 83: 89. 1928. TYPE: not located.

**Distribution:** Guatemala, El Salvador, Honduras, and Nicaragua (A. Heller 3090 SEL).

**Lophiaris** Raf., *Fl. Tellur.* 4: 40. 1838. TYPE: *Lophiaris fragans* Raf. [= *Lophiaris lanceana* (Lindl.) Braem].

*Oncidium* section *Miltoniastrum* Rchb.f., *Walp. Ann. Bot. Sys.* 6: 748–785. 1852. TYPE: *Oncidium lanceanum* Lindl.

*Oncidium* section *Plurituberculata-Sarcoptera* Lindl. *Fol. Orch. Oncidium.* Part VI–VII: 37–42. 1855. TYPE: *Oncidium haematochilum* Lindl. & Paxton.

*Oncidium* section *Lophiaris* (Raf.) Kuntze, *Lex. Gen. Phan.* 399. 1903. TYPE: *Oncidium lanceanum* Lindl.

*Oncidium* section *Aphanobulbia-Miltoniastrum* Kraenzl., *Pflanzenr.* 50(80): 96–115. 1922. TYPE: *Oncidium lanceanum* Lindl.

*Oncidium* section *Plurituberculata* (Lindl.) Garay & Stacy, *Bradea* 1(40): 393–428. 1974. TYPE: *Oncidium lanceanum* Lindl.

*Trichocentrum* Poepp. & Endlich. *pro parte, sensu* Williams et al., 2001; Chase et al., 2003, 2005, 2009.

**Distribution:** Southern Florida in the United States of America, the West Indies, and northern Mexico to southern Brazil and northern Argentina. Fig. 6.

KEY TO THE SPECIES OF *LOPHIARIS* SPECIES AND NATURAL HYBRIDS

- 1a. Flowers < 10 mm diameter; plants from south of the Amazon River . . . . . 2
- 1b. Flowers > 15 mm diameter; plants from Florida (USA), Mexico, Central America, South America north of the Amazon River, and the Antilles . . . . . 4
- 2a. Callus pulvinate; column wings downward; plants restricted to southeast Brazil . . . . . *L. schwanbachiae*
- 2b. Callus smooth; column wings downward and upward; plants from north, south, and west of south of the Amazon River . . . . . 3
- 3a. Flowers white; column wings upward . . . . . *L. morenoi*
- 3b. Flowers yellow with pink or red spots; column wings downward . . . . . *L. pumila*
- 4a. Flowers > 47 mm diameter; callus 3-teeth; plants from north and south of the Amazon River . . . . . *L. lanceana*
- 4b. Flowers < 45 mm diameter; callus 5–8-teeth; plants from Florida (USA), Mexico, Central America, north and south of the Amazon River, and the Antilles . . . . . 5
- 5a. Leaves < 11 cm long; inflorescences usually shorter than the leaves, rarely longer; flowers non-resupinate; isthmus of the labellum < 0.5 mm long; column wings triangular; plant from west and southwest of north and south of the Amazon River . . . . . *L. nana*
- 5b. Leaves > 15 cm long (except in *L. oestlundiana* of 7–30 cm long); inflorescences usually longer than the leaves, rarely shorter; flowers resupinate; isthmus of the labellum > 1 mm long; column wings dolabriform; plants from Florida (USA), Mexico, Central America, north of the Amazon River, and the Antilles. . . . . 6
- 6a. Flowers 30–45 mm diameter, yellow with bright red spots; lateral lobes of the labellum with claw; disc callus with conical accessories callus at each side of the labellar isthmus; plants from evergreen cloud and pine-oak forests at elevations of 800–2800 m . . . . . 7
- 6b. Flowers 25–35(–40) diameter, pink, brown or white with pink, purple, reddish, brown or white spots or dots; lateral lobes of the labellum without claw (truncated); disc callus without conical accessories callus at each side of the labellar isthmus (smooth); plants usually from tropical rain and deciduous forests at elevations of 0–1200 m . . . . . 10
- 7a. Sepals and petals immaculate or with a large reddish or light brown stain; width of the central lobe much larger than the length through the apices of the lateral lobes of the labellum . . . . . 8
- 7b. Sepals and petals with bright red or dark brown spots; width of the central lobe much similar than the length through the apices of the lateral lobes of the labellum . . . . . 9
- 8a. Flowers 30–34 mm diameter; callus with three small accessories teeth between the proximal and distal teeth; proximal teeth subcylindrical, ascendant and with four teeth; plants from Sierra Madre del Sur from Mexico . . . . . *L. chrysops*
- 8b. Flowers 36–41 mm diameter; callus without accessories teeth between the proximal and distal teeth; proximal teeth ovoid, semifused and with 10–15-teeth; plants from Sierra Madre de Chiapas or Cordillera Central from Mexico, Guatemala, and El Salvador . . . . . *L. bicallosa*



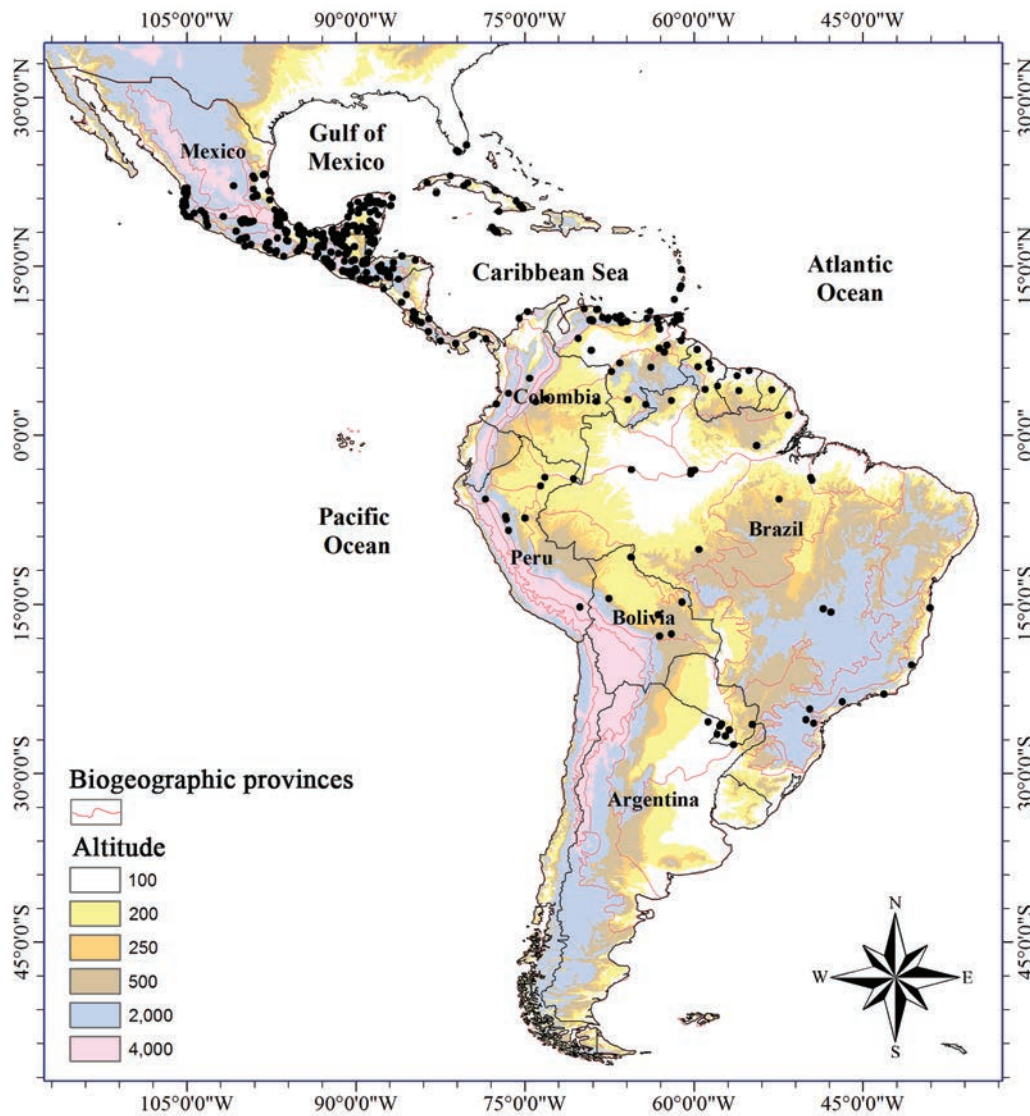


FIGURE 6. Distribution of *Lophiaris* Raf.

KEY TO THE SPECIES OF *LOPHIARIS* SPECIES AND NATURAL HYBRIDS CONT.

- 9a. Lateral lobes of the labellum obovate; disc of the callus with lateral thickenings; central lobe of the labellum 7–9 × 16–25 mm; isthmus of the labellum much longer than wide (5.0–6.5 × 3.5–4.0 mm); plants from Sierra Madre del Sur, Sierra Madre Occidental, and Eje Neovolcánico Transversal of Mexico ..... *L. pachyphylla*
- 9b. Lateral lobes of the labellum orbicular; disc of the callus without lateral thickenings (smooth); central lobe of the labellum 10–15.5 × 20–25 mm; isthmus of the labellum about as long as wide (3–4 × 3–4 mm); plants from Sierra Madre of Chiapas or Cordillera Central of Mexico, Guatemala, and El Salvador ..... *L. cavendishiana*
- 10a. Sepals and petals white cream or whitish green; sepals oblong-ovoid with the smooth margins; petals subquadrate to oblong ovoid; labellum white or white cream without spots ... 11
- 10b. Sepals and petals white with red or brown spots; sepals oblong with undulate margins (smooth in *L. lindenii* and *L. oestlundiana*); labellum white, brown with pink, purple, reddish, brown or white spots or dots or reddish or brown without spots ..... 13
- 11a. Labellum with long isthmus (4–5 mm long); labellum ca. 15 mm long; plants from Honduras and Nicaragua ..... *L. aurisasinora*
- 11b. Labellum with a very short isthmus (0.5–2 mm long); labellum not exceeding 10 mm long; plants from México ..... 12
- 12a. Pseudobulbs and leaves rarely more than 25 cm tall; claw of the dorsal sepal very short and wide (0.5 mm long); claw of the labellum central lobe 1–2 mm long; endemic to Veracruz ..... *L. straminea*
- 12b. Pseudobulbs and leaves more than 30 cm tall; claw of the dorsal sepal long and thin (1.5 mm long); claw of the labellum central lobe 4–5 mm long; endemic to Chiapas ..... *L. sierracaracolensis*
- 13a. Central lobe of the labellum ovate or transversally elliptical, reddish or red wine without spots on its surface ..... 14
- 13b. Central lobe of the labellum transversally elliptical, brown without spots on its surface or white, yellow or pink with reddish or brown spots on its surface ..... 17

KEY TO THE SPECIES OF *LOPHIARIS* SPECIES AND NATURAL HYBRIDS CONT.

- 14a. Lateral lobes of the labellum brown at base and apex; base of the disc callus and proximal teeth brown; isthmus 1–2 mm long; plants from coastal pacific in Jalisco and Nayarit States in Mexico. . . . . *L. oestlundiana*
- 14b. Lateral lobes of the labellum yellow at base and brown at the apex; base of the disc callus and proximal teeth yellow or yellow with reddish spots; isthmus 0.1–0.2 mm long; plants from coastal Atlantic in south of Mexico (Veracruz, Tabasco, Oaxaca, Chiapas, Quintana Roo, Campeche, and Yucatan states), Belize, Guatemala, and Honduras. . . . . 15
- 15a. Petals and sepals white or greenish white with brown or reddish blotches in 2/3 of its surface, oblong-ovate with smooth margins; central lobe of the labellum ovate; proximal teeth of the callus of the labellum yellow without spots; isthmus 0.5–0.6 mm long . . . . . *L. lindenii*
- 15b. Petals and sepals white with reddish or brown continuous blotches in 2/3 of its surface or purple with continuous blotches or spots, oblong with undulate margins; central lobe of the labellum widely obovate; proximal teeth of the callus of the labellum yellow with reddish spots; isthmus 0.1–0.2 mm long . . . . . 16
- 16a. Ovary and pedicel 20–21 mm long; sepals and petals white with reddish or brown continuous blotches in 2/3 of its surface; dorsal sepal 8–10 mm long; central lobe of the labellum 5–6 × 11–12; central keel of the callus parallel to distal teeth . . . . . *L. lindenii* × *L. lurida*
- 16b. Ovary and pedicel 16.5–18 mm long; sepals and petals white with reddish or purple continuous blotches or spots; dorsal sepal 5.5–6.5 mm long; central lobe of the labellum 3–3.3 × 6.7–7 mm; central keel of the callus parallel to proximal and distal teeth . . . . . *L. lindenii* × *L. oerstedii*
- 17a. Central lobe of the labellum 1/2, 1 or 3 times wider than long through the apices of the lateral lobes of the labellum. . . . . 18
- 17b. Central lobe of the labellum more or less similar or 1/4 times wider than long through the apices of the lateral lobes of the labellum. . . . . 25
- 18a. Central lobe of the labellum brown, dull brown, brown-greenish, yellow brown, reddish brown, or orange brown without spots . . . . . 19
- 18b. Central lobe of the labellum white or yellow, with brown or dark brown spots, or reddish brown with white margins . . . . . 23
- 19a. Sepals and petals white on the whole surface of the blade and with pale or dark pink confluent or dispersed spots. . . . . 20
- 19b. Sepals and petals white or dull yellowish at base and margins of the blade and the rest of the blade brown, reddish brown, pale grayish green or light yellow with dark red or light brown spots or blotches . . . . . 21
- 20a. Proximal teeth of the callus 6-partite; distal teeth of the callus 2-partite; central keel of the callus 1 or 2 times smaller than the length of the distal teeth of the callus; plants from the Atlantic drainage in the states of San Luis Potosí, Tamaulipas, Queretaro, and Veracruz in Mexico. . . . . *L. cosymbephora*
- 20b. Proximal section of the callus 8–10 parted; distal teeth of the callus 3-partite; central keel of the callus similar in length up to 3/4 the length of the distal teeth of the callus; plants from the Pacific drainage in the states of Michoacán, Guerrero, Oaxaca, and Chiapas in México. . . . . *L. andreaana*
- 21a. Central lobe of the labellum brownish-green (chocolate), or apically mustard-yellow, with a matte texture; proximal and distal teeth and central keel of the callus parallel to lateral lobes of the labellum; plants from western Mexico (Jalisco and Nayarit states). . . . . *L. nataliae*
- 21b. Central lobe of the labellum brown, greenish brown or dull brown; proximal teeth of the callus parallel to the lateral lobes of the labellum; plants from central and southern Mexico (Veracruz, Estado de Mexico, Oaxaca, Chiapas, Tabasco, Campeche, Quintana Roo, and Yucatán states) to Venezuela and Trinidad and Tobago . . . . . 22
- 22a. Petals and sepals white with brown or reddish brown spots; central lobe of the labellum brown or greenish brown; ovary with pedicel 25–32 mm long; isthmus of the labellum 5–8 (–10) . . . . . *L. lurida*
- 22b. Petals and sepals dull yellowish with brown continuous blotches or confluent brown spots; central lobe of the labellum dull brown; ovary with pedicel 15–16 mm long; isthmus of the labellum 4.0–4.3 mm long. . . . . *L. lurida* × *L. tapiae*
- 23a. Central lobe of the labellum yellow cream or light brown with dark brown or dark red spots all over its surface; plants from Florida (USA), Greater and Lesser Antilles. . . . . *L. maculata*
- 23b. Central lobe of the labellum white or light brown with confluent light brown or yellowish spots or with brown spots dispersed all over its surface; plants from Central America (Nicaragua) and north of South America (Venezuela) . . . . . 24
- 24a. Ovary with pedicel 11–15 mm long; central lobe of the labellum light yellow with brown spots dispersed all over its surface; lateral lobes of the labellum 2.0–2.2 mm long; plants from Central America (Nicaragua) . . . . . *L. crispiflora* × *L. lurida*
- 24b. Ovary with pedicel 24–25 mm long; central lobe of the labellum white with light brown or yellowish spots confluent on all of its surface; lateral lobes of the labellum 3.5–4.0 mm long; plants from north of South America (Venezuela) . . . . . *L. carthagenensis* × *L. lurida*
- 25a. Ovary with pedicel 34–37 mm long . . . . . 26
- 25b. Ovary with pedicel 17–30 mm long . . . . . 27
- 26a. Flowers yellow with dark brown spots and blotches; petals and sepals almost perpendicular to the labellum and the main axis of the flower, thus subparallel to each other; central labellum lobe yellow with brown tinges; plants restricted to the areas of the Candelaria and Palizada rivers, Campeche, Mexico. . . . . *L. tapiae*
- 26b. Flowers white with lilac or pink spots, rarely flowers concolor; sepals and petals at each side of the flowers at approximately 45° to the main axis of the flower; central lobe of the labellum pale pink tinged; plants restricted to NW Chiapas and SE Quintana Roo, Mexico. . . . . *L. teaboana*
- 27a. Lateral lobes of the labellum bright yellow; callus of the labellum bright yellow; plants restricted to the NW section of the Mexican Yucatan Peninsula . . . . . *L. andrewsiae*
- 27b. Lateral lobes of the labellum white, green with dark orange, red brown, pale pink, magenta or wine spots or pale straw-yellow with reddish spots; callus of the labellum white, yellow, pale straw-yellow or purple with pink, magenta or reddish-brown spots; plants from Mexico (SE Oaxaca, N Chiapas, Tabasco, and the Yucatan Peninsula southward) Central America and northern South America . . . . . 28
- 28a. Central lobe of the labellum brown or reddish brown with white margins. . . . . *L. oerstedii*
- 28b. Central lobe of the labellum white, yellow or greenish with red brown, magenta or pale pink spots in 2/3 of its surface or red brown, magenta or brown spots dispersed across its surface or pink to pale pink spots on almost the entirety of its surface . . . . . 29



KEY TO THE SPECIES OF *LOPHIARIS* SPECIES AND NATURAL HYBRIDS CONT.

- 29a. Flowers white or greenish with red brown, wine or magenta spots; central keel of the callus parallel to proximal and distal teeth; proximal teeth with the apex with more than 10 small, conical and irregular teeth; central keel compressed and with more than six small conical teeth; plants from northern Colombia and Venezuela . . . . . *L. carthagenensis*
- 29b. Flowers white or yellow with pink, pale pink, magenta, red or brown spots; central keel of the callus parallel to distal teeth; proximal teeth conical to ovoid with surface of the apex smooth or with 3–6 small, globose teeth; central keel compressed with one or two conical teeth; plants from northwestern Mexico to northeastern Panama . . . . . 30
- 30a. Sepals and petals white with pink or pale pink spots; spots heterogeneously dispersed over the whole surface; central lobe of the labellum white with a pink or pale pink spots or stains in almost all its surface; proximal teeth of the callus conical with smooth surface of the apex; central keel of the callus with one teeth; plants from northeastern Mexico to southwestern Honduras and Nicaragua . . . . . *L. oerstedii*
- 30b. Sepals and petals white or yellow with red brown, magenta, red, brown or pale pink spots; spots confluent or with a continuous and homogeneous pattern or covering almost the whole surface or heterogeneously dispersed over the whole surface, always non-confluent; central lobe white with a red brown, magenta or pale pink spot in 2/3 or dispersed across of its surface; proximal teeth of the callus ovoid with 3–6 small globose teeth on the surface of the apex; central keel of the callus with one or two teeth; plants from eastern Honduras and central-northeastern Nicaragua to northwest of Panama . . . . . 31
- 31a. Flowers 16–23 mm diameter, white with red brown, magenta or pale pink spots; sepals and petals with spots confluent or with a continuous and homogeneous pattern or covering almost the whole surface; dorsal sepal 8–10 x 4–6; central lobe of the labellum white with a red brown, magenta or pale pink spot in 2/3 of its surface; proximal teeth of the callus ovoid with 6 small globose teeth on the surface of the apex; central keel of the callus with one or two teeth; isthmus of the labellum 2.5–3.5 mm width; plants from eastern Honduras and central-northeastern Nicaragua . . . . . *L. crispiflora*
- 31b. Flowers 25–30 mm diameter, yellow with red or brown spots; sepals and petals with spots heterogeneously dispersed over the whole surface, always non-confluent; dorsal sepal 12–14 x 8–11 mm; central lobe of the labellum yellow with red or brown spots dispersed across its surface; proximal teeth of the callus ovoid with 3 small globose teeth on the surface of the apex; central keel of the callus with one tooth; isthmus of the labellum 5 mm width; plants from northwestern Panama . . . . . *L. silverarum*

**Lophiaris andreana** (Cogn.) R.Jiménez & Carnevali, Harvard Pap. Bot. 6(1): 284. 2001. Fig. 7A.

Basionym: *Oncidium carthagenense* (Jacq.) Sw. var. *andream* Cogn., Fl. Bras. 3(6): 411. 1906. TYPE: [MEXICO]. [Guerrero]: de la prov. de Guerrero (Mexico) Recu de Ed. André, 6 May 1899, *E. André s. n.* (Holotype: BR).

Homotypic synonyms: *Oncidium andream* (Cogn.) Garay, Amer. Orchid Soc. Bull. 51(6): 607. 1982. *Trichocentrum andream* (Cogn.) R.Jiménez & Carnevali, Icon. Orchid. 5–6: t. 697. 2003.

Heterotypic synonym: *Trichocentrum perezii* Beutelspacher, Lacandonia 2(2): 11–15. 2009. **Syn. nov.** TYPE: MEXICO. Chiapas, Villaflores, 5 km del entronque a Grutas de Guaymas, 15 August 2008, *F. Pérez Cruz s. n.* (Holotype: HEM).

**Distribution:** Endemic to Mexico.

An analysis of the protologue *T. perezii* shows it is only a pale-colored form of the variable *L. andreana*. Thus, it is here referred to the synonymy of the latter.

**Lophiaris andrewsiae** R.Jiménez & Carnevali, Harvard Pap. Bot. 5(2): 419–422. 2001. TYPE: MEXICO. Campeche: Mun. Hopelchén, 11 km al sur de la frontera Yucatán-Campeche, ca. San Antonio Yaaxché, 20°05'00"N, 89°43'50"W, 20 September 1999, *G. Carnevali, F. May & J. L. Tapia 5673* (Holotype: CICY; Isotypes: AMO, AMES, FLAS, SEL). Fig. 7B.

Homotypic synonym: *Trichocentrum andrewsiae* (R.Jiménez & Carnevali) R.Jiménez & Carnevali, Icon. Orchid. 5–6: 9. 2003.

**Distribution:** Endemic to Mexico.

**Lophiaris aurisasinora** (Standl. & L.O.Williams) Braem, Schlechteriana 4: 17. 1993. Fig. 7C.

Basionym: *Oncidium aurisasinorum* Standl. & L.O.Williams, Ceiba 3(1): 39. 1952; TYPE:

HONDURAS. Francisco Morazán: margines de la Quebrada de las Burras, entre Suyapa y Tegucigalpa, 1050 m, 11 December 1948, flores blancas, sobre árboles, común, floresta mezclada, *A. Molina 1823* (Holotype: US, photo EAP; Isotype: F).

Homotypic synonym: *Trichocentrum aurisasinorum* (Standl. & L.O.Williams) M.W.Chase & N.H.Williams, Lindleyana 16(2): 137. 2001.

**Distribution:** Guatemala, El Salvador, Honduras and Nicaragua.

**Lophiaris bellaniana** Königler, Arcula 22: 468. 2012. TYPE: MEXICO. Without exact locality, flowered in culture at "Orchids & more," Ismaning, *W. Königler WK-166* (Holotype: M; Isotype: Herb. H. Königler).

Homotypic synonym: *Trichocentrum bellanianum* (Königler) J.M.H.Shaw, Orchid Rev. Suppl., 122(1305): 17. 2014.

**Distribution:** Mexico (without exact origin).

**Lophiaris bicallosa** (Lindl.) Braem, Schlechteriana 4(1–2): 17. 1993. Fig. 7D.

Basionym: *Oncidium bicallosum* Lindl., Pl. Hartw. p. 94. t. 12. 1843. TYPE: GUATEMALA. Hacienda de Diegero, *K. T. Hartweg s. n.* (Holotype: K-Lindl.).

Homotypic synonym: *Trichocentrum bicallosum* (Lindl.) M.W.Chase & N.H.Williams, Lindleyana 16(2): 137. 2001.

**Distribution:** Mexico, Guatemala, El Salvador, and Honduras.

**Lophiaris carthagenensis** (Jacq.) Braem, Schlechteriana 4(1–2): 17. 1993. Fig. 7E.

Basionym: *Epidendrum carthagenense* Jacq., Enum. Syst. Pl. Carib. 30. 1760. TYPE: COLOMBIA: Cartagena. *N. J. von Jacquin s. n.* (Holotype: BM).

Homotypic synonyms: *Oncidium carthagenense* (Jacq.)

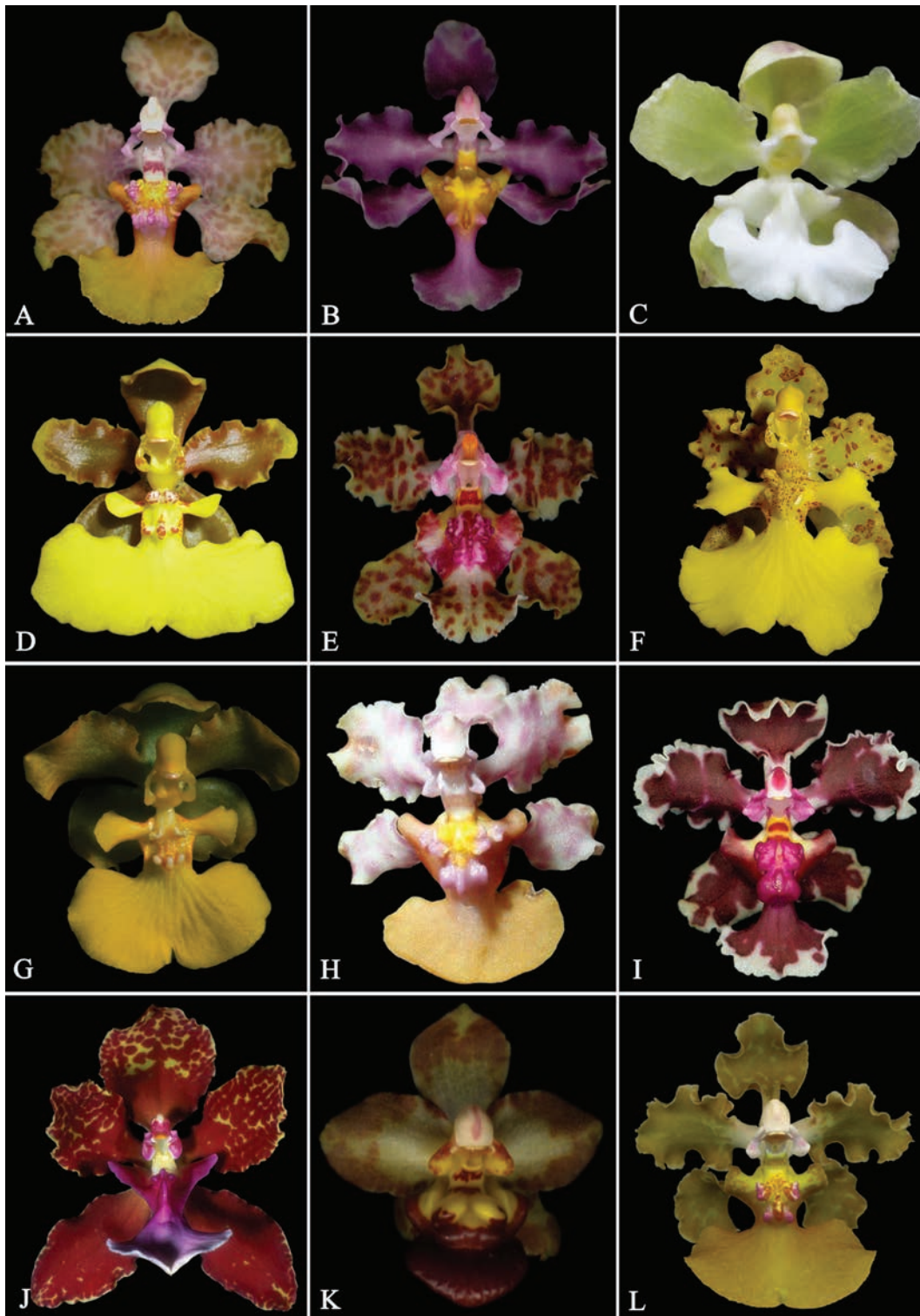


FIGURE 7. Floral morphology. **A**, *Lophiaris andreana* (Cogn.) R.Jiménez & Carnevali (Cetzal 4 CICY); **B**, *Lophiaris andrewsiae* R.Jiménez & Carnevali (Cetzal s.n. CICY); **C**, *Lophiaris aurisasinora* (Standl. & L.O.Williams) Braem (Vega s.n. CICY); **D**, *Lophiaris bicallosa* (Lindl.) Braem (Vega s.n. CICY); **E**, *Lophiaris carthagenensis* (Jacq.) Braem (Noguera-Savelli et al. 712 VEN); **F**, *Lophiaris cavendishiana* (Bateman) Braem (Carnevali 7264 CICY); **G**, *Lophiaris chrysops* (Rchb.f.) R.Jiménez & Carnevali (Kennedy s.n. AMES); **H**, *Lophiaris cosymphephora* (C.Morren) R.Jiménez & Carnevali (Carnevali 7251 CICY); **I**, *Lophiaris crispiflora* (Schltr.) Balam & Cetzal (Bogarín & Pupulin 2228 JBL); **J**, *Lophiaris lanceana* (Lindl.) Braem (Kennedy s.n. AMES); **K**, *Lophiaris lindenii* (Brongn.) Braem (Cetzal 373 CICY); **L**, *Lophiaris lurida* (Lindl.) Braem (Noguera & Cetzal 1020 CH). Photographs: [A–B, E–F, K–L] W. Cetzal-Ix, [C–D] H. Vega, [G, J] G. Kennedy, [H] G. Carnevali, [I] Jardín Botánico Lankester (<http://www.epidendra.org/>).

Sw., Kongl. Vetensk. Acad. Nya Handl. 21: 240. 1800. *Trichocentrum carthagenense* (Jacq.) M.W.Chase & N.H.Williams, Lindleyana 16(2): 137. 2001.

Heterotypic synonyms: *Oncidium panduriferum* Kunth, Nov. Gen. Sp. (quarto ed.) 1: 346–347, t. 82. 1815. TYPE: COLOMBIA. Crescit in convallibus Regni Novogranatensis, sub coelo mitori, ad radices Parami Pitatumba, juxta pagum Pongo, inter urbes Almaguer et Pasto, alt. 1370 hex, floret Novembri, A. von Humboldt & A. Bonpland s.n. (Holotype: P [00320016, 00320017; drawing of type 00437513]).

*Oncidium carthagenense* (Jacq.) Sw. var. *sanguineum* (Lindl.) Lindl., Fol. Orchid. 40. 1855. *Oncidium sanguineum* Lindl., Sert. Orch. Plate 27. 1839. TYPE: VENEZUELA: Distrito Federal, La Guaira ex Hort. Loddiges s.n. (Holotype: K-Lindl.).

*Oncidium carthagenense* (Jacq.) Sw. var. *klotzschii* Lindl., Fol. Orchid. 40. 1855. TYPE: VENEZUELA. Distrito Federal. Caracas, H. Wagener s.n. (Holotype: K-Lindl.).

*Oncidium carthagenense* (Jacq.) Sw. var. *swartzii* Lindl., Fol. Orchid. 40. 1855. TYPE: COLOMBIA. Thick forests of Cartagena, N. J. von Jacquin s.n. (Holotype: presumably at BM, not seen).

**Distribution:** Colombia and Venezuela.

**Lophiaris cavendishiana** (Bateman) Braem, Schlechteriana 4(1–2): 17. 1993. Fig. 7F.

Basionym: *Oncidium cavendishianum* Bateman, Orchid. Mexico & Guatemala, t. 3. 1837. TYPE: GUATEMALA. G. U. Skinner s.n. (Holotype: K-Lindl., photo at AMO).

Homotypic synonym: *Trichocentrum cavendishianum* (Bateman) M.W.Chase & N.H.Williams, Lindleyana 16(2): 137. 2001.

**Distribution:** Mexico, Guatemala, El Salvador, and Honduras.

**Lophiaris chrysops** (Rchb.f.) R.Jiménez & Carnevali, Harvard Pap. Bot. 6(1): 284. 2001. Fig. 7G.

Basionym: *Oncidium chrysops* Rchb.f., Gard. Chron. n.s. 3: 104. 1888. TYPE: MEXICO. Without locality precise, H. Low s.n. (Holotype: W-Reichenbach No. 7972).

Homotypic synonym: *Trichocentrum chrysops* (Rchb.f.) Soto Arenas & R.Jiménez, Icon. Orchid 5–6: ix. 2003.

Heterotypic synonyms: *Oncidium margalefii* Hágsater, Orquídea 4: 256. 1974. TYPE: MEXICO. Guerrero: Cruz de Ocoté, between Yextla and Jaleaca, 2000 m, December 1973, E. Hágsater 3690 (Holotype: MEXU No. 177143).

*Lophiaris margalefii* (Hágsater) Braem, Schlechteriana 4(1–2): 19. 1993.

*Trichocentrum margalefii* (Hágsater) M.W.Chase & N.H.Williams, Lindleyana 16(2): 137. 2001.

**Distribution:** Endemic to Mexico.

**Lophiaris cosymbephora** (C.Morren) R.Jiménez & Carnevali, Harvard Pap. Bot. 6(1): 284. 2001. Fig. 7H.

Basionym: *Oncidium cosymbephorum* C.Morren, Ann. Soc. Roy. Agric. Gand. 5: 333–334, t. 275. 1849. TYPE: Sa patrie nous est inconnue. M. Heynderyx la cultive (protologue), ex Hort. (Holotype: not located and most likely lost).

Homotypic synonyms: *Oncidium luridum* Lindl. var. *morreni* Lindl., Fol. Orchid. Oncidium. 41. 1855. *Trichocentrum cosymbephorum* (C.Morren) R.Jiménez & Carnevali, Icon. Orchid. 5–6: 9. 2003.

Heterotypic synonyms: *Oncidium luridum* var. *atratum* Lindl., J. Hort. Soc. London 6: 54. 1851. TYPE: MEXICO. Near Tampico, K. T. Hartweg s.n. (Holotype: K-79377). *Oncidium luridum* var. *henchmannii* Knowles & Westc., Floricultural Cabinet, and Florist's Magazine 3: 21, t. 97. 1839. *Oncidium henchmannii* (Knowles & Westc.) Lodd., Cat. Orchid. 2: 1323. 1842. *non O. henchmannii* Lodd. ex Lindl. Fol. Orchid. *Oncidium* 40. 1855. TYPE: MEXICO. Hidalgo: Real del Monte, ex Hort. Low. and Co., 1837. Lectotype t. 97, designated by Christenson, Lindleyana 11: 21. 1996.

**Distribution:** Endemic to Mexico.

**Lophiaris crispiflora** (Schltr.) Balam & Cetzal, J. Torrey Bot. Soc. 139(1): 14. 2012. Fig. 7I.

Basionym: *Oncidium oerstedii* var. *crispiflorum* Schltr., Repert. Spec. Nov. Regni Veg. Beih. 17: 85. 1922. TYPE: PANAMA. An der Küste des Pacifischen Ozeans bei Panama City—no. 1 (Holotype: destroyed); Lectotype: Panama, Margin of Pacific Ocean, C. W. Powell 1 (AMES-23920) designated by Christenson, Lindleyana 6: 129. 1991.

Homotypic synonym: *Trichocentrum crispiflorum* (Schltr.) Bogarin, Lankesteriana 14(3): 274. 2014.

Heterotypic synonyms: *Lophiaris mosquitensis* Dressler, *nom. nud.*

**Distribution:** Eastern Honduras, central-northeastern Nicaragua, and northwest Panama.

**Lophiaris lanceana** (Lindl.) Braem, Schlechteriana 4(1–2): 17. 1993. Fig. 7J.

Basionym: *Oncidium lanceanum* Lindl. Trans. Hort. Soc. London 2:100. t. 7. 1836. *Lophiaris fragrans* Raf., Fl. Tellur. 4:41. 1838, *nom. superfl.* TYPE: SURINAM. Uncertain locality, J. H. Lance & F. W. Hostmann 342 (Holotype: K-Lindl., not seen).

Homotypic synonym: *Trichocentrum lanceanum* (Lindl.) M.W.Chase & N.H.Williams, Lindleyana 16(2): 137. 2001.

Heterotypic synonyms: *Oncidium lanceanum* Lindl. var.  $\beta$  *superbum* Lindl. ex Seemann, Harting. Parad. Vindob. 1: t. 12. 1844. TYPE: The illustration accompanying the protologue.

*Oncidium lanceanum* Lindl. var. *louvrexianum* Rchb.f., Gard. Chron. 18: 218. 1882. TYPE: Not located.

*Oncidium lanceanum* forma *aureum* Christenson, Phytologia 71(6): 442. 1992. TYPE: Not located.

**Distribution:** Colombia, Venezuela, Trinidad and Tobago, Guyana, Suriname, and Brazil.



**Lophiaris lindenii** (Brongn.) Braem, Schlechteriana 4(1–2): 19. 1993. [as “*lindenii*”]. Fig. 7K.

Basionym: *Oncidium lindenii* Brongn., L’Horticulteur Universel 3: 372–373. 1842. [non *Oncidium lindenii* Lodd. ex Lindl. Sertum Orchidaceum sub t. 48. 1841. *nom. nud.*; as “*Lindenii*”]. TYPE: MEXICO. [Campeche:] Habite aux environs de Campeche (protologue), *L. Linden s.n.* (Holotype: BR; drawing at AMES [102500]).

Homotypic synonym: *Trichocentrum lindenii* (Brongn.) M.W.Chase & N.H.Williams, Lindleyana 16(2): 137. 2001.

Heterotypic synonym: *Oncidium retemeyerianum* Rchb.f., Bot. Zeitung (Berlin) 14(30): 513–514. 1856. [as “*Retemeyerianum*”]. TYPE: Unknown origin, cultivated in Vienna from plants supplied by Herr Retemeyer (Holotype: probably W-Reichenbach-23960, not seen; drawing in AMES-24269).

**Distribution:** Mexico, Belize, Guatemala, and Honduras.

**Lophiaris lurida** (Lindl.) Braem, Schlechteriana 4(1–2): 19. 1993. Fig. 7L.

Basionym: *Oncidium luridum* Lindl., Bot. Reg. 9: pl. 727. 1823. TYPE: “An unrecorded species... Native of South America,” ex Hort Griffin, at South Lambeth. (Holotype: The illustration accompanying the protologue).

Homotypic synonym: *Trichocentrum luridum* (Lindl.) M.W.Chase & N.H.Williams, Lindleyana 16(2): 137. 2001.

**Distribution:** Mexico, Belize, Guatemala, El Salvador, Honduras, Nicaragua, Costa Rica, Colombia, Venezuela, and Trinidad and Tobago.

**Lophiaris maculata** (Aubl.) Ackerman, Lindleyana 15(2): 92. 2000. Fig. 8A.

Basionym: *Epidendrum maculatum* Aubl., Hist. Pl. Guiane 2: 825. 1775. TYPE: presumably collected in St. Vincent (St. Vincent and the Grenadines), Pl. Amer. 173, t. 178, fig. 2. 1758; Lectotype, designated by Ackerman, 2014: 537: *Helleborine maculofa, follis aloes carinatis* in Burman, Pl. Amer. t. 178; Epitype, designated here: St. John, Carlota, *R. Howard 11283* [AMES]).

Homotypic synonym: *Trichocentrum maculatum* (Aubl.) M.W.Chase & N.H.Williams, Lindleyana 16(3): 218. 2001.

Heterotypic synonyms: *Epidendrum undulatum* Sw., Prodr. 122. 1788. TYPE: JAMAICA. *O. Swartz s.n.* (Lectotype, designated by Ackerman, 2014: 537: S; Isolectotypes: UPS [not seen], G [not seen]).

*Oncidium luridum* Lindl. var. *guttatum* Lindl., Edwards’s Bot. Reg. 25: t. 16. 1839. TYPE: JAMAICA. Hort. (Holotype: K-Lindl., not seen).

*Oncidium undulatum* (Sw.) Salisb., Trans. Hort. Soc. London 1: 295. 1812.

*Trichocentrum undulatum* (Sw.) Ackerman & M.W.Chase, Lindleyana 16(4): 225. 2001.

*Oncidium luridum* Lindl. var. *intermedium* Lindl., Fol. Orchid. Oncidium 41. 1855. TYPE: CUBA. Santiago in Cuba, on the Sierra Maestre, at the height of 5000 ft., *L. Linden s.n.* (Holotype: K-Lindl., not seen).

*Oncidium intermedium* Knowl. & Westc., Fl. Cab. 2: 53, t. 60. 1838 [non *O. intermedium* Bert. ex Spreng., Syst. Veg. 16(3): 728. 1826].

*Oncidium guttatum* var. *intermedium* (Lindl.) Rchb. f., Ann. Bot. Syst. 6: 782. 1863.

**Distribution:** Florida (USA) and the Greater (Cuba and Jamaica) and Lesser (Martinique, San Vicent, and The Grenadines) Antilles.

**Lophiaris morenoi** (Dodson & Luer) Braem, Schlechteriana 4(1–2): 19. 1993. Fig. 8B.

Basionym: *Oncidium morenoi* Dodson & Luer, Selbyana 1: 44. 1976. TYPE: BOLIVIA. 10 km east of Santa Cruz, flowering in cult. [Sic.], *F. Fuchs s.n.* (Holotype: SEL-1366).

Homotypic synonym: *Trichocentrum morenoi* (Dodson & Luer) M.W.Chase & N.H.Williams, Lindleyana 16: 138. 2001.

**Distribution:** Bolivia, Peru, and Brazil.

**Lophiaris nana** (Lindl.) Braem, Schlechteriana 4(1–2): 19. 1993. Fig. 8C.

Basionym: *Oncidium nanum* Lindl. Edwards’s Bot. Reg. 28(30): 37. 1842. TYPE: GUYANA. Uncertain locality, *C. Loddiges 1327* (Holotype: K-Lindl.).

Homotypic synonym: *Trichocentrum nanum* (Lindl.) M.W.Chase & N.H.Williams, Lindleyana 16(2): 138. 2001.

Heterotypic synonyms: *Oncidium thyrsoflorum* Barb. Rodr., Gen. Sp. Orchid. 2: 194, t. 340. 1881. TYPE: BRAZIL. [Pará:] Dans les environs de la ville de Santarem, province du Pará, June, *J. Barbosa Rodrigues* (Holotype: destroyed; Lectotype, here designated, RB, not seen [reproduced in Sprunger et al., 1996: 390]).

*Oncidium patulum* Schltr., Orchis 8: 18. 1914. TYPE: Probably Brazil, without locality, date, or collector (Holotype: B, destroyed).

**Distribution:** Colombia, Venezuela, Guyana, Peru, Bolivia, and Brazil.

**Lophiaris nataliae** Balam & Carnevali, Lankesteriana 9(3): 522 (521–525; fig. 1). 2010. TYPE: MEXICO. Jalisco: Cabo Corrientes, 1.3 km. después del puente Los Horcones, ca. 11 km después de Boca de Tomatlán, rumbo a El Tuito, 20°26’47”N, 105°17’05”W, 460–470 m; floreciendo en cultivo en Dzityá, Yucatán, 25 Marzo 2008, de una planta colectada en Julio de 2007, *G. Carnevali & I. Ramírez 7271* (Holotype: CICY; Isotype: AMES). Fig. 8D.

Homotypic synonym: *Trichocentrum nataliae* (Balam & Carnevali) R.Jiménez & Solano, Acta Bot. Mex. 97: 54. 2011.

**Distribution:** Endemic to Mexico.

**Lophiaris oerstedii** (Rchb.f.) R.Jiménez, Carnevali & Dressler, Harvard Pap. Bot. 5(2): 423. 2001. Fig. 8E.

Basionym: *Oncidium oerstedii* Rchb.f., Bonplandia (Hanover) 2: 91. 1854. TYPE: NICARAGUA. Without locality, “undoubtedly the most beautiful discovery of... Oersted [Unzweifelhaft die schönste Entdeckung des

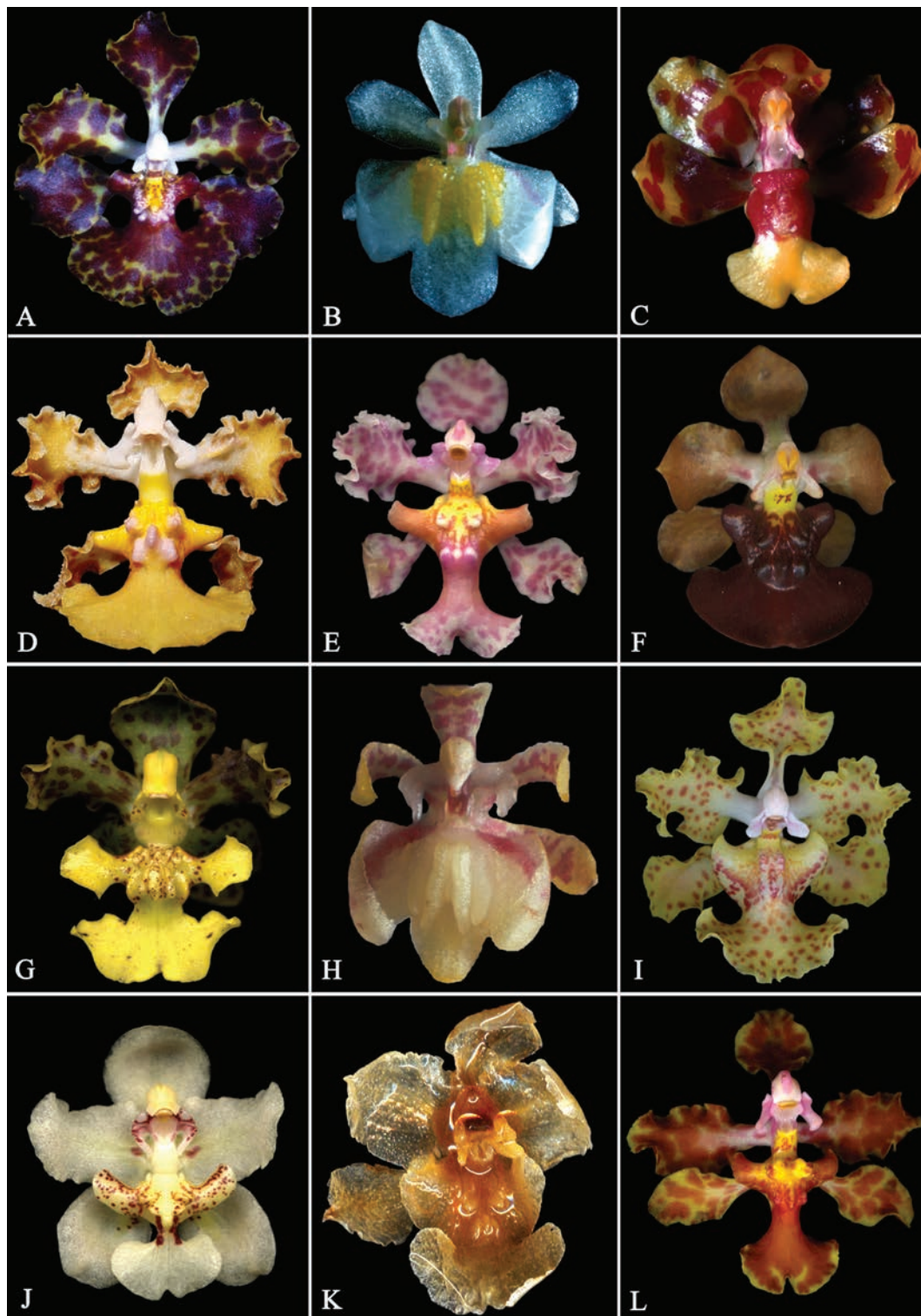


FIGURE 8. Floral morphology. **A**, *Lophiaris maculata* (Aubl.) Ackerman (*Kennedy s.n.* AMES); **B**, *Lophiaris morenoi* (Dodson & Luer) Braem (*Kennedy s.n.* AMES); **C**, *Lophiaris nana* (Lindl.) Braem (*Kennedy s.n.* AMES); **D**, *Lophiaris nataliae* Balam & Carnevali (*Carnevali & Ramírez 6931 CICY*); **E**, *Lophiaris oerstedii* (Rchb.f.) R.Jiménez, Carnevali & Dressler (*Balam s.n.* CICY); **F**, *Lophiaris oestlundiana* (L.O.Williams) Braem (*Cetzal 404 CICY*); **G**, *Lophiaris pachyphylla* (Hook.) R.Jiménez & Carnevali (*Ramírez s.n.* CICY); **H**, *Lophiaris pumila* (Lindl.) Braem (*Kennedy s.n.* AMES); **I**, *Lophiaris silverarum* Carnevali & Cetzal (*Silveira & Rodríguez s.n.* CICY); **J**, *Lophiaris straminea* (Bateman ex Lindl.) Braem (*Carnevali 7161 CICY*); **K**, *Lophiaris sierracaracolensis* Cetzal & Balam (*Pérez Farrera 565 HEM*); **L**, *Lophiaris tapiae* Balam & Carnevali (*Balam 114 CICY*). Photographs: [A–C, H] G. Kennedy, [D] G. Carnevali, [E–G, I–L] W. Cetzal-Ix.

- Hrn. Dr. A. Oersted],” *A. Oersted* s.n. (Holotype: W-Reichenbach, not seen, photograph and drawing of holotype at AMES-24182, 39629; photograph at AMO).  
 Homotypic synonym: *Oncidium carthagenense* var. *oerstedii* (Rchb.f.) Lindl., *Fol. Orchid.* 40. 1855.  
*Trichocentrum oerstedii* (Rchb.f.) R.Jiménez & Carnevali, *Icon. Orchid.* 5–6: ix. 2003.  
 Heterotypic synonyms: *Oncidium salvadorensense* Schltr., *Repert. Spec. Nov. Regni Veg.* 12(322–324): 215. 1913. TYPE: EL SALVADOR. San Salvador, in Wäldern bei Izalco, blühend im Feb 1907, *H. Pittier* 5753 (Holotype: B, destroyed; Isotype: US-593112).  
*Oncidium kymatoides* Kraenzl., *Pflanzenr.* 50 (Heft. 80): 112. 1922. TYPE: GUATEMALA. Without locality, *H. von Tuerckheim* s.n. (Holotype: presumably at BM, not seen).  
*Oncidium obsoletum* A. Rich & Galeotti ex Lindl., *Fol. Orchid.* 6: 41 (1855). *nom. nud.*  
**Distribution:** Mexico, Belize, Guatemala, El Salvador, Honduras, and Nicaragua.
- Lophiaris oestlundiana** (L.O.Williams) Braem, *Schlechteriana* 4(1–2): 19. 1993. Fig. 8F.  
 Basionym: *Oncidium oestlundianum* L.O.Williams, *Amer. Orch. Soc. Bull.* 9(12): 336, f. f. 5–9. 1941. [as *Oncidium* “Oestlundianum”]. TYPE: MEXICO. Nayarit, on a tree in open field, region of Yago, 21°50'N, 105°04'W, 300 m, 12 August 1936, *O. Nagel* & *J. González* 5134 (Holotype: AMES [43784]; Isotype: US [1809825]).  
 Homotypic synonym: *Trichocentrum oestlundianum* (L.O.Williams) M.W.Chase & N.H.Williams, *Lindleyana* 16(2): 138. 2001.  
**Distribution:** Endemic to Mexico.
- Lophiaris pachyphylla** (Hook.) R.Jiménez & Carnevali, *Harvard Pap. Bot.* 6(1): 284. 2001. Fig. 8G.  
 Basionym: *Oncidium pachyphyllum* Hook., *Bot. Mag.* 67: t. 3807. 1840. TYPE: MEXICO. Without locality precise, ex Hort. *J. Parkinson* s.n. (Holotype: K-Lindl., photo, AMO).  
 Homotypic synonym: *Trichocentrum pachyphylla* (Hook.) R.Jiménez & Carnevali, *Icon. Orchid* 5–6: ix. 2003.  
 Heterotypic synonym: *Oncidium pachyphyllum* Hook. var. *chrysoglossum* Rchb.f., *Xenia Orch.* 1: 237, t. 99, fig. IV, 9–12. 1858. TYPE: Unknown origin (probably Mexico), *Herrn Senator Jenisch* 52 (Holotype: W-R No. 7981; slide AMO).  
**Distribution:** Endemic to Mexico.
- Lophiaris pumila** (Lindl.) Braem, *Schlechteriana* 4(1–2): 21. 1993. Fig. 8H.  
 Basionym: *Oncidium pumilum* Lindl., *Bot. Reg.* 11: t. 920. 1825. TYPE: BRAZIL. Between Río Janeiro and Boto Fogo, upon the trunk of a *Bombax Ceiba* [Sic.], flowering in cult., *W. Herbert* s.n. (Holotype: K-Lindl, not seen).  
 Homotypic synonym: *Trichocentrum pumilum* (Lindl.) M.W.Chase & N.H.Williams, *Lindleyana* 16(2): 137. 2001. *Lophiarella pumila* (Lindl.) Szlach., *Mytnik & Romowicz*, *Polish Bot. J.* 51: 54. 2006.  
 Heterotypic synonyms: *Oncidium pumilum* var. *angustifolium* Cogn., *Fl. Bras.* 3(6): 374. 1905. TYPE: BRAZIL. In prov. S. Paulo ad Campinas, *F. Noack* s.n. (Holotype: BR, not seen).  
*Oncidium pumilum* var. *robustum* Cogn., *Fl. Bras.* 3(6): 374. 1905. TYPE: BRAZIL. In prov. Río de Janeiro, *L. Riedel* n. 3, 4 (Syntype: BR); in prov. S. Paulo prope Campinas, *campes novae* in comm. *N. Geogr. & G. Paulo* 2865 (Syntype: BR).  
*Oncidium pumilum* var. *laxum* Kraenzl., *Ark. Bot.* 16(8): 27. 1921. TYPE: BRAZIL. Sao Paulo: Campinas, *A. Heiner* s.n. (Holotype: S; Isotype: BR)  
**Distribution:** Brazil, Paraguay, and Argentina.
- Lophiaris schwambachiae** (V.P.Castro & Toscano) Senghas, *Schlechter Orchideen I/C* (33–36): 2128. 1997.  
 Basionym: *Oncidium schwambachiae* V.P.Castro & Toscano, *Bradea* 3(39): 353–357. 1983. [as *schwambachii*]. TYPE: BRAZIL. Espírito Santo: Domingos Martins, ca. 500–600 m, in moist forest, 22 December 1981, *R. A. Kautsky* s.n. (Holotype: HB [71550]).  
 Homotypic synonym: *Trichocentrum schwambachiae* (V.P.Castro & Toscano) Meneguzzo, *Harvard Pap. Bot.* 9: 74. 2014.  
**Distribution:** Endemic to Brazil.
- Lophiaris sierracaracolensis** Cetzal & Balam, *Novon* 18(1): 12–15, f. 1C. 2008. TYPE: MEXICO. Chiapas: Mun.Villaflores, Sierra El Caracol, 10 km al O delejido La Sombra de la Selva, ca. 14°19'00"N, 93°37'00"W. ca. 860 m, selva baja caducifolia, 17 July 1995, *M. A. Pérez Farrera* 565 (Holotype: HEM; isotypes, CICY, MO [holotype fragm.]). Fig. 8I.  
 Homotypic synonym: *Trichocentrum sierracaracolense* (Cetzal & Balam) R.Jiménez & Solano, *Acta Bot. Mex.* 97: 54. 2011.  
**Distribution:** Endemic to Mexico.
- Lophiaris silverarum** Carnevali & Cetzal, *Phytotaxa* 162(3): 165–172. 2014. TYPE: PANAMA. Veraguas: Distrito de La Mesa, Palo Verde, Río Subí, Costa Pacífica 8°13'N, 81°10'W, 180 m, December 2005, vegetación primaria a orillas del río, *G. Silvera* & *B. Rodríguez* s.n. (Holotype: PMA; Isotypes: AMES, CICY). Fig. 8J.  
 Homotypic synonym: *Trichocentrum silverarum* (Carnevali & Cetzal) J.M.H.Shaw, *Orchid Rev.* 122(1306): 37. 2014  
**Distribution:** Endemic to Panama.
- Lophiaris straminea** (Bateman ex Lindl.) Braem, *Schlechteriana* 4(1–2): 21. 1993. Fig. 8K.  
 Basionym: *Oncidium stramineum* Bateman ex Lindl., *Edwards’s Bot. Reg.* 24: Misc. 39. 1838. TYPE: MEXICO. Veracruz: Zacuapam, *K.T. Hartweg* s.n. (Holotype: K).  
 Homotypic synonym: *Trichocentrum stramineum* (Bateman ex Lindl.) M.W.Chase & N.H.Williams, *Lindleyana* 16(2): 138. 2001.  
 Heterotypic synonym: *Oncidium saltator* Lem., *Fl. Serres Jard. Eur.* 3: sub t. 237B. 1847. TYPE: Not located.  
**Distribution:** Endemic to Mexico.



**Lophiaris tapiae** Balam & Carnevali, Acta Bot. Mex. 97: 21 (17–29; Figs. 1–3). 2011. TYPE: MÉXICO. Campeche: Municipio Candelaria, en la periferia del poblado de Candelaria, específicamente a 25 m NE del puente, creciendo sobre árboles a orillas del río Candelaria, remanentes de selva mediana subperennifolia, 18°11'15.20"N, 91°2'55.57"W, 35 m, floreciendo en cultivo en Mérida, Yucatán, México el 9 de noviembre de 2009 de una planta colectada el 21 de julio de 2009, R. Balam, W. Cetzal & G. Cáceres 114 (Holotype, CICY; Isotypes: AMES, MEXU). Fig. 8L.

Homotypic synonym: *Trichocentrum tapiae* (Balam & Carnevali) J.M.H.Shaw, Orchid Rev. 122(1305): 18. 2014.

**Distribution:** Endemic to Mexico.

**Lophiaris × teaboana** R. Jiménez, Carnevali & Tapia-Muñoz, Harvard Pap. Bot. 5(2): 423–425, f. 6. 2001. TYPE: MEXICO. Yucatán, Mpio. Teabo, población de Teabo, remanentes de selva mediana subcaducifolia, colectado por G. Campos Ríos (no. 2511) y accionado por el Jardín Botánico Regional del CICY como 89-020-a, floreciendo en cultivo en Mérida, Yucatán, México, 29 October 1999, G. Carnevali 5905 (Holotype: CICY, Isotype: AMO). Fig. 9A. Homotypic synonym: *Trichocentrum × teaboanum* (R.Jiménez, Carnevali & Tapia-Muñoz) R.Jiménez & Carnevali (non *teaboana*), Icon. Orchid. 5–6: 9. 2003.

**Distribution:** Mexico.

**Lophiaris × haematochila** (Lindl. & Paxton) Braem, Schlechteriana 4(1–2): 19. 1993.

Basionym: *Oncidium × haematochilum* Lindl. & Paxton, Paxt. Fl. Gard. 1: 21, t. 6. 1850.

Homotypic synonym: *Trichocentrum haematochilum* (Lindl. & Paxton) M.W.Chase & N.H.Williams, Lindleyana 16(2): 137. 2001.

**Distribution:** Colombia, Venezuela, and Trinidad and Tobago.

**Lophiaris × oerstelurida** Cetzal & Balam, J. Torrey Bot. Soc. 139(1): 20. 2012. TYPE: MEXICO. Chiapas: Colonia Reforma, Acacoyagua, colectado el 7 de Noviembre del 2008 y florecida en cultivo en marzo del 2009, C. R. Beutelspacher s.n. (Holotype: HEM). Fig. 9B.

Homotypic synonym: *Trichocentrum × oersteluridum* (Cetzal & Balam) J.M.H.Shaw, Orchid Rev. 122(1305): 17. 2014.

**Distribution:** Mexico, Guatemala, and Honduras.

**Trichocentrum** Poepp. & Endl. Nov. Gen. Sp. Pl. 2: 11, pl. 115. 1836. TYPE: *Trichocentrum pulchrum* Poepp. & Endl. *Acoidium* Lindl., Edwards's Bot. Reg. t. 1951. 1837. TYPE: *Acoidium fuscum* Lindl., *Trichocentrum fuscum* Lindl.

**Distribution:** Southwestern Mexico to southern Brazil. Fig. 10.

#### KEY TO THE GROUPS OF *TRICHOCENTRUM*

- 1a. Spur gibbous, 2–4 lobed, or clavate ..... 2
- 1b. Spur slender, conic or tubular ..... 3
- 2a. Spur short, less than 5 mm long, 2–4 lobed; labellum elliptic-ovate ..... *T. candidum* group
- 2b. Spur longer than 10 mm long, clavate; labellum pandurate ..... *T. hoegei* group (monotypic taxon)
- 3a. Labellum with two lateral, erect, falcate lobes near the base ..... *T. pfavii* group
- 3b. Labellum without lateral, erect, falcate lobes near the base ..... 4
- 4a. Spur longer or equaling the labellum, flexuous to uncinated ..... 5
- 4b. Spur shorter than labellum, linear ..... 6
- 5a. Ovary triquetrous; disc thickly bicarinate ..... *T. pulchrum* group
- 5b. Ovary not triquetrous; disc with two to four slender carines ..... *T. fuscum* group
- 6a. Labellum concave, strongly narrowed above; flowers campanulate, produced on successive inflorescence ..... *T. brachyceras* group
- 6b. Labellum flat to slightly convex, with dilated lamina; flowers spreading on 1–2-flowered, simultaneous inflorescences ..... *T. trigrinum* group (monotypic taxon)

#### KEY TO THE SPECIES OF THE *TRICHOCENTRUM CANDIDUM* GROUP

- 1a. Column wings decurrent, obtuse with introrse apexes; anther cap glabrous; lip marked with broad purple blotches ..... *T. pupulinianum*
- 1b. Column wing ascending or porrect, acute, with somewhat revolute apexes; anther cap papillose or hirsute; lip entirely white or with scattered purple spots ..... 2
- 2a. Leaves widely ovate; lip with scattered purple spots ..... *T. caloceras*
- 2b. Leaves oblong-elliptic; lip entirely white ..... 3
- 3a. Labellum narrow in the middle; flowers small (sepals and petals to 5–6 mm long); inflorescence erect to patent ..... *T. brenesi*
- 3b. Labellum elliptic ovate or rhombic; flowers medium to large (sepals and petals longer than 15 mm); inflorescence pendule ..... 4
- 4a. Labellum shorter than sepals, acute to obtuse ..... *T. capistratum*
- 4b. Labellum longer than sepals, retuse at apex ..... 5
- 5a. Labellum obovate; column wings entire ..... *T. candidum*
- 5b. Labellum broadly rhombic; column wings erose at the apex ..... *T. cymbiglossum*

#### KEY TO THE SPECIES OF THE *TRICHOCENTRUM PFAVII* GROUP

- 1a. Spur more than 5 mm long; column wings with longitudinal brown stripes ..... *T. dianthum*
- 1b. Spur less than 5 mm long; column wings white with brown spots at margins ..... 2
- 2a. Labellum flabellate, with very crisped apex; lateral lobes of the labellum digitate ..... *T. pfavii*
- 2b. Labellum obovate, fleshy, with plane apex; lateral lobes of the labellum short and rounded. .... *T. estrellense*

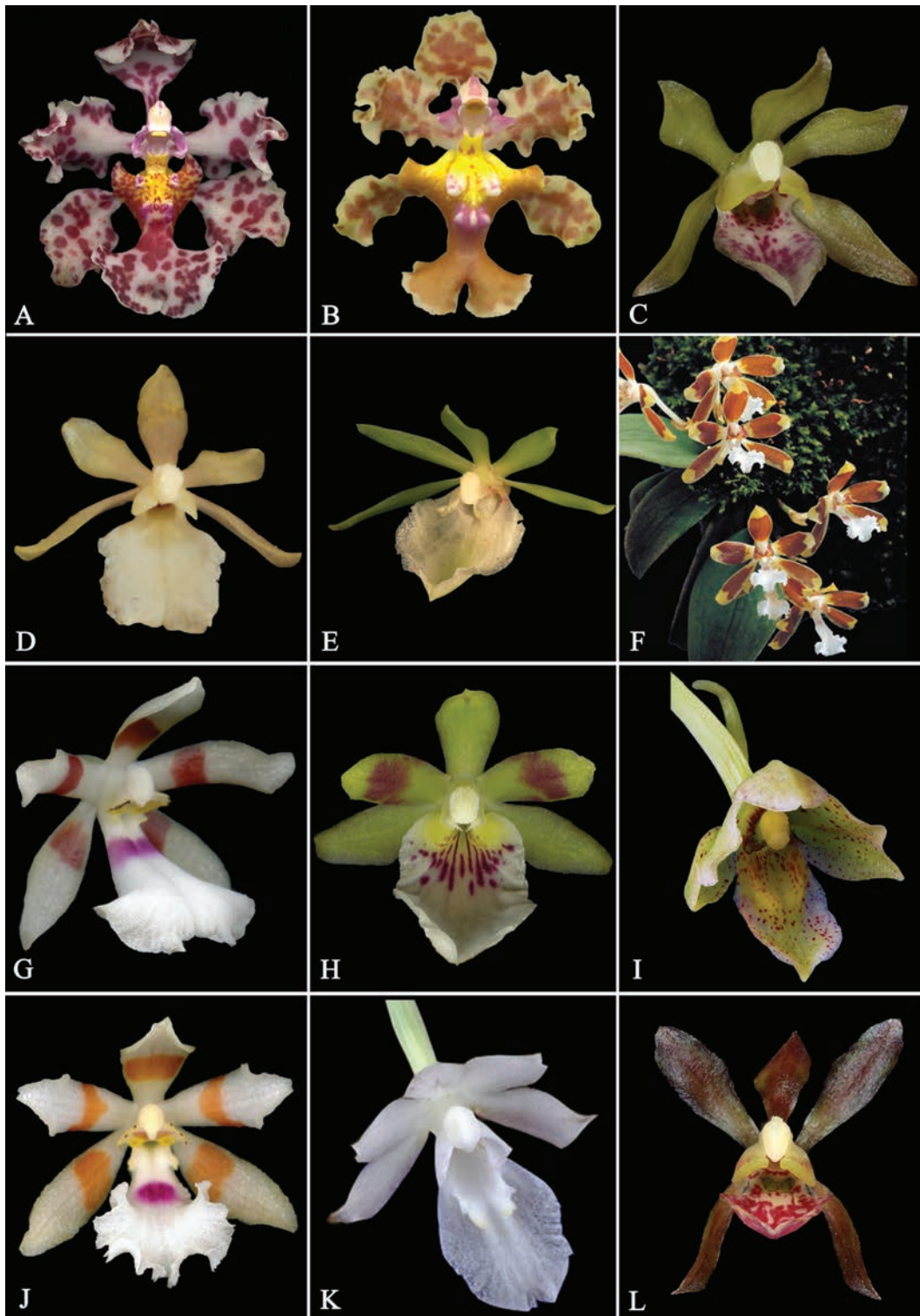


FIGURE 9. Floral morphology. **A**, *Lophiaris teaboana* R.Jiménez, Carnevali & Tapia-Muñoz (*Carnevali* 7504 CICY); **B**, *Lophiaris* × *oerstelurida* Cetzal & Balam (*Cetzal s.n.* CICY); **C**, *Trichocentrum caloceras* Endres & Rehb.f.; **D**, *Trichocentrum candidum* Lindl.; **E**, *Trichocentrum cymbiglossum* Pupulin (*Bogarin* 7379 JBL); **F**, *Trichocentrum dianthum* Pupulin & Mora-Retana (*Pupulin* 21 JBL); **G**, *Trichocentrum estrellense* Pupulin & J.B.García (*Pupulin* 7102 JBL); **H**, *Trichocentrum hoegei* Rehb.f. (*Cetzal s.n.* CICY); **I**, *Trichocentrum loyolicum* Pupulin, Karremans & G.Merino (*Karremans* 2133 JBL); **J**, *Trichocentrum pfavii* Rehb.f. subsp. *pfavii* (*Pupulin* 3447 JBL); **K**, *Trichocentrum popowianum* Königër (*Pupulin s.n.* JBL); **L**, *Trichocentrum pupulinianum* Bogarín & Karremans (*Karremans et al.* 3963 JBL). Photographs: [A–B, H] W. Cetzal-Ix, [C–G, I–L] Jardín Botánico Lankester (<http://www.epidendra.org/>).



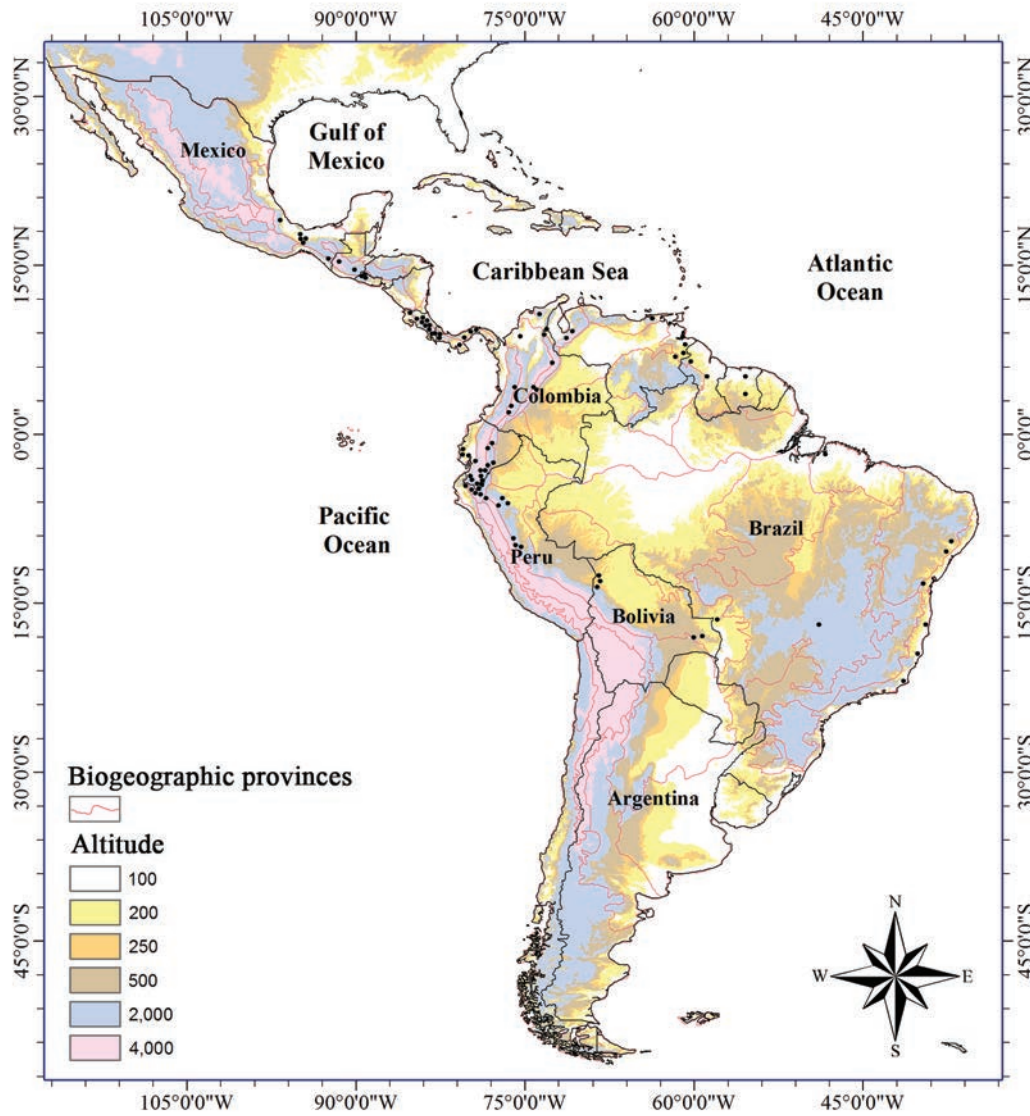


FIGURE 10. Distribution of *Trichocentrum* Poeppig & Endlicher.

KEY TO THE SPECIES OF THE *TRICHOCENTRUM PULCHRUM* GROUP

- 1a. Spur more than twice as long as the labellum . . . . . *T. longicalcaratum*
- 1b. Spur less than twice as long as the labellum . . . . . 2
- 2a. Disk of the labellum without keels . . . . . *T. neudeckeri*
- 2a. Disk of the labellum with keels. . . . . 3
- 3a. Disk of the labellum with 4 keels; labellum obcordate . . . . . *T. obcordilabium*
- 3b. Disk of the labellum with 3 keels; labellum obovate . . . . . 4
- 4a. Keels of the labellum glabrous or minutely puberulent; sepals and petals greenish white without purple spots or blotches . . . . . *T. viridulum*
- 4b. Keels of the labellum papillose; sepals and petals greenish white with purple spots or blotches . . . . . 5
- 5a. Spur 1.5 times longer than the blade of the labellum; keels of the labellum divergent at apex; column wings 3 mm long. . . . . *T. pulchrum*
- 5b. Spur as long as the blade of the labellum; keels of the labellum incurved, convergent at apex; column wings 1 mm long . . . . . *T. loyolicum*

KEY TO THE SPECIES OF THE *TRICHOCENTRUM FUSCUM* GROUP

- 1a. Inflorescence simultaneously 2–5 flowered . . . . . *T. panduratum*
- 1b. Inflorescence successive . . . . . 2
- 2a. Column wings lanceolate to strictly triangular . . . . . 3
- 2b. Column wings broad, obtuse to truncate at apex . . . . . 5
- 3a. Disc of the labellum with four keels . . . . . *T. albo-coccineum*
- 3b. Disc of the labellum with two keels . . . . . 4

KEY TO THE SPECIES OF THE *TRICHOCENTRUM FUSCUM* GROUP CONT.

- 4a. Spur as long as the labellum ..... *T. tenuiflorum*  
 4b. Spur 1.5 times longer than the labellum ..... *T. popowianum*  
 5a. Disc of the labellum with two keels ..... *T. recurvum*  
 5b. Disc of the labellum with four keels ..... 6  
 6a. Spur about twice long than the labellum ..... *T. wagneri*  
 6b. Spur as long as the labellum or shorter ..... 7  
 7a. Labellum obovate-oblong ..... *T. purpureum*  
 7b. Labellum subpandurate ..... *T. fuscum*

KEY TO THE SPECIES OF THE *TRICHOCENTRUM BRACHYCERAS* GROUP

- 1a. Labellum longer than sepals, apiculate, with two distinct keels near the base ..... *T. brachyceras*  
 1b. Labellum markedly shorter than sepals, minutely retuse, without keels ..... *T. brevicealcaratum*

**Trichocentrum albo-coccineum** Linden, Belgique Hort. 15: 103. 1865. TYPE: BRAZIL. Amazonas: epiphytic in forest along Rio Negro, *G. Wallis s.n.* (Holotype: W).

Heterotypic synonyms: *Trichocentrum albopurpureum* Linden & Rchb.f., Gen. Sp. Orchid. 219. 1866. TYPE: based on the same type as *T. albo-coccineum*, Linden (Holotype: W).

*Trichocentrum albopurpureum* var. *striatum* Linden & Barb.Rodr. Lindenia 2: 77, t. 85. 1866.

*Trichocentrum alboviolaceum* Schltr., Die Orchideen 446. 1927.

*Trichocentrum amazonicum* Barb.Rodr., Gen. Sp. Orchid. 1: 140. 1877. TYPE: BRAZIL. Villa Bella da Imperatriz, along Macurany lake, *Barbosa Rodrigues s.n.* (Holotype: not located).

*Trichocentrum atropurpureum* Linden & Rchb.f., Gard. Chron. 219. 1866.

*Trichocentrum ionophthalmum* Rchb.f., Gard. Chron. n.s., 6: 100. 1876. TYPE: BRAZIL. *Cult Hamburg Bot. Gard. s.n.* (Holotype: W).

*Trichocentrum leeanum* Rchb.f., Flora 69: 550. 1886. TYPE: PERU. Ex cord. occid. Am. aequat. ex hort Lee, *Ex hort. Lee s.n.* (Holotype: W).

*Trichocentrum orthoplectron* Rchb.f., Gard. Chron. n.s. 19: 562. 1883. TYPE: Origin unknown, *ex hort. Linden s.n.* (Holotype: W).

*Trichocentrum porphyrio* Rchb.f., Ill. Hort. 31: 9, t. 508. 1884. TYPE: Origin unknown, *ex hort. Linden s.n.* (Holotype: W).

**Distribution:** Peru, Bolivia, and Brazil.

**Trichocentrum brachyceras** Schltr., Repert. Spec. Nov. Regni Veg. Beih. 7: 184. 1920. TYPE: COLOMBIA. Cauca: *M. Madero s.n.* (Holotype: B, destroyed; drawing, Repert. Spec. Nov. Regni Veg. Beih. 57: t 65, Fig. 252. 1929).

**Distribution:** Endemic to Colombia.

**Trichocentrum brenesii** Schltr., Repert. Spec. Nov. Regni Veg. Beih. 19: 248. 1923. TYPE: COSTA RICA. Alajuela: San Pedro de San Ramón, September 1921, *A. Brenes 116* (Holotype: B [destroyed]; Lectotype, designated by Barringer, 1986: AMES).

**Distribution:** Endemic to Costa Rica.

**Trichocentrum brevicealcaratum** C.Schweinf., Amer. Orchid Soc. Bull. 13: 388. 1945. TYPE: PERU. Junín: Chanchahmayo Valley, 1800 m, July 1924–1927, *C. Schunke s.n.* (Holotype: F).

**Distribution:** Endemic to Peru.

**Trichocentrum caloceras** Endres & Rchb.f., Gard. Chron. 1257. 1871. TYPE: COSTA RICA. “Mr. Endres, the excellent Costa Rica traveller, has found since 1867, in Costa Rica, another *Trichocentrum*” (holotype presumed to be located at W, not located; lectotype designated by Bogarin and Karremans (2013): Costa Rica, without collecting data, *A.R. Endres s.n.*, illustration kept at W, 0020954!). The neotype designation by Pupulin (1995): Costa Rica. Puntarenas: Coto Brus, *F. Pupulin and D. Castelfranco 1* (USJ) is rejected by Bogarin and Karremans (2013), as the specimen selected is in conflict with the protologue and the natural distribution of this species. Fig. 9C.

Heterotypic synonyms: *Trichocentrum costaricense* Mora-Ret. & Pupulin, Selbyana 15(2): 94–96, f. 5. 1994. TYPE: COSTA RICA. Alajuela: epiphytic in forest near Ciudad Quesada (about 700 m), 1988, flowered in cultivation 1989, *C.K. Horich s.n.* (USJ). Lectotype, designated by Bogarin and Karremans (2013): Costa Rica. Alajuela: San Carlos, 600 m, March 1989, *C.K. Horich s.n.* (USJ Spirit, 57624). Rejected lectotype of Morales & Villalobos (2004) by Bogarin and Karremans (2013): Costa Rica. San José: Pérez Zeledón, San Isidro del General, “florece en mayo,” *C.K. Horich s.n.* (USJ-Spirit, 57468!).

**Distribution:** Endemic to Costa Rica.

**Trichocentrum candidum** Lindl., Edwards’s Bot. Reg. 29: Misc. 9. 1843. TYPE: GUATEMALA. Without specific locality, *G. U. Skinner s.n.* (Holotype: K). Fig. 9D.

Heterotypic synonyms: *Trichocentrum albiflorum* Rolfe, Bull. Misc. Inform. Kew 336. 1893. TYPE: MEXICO. Veracruz: without locality, *H. Fink s.n.* (Holotype: K).

**Distribution:** Mexico, Guatemala, and El Salvador.

**Trichocentrum capistratum** Linden & Rchb.f., Gard. Chron. 1257. 1871. TYPE: COSTA RICA. Without specific locality. Floreació en el jardí de Linden, Bélgica, 23 September 1868, *G. Wallis s.n.* (Holotype: W; photo USJ). Heterotypic synonyms: *Trichocentrum panamense* Rolfe,

Bull. Misc. Inform. Kew 1913(9): 341–342. 1913. TYPE: PANAMA. on bush-covered hills east of the Panama Canal, 255 m, *L.J. Lipscomb s.n.* (Holotype: K).

*Trichocentrum pusillum* Lehm. ex Pupulin, in Herb. Kew., Ms. nom. inval.

**Distribution:** Costa Rica, Panama, Colombia, and Venezuela.

**Trichocentrum cymbiglossum** Pupulin, Lindleyana 9(1): 51. 1994. TYPE: COSTA RICA. Alajuela: San Carlos, Laguna Bosque Alegre, *F. Pupulin 5* (Holotype: USJ; illustration of type). Fig. 9E.

**Distribution:** Endemic to Costa Rica.

**Trichocentrum dianthum** Pupulin & Mora-Retana, Selbyana 15: 90. 1994. TYPE: COSTA RICA. San José: Pérez Zeledón, Las Nubes de Quizarrá, 1000 m, epiphytic on short trees along a little river, 1988, flowered in cultivation in March 1989, *J. Cambronero s.n.* (Holotype: USJ; illustration of type). Fig. 9F.

**Distribution:** Endemic to Costa Rica.

**Trichocentrum estrellense** Pupulin & J.B.García, Lindleyana 10(3): 196. 1995. TYPE: COSTA RICA. Cartago: El Guarco, in valleys under Palo Verde, epiphytic on tall trees along a minor affluent of Río Reventazón, 1250 m, 30 Apr. 1992, *F. Pupulin 209* (Holotype: USJ; illustration of type). Fig. 9G.

**Distribution:** Endemic to Costa Rica.

**Trichocentrum fuscum** Lindl., Edwards's Bot. Reg. 23: t. 1951. 1837. TYPE: incorrectly said to be from Mexico, cultivated in the collection of Mr. Knight, *Warming s.n.* (Holotype: not located; drawing, K).

Heterotypic synonyms: *Acoidium fuscum* Lindl., Edwards's Bot. Reg. 23: sub t. 1951. 1837. nom. nud.

*Trichocentrum cornucopiae* Linden & Rchb.f., Gard. Chron. 266. 1866. TYPE: BRAZIL: Amazonas: Rio Negro, *G. Wallis s.n.* (Holotype: W).

*Trichocentrum hartii* Rolfe, Bull. Misc. Inform. Kew 1894: 395. 1894. TYPE: VENEZUELA. Monagas: cult. Kew Bot. Gard., *D. M. D. Hart s.n.* (Holotype: K).

*Trichocentrum mattogrossense* Hoehne, Comm. Lin. Telegr., Bot. 5(1): 55. 1910. TYPE: BRAZIL. San Luis de Cáceres, along the Rio Paraguay, *F. Hoehne s.n.* (SP).

*Trichocentrum pinelii* Lindl., Gard. Chron. 772. 1854. TYPE: BRAZIL. Rio de Janeiro, without specific locality, *C. Pinel s.n.* (Holotype: K; photo, USJ).

**Distribution:** Venezuela, Suriname, Brazil, Ecuador, Peru, and Bolivia.

**Trichocentrum hoegi** Rchb.f., Gard. Chron., n.s. 16: 717. 1881. TYPE: MEXICO. Veracruz: near Córdoba, *C. T. Hoegi s.n.* (Holotype: W; Illustration in Xenia Orch. 3: 69, t. 234, Fig. 6. 1890). Fig. 9H.

**Distribution:** Endemic to Mexico.

**Trichocentrum longicalcaratum** Rolfe, Orchid Review 4: 260. 1896. TYPE: COLOMBIA. Without specific locality, *F.C. Lehmann s.n.* (Holotype: K).

Heterotypic synonyms: *Trichocentrum brandtia* Kraenzl., Bull. Herb. Boissier 5: 109. 1897. TYPE: COLOMBIA. Without specific locality, *Barbey s.n.* (Holotype: not located).

*Trichocentrum verruciferum* Schltr., Repert. Spec. Nov. Regni Veg. Beih. 7: 184. 1920. TYPE: COLOMBIA. Cauca: *M. Madero s.n.* (Holotype: B destroyed; drawings, Repert. Spec. Nov. Regni Veg. Beih. 57: t. 253. 1929).

**Distribution:** Endemic to Colombia.

**Trichocentrum loyolicum** Pupulin, Karremans & G.Merino, Harvard Pap. Bot. 13(2): 220. 2008. TYPE: ECUADOR. Loja: Valladolid, Loyola, 1000–1200 m, collected by G. Merino in 2002, flowered in cultivation, *A. Karremans 2133* (Holotype: QCNE; illustration of type; photo of the flower from the plant that served as the holotype). Fig. 9I.

**Distribution:** Endemic to Ecuador.

**Trichocentrum neudeckeri** Königer, Arcula 6: 175. 1996. TYPE: BOLIVIA. Santa Cruz: Florida, 1500 m, gesammelt 1977 von T. Neudecker s.n., in Kultur in Blüte 1996 in München bei *W. Königer WK-71* (Holotype: M; Isotypes: K, LPB, Herb. H. Königer; illustration of type).

Heterotypic synonyms: *Trichocentrum teaguei* Christenson, Orch. Digest 61: 32. 1997. BOLIVIA. TYPE: Road between La Paz and Coroico, ca. 2000m, wet forest on steep slopes. Cultivated by M. Turkel s.n. *sub A. Hirtz et al. s.n.* (Holotype: K).

**Distribution:** Endemic to Bolivia.

**Trichocentrum obcordilabium** Pupulin, Novon 8(3): 283, f. 1. 1998. TYPE: ECUADOR. Morona-Santiago: San Juan Bosco, 1600 m, 16 February 1993; coll. by J. Portilla, fl. in cultivation 6 July 1996, *F. Pupulin 285* (Holotype: SEL; Isotypes: MO, QCNE, USJ; illustration of type).

**Distribution:** Endemic to Ecuador.

**Trichocentrum panduratum** C.Schweinf., Amer. Orchid Soc. Bull. 14: 104, t. 1946. TYPE: PERU. San Martín: Juan Jui, Alto Rio Huallaga, *G. Klug 4260* (Holotype: AMES; Isotypes: K, MO).

**Distribution:** Endemic to Peru.

**Trichocentrum pfavii** Rchb.f. subsp. *pfavii* Gard. Chron., n.s., 16: 70. 1881. TYPE: PANAMA. Chiriquí, without specific locality, 19 November 1980, *R. Pfau 80* (Holotype: W). Fig. 9J.

Heterotypic synonyms: *Trichocentrum pfavii* var. *zonale* Rchb.f., Gard. Chron., n.s. 19: 44. 1883. TYPE: COSTA RICA. San José: Boca de Dota, along the cracks on the trunks of young trees, *Endres s.n.* (Holotype: W).

*Trichocentrum saundersianum* Endrés & Rchb.f. ex Pupulin, nom. inval.



*Trichocentrum saundersii* Endrés & Rchb.f. ex Pupulin, *nom. inval.*

*Trichocentrum zonale* Rchb.f., *nom. inval.*

*Trichocentrum pfavii* var. *album* Henderson ex Pupulin, *nom. illeg.*

**Distribution:** Costa Rica and Panama.

**Trichocentrum pfavii** subsp. **dotae** Pupulin, Selbyana 22(1): 23–25, f. 5A–F. 2001. TYPE: COSTA RICA. San José: Dota, Santa Maria, road to San Joaquín, collected by A. Flores, Apr 1999, flowered in cultivation at Gaia Botanical Garden, 11 December 1999, *F. Pupulin 1871* (Holotype: USJ; Paratype: USJ; illustration of type).

**Distribution:** Endemic to Costa Rica.

**Trichocentrum popowianum** König, Arcula 6: 178. 1996. TYPE: ECUADOR. Morona-Santiago: El Panguí, 1000 m, importiert 1995 von Herrn N. Popow zusammen mit *Trichocentrum pulchrum*, in Kulture in Blüte in München bei W. König WK-72 (Holotype: M; Isotypes: K, QCA, Herb. H. König; illustration of type). Fig. 9K.

**Distribution:** Endemic to Ecuador.

**Trichocentrum pulchrum** Poepp. & Endl., Nov. Gen. Sp. Pl. 2: 11, pl. 115. 1836. TYPE: PERU. Huánuco: near Pampayacu, *Poeppig s.n.* (Holotype: W).

Heterotypic synonyms: *Orchis punctata* Ruiz & Pav. ex Pupulin, *nom. inval.*

*Trichocentrum maculatum* Lindl., Orchid. Linden. 24, No. 127. 1846. TYPE: COLOMBIA. Río Hacha, Sierra de Santa Marta, along the Río San Antonio, 1300 m, 1844, *L. Linden 1666* (Holotype: K; Isotype: BR, P, W; USJ (photo)).

*Trichocentrum speciosum* Schlim ex Pupulin, *nom. inval.*

**Distribution:** Colombia, Venezuela, Ecuador, and Peru.

**Trichocentrum pupulinianum** Bogarín & Karremans, Lindleyana in Orchids (West Palm Beach) 82(2): 106–108. 2013. TYPE: COSTA RICA. Coto Brus, Sabalito, San Miguel, carretera entre Unión y Mellizas, 2.5 km después de Unión, orillas de la Quebrada Sereno, 8°51'17.0"N, 82°52'35.2" W, 994 m, bosque muy humedo premontano transición a pluvial “supra truncos ad ripas silvarum prope San Miguel juxta flumen ad Quebrada Sereno,” 18 April

2011, A.P. Karremans et al. 3963 (Holotype: JBL–spirit; illustration of the plant that served as the holotype). Fig. 9L.

**Distribution:** Southern Costa Rica and western Panama.

**Trichocentrum purpureum** Lindl. ex Rchb.f., Gard. Chron. 772. 1854. TYPE: GUYANA. *Ex hort. Veitch* (Holotype: K).

**Distribution:** Endemic to Guyana.

**Trichocentrum recurvum** Lindl., Edwards's Bot. Reg. 29: misc. 29. 1843. TYPE: GUYANA. Without locality, *Ex hort. Loddiges* (Holotype: K).

Heterotypic synonyms: *Trichocentrum cornu-vaccae* Rchb.f. ex Pupulin, in Lindleyana 10(3): 203. 1995.

*Trichocentrum plectrophora* Rchb.f. in Herb. Jard. Bot. Etat Bruxelles (BR), Ms., non (Lodd. Ex Lindl.) Rchb.f. [= *Plectrophora iridifolia*].

**Distribution:** Ecuador (?), Guyana, and Suriname.

**Trichocentrum tenuiflorum** Lindl., Paxt. Fl. Gard. 1: 12. 1850. TYPE: BRAZIL. Bahia: without locality, *Morel s.n.* (Holotype: K).

**Distribution:** Brazil.

**Trichocentrum tigrinum** Linden & Rchb.f., Gard. Chron., n.s. 862. 1869. TYPE: ECUADOR. Guayas: Guayaquil, 1875, *G. Wallis s.n.* (Holotype: W).

Heterotypic synonyms: *Trichocentrum tigrinum* var. *splendens* Linden & Barb.Rodr., Lindenia 1: 53, t. 24. 1885.

**Distribution:** Ecuador and Peru.

**Trichocentrum viridulum** Pupulin, Novon 8(3): 285, f. 2. 1998. TYPE: COLOMBIA. Santander: Charalá, Virolín, 1900 m, collected in Mar 1990, flowered in cult. at Colomborquideas, 24 August 1996, *F. Pupulin 388* (Holotype: SEL; Isotypes: MO, USJ; illustration of type).

**Distribution:** Endemic to Colombia.

**Trichocentrum wagneri** Pupulin, Lindleyana 10(3): 203, f. 14. 1995. TYPE: BRAZIL. Without locality, introduced by A. Seidel, flowered in cultivation by A. Wagner in Santa Margherita, Italy, 25 September 1990, *F. Pupulin 289* (Holotype: SEL).

**Distribution:** Brazil.

#### LITERATURE CITED

- ACKERMAN, J. D. 2014. *Trichocentrum*. Pages 536–539 in J. D. ACKERMAN, Taxon Coordinator, Orchid Flora of the Greater Antilles. Mem. New York Bot. Gard. 109: 1–625.
- BRAEM, G. J. 1993. Studies in the Oncidiinae: discussion of some taxonomic problems with description of *Gudrunia* Braem, gen. nov., and reinstatement of the genus *Lophiaris* Rafinesque. *Schlechteriana* 4: 8–29.
- BALAM, R. 2007. *Sistemática y filogenia del género Lophiaris Raf. (Orchidaceae)*. M.S. thesis, Centro de Investigación Científica de Yucatán, A. C., Mérida.
- . 2011. *Sistemática de Lophiaris Raf. (Orchidaceae)*. Ph.D. dissertation, Centro de Investigación Científica de Yucatán, A. C., Mérida.
- , G. CARNEVALI, W. CETZAL-IX, AND R. DUNO. 2011. *Lophiaris tapiae*, a new species in the *Lophiaris oerstedii* complex (Orchidaceae) from the Yucatan Peninsula, Mexico. *Acta Bot. Mex.* 97: 17–29.
- AND W. CETZAL-IX. 2012. Una revisión del complejo *Lophiaris cavendishiana* (Orchidaceae: Oncidiinae). *Caldasia* 34: 87–107.
- , W. CETZAL-IX AND G. CARNEVALI. 2010. A new species of *Lophiaris* Raf. (Orchidaceae) from the Pacific Coastal of Mexico. *Lankesteriana* 9: 521–525.
- BOGARÍN, D. AND A. P. KARREMANS. 2013. *Trichocentrum pupulinianum* (Orchidaceae). A new species from Costa Rica and Panama honors Lankester Botanical Garden's head of research. *Orchids (West Palm Beach)* 82: 106–110.



- CARNEVALI, G., W. CETZAL-IX, R. BALAM-NARVÁEZ AND G. A. ROMERO-GONZÁLEZ. 2010. A synopsis of *Cohniella* (Orchidaceae, Oncidiinae). *Brittonia* 62: 153–177.
- , W. CETZAL-IX, R. BALAM, C. LEOPARDI AND G. A. ROMERO-GONZÁLEZ. 2013. A combined evidence phylogenetic re-circumscription and a taxonomic revision of *Lophiarella* (Orchidaceae: Oncidiinae). *Sys. Bot.* 38: 46–63.
- CETZAL-IX, W. 2012. *Oncidium lacerum*, an older and ignored name for *Cohniella stipitata* (Orchidaceae, Cymbideae, Oncidiinae). *Ann. Bot. Fenn.* 49: 137–143.
- , AND R. BALAM. 2012. The identity and distribution of *Lophiaris carthagenensis* (Orchidaceae, Oncidiinae): Two centuries of confusion. *J. Torrey Bot. Soc.* 139: 9–25.
- , R. BALAM-NARVÁEZ, AND G. CARNEVALI. 2008. A new species in *Lophiaris* (Orchidaceae, Oncidiinae) in the *Lophiaris straminea* Complex. *Novon* 18: 12–15.
- AND G. CARNEVALI. 2010. A revision of *Cohniella* Pfitzer (Orchidaceae) in Mexico. *J. Torrey Bot. Soc.* 137: 180–213.
- , G. CARNEVALI, AND E. NOGUERA-SAVELLI. 2014. A new species in the *Cohniella ascendens* complex from Amazonian Venezuela (Orchidaceae, Oncidiinae). *Lankesteriana* 13: 207–214.
- , G. CARNEVALI, E. NOGUERA-SAVELLI, AND D. JÁUREGUI. 2013a. Morphological and anatomical characterization of a new natural hybrid between *Cohniella ascendens* and *C. brachyphylla* (Orchidaceae, Oncidiinae). *Phytotaxa* 144: 45–55.
- , G. CARNEVALI, E. NOGUERA-SAVELLI, AND G. A. ROMERO-GONZÁLEZ. 2013b. Really, what is *Cohniella cebolleta*? A re-circumscription plus new and resurrected species and combinations. *Sys. Bot.* 38: 606–623.
- , G. CARNEVALI, AND V. PAIVA-CASTRO. 2012. *Cohniella* (Orchidaceae: Oncidiinae) south of the Amazon River. *Sys. Bot.* 37: 1–20.
- CHASE, M. W. 2009. Subtribe Oncidiinae. Pages 211–220 in A. M. PRIDGEON, P. J. CRIBB, M. W. CHASE, AND T. N. RASMUSSEN, EDS. *Genera Orchidacearum. Epidendroideae. Volume 5. Part II*. Oxford University Press, United Kingdom, England.
- CHRISTENSON, E. A. 1999. The return of *Cohniella* (Orchidaceae: Oncidiinae). *Lindleyana* 14: 176–177.
- DUNSTERVILLE, G. C. K. AND L. A. GARAY. 1979. *Orchids of Venezuela, an Illustrated Field Guide*. Botanical Museum, Harvard University Press, Cambridge, Massachusetts.
- ESRI. 1999. ArcView gis 3.2. Environmental Systems Research Institute, Inc. New York.
- HUMANS, R. J., L. GUARINO, C. BUSSINK, P. MATHUR, M. CRUZ, I. BARRENTES, AND E. ROJAS. 2004. DIVA-GIS. Vsn. 5.0. A geographic information system for the analysis of species distribution data. Freely available at <<http://www.diva-gis.org>>
- KOLANOWSKA M. AND SZLACHETKO D. 2016. Notes on the taxonomic position of the genus *Cohniella* (Orchidaceae-Epidendroideae-Oncidiinae) with description of four new species. *Phyton (Horn)* 56: 15–26.
- LÖWENBERG-NETO, P. 2014. Neotropical region: a shapefile of Morrone's (2014) biogeographical regionalization. *Zootaxa* 3802: 300–300.
- NEUBIG, K. M., W. M. WHITTEN, N. H. WILLIAMS, M. A. BLANCO, L. ENDARA, J. G. BURLEIGH, K. SILVERA, J. C. CUSHMAN, AND M. W. CHASE. 2012. Generic re-circumscriptions of Oncidiinae (Orchidaceae: Cymbidieae) based on maximum likelihood analysis of combined DNA datasets. *Bot. J. Linn. Soc.* 168: 117–228.
- PUPULIN, F. 1995. A revision of the genus *Trichocentrum* (Orchidaceae: Oncidiinae). *Lindleyana* 10: 183–210.
- . 1998. New Species of *Trichocentrum* (Orchidaceae) from the Andes with a Realignment of the *Trichocentrum pulchrum* Group. *Novon* 8: 283–287.
- AND G. CARNEVALI. 2005. *Cohniella* Pfitz. Pages 141–147 in F. PUPULIN, ED. *Vanishing Beauty: Native Costa Rican Orchids Vol. I*. Costa Rica University Press, San José, Costa Rica.
- , A. KARREMANS, AND G. MERINO. 2008. *Trichocentrum loyolicum*, a new species in the genus *Trichocentrum* s.str. (Orchidaceae: Oncidiinae). *Harvard Pap. Bot.* 13: 219–222.
- SOSA, V. M., M. W. CHASE, G. SALAZAR, G. M. WHITTEN, AND N. H. WILLIAMS. 2001. Phylogenetic position of *Dignathe* (Orchidaceae: Oncidiinae): evidence from nuclear ITS ribosomal DNA sequences. *Lindleyana* 16: 94–101.
- SPRUNGER, S., P. J. W. CRIBB, AND A. TOSCANO DE BRITO. 2009. João Barbosa Rodrigues—Iconographie des Orchidées du Brésil I. Friedrich Reinhardt, Basle.
- SZLACHETKO, D. L., J. MYTNIK-EJSMONT, AND A. ROMOWICZ. 2006. Genera et Species Orchidacearum. 14. Oncidieae. *Polish Bot. J.* 51: 53–55.
- WILLIAMS, N. H., M. W. CHASE, T. FULCHER, AND W. M. WHITTEN. 2001. Molecular systematic of the Oncidiinae based on evidence from four DNA sequence regions: expanded circumscriptions of *Cyrtorchilum*, *Erycina*, *Otoglossum*, *Trichocentrum*, and a new genus (Orchidaceae). *Lindleyana* 16: 113–139.

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## PHYLOGENETIC REASSESSMENT OF *ACIANTHERA* (ORCHIDACEAE: PLEUROTHALLIDINAE)

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**Abstract.** The phylogenetic relationships within the *Acianthera* affinity are re-evaluated using Bayesian analyses of nrITS and chloroplast *matK* sequence data. Emphasis is made on species from the Antilles, Central America and the Andean South America as those have been less represented in previous studies. *Acianthera* is retrieved largely monophyletic, but is redefined to include the genera *Aberrantia*, *Antilla*, *Apoda-prorepentia*, *Arthrosia*, *Brenesia*, *Cryptophoranthus*, *Didactylus*, *Dondodia*, *Kraenzlinella*, *Ogygia*, *Pleurobotryum*, *Proctoria*, *Sarracenella* and *Unguella*. Four well-supported subgenera are proposed for *Acianthera* and characterized both geographically and morphologically. The species belonging to the three newly proposed subgenera are listed.

**Keywords:** *Antilla*, *Brenesia*, *Kraenzlinella*, molecular phylogeny, synonyms, systematics

The genus *Acianthera* Scheidw. (Orchidaceae: Pleurothallidinae) was historically considered a synonym of *Pleurothallis* R.Br. (Luer, 1986; Pupulin et al., 2007). On the basis of the molecular studies of the Pleurothallidinae by Pridgeon et al. (2001), it was re-instated by Pridgeon and Chase (2001) and Pridgeon (2005), and broadened to include the generic concepts of *Cryptophoranthus* Barb. Rodr., *Brenesia* Schltr., and *Sarracenella* Luer. Additional species were subsequently transferred to the genus by several authors, most notably Luer (2004).

Chiron and van den Berg (2012) revised the systematics of *Acianthera* on the basis of a broader molecular study of nrITS by Chiron et al. (2012). The latter especially included Brazilian material, where *Acianthera* is richest in species numbers. The authors expanded the concept of the genus, including into its synonymy the genera *Arthrosia* Luer and *Pleurobotryum* Barb.Rodr. A sectional and subsectional classification for the genus was proposed by the authors. However, due to the relatively reduced representation, the phylogenetic placement of the Central American, Antillean and Andean clades of *Acianthera* was not completely resolved.

The relationships of several additional genera with *Acianthera* were subsequently noted. Bogarín et al. (2008) gave formal recognition to the synonymy of *Aberrantia* Luer, as suggested by Luer (2004). Stenzel (2004; 2007) and Karremans (2016) added *Antilla* (Luer)

Luer, following a suggestion by the same Luer (2000). *Apoda-prorepentia* (Luer) Luer, as suggested by Solano-Gómez (2011), and shown by Stenzel (2004) was reconsidered by Karremans and Rincón-González (2015), while *Ogygia* Luer was synonymized by Solano-Gómez (2003; 2015). Close relationships with *Acianthera* of *Didactylus* Luer and *Unguella* Luer were suggested by Luer (2004), while *Dondodia* Luer and *Proctoria* Luer were suggested to be *Acianthera* relatives by Luer (2006), Stenzel (2007) and Karremans (2016). Additionally, the single sequence of *Kraenzlinella* Kuntze analyzed by Pridgeon et al. (2001) was retrieved in a clade together with the genera *Brachionidium* Lindl. and *Myoxanthus* Poepp. & Endl. and therefore *Kraenzlinella* was accepted by Pridgeon and Chase (2001) and Pridgeon (2005). Nevertheless, Karremans (2016) pointed out that additional unpublished DNA data placed genus *Kraenzlinella* in the *Acianthera* affinity, as had already been suggested by Luer (1994) based on morphological similarity.

In an attempt to re-evaluate and clarify the phylogenetic relationships within the *Acianthera* affinity as defined by Karremans (2016), we have reconstructed a DNA-based phylogeny inferred from a combined nrITS and *matK* matrix from a broad set of species. It covers about one third of the ±300 species and most of the generic names proposed within the group. A subgeneric classification of *Acianthera* is proposed.

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## MATERIALS AND METHODS

Plant material in Costa Rica was collected under the scientific permits granted by the Costa Rican Ministry of Environment (MINAE) to researchers at JBL. Individual plants were photographed, illustrated and preserved as spirit specimens (only including flowers and young leaf tissue) in formaldehyde: acetic acid: ethanol (FAA: 53% ethanol, 37% water, 5% formaldehyde and 5% glycerol) for future reference, deposited at JBL-spirit and L-spirit. The DNA extracts were preserved at the Naturalis Biodiversity Center.

The data matrix is composed of 143 terminals (Table 1), including 126 nrITS and 52 *matK* accessions, of which 66 were produced for this study. The remaining sequences were obtained from GenBank (from Pridgeon et al., 2001; Borba et al., 2002; Stenzel, 2004; Lahaye et al., 2008; Chiron et al., 2012; Karremans, 2014; Karremans and Rincón-González, 2015; and Rodrigues et al., 2015). The DNA sequences of *Acianthera fornograndensis* L.Kollmann & A.P.Fontana and *Acianthera maculiglossa* Chiron & N.Sanson were obtained from the plants that served as type material (Chiron et al., 2012). The specimens of *Acianthera cabiriae* Pupulin, G.A.Rojas & J.D.Zuñiga come from the type locality.

Fresh leaf and flower cuttings of approximately 1 cm<sup>2</sup> were dried with silica gel. Samples (20 mg) were pulverized and extraction performed following the DNEasy procedure (Qiagen). The nuclear ribosomal internal transcribed spacer (nrITS) region was amplified using the methods and primers for sequencing and amplification described by Sun et al.

(1994) and the chloroplast gene *matK* was amplified and sequenced using the Kew *matK* primers 2.1aF and 5R. Sanger sequencing was done commercially by Macrogen on a 96-capillary 3730xl DNA Analyzer automated sequencer (Applied Biosystems, Inc.) using standard dye-terminator chemistry (Macrogen, Inc.).

The Staden et al. (2003) package was used for editing of the sequences. Contigs were exported as .fas files and opened in Mesquite v2.72 (Maddison and Maddison, 2007), where they were checked for base calling errors, each locus was aligned separately using MAFFT version 7.1 (Kato and Standley, 2013). The ends of each data set were trimmed to eliminate possible erroneous data, and gaps were regarded as missing data. *Arpophyllum giganteum* Hartw. ex Lindl. was used as the outgroup, as it was found to be one of the most distantly related of all included species in this phylogenetic analysis (Pridgeon et al., 2001). The trees were produced with an analysis of the nrITS + *matK* dataset using BEAST v1.8.0. (Drummond et al., 2012). Parameters were set to preset, except for substitution model GTR with 10 categories for ITS and 8 categories for *matK*, clock models uncorrelated lognormal and exponential respectively, tree prior Yule process, and number of generations 30,000,000. The resulting trees were combined using TreeAnnotator v1.8.0., where the first 20% of the trees were used as burn-in. FigTree v1.3.1. (Rambaut, 2009) was used to edit the resulting tree. Posterior probabilities are given for each node in decimal form.

TABLE 1. List of the accessions used in the phylogenetic analysis. The vouchers, NCBI GenBank accession number, and source are given.

TAXON	VOUCHER COLLECTOR AND NUMBER	ITS	<i>matK</i>	SOURCE
<i>Acianthera aberrans</i> (Luer) Pupulin & Bogarín	<i>Pupulin 7839A</i> ; JBL-spirit	KY084267	KY218740	This Study
<i>Acianthera aberrans</i> (Luer) Pupulin & Bogarín	<i>Pupulin 7839B</i> ; JBL-spirit	KY084268	KY218741	This Study
<i>Acianthera aberrans</i> (Luer) Pupulin & Bogarín	<i>Pupulin 7839C</i> ; JBL-spirit	–	KY218742	This Study
<i>Acianthera adamantinensis</i> (Brade) F.Barros	None	AF366936	–	Borba et al. 2002
<i>Acianthera aphthosa</i> (Lindl.) Pridgeon & M.W.Chase	<i>van den Berg 1998</i>	JQ306355	–	Chiron et al. 2012
<i>Acianthera asaroides</i> (Kraenzl.) Pridgeon & M.W.Chase	<i>Chiron 11227</i>	JQ306431	–	Chiron et al. 2012
<i>Acianthera atropurpurea</i> (Barb.Rodr.) Chiron & Van den Berg	<i>Zampin 25</i>	KT599874	–	Rodrigues et al. 2015
<i>Acianthera auriculata</i> (Lindl.) Pridgeon & M.W.Chase	<i>Chase 1456</i>	AF262856	–	Pridgeon et al. 2001
<i>Acianthera barbacenensis</i> (Barb.Rodr.) Pridgeon & M.W.Chase	<i>van den Berg 2004</i>	JQ306423	–	Chiron et al. 2012
<i>Acianthera binotii</i> (Regel) Pridgeon & M.W.Chase	<i>van den Berg 2044</i>	JQ306361	–	Chiron et al. 2012
<i>Acianthera binotii</i> (Regel) Pridgeon & M.W.Chase	<i>van den Berg 2083</i>	JQ306430	–	Chiron et al. 2012
<i>Acianthera bragae</i> (Ruschi) F.Barros	<i>van den Berg 1990</i>	JQ306362	–	Chiron et al. 2012
<i>Acianthera breedlovei</i> Soto Arenas, Solano & Salazar	<i>Karremans 3962</i> ; JBL-spirit	KY084269	KY218743	This Study
<i>Acianthera brunnescens</i> (Schltr.) Karremans	<i>Karremans 2746</i> ; JBL-spirit	KR816549	KR816558	Karremans and Rincón-González 2015
<i>Acianthera brunnescens</i> (Schltr.) Karremans	<i>Karremans 2460A</i> ; JBL-spirit	–	KY218744	This Study



TABLE 1 CONT. List of the accessions used in the phylogenetic analysis.

TAXON	VOUCHER COLLECTOR AND NUMBER	ITS	matK	SOURCE
<i>Acianthera brunnescens</i> (Schltr.) Karremans	Karremans 2460B; JBL-spirit	–	KY218745	This Study
<i>Acianthera brunnescens</i> (Schltr.) Karremans	Karremans 4511; JBL-digital	–	KY218746	This Study
<i>Acianthera brunnescens</i> (Schltr.) Karremans	Karremans 4912; JBL-spirit	–	KY218747	This Study
<i>Acianthera brunnescens</i> (Schltr.) Karremans	Karremans 5204; JBL-spirit	–	KY218748	This Study
<i>Acianthera butcheri</i> (L.O.Williams) Pridgeon & M.W.Chase	Pupulin 8127; no voucher	KY084270	KY218749	This Study
<i>Acianthera cabiriae</i> Pupulin, G.A.Rojas & J.D.Zuñiga	Karremans 5439; JBL-digital	KY084271	KY218750	This Study
<i>Acianthera cabiriae</i> Pupulin, G.A.Rojas & J.D.Zuñiga	Karremans 5440; JBL-spirit	KY084272	KY218751	This Study
<i>Acianthera capanemae</i> (Barb.Rodr.) Pridgeon & M.W.Chase	Chiron 09573	JQ306367	–	Chiron et al. 2012
<i>Acianthera capillaris</i> (Lindl.) Pridgeon & M.W.Chase	van den Berg 2081	JQ306424	–	Chiron et al. 2012
<i>Acianthera capillaris</i> (Lindl.) Pridgeon & M.W.Chase	van den Berg 2153	JQ306425	–	Chiron et al. 2012
<i>Acianthera circumplexa</i> (Lindl.) Pridgeon & M.W. Chase	Karremans 3119; JBL-spirit	–	KY218752	This Study
<i>Acianthera cogniauxiana</i> (Schltr.) Pridgeon & M.W. Chase	Karremans 5879; no voucher	KR816545	KR816554	Karremans and Rincón-González 2015
<i>Acianthera cogniauxiana</i> (Schltr.) Pridgeon & M.W. Chase	Karremans 6012; JBL-spirit	–	KY218753	This Study
<i>Acianthera compressiflora</i> (Barb.Rodr.) Chiron & Van den Berg	van den Berg 2111	JQ306436	–	Chiron et al. 2012
<i>Acianthera costaricensis</i> (Schltr.) Pupulin & Karremans	Karremans 5727; no voucher	KR816547	KR816556	Karremans and Rincón-González 2015
<i>Acianthera costaricensis</i> (Schltr.) Pupulin & Karremans	Pupulin 6241; no voucher	–	EU214424	Lahaye et al. 2008
<i>Acianthera crassilabia</i> (Ames & C.Schweinf.) Luer	Karremans 5870; no voucher	KY084273	KY218754	This Study
<i>Acianthera crepiniana</i> (Cogn.) Chiron & Van den Berg	Rodrigues 502	KT599875	–	Rodrigues et al. 2015
<i>Acianthera crinita</i> (Barb.Rodr.) Pridgeon & M.W.Chase	Chiron 11223	JQ306434	–	Chiron et al. 2012
<i>Acianthera crinita</i> (Barb.Rodr.) Pridgeon & M.W.Chase	Chiron 11225	JQ306435	–	Chiron et al. 2012
<i>Acianthera cryptantha</i> (Barb.Rodr.) Pridgeon & M.W.Chase	Chiron 11039	JQ306433	–	Chiron et al. 2012
<i>Acianthera decipiens</i> (Ames & C. Schweinf.) Pridgeon & M.W. Chase	Karremans 4229; no voucher	KR816546	KR816555	Karremans and Rincón-González 2015
<i>Acianthera decipiens</i> (Ames & C. Schweinf.) Pridgeon & M.W. Chase	Karremans 4032; JBL-spirit	KY084274	KY218755	This Study
<i>Acianthera fabiobarrosii</i> (Borba & Semir) F.Barros & F.Pinheiro	van den Berg 2080	JQ306426	–	Chiron et al. 2012
<i>Acianthera fenestrata</i> (Barb.Rodr.) Pridgeon & M.W. Chase	Chase 6798	AF262857	AF265468	Pridgeon et al. 2001
<i>Acianthera foetens</i> (Lindl.) Chiron & Van den Berg	van den Berg 2107	JQ306432	–	Chiron et al. 2012
<i>Acianthera fornograndensis</i> L.Kollmann & A.P.Fontana	Kollmann 7266	JQ306448	–	Chiron et al. 2012
<i>Acianthera fornograndensis</i> L.Kollmann & A.P.Fontana	van den Berg 2133	JQ306353	–	Chiron et al. 2012
<i>Acianthera freyi</i> (Luer) F.Barros & V.T.Rodrigues	van den Berg 2141	JQ306494	–	Chiron et al. 2012
<i>Acianthera geminicaulina</i> (Ames) Pridgeon & M.W. Chase	Karremans 5209A; JBL-spirit	KY084275	KY218756	This Study
<i>Acianthera geminicaulina</i> (Ames) Pridgeon & M.W. Chase	Karremans 5209B; JBL-spirit	KY084276	KY218757	This Study
<i>Acianthera geminicaulina</i> (Ames) Pridgeon & M.W. Chase	Karremans 3205; JBL-spirit	–	KY218758	This Study
<i>Acianthera glanduligera</i> (Lindl.) Luer	Chiron 09511	JQ306369	–	Chiron et al. 2012

TABLE 1 CONT. List of the accessions used in the phylogenetic analysis.

TAXON	VOUCHER COLLECTOR AND NUMBER	ITS	<i>matK</i>	SOURCE
<i>Acianthera gracilisepala</i> (Brade) Luer	van den Berg 2077	JQ306404	–	Chiron et al. 2012
<i>Acianthera hamata</i> Pupulin & G.A.Rojas	Bogarín 5114; JBL-spirit	KY084277	KY218759	This Study
<i>Acianthera hamosa</i> (Barb.Rodr.) Pridgeon & M.W.Chase	van den Berg 2055	JQ306374	–	Chiron et al. 2012
<i>Acianthera hamosa</i> (Barb.Rodr.) Pridgeon & M.W.Chase	Chiron 11079	JQ306447	–	Chiron et al. 2012
<i>Acianthera hatschbachii</i> (Schltr.) Chiron & Van den Berg	Karremans 4850; no voucher	KY084278	–	This Study
<i>Acianthera hatschbachii</i> (Schltr.) Chiron & Van den Berg	van den Berg 2149	JQ306406	–	Chiron et al. 2012
<i>Acianthera hatschbachii</i> (Schltr.) Chiron & Van den Berg	Rodrigues 503	KT599876	–	Rodrigues et al. 2015
<i>Acianthera heringeri</i> (Hoehne) F.Barros	van den Berg 2045	JQ306363	–	Chiron et al. 2012
<i>Acianthera hondurensis</i> (Ames) Pridgeon & M.W.Chase	Karremans 6062; JBL-spirit	KY084279	KY218760	This Study
<i>Acianthera hondurensis</i> (Ames) Pridgeon & M.W.Chase	Bogarín 9255; no voucher	KY084280	KY218761	This Study
<i>Acianthera hygrophila</i> (Barb.Rodr.) Pridgeon & M.W.Chase	Karremans 4829; L-spirit	KY084281	–	This Study
<i>Acianthera hystrix</i> (Kraenzl.) F.Barros	Rodrigues 507	KT599877	–	Rodrigues et al. 2015
<i>Acianthera johannensis</i> (Barb.Rodr.) Pridgeon & M.W.Chase	None	AF366939	–	Borba et al. 2002
<i>Acianthera johnsonii</i> (Ames) Pridgeon & M.W.Chase	Karremans 5720; JBL-spirit	KY084282	KY218762	This Study
<i>Acianthera jordanensis</i> (Brade) F.Barros	van den Berg 2134	JQ306378	–	Chiron et al. 2012
<i>Acianthera karlii</i> (Pabst) C.N.Gonç. & Waechter	van den Berg 2085	JQ306489	–	Chiron et al. 2012
<i>Acianthera klotzschiana</i> (Rchb.f.) Pridgeon & M.W.Chase	van den Berg 2099	JQ306445	–	Chiron et al. 2012
<i>Acianthera lanceana</i> (Lodd. ex Lindl.) Pridgeon & M.W. Chase	Karremans 5451A; JBL-spirit	KY084283	KY218763	This Study
<i>Acianthera lanceana</i> (Lodd. ex Lindl.) Pridgeon & M.W. Chase	Karremans 5451B; JBL-spirit	–	KY218764	This Study
<i>Acianthera lanceana</i> (Lodd. ex Lindl.) Pridgeon & M.W. Chase	Karremans 5452; JBL-spirit	KY084284	KY218765	This Study
<i>Acianthera lepidota</i> (L.O.Williams) Pridgeon & M.W.Chase	Karremans 5796; L-spirit	KY084285	KY218766	This Study
<i>Acianthera leptotifolia</i> (Barb.Rodr.) Pridgeon & M.W.Chase	Chase 5622	AF262854	–	Pridgeon et al. 2001
<i>Acianthera limae</i> (Porto & Brade) Pridgeon & M.W.Chase	APF1152	JQ306450	–	Chiron et al. 2012
<i>Acianthera luteola</i> (Lindl.) Pridgeon & M.W.Chase	Chiron 10007	JQ306364	–	Chiron et al. 2012
<i>Acianthera macropoda</i> (Barb.Rodr.) Pridgeon & M.W.Chase	van den Berg 2123	JQ306449	–	Chiron et al. 2012
<i>Acianthera maculiglossa</i> Chiron & N.Sanson	van den Berg 2090	JQ306455	–	Chiron et al. 2012
<i>Acianthera maculiglossa</i> Chiron & N.Sanson	Chiron 09291	JQ306453	–	Chiron et al. 2012
<i>Acianthera mantiquyrana</i> (Barb.Rodr.) V.T. Rodrigues & F. Barros	Rodrigues 520	KT599878	–	Rodrigues et al. 2015
<i>Acianthera melanochthoda</i> (Rchb.f.) Pridgeon & M.W. Chase	Chase 1419	AF262853	–	Pridgeon et al. 2001
<i>Acianthera micrantha</i> (Barb.Rodr.) Pridgeon & M.W.Chase	van den Berg 2017	JQ306373	–	Chiron et al. 2012
<i>Acianthera minima</i> (Cogn.) F.Barros	Chiron 05816	JQ306382	–	Chiron et al. 2012
<i>Acianthera montana</i> (Barb.Rodr.) F.Barros & L.R.S.Guim.	van den Berg 2114	JQ306437	–	Chiron et al. 2012
<i>Acianthera murex</i> (Rchb.f.) Luer	Stenzel 483	KY081772	–	Stenzel 2004
<i>Acianthera nemorosa</i> (Barb.Rodr.) F.Barros	van den Berg 2119	JQ306466	–	Chiron et al. 2012
<i>Acianthera ochreatea</i> (Lindl.) Pridgeon & M.W.Chase	van den Berg 2015	JQ306354	–	Chiron et al. 2012
<i>Acianthera ochreatea</i> (Lindl.) Pridgeon & M.W.Chase	van den Berg 2118	JQ306427	–	Chiron et al. 2012

TABLE 1 CONT. List of the accessions used in the phylogenetic analysis.

TAXON	VOUCHER COLLECTOR AND NUMBER	ITS	matK	SOURCE
<i>Acianthera ochreatea</i> (Lindl.) Pridgeon & M.W.Chase	<i>C293 AY</i>	AF262858	AY008458	Pridgeon et al. 2001
<i>Acianthera octophrys</i> (Rchb.f.) Pridgeon & M.W.Chase	<i>Rodrigues 521</i>	KT599879	–	Rodrigues et al. 2015
<i>Acianthera odontotepala</i> (Rchb.f.) Luer	<i>Stenzel 784</i>	KY081773	–	Stenzel 2004
<i>Acianthera panduripetala</i> (Barb.Rodr.) Pridgeon & M.W.Chase	<i>van den Berg 2132</i>	JQ306371	–	Chiron et al. 2012
<i>Acianthera pantasmi</i> (Rchb.f.) Pridgeon & M.W. Chase	<i>Karremans 4950; JBL-spirit</i>	–	KY218767	This Study
<i>Acianthera pantasmi</i> (Rchb.f.) Pridgeon & M.W. Chase	<i>Karremans 4952; JBL-spirit</i>	–	KY218768	This Study
<i>Acianthera papillosa</i> (Lindl.) Pridgeon & M.W.Chase	<i>Chiron 11038</i>	JQ306501	–	Chiron et al. 2012
<i>Acianthera pavimentata</i> (Rchb.f.) Pridgeon & M.W.Chase	<i>Chiron 09784</i>	JQ306443	–	Chiron et al. 2012
<i>Acianthera pavimentata</i> (Rchb.f.) Pridgeon & M.W.Chase	<i>van den Berg 2112</i>	JQ306444	–	Chiron et al. 2012
<i>Acianthera pectinata</i> (Lindl.) Pridgeon & M.W.Chase	<i>Chase 1296</i>	AF262849	–	Pridgeon et al. 2001
<i>Acianthera per-dusenii</i> (Hoehne) F.Barros & L.R.S.Guim.	<i>van den Berg 2082</i>	JQ306454	–	Chiron et al. 2012
<i>Acianthera platystachys</i> (Regel) Chiron & Van den Berg	<i>Chiron 09472</i>	JQ306428	–	Chiron et al. 2012
<i>Acianthera pubescens</i> (Lindl.) Pridgeon & M.W.Chase	<i>Chiron 04848</i>	JQ306365	–	Chiron et al. 2012
<i>Acianthera pubescens</i> (Lindl.) Pridgeon & M.W.Chase	<i>van den Berg 2131</i>	JQ306366	–	Chiron et al. 2012
<i>Acianthera hystrix</i> (Kraenzl.) F.Barros	<i>APs.n.; no voucher</i>	KC425836	–	This Study
<i>Acianthera ramosa</i> (Barb.Rodr.) F.Barros	<i>van den Berg 2120</i>	JQ306438	–	Chiron et al. 2012
<i>Acianthera recurva</i> (Lindl.) Pridgeon & M.W.Chase	<i>van den Berg 2145</i>	JQ306375	–	Chiron et al. 2012
<i>Acianthera rodriguesii</i> (Cogn.) Pridgeon & M.W.Chase	<i>Chiron 11044</i>	JQ306446	–	Chiron et al. 2012
<i>Acianthera rubroviridis</i> (Lindl.) Pridgeon & M.W.Chase	<i>Stenzel 893</i>	KY081774	–	Stenzel 2004
<i>Acianthera saundersiana</i> (Rchb.f.) Pridgeon & M.W.Chase	<i>van den Berg 2109</i>	JQ306452	–	Chiron et al. 2012
<i>Acianthera saurocephala</i> (Lodd.) Pridgeon & M.W. Chase	<i>van den Berg 1985</i>	JQ306356	–	Chiron et al. 2012
<i>Acianthera serpentula</i> (Barb.Rodr.) F.Barros	<i>Chiron 09029</i>	JQ306370	–	Chiron et al. 2012
<i>Acianthera serpentula</i> (Barb.Rodr.) F.Barros	<i>van den Berg 2135</i>	JQ306411	–	Chiron et al. 2012
<i>Acianthera sicaria</i> (Lindl.) Pridgeon & M.W.Chase Rincón-González 2015	<i>Pupulin 7190; JBL-spirit</i>	KR816550	KR816559	Karremans and
<i>Acianthera sicaria</i> (Lindl.) Pridgeon & M.W.Chase	<i>Karremans 121; JBL-spirit</i>	KY084286	KY218769	This Study
<i>Acianthera sicaria</i> (Lindl.) Pridgeon & M.W.Chase	<i>Bogarín 7727; JBL-spirit</i>	–	KY218770	This Study
<i>Acianthera sicaria</i> (Lindl.) Pridgeon & M.W.Chase	<i>Karremans 4939; JBL-spirit</i>	–	KY218771	This Study
<i>Acianthera sicaria</i> (Lindl.) Pridgeon & M.W.Chase	<i>Chase 5609</i>	AF262848	–	Pridgeon et al. 2001
<i>Acianthera sp.</i>	<i>Karremans 5432; JBL-spirit</i>	KY084287	KY218772	This Study
<i>Acianthera sonderiana</i> (Rchb.f.) Pridgeon & M.W.Chase	<i>van den Berg 2098</i>	JQ306377	–	Chiron et al. 2012
<i>Acianthera sonderiana</i> (Rchb.f.) Pridgeon & M.W.Chase	<i>van den Berg 2144</i>	JQ306496	–	Chiron et al. 2012
<i>Acianthera spilantha</i> (Barb.Rodr.) Luer	<i>van den Berg 2037</i>	JQ306359	–	Chiron et al. 2012
<i>Acianthera spilantha</i> (Barb.Rodr.) Luer	<i>van den Berg 2046</i>	JQ306360	–	Chiron et al. 2012
<i>Acianthera teres</i> (Lindl.) Borba	None	AF366935	–	Borba et al. 2002
<i>Acianthera teres</i> (Lindl.) Borba	None	AF366937	–	Borba et al. 2002
<i>Acianthera teres</i> (Lindl.) Borba	<i>Karremans 4849; no voucher</i>	KY084288	–	This Study

TABLE 1 CONT. List of the accessions used in the phylogenetic analysis.

TAXON	VOUCHER COLLECTOR AND NUMBER	ITS	matK	SOURCE
<i>Acianthera testifolia</i> (Sw.) Solano	Karremans 4914; JBL-spirit	KR816551	KR816560	Karremans and Rincón-González 2015
<i>Acianthera testifolia</i> (Sw.) Solano	Stenzel 656	KR816552	–	Stenzel 2004
<i>Acianthera translucida</i> (Barb.Rodr.) Luer	van den Berg 2092	JQ306368	–	Chiron et al. 2012
<i>Acianthera tricarinata</i> (Poepp. & Endl.) Pridgeon & M.W.Chase	Chiron 07792	JQ306495	–	Chiron et al. 2012
<i>Acianthera tricarinata</i> (Poepp. & Endl.) Pridgeon & M.W.Chase	Karremans 5954; L-spirit	KY084289	KY218773	This Study
<i>Acianthera wilsonii</i> (Lindl.) Pridgeon & M.W.Chase	Stenzel 621	KY081776	–	Stenzel 2004
<i>Anathallis lewisiae</i> (Ames) Solano & Soto Arenas	Bogarín 1056; JBL-spirit	KC425733	KC425858	Karremans 2014
<i>Anathallis obovata</i> (Lindl.) Pridgeon & M.W.Chase	Karremans 4796; L-spirit	KF747797	–	Karremans 2014
<i>Anathallis pabstii</i> (Garay) Pridgeon & M.W. Chase	Karremans 4821; L-spirit	KC425737	KC425859	Karremans 2014
<i>Anathallis sertularioides</i> (Sw.) Pridgeon & M.W.Chase	Solano 807	AF262871	–	Pridgeon et al. 2001
<i>Antilla erosa</i> (Urb.) Luer	Karremans 6469; L-spirit	–	KY218774	This Study
<i>Antilla erosa</i> (Urb.) Luer	Karremans 7315; L-spirit	KY084290	KY218775	This Study
<i>Antilla parvula</i> (Ames & C. Schweinf.) Luer	Karremans 7316; no voucher	–	KY218776	This Study
<i>Antilla prostrata</i> (Lindl.) Luer	Stenzel 856	KY081777	–	Stenzel 2004
<i>Antilla trichophora</i> (Lindl.) Luer	Stenzel 606	KY081778	–	Stenzel 2004
<i>Antilla trichophora</i> (Lindl.) Luer	Stenzel 630	KY081779	–	Stenzel 2004
<i>Arpophyllum giganteum</i> Hartw. ex Lindl.	None	AF266742	AF265485	Pridgeon et al. 2001
<i>Dilomilis montana</i> (Sw.) Summerh.	Chase 206	AF262915	AF263765	Pridgeon et al. 2001
<i>Kraenzlinella anfracta</i> (Luer) Luer	Karremans 5499; no voucher	KY084291	KY218777	This Study
<i>Kraenzlinella anfracta</i> (Luer) Luer	Karremans 5790; L-spirit	KY084292	–	This Study
<i>Kraenzlinella echinocarpa</i> (C. Schweinf.) Luer	AP213; no voucher	KF747840	–	This Study
<i>Kraenzlinella erinacea</i> (Rchb.f.) Solano	Karremans 5984; L-spirit	KY084293	KY218778	This Study
<i>Kraenzlinella erinacea</i> (Rchb.f.) Solano	Solano 900	AF262923	–	Pridgeon et al. 2001

## RESULTS

The resulting “target” tree of the Bayesian analysis of the combined nrITS and *matK* matrices have been used to establish the clades (Fig. 1). Support measures are given as P.P. (Posterior Probabilities). The *Acianthera* affinity forms a well-supported clade (P.P.=1) that is here divided into four subclades.

**Clade *Brenesia*** (P.P.=1) is recovered as sister to a clade that includes the clades *Kraenzlinella* and *Antilla* with low support (P.P.=0.66). It includes the accessions of *Acianthera costaricensis* (type species of *Brenesia*), and *A. johnsonii*.

**Clade *Kraenzlinella*** (P.P.=1) is sister to the *Antilla* clade (P.P.=1) and includes the accessions of *Kraenzlinella echinocarpa* and *K. erinacea*.

**Clade *Antilla*** (P.P.=1) includes the accessions of *Acianthera murex*, and *Antilla erosa*, *A. parvula*, *A. prostrata*, and *A. trichophora* (type species of *Antilla*).

**Clade *Acianthera*** (P.P.=1) contains all the remaining species of *Acianthera*, including *Acianthera aberrans* (type species of *Aberrantia*), *A. atropurpurea* (type species of *Pleurobotryum*), *A. auriculata* (type species of *Arthrosia*), *A. bragae* (type species of *Sarracenella*), *A. butcheri* (type species of *Didactylus*), *A. fenestrata* (type species of *Cryptophoranthus*), *A. lepidota* (type species of *Unguella*), *A. recurva* (type species of *Acianthera*), and *A. testifolia* (type species of *Apoda-prorepentia*).





## DISCUSSION

Our nrITS+*matK* combined analysis of a broad set of *Acianthera* species complements and expands the analyses of Pridgeon et al. (2001) and Chiron et al. (2012). The placement in *Acianthera* of the genera *Arthrosia*, *Brenesia*, *Cryptophoranthus*, *Pleurobotryum* and *Sarracenella*, as previously proposed (Pridgeon and Chase, 2001; Pridgeon, 2005; Chiron and van den Berg, 2012), is confirmed. In addition, the analysis of the type species of *Aberrantia*, *Antilla*, *Apoda-proreperntia*, *Didactylus* and *Unguella*, and of two representative species of *Kraenzlinella*, shows that these genera are also imbedded within a broad circumscription of *Acianthera*. No DNA data of the monotypic *Dondodia*, *Ogygia*, and *Proctoria* were available for this study, but the three genera are included within *Acianthera* on the basis of their morphological similarity.

*Aberrantia* was proposed by Luer (2005) to accommodate a single species previously placed by the author in *Pleurothallis* subgen. *Aberrantia* Luer (2004). It was not included in *Acianthera* because of a “floral structure that is incompatible,” namely the bicallose, truncate petals ending into a short apiculum and long claw of the lip. However, other morphological features, especially the leaf with margins decurrent on the ramicaul, the short inflorescence, borne above the base of the leaf and the glabrous, gapping flowers, are common to several other *Acianthera* species (Bogarín et al., 2008). The accessions of *A. aberrans* were here retrieved embedded within *Acianthera* in a clade containing mainly species found from Costa Rica to Ecuador.

*Antilla* was proposed by Luer (2004) to accommodate a dozen species with pendulous plants and leaves with dentate margins, endemic to the Greater Antilles, which he noted were related to *Acianthera* (Luer, 2000). The species of *Antilla* have mostly been considered as members of *Pleurothallis* (Luer, 1986, 2000; Pridgeon, 2005). Here species of *Antilla* are found in a highly supported clade. We give subgeneric status to this clade to distinguish it from the members of *Kraenzlinella* to which it is closely related, but that have quite different morphologies and distribution.

*Apoda-proreperntia* was proposed by Luer (2004) to segregate about ten species, with highest diversity in the Ecuadorian and Colombian Andes, previously assigned to *Pleurothallis* subgen. *Apoda-proreperntia* Luer (1986). Luer (2007) characterized the group by the repent, often pendent habit, with broad, short-stemmed, overlapping leaves, single-flowered (sometimes successive) inflorescences, fleshy sepals often pubescent externally, never spreading, commonly connate, single-veined and spatulate petals and an apically denticulate to fringed lip with a pair of lateral lobes. Stenzel (2004) and Karremans and Rincón-González (2015) found *A. testifolia*, type species of *Apoda-proreperntia*, embedded within *Acianthera*, as suggested by Solano-Gómez et al. (2011). Here the accessions of two species assigned to this genus are found in a highly supported clade including several other species with mainly pendent habits and mostly found from Costa Rica down to Ecuador.

*Arthrosia* was proposed by Luer (2006) to accommodate 14 species previously assigned to *Pleurothallis* subgen. *Arthrosia* Luer (Luer, 1986). The species assigned to this

genus form a monophyletic group in the analyses, however, it is well embedded within *Acianthera*. Sectional status was given to this particular clade as *Acianthera* sect. *Arthrosiae* (Luer) Chiron & van den Berg. The species belonging to this clade are mostly found in Bolivia and Brazil.

*Brenesia* was proposed to recognize the distinctness of a species with Pleurothallidinae-like flowers but with the inflorescence arising from a basal node of the stem rather than the apex of the ramicaul. Luer (2004) transferred the species of *Echinosepala* Pridgeon & M.W. Chase, some of which also have rhizomatous inflorescences, to *Brenesia* in the believe that they were related to each other. However, such a relationship has been disproven by DNA data (Pridgeon et al., 2001; Pupulin and Karremans, in prep.). The clade that includes the type species of *Brenesia* is found sister (with low support) to a clade that includes *Antilla* and *Kraenzlinella*, altogether highly supported as sisters to the rest of *Acianthera*. Four species of Central American distribution are recognized in this clade, which is here given subgeneric status.

*Cryptophoranthus* was proposed to recognize a group of species distinguished by the connation of the dorsal sepal with the synsepal at the base and apex, forming a pair of lateral “windows.” It is now known that flowers with diversely connate sepals occur in several different affinities within Pleurothallidinae (Karremans, 2016), and the species once included in *Cryptophoranthus* belong to several unrelated genera (Luer, 1986). The type species, however, was found embedded within *Acianthera*. Six Brazilian endemic species characterized, aside from the lateral “windows,” by the short ramicauls and 1–2 flowered inflorescences were given section status by Chiron and van den Berg (2012).

*Didactylus* was proposed by Luer (2005) to accommodate four species previously placed by the author in *Pleurothallis* subgen. *Didactylus* Luer (2004). They were not included within *Acianthera* in essence because of the presence of “two narrow, curved, lateral lobes on the rostellum.” The species of *Didactylus* are otherwise indistinguishable from other *Acianthera*. The accession of *A. butcheri*, type species of *Didactylus*, is found in a clade including several other species with pendent habits, distributed mostly ranging from Costa Rica to Ecuador.

*Dondodia* Luer was proposed to segregate *Acianthera cymbiformis* (Dod) Pridgeon & M.W. Chase, an unusual species known only from Hispaniola. It had been previously placed in *Pleurothallis* sect. *Cryptophoranthae* Luer (1986) on account of the connation of the dorsal sepal with the lateral synsepal. The species of that section would later be found embedded within *Acianthera* (Pridgeon et al., 2001) and transferred to the genus (Pridgeon and Chase, 2001), transferring this species too. Karremans (2016) suggested that *A. cymbiformis* is related to the also Antillean species placed in the genera *Antilla* and *Proctoria*, rather than to the Brazilian members of *Acianthera* sect. *Cryptophoranthae*. No DNA data of the species were available for this study but the thickly coriaceous leaf with erose margins, infundibuliform floral bract, the sepals externally papillose,

the dorsal sepal connate apically to the lateral sepals, lanceolate petals, thick, verrucose lip, with a rounded margin and a basal claw, and the clavate column with a denticulate apex are reminiscent of several other Antillean *Acianthera* species.

*Kraenzlinella* was proposed more than a century ago but received little recognition as a distinct genus (Luer, 1986; Luer, 1994) until it was re-circumscribed by Pridgeon and Chase (2001). The single sequence of *Kraenzlinella* analyzed by Pridgeon et al. (2001) was retrieved in a clade together with the genera *Brachionidium* and *Myoxanthus* rather than *Acianthera*. That same sequence is here found embedded with high support within *Acianthera*, alongside other sequences of *Kraenzlinella*. It is likely that the relatively long branches of the accessions of both *Kraenzlinella* and *Brachionidium* had initially misplaced the two genera in Pridgeon et al. (2001), as neither is related to *Myoxanthus* (Karremans, 2016). Here *Kraenzlinella* is given subgeneric status to distinguish its nine species with stout erect habits distributed from Mexico through Central America southwards into Bolivia, from the members of *Antilla* to which they are closely related.

*Ogygia* was proposed by Luer (2006) to accommodate a single species endemic to the Revillagigedo Archipelago in Mexico, and of which the only available specimens, at the time of proposal, were sterile. Solano-Gómez (2003) transferred the species to *Acianthera* after studying fertile material of *A. unguicallosa* from the type locality. Even though no DNA data was available for this study the author's illustration shows a species that is indeed morphologically similar to other *Acianthera* species from Mexico.

*Pleurobotryum* was proposed by Barbosa Rodrigues (1877) to accommodate a species distinguished among the Pleurothallidinae by the conspicuously long articulate, motile lip and the unusual cylindrical leaves. *Pleurobotryum* was later redefined and expanded by Hoehne (1936) adding a handful of species to it, but the genus has been mostly considered a synonym of *Pleurothallis* (Luer, 1986; Pridgeon, 2005). Chiron et al., (2012) found it to be embedded within *Acianthera*, creating *Acianthera* sect. *Pleurobotryae* Chiron & van den Berg (2012), and assigning seven Brazilian endemic species to it. Rodrigues et al. (2015) revised the section and reduced it to only four species.

*Proctoria* was proposed by Luer (2004) for the only species of Pleurothallidinae found in the Cayman Islands,

and which the author believed it to be a "long isolated" relative of *Acianthera*. No DNA data were available for this study, but the shortly creeping rhizome, thick, sessile leaves, with irregular margins, the long, lax inflorescence, and the three-lobed lip, with a pair of calli near the middle, auricles at the base and apically obtuse are indeed reminiscent of species of *Acianthera* subgen. *Antilla*. The distribution of this species, Cayman Islands and Cuba (Luer, 2006; Stenzel, 2007), is compatible with this hypothesis.

*Sarracenella* was proposed for two Brazilian endemics characterized by the creeping rhizome with thick leaves, and a short raceme with a pair of fleshy, tubular flowers. Not long after, Luer (1986) would place *Sarracenella* under the synonymy of *Pleurothallis* recognizing that besides the unusual sepaline tube, the two species could be otherwise placed among the latter. Pridgeon et al. (2001) found the two species of *Sarracenella* well embedded within *Acianthera*. *Acianthera* sect. *Sarracenella* (Luer) Chiron & van den Berg (2012) was created to accommodate these two species.

*Unguella* was proposed by Luer (2005) to accommodate two species previously placed by the author in *Pleurothallis* subgen. *Unguella* Luer (2004). They were not included within *Acianthera* because of the presence of "a narrow claw of a three-lobed lip that articulates with a narrow extension of the column-foot." The species of *Unguella* are otherwise indistinguishable from other *Acianthera*. The accession of *A. lepidota*, type species of *Unguella*, is found in a clade together with the type of *Didactylus*, and other species with pendent habits from Costa Rica, Panama, Colombia and Ecuador.

Acceptance of the splinter generic concepts within *Acianthera* subgen. *Acianthera* would require their complete recircumscription and/or the establishment of additional segregate generic concepts, which we believe to be unnecessary. *Antilla*, *Brenesia* and *Kraenzlinella* are given subgeneric status in recognition of their unique morphologies and distribution, supported by genetic distance, as has been previously done with *Specklinia* Lindl. (Karremans et al., 2016). Their overall similarity to other species of *Acianthera* prevents us from recognizing them as distinct genera. The 14 validly published generic concepts that are here placed within the *Acianthera* affinity are regarded as synonyms of the latter. As such, the genus, just shy of 300 species, is manageable in size, well-defined and morphologically diagnosable (Fig. 2, 3).

#### TAXONOMIC TREATMENT

***Acianthera* Scheidw., Allg. Gartenzeitung 10: 292. 1842.**

TYPE: *Acianthera punctata* Scheidw., Allg. Gartenzeitung 10: 292. 1842.

Synonyms: *Centranthera* Scheidw., Allg. Gartenzeitung 10: 293. 1842, *nom. illeg.*

*Pleurobotryum* Barb.Rodr., Gen. Spec. Orchid. 1: 20. 1877.

*Cryptophoranthus* Barb.Rodr., Gen. Spec. Orchid. 2: 79. 1881.

*Otopetalum* F.Lehm. & Kraenzl., Bot. Jahrb. Syst. 26: 457. 1899, *nom. illeg.*

*Kraenzlinella* Kuntze in T.E.von Post, Lex. Gen. Phan.: 310. 1903.

*Brenesia* Schltr., Repert. Spec. Nov. Regni Veg., Beih. 19: 199. 1923.

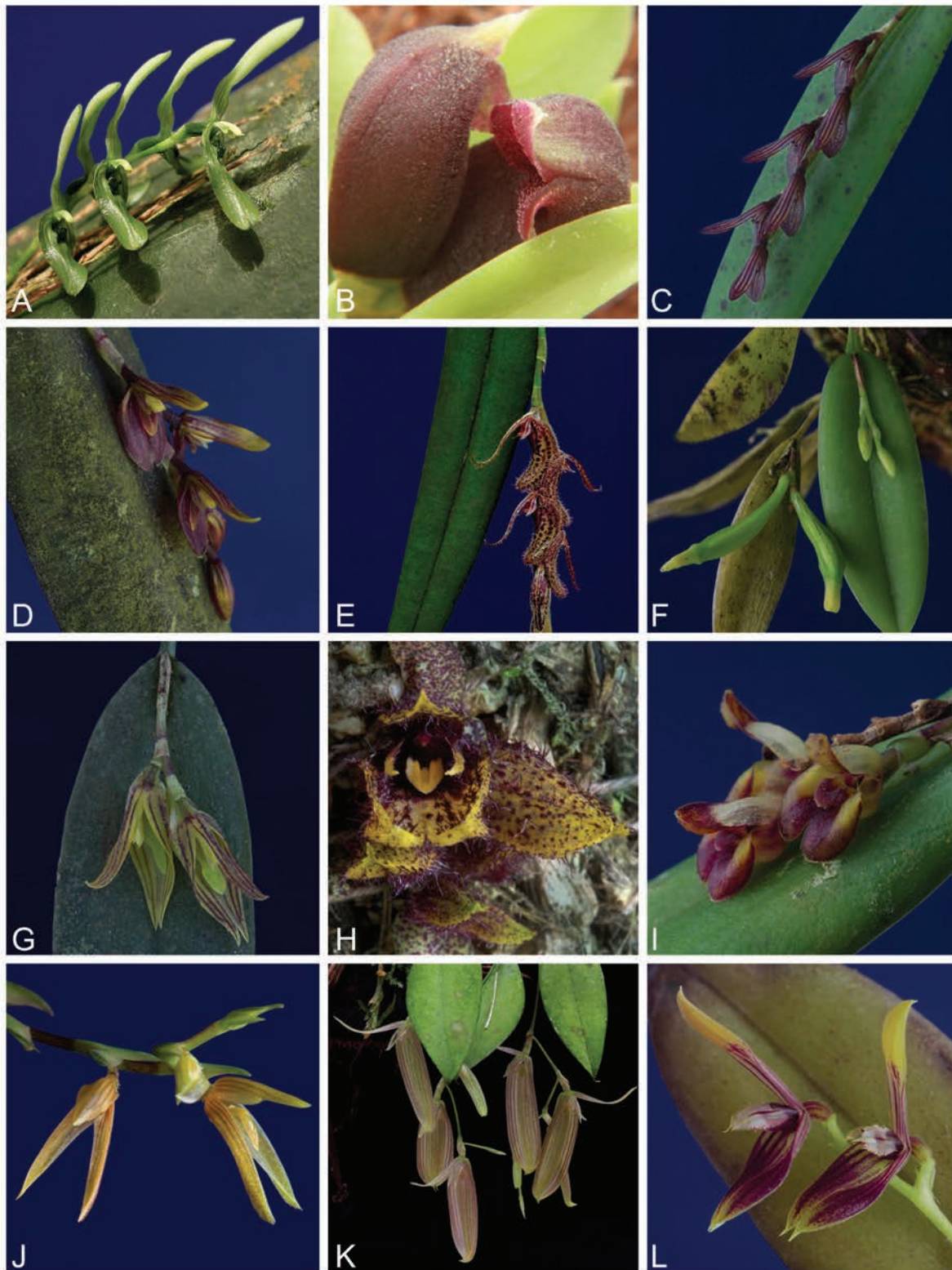
*Geocalpa* Brieger, Die Orchidee 440. 1975, *nom. inval.*

*Sarracenella* Luer, Selbyana 5: 388. 1981.

*Aberrantia* (Luer) Luer, Monogr. Syst. Bot. Missouri Bot. Gard. 95: 253. 2004, *nom. inval.*

*Antilla* (Luer) Luer, Monogr. Syst. Bot. Missouri Bot. Gard. 95: 255. 2004.





A - *Acianthera aberrans* (FP4857)

B - *Acianthera bragae*

C - *Acianthera breedlovei* (AK3962)

D - *Acianthera brunnescens* (AK5204)

E - *Acianthera butcheri* (FP2503)

F - *Acianthera cabiriae* (AK5439)

G - *Acianthera cachensis* (MF333)

H - *Acianthera costaricensis* (AK4981)

I - *Acianthera decipiens* (AK4032)

J - *Acianthera erinacea*

K - *Acianthera erosa* (AK7315)

L - *Acianthera geminicaulina* (AK5209)

FIGURE 2. Species of *Acianthera*, including the type species of the genera *Aberrantia* (A), *Brenesia* (H), *Didactylus* (E) and *Sarracenella* (B), and representative species of *Acianthera* subgen. *Antilla* (K) and *Acianthera* subgen. *Kraenzlinella* (J). Photographs by F. Pupulin (A, E, F, J), M. Díaz (D, I, L), W. Driessen (B, K), A.P. Karremans (C, H) and D. Bogarín (G). Vouchers for A, C, D, E, I and L at JBL (spirit).



A - *Acianthera hamata* (DB5114)

B - *Acianthera hondurensis* (AK6062)

C - *Acianthera johnsonii*

D - *Acianthera lanceana* (AK5451)

E - *Acianthera panduripetala*

F - *Acianthera pantasmii* (AK4952)

G - *Acianthera saundersiana*

H - *Acianthera sicaria* (AK4939)

I - *Acianthera sicaria* (FP7190)

J - *Acianthera sigmoidea* (DB8360)

K - *Acianthera testifolia* (AK4914)

L - *Acianthera tricarinata*

FIGURE 3. Species of *Acianthera*, including the type species of genus *Apoda-prorepentia* (K), and representative species of *Acianthera* subgen. *Brenesia* (C) and *Acianthera* subgen. *Kraenzlinella* (J). Photographs by M. Díaz (A, D, F, H, I), W. Driessen (C, E, G, L), A.P. Karremans (B, K) and D. Bogarín (J). Vouchers for A, B, D, F, H, I and K at JBL (spirit).



*Apoda-prorepentia* (Luer) Luer, Monogr. Syst. Bot. Missouri Bot. Gard. 95: 255. 2004.

*Didactylus* (Luer) Luer, Monogr. Syst. Bot. Missouri Bot. Gard. 95: 257. 2004, *nom. inval.*

*Proctoria* Luer, Monogr. Syst. Bot. Missouri Bot. Gard. 95: 258. 2004.

*Unguella* (Luer) Luer, Monogr. Syst. Bot. Missouri Bot. Gard. 95: 265. 2004, *nom. inval.*

*Aberrantia* Luer, Monogr. Syst. Bot. Missouri Bot. Gard. 103: 310. 2005.

*Didactylus* Luer, Monogr. Syst. Bot. Missouri Bot. Gard. 103: 310. 2005.

*Unguella* Luer, Monogr. Syst. Bot. Missouri Bot. Gard. 103: 310. 2005.

*Arthrosia* Luer, Monogr. Syst. Bot. Missouri Bot. Gard. 105: 248. 2006.

*Dondodia* Luer, Monogr. Syst. Bot. Missouri Bot. Gard. 105: 85. 2006.

*Ogygia* Luer, Monogr. Syst. Bot. Missouri Bot. Gard. 105: 252. 2006.

### 1. *Acianthera* subgen. *Acianthera*

Synonyms: *Acianthera* Scheidw., Allg. Gartenzeitung 10: 292. 1842. *Centranthera* Scheidw., Allg. Gartenzeitung 10: 293. 1842, *nom. illeg.* *Pleurothallis* sect. *Acianthera* (Scheidw.) Luer, Monogr. Syst. Bot. Missouri Bot. Gard. 20: 12. 1986. *Pleurothallis* sect. *Brachystachyae* Lindl., Fol. Orchid. *Pleurothallis* 21. 1859. *Pleurothallis* sect. *Sarcodanthae* Barb.Rodr., Gen. Sp. Orchid. 2: 10. 1882. TYPE: *Acianthera recurva* (Lindl.) Pridgeon & M.W.Chase, Lindleyana 16: 246. 2001.

*Pleurothallis* sect. *Sicariae* Lindl., Fol. Orchid. *Pleurothallis* 12. 1859. *Acianthera* sect. *Sicariae* (Lindl.) Chiron & van den Berg, Richardiana 12(2): 69. 2012. *Pleurothallis* sect. *Sicariae* subsect. *Sicariae* (Lindl.) Luer, Monogr. Syst. Bot. Missouri Bot. Gard. 20: 20. 1986. *Acianthera* sect. *Sicariae* subsect. *Sicariae*. TYPE: *Acianthera sicaria* (Lindl.) Pridgeon & M.W.Chase, Lindleyana 16: 246. 2001.

*Pleurobotryum* Barb.Rodr., Gen. Spec. Orchid. 1: 20. 1877. *Pleurothallis* subgen. *Pleurobotryum* (Barb. Rodr.) Luer., Monogr. Syst. Bot. Missouri Bot. Gard. 20: 53. *Acianthera* sect. *Pleurobotryum* (Barb.Rodr.) Chiron & van den Berg, Richardiana 12(2): 68. 2012 [as *Acianthera* sect. *Pleurobotryae* Chiron & van den Berg]. *Pleurothallis* sect. *Pleurobotryum* (Barb. Rodr.) Cogn., NEW 3(4): 587. 1896. 1986. TYPE: *Acianthera atropurpurea* (Barb.Rodr.) Chiron & Van den Berg, Richardiana 12(2): 72. 2012.

*Cryptophoranthus* Barb.Rodr., Gen. Spec. Orchid. 2: 79. 1881. *Pleurothallis* sect. *Cryptophoranthae* Luer, Monogr. Syst. Bot. Missouri Bot. Gard. 20: 16. 1986. *Acianthera* sect. *Cryptophoranthae* (Luer) Chiron & van den Berg, Richardiana 12(2): 68. 2012. TYPE: *Acianthera fenestrata* (Barb.Rodr.) Pridgeon & M.W.Chase, Lindleyana 16: 243. 2001.

*Sarracenella* Luer, Selbyana 5: 388. 1981. *Geocalpa* Brieger, Die Orchidee 440. 1975, *nom. inval.* *Pleurothallis* subgen. *Sarracenella* (Luer) Luer, Monogr. Syst. Bot. Missouri Bot. Gard. 20: 73. *Acianthera* sect. *Sarracenella* (Luer) Chiron & van den Berg, Richardiana 12(2): 67. 2012 [as *Acianthera* sect. *Sarracenellae* Chiron & van den Berg]. TYPE: *Acianthera bragae* (Ruschi) F.Barros, Hoehnea 30: 183. 2003.

*Pleurothallis* sect. *Tomentosae* Luer, Monogr. Syst. Bot. Missouri Bot. Gard. 20: 22. 1986. *Acianthera* sect. *Tomentosae* (Luer) Chiron & van den Berg, Richardiana 12(2): 71. 2012. TYPE: *Acianthera herzogii* (Schltr.) Baumbach, Orchidee (Hamburg) 58: 100. 2007.

*Pleurothallis* sect. *Tricarinatae* Luer, Monogr. Syst. Bot. Missouri Bot. Gard. 20: 22. 1986. *Acianthera* sect. *Tricarinatae* (Luer) Chiron & van den Berg, Richardiana 12(2): 72. 2012. TYPE: *Acianthera tricarinata* (Poepp. & Endl.) Pridgeon & M.W.Chase, Lindleyana 16: 246. 2001.

*Apoda-prorepentia* (Luer) Luer, Monogr. Syst. Bot. Missouri Bot. Gard. 95: 255. 2004. *Pleurothallis* subgen. *Apoda-prorepentia* Luer, Monogr. Syst. Bot. Missouri Bot. Gard. 20: 31. 1986. *Pleurothallis* sect. *Apodae-Prorepenes* Lindl., Fol. Orchid. *Pleurothallis* 42. 1859. TYPE: *Acianthera testifolia* (Sw.) Solano, Acta Bot. Mex. 97: 50. 2011.

*Aberrantia* Luer, Monogr. Syst. Bot. Missouri Bot. Gard. 103: 310. 2005. *Aberrantia* (Luer) Luer, Monogr. Syst. Bot. Missouri Bot. Gard. 95: 253. 2004, *nom. inval.* *Pleurothallis* subgen. *Aberrantia* Luer, Monogr. Syst. Bot. Missouri Bot. Gard. 95: 76. 2004, *nom. inval.* TYPE: *Acianthera aberrans* (Luer) Pupulin & Bogarín, Lankesteriana 8(2): 53. 2008.

*Didactylus* Luer, Monogr. Syst. Bot. Missouri Bot. Gard. 103: 310. 2005. *Didactylus* (Luer) Luer, Monogr. Syst. Bot. Missouri Bot. Gard. 95: 257. 2004, *nom. inval.* *Pleurothallis* subgen. *Didactylus* Luer, Monogr. Syst. Bot. Missouri Bot. Gard. 95: 77. 2004, *nom. inval.* TYPE: *Acianthera butcheri* (L.O.Williams) Pridgeon & M.W.Chase, Lindleyana 16: 242. 2001.

*Unguella* Luer, Monogr. Syst. Bot. Missouri Bot. Gard. 103: 310. 2005. *Unguella* (Luer) Luer, Monogr. Syst. Bot. Missouri Bot. Gard. 95: 265. 2004, *nom. inval.* *Pleurothallis* subgen. *Unguella* Luer, Monogr. Syst. Bot. Missouri Bot. Gard. 95: 77. 2004, *nom. inval.* TYPE: *Acianthera lepidota* (L.O.Williams) Pridgeon & M.W.Chase, Lindleyana 16: 244. 2001.

*Arthrosia* (Luer) Luer, Monogr. Syst. Bot. Missouri Bot. Gard. 105: 248. 2006. *Pleurothallis* subgen. *Arthrosia* Luer, Monogr. Syst. Bot. Missouri Bot. Gard. 20: 34. 1986. *Acianthera* sect. *Arthrosia* (Luer) Chiron & van den Berg, Richardiana 12(2): 67. 2012 [as *Acianthera* sect. *Arthrosiae* Chiron & van den Berg]. TYPE: *Acianthera auriculata* (Lindl.) Pridgeon & M.W.Chase, Lindleyana 16: 242. 2001.

*Ogygia* Luer, Monogr. Syst. Bot. Missouri Bot. Gard. 105: 252. 2006. TYPE: *Acianthera unguicallosa* (Ames & C.Schweinf.) Solano, Icon. Orchid. 5-6: t. 512. 2002 (2003).

*Pleurothallis* sect. *Leptotifolia* Pabst, Orchid. Bras. 1: 156. 1975. TYPE: *Acianthera leptotifolia* (Barb. Rodr.) Pridgeon & M.W.Chase, Lindleyana 16: 244. 2001.

*Acianthera* sect. *Crinitae* Chiron & van den Berg, Richardiana 12(2): 68. 2012. TYPE: *Acianthera crinita* (Barb.Rodr.) Pridgeon & M.W.Chase, Lindleyana 16: 243. 2001.

*Acianthera* sect. *Sulcatae* Chiron & van den Berg, Richardiana 12(2): 71. 2012. TYPE: *Acianthera luteola* (Lindl.) Pridgeon & M.W.Chase, Lindleyana 16: 244. 2001.

*Acianthera* sect. *Sicariae* subsect. *Auritae* Chiron & van den Berg, Richardiana 12(2): 70. 2012. TYPE: *Acianthera glanduligera* (Lindl.) Luer, Monogr. Syst. Bot. Missouri Bot. Gard. 95: 253. 2004.

*Pleurothallis* sect. *Sicariae* subsect. *Pectinatae* Luer, Monogr. Syst. Bot. Missouri Bot. Gard. 20: 20. 1986.

*Acianthera* sect. *Sicariae* subsect. *Pectinatae* (Luer) Chiron & van den Berg, Richardiana 12(2): 71. 2012. TYPE: *Acianthera pectinata* (Lindl.) Pridgeon & M.W.Chase, Lindleyana 16: 245. 2001.

Out of the 299 species currently accepted in *Acianthera*, 268 belong to *Acianthera* subgen. *Acianthera*. It is premature at this time to present a full list of species belonging to this subgenus (as is done hereafter for the three remaining subgenera), and a thorough revision of *Acianthera* subgen. *Acianthera* is left for a future study. Most species have been revised in previous studies (Luer, 2004; Chiron and van den Berg, 2012; Rodrigues et al., 2015; Solano-Gómez, 2015), but there are still some obscure names that require attention. Species belonging to this subgenus are variable morphologically, but can be recognized in general terms by the stout habit, a more or less bilobed ramicaul with a depression along the middle, a sessile leaf, fleshy flowers, commonly pubescent to verrucose, lateral sepals fused into a concave synsepal, petals lanceolate, denticulate, the lip thick, oblong, bicalous, with lateral lobes below the middle, and a pair of auricles at the base. *Acianthera* species are distributed from Mexico to Argentina and Uruguay, through Central America and the Antilles, and the genus is notably species-rich in Brazil.

Formal sectional status has been assigned to several groups of species belonging to subgen. *Acianthera* (Lindley, 1859; Barbosa Rodrigues, 1882; Luer, 1986; Chiron and van den Berg, 2012), and a few subsections were also proposed (Chiron and van den Berg, 2012). Our genetic analyses do not include enough samples in some of the groups to test their consistence on a broader geographical scale, and our inclusions of the sectional groups into the synonymy of subgen. *Acianthera* is aimed at providing a general frame of the subgenus' taxonomy and of those names that actually refer to the same taxa.

## 2. *Acianthera* subgen. *Antilla* (Luer) Karremans, *comb. nov.*

Basionym: *Antilla* (Luer) Luer, Monogr. Syst. Bot. Missouri Bot. Gard. 95: 255. 2004. *Pleurothallis* subgen. *Antilla* Luer, Monogr. Syst. Bot. Missouri Bot. Gard. 79: 39. 2000. *Acianthera* sect. *Antilla* (Luer) A.Douchette, Phytotaxa 275(3): 270. 2016. TYPE: *Acianthera trichophora* (Lindl.) A.Douchette, Phytotaxa 275(3): 270.

Synonyms: *Proctoria* Luer, Monogr. Syst. Bot. Missouri Bot. Gard. 95: 258. 2004. *Acianthera caymanensis* (C.D.Adams) Karremans.

*Dondodia* Luer, Monogr. Syst. Bot. Missouri Bot. Gard. 105: 85. 2006. TYPE: *Acianthera cymbiformis* (Dod) Pridgeon & M.W.Chase, Lindleyana 16: 243. 2001.

*Acianthera alainii* (Dod) A.Douchette, Phytotaxa 275(3): 270. 2016.

Basionym: *Pleurothallis alainii* Dod, Moscosoa 3: 54. 1978.

*Acianthera alpestris* (Sw.) A.Douchette, Phytotaxa 275(3): 270. 2016.

Basionym: *Epidendrum alpestre* Sw., Prodr. Veg. Ind. Occ.: 125. 1788.

*Acianthera appendiculata* (Cogn.) A.Douchette, Phytotaxa 275(3): 270. 2016.

Basionym: *Pleurothallis appendiculata* Cogn., in I.Urban, Symb. Antill. 7: 174. 1912.

*Acianthera bahoruense* (Luer) A.Douchette, Phytotaxa 275(3): 270. 2016.

Basionym: *Pleurothallis bahoruensis* Luer, Lindleyana 14: 108. 1999.

*Acianthera caymanensis* (C.D.Adams) Karremans, *comb. nov.*

Basionym: *Pleurothallis caymanensis* C.D.Adams, Orquideologia 6: 146. 1971.

*Acianthera compressicaulis* (Dod) Pridgeon & M.W. Chase, Lindleyana 16(4): 243. 2001.

Basionym: *Pleurothallis compressicaulis* Dod, Moscosoa 3: 113. 1981.

*Acianthera cymbiformis* (Dod) Pridgeon & M.W.Chase, Lindleyana 16: 243. 2001.

Basionym: *Pleurothallis cymbiformis* Dod, Moscosoa 3: 101. 1984. Replacement name for *Cryptophoranthus erosus* Garay.

*Acianthera denticulata* (Cogn.) Karremans, *comb. nov.*

Basionym: *Pleurothallis denticulata* Cogn. in I.Urban, Symb. Antill. 6: 425. 1909.

Synonym: *Pleurothallis parvula* Ames & C.Schweinf., Schedul. Orchid. 8: 30. 1925.



*Acianthera erosa* (Urb.) A.Douchette, *Phytotaxa* 275(3): 270. 2016.

Basionym: *Pleurothallis erosa* Urb., *Repert. Spec. Nov. Regni Veg.* 15: 104. 1917.

*Acianthera laxa* (Sw.) A.Douchette, *Phytotaxa* 275(3): 270. 2016.

Basionym: *Epidendrum laxum* Sw., *Prodr. Veg. Ind. Occ.*: 125. 1788.

*Acianthera murex* (Rchb.f.) Luer, *Monogr. Syst. Bot. Missouri Bot. Gard.* 115: 257. 2009.

Basionym: *Pleurothallis murex* Rchb.f., *Flora* 48: 276. 1865.

Synonym: *Pleurothallis papulifolia* Luer, *Lindleyana* 14(2): 116. 1999.

*Acianthera oricola* (H. Stenzel) Karremans, Chiron & Van den Berg, *Phytotaxa* 270(1): 60. 2016.

Basionym: *Pleurothallis oricola* H. Stenzel, *Willdenowia* 32(1): 101. 2002.

*Acianthera pendens* (Dod) A.Douchette, *Phytotaxa* 275(3): 270. 2016.

Basionym: *Pleurothallis pendens* Dod, *Moscoso* 1(2): 49. 1977.

*Acianthera privigna* (Luer) A.Douchette, *Phytotaxa* 275(3): 270. 2016.

Basionym: *Pleurothallis privigna* Luer, *Lindleyana* 14: 118. 1999.

*Acianthera prostrata* (Lindl.) A.Douchette, *Phytotaxa* 275(3): 270. 2016.

Basionym: *Pleurothallis prostrata* Lindl., *Ann. Mag. Nat. Hist.*, III, 1: 327. 1858.

*Acianthera quisqueyana* (Dod) A.Douchette, *Phytotaxa* 275(3): 270. 2016.

Basionym: *Pleurothallis quisqueyana* Dod, *Moscoso* 1: 51. 1977.

*Acianthera stenzelii* Luer, *Mem. New York Bot. Gard.* 109: 575. 2014.

*Acianthera trichophora* (Lindl.) A.Douchette, *Phytotaxa* 275(3): 271. 2016.

Basionym: *Pleurothallis trichophora* Lindl., *Ann. Mag. Nat. Hist.*, III, 1: 326. 1858.

Eighteen species belong to *Acianthera* subgen. *Antilla*. They can be recognized by the ramicaul shorter to about as long as the, elliptical and sessile, leaf. The leaves are notably coriaceous, sometimes verruculose on the adaxial surface and frequently with denticulate or erose margins. The inflorescence is a loose, frequently flexuous and pendulous, raceme emerging from the spathe at the base of the leaf. The ovary of most species is notoriously spiculate-verrucose. Dorsal sepal almost completely free, ovate, acute, lateral sepals connate, concave, bifid at the apex. The

petals are narrow, entire to microscopically serrate, acute. The lip in most species is conspicuously unguiculate, the blade is bicallous, with a pair of lateral lobes near the middle and minutely auriculate at the base, with the apex obtuse. The column is elongate, clavate, broadly winged close to the apex, conspicuously fimbriate-dentate at the apex. The species of *Antilla* are endemic to the Antilles, where they are restricted to the Cayman Islands, Cuba, Hispaniola, Jamaica and Puerto Rico (Luer 2014).

**3. *Acianthera* subgen. *Brenesia* (Schltr.) Karremans, *comb. nov.***

Basionym: *Brenesia* Schltr., *Repert. Spec. Nov. Regni Veg.*, Beih. 19: 199. 1923. TYPE: *Acianthera costaricensis* (Schltr.) Pupulin & Karremans.

*Acianthera costaricensis* (Schltr.) Pupulin & Karremans, *comb. nov.*

Basionym: *Brenesia costaricensis* Schltr., *Repert. Spec. Nov. Regni Veg. Beih.* 19: 200. 1923.

This species has traditionally been considered a synonym of *A. johnsonii*, however, it is morphologically quite different. *Acianthera costaricensis* has larger plants that mostly produce basal inflorescences (vs. mostly apical), has yellow sepals that are conspicuously long hirsute (vs. reddish-cream and shortly puberulent), and has lanceolate petals (vs. oblong). Photographs of both are shown in the figures.

*Acianthera herrerae* (Luer) Solano & Soto Arenas, *Icon. Orchid.* 5-6: x. 2002 [2003].

Basionym: *Pleurothallis herrerae* Luer, *Lindleyana* 6: 100. 1991.

*Acianthera johnsonii* (Ames) Pridgeon & M.W. Chase, *Lindleyana* 16(4): 244. 2001.

Basionym: *Pleurothallis johnsonii* Ames, *Sched. Orch.* 2: 21. 1923.

*Acianthera sotoana* Solano, *Lankesteriana* 9(3): 447. 2010.

Species of *Acianthera* subgen. *Brenesia* can be recognized by the large fleshy plants, and especially by the multiflowered inflorescence that can be produced both on the apex and the lowermost nodes of the ramicaul. The flowers do not spread widely, are fleshy and hirsute-papillose externally. The four species of this subgenus are only found from Mexico to Panama (Bogarín et al., 2014; Solano-Gómez, 2015).

**4. *Acianthera* subgen. *Kraenzlinella* (Kuntze) Karremans, *comb. nov.***

Basionym: *Kraenzlinella* Kuntze, *Lex. Gen. Phan.*: 310. 1903.

Synonyms:

*Otopetalum* F.Lehm. & Kraenzl., *Bot. Jahrb. Syst.* 26: 457. 1899, *nom. illeg.*

*Pleurothallis* subgen. *Kraenzlinella* (Kuntze) Luer, *Monogr. Syst. Bot. Missouri Bot. Gard.* 20: 44. 1986.

*Acianthera* sect. *Kraenzlinella* (Kuntze) A.Douchette, Phytotaxa 275(3): 271. 2016. TYPE: *Acianthera tunguraguae* (F.Lehm. & Kraenzl.) A.Douchette, Phytotaxa 275(3): 272.

*Acianthera echinocarpa* (C.Schweinf.) A.Douchette, Phytotaxa 275(3): 271. 2016.  
Basionym: *Pleurothallis echinocarpa* C.Schweinf., Bot. Mus. Leaflet. 10: 179. 1942.

*Acianthera erinacea* (Rchb.f.) A.Douchette, Phytotaxa 275(3): 271. 2016.  
Basionym: *Pleurothallis erinacea* Rchb.f., Bonplandia (Hannover) 3: 72. 1855.

*Acianthera gigantea* (Lindl.) A.Douchette, Phytotaxa 275(3): 271. 2016.  
Basionym: *Pleurothallis gigantea* Lindl., Fol. Orchid. 9: 28. 1859.

*Acianthera hintonii* (L.O.Williams) A.Douchette, Phytotaxa 275(3): 271. 2016.  
Basionym: *Pleurothallis hintonii* L.O.Williams, Amer. Orchid Soc. Bull. 9: 69. 1940.

*Acianthera lappago* (Luer) A.Douchette, Phytotaxa 275(3): 272. 2016.  
Basionym: *Pleurothallis lappago* Luer, Phytologia 46: 368. 1980.

#### ADDITIONAL TRANSFERS TO *ACIANTHERA*

*Acianthera albiflora* (Barb.Rodr.) Karremans, *comb. nov.*  
Basionym: *Pleurothallis albiflora* Barb.Rodr., Vellozia, ed. 2, 1: 116. 1891.

*Pleurothallis albiflora* has traditionally been placed under the synonym of *Acianthera hygrophila* (Barb.Rodr.) Pridgeon & M.W.Chase. From Barbosa Rodrigues' original drawings and descriptions it can be distinguished from the latter by the wider and longer leaves, the much shorter and congested inflorescences, the more compact flowers, the sub-trapezoid petals and the differently shaped lip, with a much larger difference between the width below the middle and below the apex, and a recurved apex. The flowers are said to be fully white, and not dirty-white with carmine markings.

*Acianthera barthelemyi* (Luer) Karremans, *comb. nov.*  
Basionym: *Pleurothallis barthelemyi* Luer, Bull. Mus. Natl. Hist. Nat., B, Adansonia 16: 231. 1994(1995).

*Acianthera beyrodtiana* (Kraenzl.) Karremans, *comb. nov.*  
Basionym: *Pleurothallis beyrodtiana* Kraenzl., Repert. Spec. Nov. Regni Veg. 6: 65. 1908.

The type specimen of this species clearly shows the plant morphology of a species of *Acianthera* as defined here.

*Acianthera brunnescens* (Schltr.) Karremans, *comb. nov.*  
Basionym: *Pleurothallis brunnescens* Schltr., Repert. Spec. Nov. Regni Veg. Beih. 19: 183. 1923.

*Acianthera nellyae* (P.Ortiz) Karremans, *comb. nov.*  
Basionym: *Pleurothallis nellyae* P.Ortiz, Orquideología 20: 325. 1997.

*Acianthera phrynoglossa* (Luer & Hirtz) A.Douchette, Phytotaxa 275(3): 272. 2016.  
Basionym: *Pleurothallis phrynoglossa* Luer & Hirtz, Monogr. Syst. Bot. Missouri Bot. Gard. 65: 116. 1998.

*Acianthera sigmoidea* (Ames & C.Schweinf.) A.Douchette, Phytotaxa 275(3): 272. 2016.  
Basionym: *Pleurothallis sigmoidea* Ames & C.Schweinf., Schedul. Orchid. 10: 36. 1930.

*Acianthera tunguraguae* (F.Lehm. & Kraenzl.) A.Douchette, Phytotaxa 275(3): 272. 2016.  
Basionym: *Otopetalum tunguraguae* F.Lehm. & Kraenzl., Bot. Jahrb. Syst. 26: 457. 1899.

Nine species belong to *Acianthera* subgen. *Kraenzlinella*. They can be recognized by the short, stout ramicaul and a longer, fleshy, sessile leaf, a racemose inflorescence with successive flowers, and the ovaries variously ornamented. The flowers are fleshy and have more or less free, carinate sepals. The petals are more or less auriculate at the base, the unguiculate lip with a biauriculate claw. The column is slender, winged, the clinandrium hooded. They are distributed from Mexico through Central America into Bolivia (Luer, 1994).

*Pleurothallis brunnescens* originally described from San Ramón, Costa Rica has long been considered a synonym of *Acianthera lojiae* (Schltr.) Luer, based on a type from Loja, Ecuador. The two localities have little flora in common, and even though the floral details might be somewhat similar the two have quite dissimilar plant morphology. As it is hard to believe that they represent the same species, a combination for *P. brunnescens* in *Acianthera* is required.

*Acianthera cachensis* (Ames) Karremans, *comb. nov.*  
Basionym: *Pleurothallis cachensis* Ames, Schedul. Orchid. 4: 17. 1923.

Luer placed this species in genus *Unguella* which is here considered a synonym of *Acianthera*.

*Acianthera minuta* (Rolfe) Karremans, *comb. nov.*  
Basionym: *Cryptophoranthus minutus* Rolfe, Bull. Misc. Inform. Kew 1895: 5. 1985.

This species is most probably closely related to *Acianthera punctatiflora* and *A. minima*, it would have priority over any of the two.

*Acianthera paradoxa* (Luer & Dalström) Karremans, *comb. nov.*  
Basionym: *Pleurothallis paradoxa* Luer & Dalström, Lindleyana 11: 177. 1996.

Luer (2005) placed this species in genus *Didactylus* which is here considered a synonym of *Acianthera*.

*Acianthera purpurascens* (Luer & Hirtz) Karremans, *comb. nov.*

Basionym: *Pleurothallis purpurascens* Luer & Hirtz, *Lindleyana* 11(3): 181. 1996.

*Acianthera scabripes* (Lindl.) Karremans, *comb. nov.*

Basionym: *Pleurothallis scabripes* Lindl., *Edwards's Bot. Reg.* 25(Misc.): 94. 1839.

We agree with Luer (1992) that this is not a *Myoxanthus* species on account of the few flowers born from a spathe,

with sepals much longer than petals and lateral sepals fused into a synsepal.

*Acianthera thysana* (Luer & J.Portilla) Karremans, *comb. nov.*

Basionym: *Pleurothallis thysana* Luer & J.Portilla, *Revista Soc. Boliv. Bot.* 3: 62. 2001.

Luer (2005) placed this species in genus *Didactylus* which is here considered a synonym of *Acianthera*.

#### ADDITIONAL PROPOSED TRANSFERS

*Anathallis anfracta* (Luer) Karremans, *comb. nov.*

Basionym: *Pleurothallis anfracta* Luer, *Monogr. Syst. Bot. Missouri Bot. Gard.* 52: 92. 1994.

This unusual species was placed in *Kraenzlinella* by

Luer (1994). The DNA evidence presented here shows that it actually belongs in genus *Anathallis* Barb.Rodr. It is most likely closely related to *Anathallis smaragdina* (Luer) Pridgeon & M.W.Chase.

#### LITERATURE CITED

- BARBOSA RODRIGUES, J. 1877. *Genera et Species Orchidearum Novarum*, I. Sebastianopolis, Brazil.
- . 1882. *Genera et species orchidearum novarum* II. Sebastianopolis, Brazil.
- BOGARÍN, D., A. P. KARREMANS, AND F. PUPULIN. 2008. New species and records of Orchidaceae from Costa Rica. *Lankesteriana* 8(2): 53–74.
- BOGARÍN, D., D., Z. SERRACÍN, Z. SAMUDIO, R. RINCÓN, AND F. PUPULIN. 2014. An updated checklist of the Orchidaceae of Panama. *Lankesteriana* 14 (1): 135–364.
- BORBA, E. L., G. J. SHEPPERD, C. VAN DEN BERG, AND J. SEMIR. 2002. Floral and Vegetative Morphometrics of Five *Pleurothallis* (Orchidaceae) Species: Correlation with Taxonomy, Phylogeny, Genetic Variability and Pollination Systems. *Annals of Botany* 90: 219–230.
- CHIRON, G. R., AND C. VAN DEN BERG. 2012. Révision taxinomique du genre *Acianthera* (Orchidaceae, Pleurothallidinae). *Richardiana* 12: 59–77.
- CHIRON, G. R., J. GUIARD, AND C. VAN DEN BERG. 2012. Phylogenetic relationships in Brazilian *Pleurothallis* sensu lato (Pleurothallidinae, Orchidaceae): evidence from nuclear ITS rDNA sequences. *Phytotaxa* 46: 34–58.
- DRUMMOND, A. J., M. A. SUCHARD, D. XIE, AND A. RAMBAUT. 2012. Bayesian phylogenetics with BEAUti and the BEAST 1.7. *Mol. Biol. Evol.* 29: 1969–1973.
- HOEHNE, F. C. 1936. *Orchidaceas dos Herbários de Alexandre Curt Brade e do Museu Nacional*. *Boletim do Museu Nacional* 12: 1–37.
- KARREMANS, A. P. 2014. *Lankesteriana*, a new genus in the Pleurothallidinae (Orchidaceae). *Lankesteriana* 13(3): 319–332.
- . 2016. *Genera Pleurothallidarum*: an updated phylogenetic overview of Pleurothallidinae. *Lankesteriana* 16(2): 219–241.
- KARREMANS, A. P., AND M. RINCÓN-GONZÁLEZ. 2015. Nomenclatural notes in the Pleurothallidinae (Orchidaceae): *Apodaproprepentia*. *Phytotaxa* 238(2): 174–182.
- KARREMANS, A. P., F. J. ALBERTAZZI, F. T. BAKKER, D. BOGARÍN, M. C. M. EURLINGS, A. PRIDGEON, F. PUPULIN, AND B. GRAVENDEEL. 2016. Phylogenetic reassessment of *Specklinia* and its allied genera in the Pleurothallidinae (Orchidaceae). *Phytotaxa* 272(1): 1–36.
- KATO, K., AND D. M. STANDLEY. 2013. MAFFT multiple sequence alignment software version 7: improvements in performance and usability. *Mol. Biol. Evol.* 30: 772–780. <http://dx.doi.org/10.1093/molbev/mst010>.
- LAHAYE, R., M. VAN DER BANK, D. BOGARÍN, J. WARNER, F. PUPULIN, G. GIGOT, O. MAURIN, S. DUTHOIT, T.G. BARRACLOUGH, AND V. SAVOLAINEN. 2008. DNA barcoding the floras of biodiversity hotspots. *Proc. Natl. Acad. Sci. USA* 105: 2923–2928.
- LINDLEY, J. 1859. *Folia Orchidaceae*. Matthews, London.
- LUER, C. A. 1986. Systematics of the genus *Pleurothallis* (Orchidaceae). *Monogr. Syst. Bot. Missouri Bot. Gard.* 20: 1–108.
- . 1992. *Icones Pleurothallidarum IX*. Systematic of *Myoxanthus*. Addenda Addenda to *Platystele*, *Pleurothallis*, subgenus *Scopula* and *Scaphosepalum* (Orchidaceae). *Monogr. Syst. Bot. Missouri Bot. Gard.* 44: 1–128.
- . 1994. *Icones Pleurothallidarum XI* Systematics of *Lepanthes* Subgenus *Brachycladium* and *Pleurothallis* Subgenus *Aenigma*, Subgenus *Elongatia*, Subgenus *Kraenzlinella* (Orchidaceae). *Monogr. Syst. Bot. Missouri Bot. Gard.* 52: 1–137.
- . 2000. *Icones Pleurothallidarum XX*. Systematics of *Jostia*, *Andinia*, *Barbosella*, *Barbrodia*, *Pleurothallis* subgen. *Antilla*, subgen. *Effusia*, subgen. *Restrepoidia*. Addenda to *Lepanthes*, *Masdevallia*, *Platystele*, *Pleurothallis*, *Restreplopsis*, *Scaphosepalum*, and *Teagueia*. *Monogr. Syst. Bot. Missouri Bot. Gard.* 79: 1–140.
- . 2004. *Icones Pleurothallidarum XXVI*. Systematics of *Pleurothallis* subgenus *Acianthera* (Orchidaceae); A second century of new species of *Stelis*; *Epibator*, *Ophidion*, *Zootrophion*. *Monogr. Syst. Bot. Missouri Bot. Gard.* 95: 1–265.
- . 2005. *Icones Pleurothallidarum XXVII*. *Dryadella* and *Acronia* section *Macrophyllae-Fasciculatae*. *Monogr. Syst. Bot. Missouri Bot. Gard.* 103: 1–310.
- . 2006. *Icones Pleurothallidarum XXVIII*. Reconsideration of *Masdevallia*, and the Systematics of *Specklinia* and vegetatively similar genera (Orchidaceae). *Monogr. Syst. Bot. Missouri Bot. Gard.* 105: 1–274.
- . 2007. *Icones Pleurothallidarum XXIX*. A third century of *Stelis* of Ecuador; Systematics of *Apoda-proprepentia*; Systematics of Miscellaneous small genera; Addenda: new genera, species and combination (Orchidaceae). *Monogr. Syst. Bot. Missouri Bot. Gard.* 112: 1–130.
- . 2014. *Pleurothallis*. Pages 366–429 in J. D. Ackerman, ed., *Orchid Flora of the Greater Antilles*. The New York Botanical Garden Press, New York.
- MADDISON, W. P., AND D. R. MADDISON. 2007. Mesquite: a modular system for evolutionary analysis. *Mesquite v. 2.72*. <http://mesquiteproject.org>

- PRIDGEON, A. M. 2005. *Acianthera*. Pages 328–331 in A. M. PRIDGEON, P. J. CRIBB, M. W. CHASE AND F. N. RASMUSSEN, EDS. *Genera Orchidacearum*, 4. Epidendroideae (Part One). Oxford University Press, Oxford.
- AND M. W. CHASE. 2001. A phylogenetic reclassification of Pleurothallidinae (Orchidaceae). *Lindleyana* 16: 235–271.
- PRIDGEON, A. M., R. SOLANO-GÓMEZ, AND M. W. CHASE. 2001. Phylogenetic relationships in Pleurothallidinae (Orchidaceae): combined evidence from nuclear and plastid DNA sequences. *Am. J. Bot.* 88: 2286–2308. <http://dx.doi.org/10.2307/3558390>
- PUPULIN, F., G. ROJAS, AND J. D. ZÚÑIGA. 2007. Three new species of *Acianthera* (Orchidaceae: Pleurothallidinae) from Costa Rica. *Harv. Pap. Bot.* 12(1): 155–162.
- RAMBAUT, A. 2009. FigTree v1.3.1. <http://tree.bio.ed.ac.uk/software/>
- RODRIGUES, V. T., E. C. SMIDT, AND F. BARROS. 2015. Revisão taxonômica de *Acianthera* sect. *Pleurobotryae* (Orchidaceae, Pleurothallidinae). *Hoehnea* 42(4): 615–627.
- SOLANO-GÓMEZ, R. 2003. *Acianthera unguicallosa* (L.O. Williams) Solano. Plate 512 in E. HÁGSATER AND M. A. SOTO, EDS. *Orchids of Mexico*, parts 2 and 3. *Icones Orchidacearum* 5–6. Instituto Chinoín, A. C., Mexico D. F.
- . 2015. A taxonomic synopsis of the Mexican species of *Acianthera* (Orchidaceae: Pleurothallidinae) including a new species. *Phytotaxa* 218(1): 39–60.
- , G. A. SALAZAR, AND R. JIMÉNEZ. 2011. New combinations in Orchidaceae of Mexico. *Acta Bot. Mex.* 97: 49–56.
- STADEN, R., D. P. JUDGE, AND J. K. BONFIELD. 2003. Analyzing sequences using the Staden Package and EMBOSS. Pages 393–410 in S. A. KRAWETZ AND D. D. WOMBLE, EDS. *Introduction to Bioinformatics. A Theoretical and Practical Approach*. Human Press Inc., New Jersey.
- STENZEL, H. 2004. Systematics and evolution of the genus *Pleurothallis* R. Br. (Orchidaceae) in the Greater Antilles. Dissertation thesis. Mathematisch–Naturwissenschaftlichen Fakultät I der Humboldt–Universität zu Berlin.
- . 2007. Orchidaceae II. Pleurothallidinae 1. Pages 1–152 in W. GREUTER AND R. RANKIN RODRÍGUEZ, EDS. *Flora de la Republica de Cuba*. Fascicle 12(2). Gantner, Liechtenstein.
- SUN, Y., D. Z. SKINNER, G. H. LIANG, AND H. HULBERT. 1994. Phylogenetic analysis of *Sorghum* and related taxa using internal transcribed spacers of nuclear ribosomal DNA. *Theor. Appl. Genet.* 89: 26–32



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## A NEW SPECIES OF *CALYPTRANTHES* (MYRTACEAE) FROM PERU

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**Abstract.** A new species of Myrtaceae from lowland forests of Peru is described and illustrated. *Calyptranthes mcvaughii* is characterized by the subsessile, ovate to lanceolate leaves, obtuse to subcordate at base and by the spiciform panicles.

**Resumen.** Se describe y se ilustra una especie nueva de Myrtaceae proveniente de bosques húmedos de las tierras bajas del Perú. *Calyptranthes mcvaughii* se caracteriza por las hojas subsésiles, ovadas a lanceoladas, obtusas a subcordadas en la base y por las panículas espiciformes.

**Keywords:** *Calyptranthes*, Myrtaceae, Peru

*Calyptranthes* Sw. is a genus of Myrtaceae traditionally included in the subtribe Myrciinae O. Berg (Berg, 1855); probably more than 200 species occur in the tropical and subtropical regions of America, from southeastern United States (Florida) to Mexico, Central and South America, and the Caribbean. The species of *Calyptranthes* are trees or shrubs usually characterized by: stems branching predominantly bifurcate, the branchlets often bicarinate to 2-winged; flowers in paired panicles, the calyx closed in bud, calyptriiform and circumscissile, the calyptra deciduous; petals absent or inconspicuous; ovary 2-locular, with two ovules per locule; fruits globose to oblate, dark purple when mature, crowned by a circular scar; seeds 1 or 2; embryo myrcioid, with cotyledons leafy and folded, the radicle well developed, equaling cotyledons in length.

*Calyptranthes* is represented in Peru by ca. 20 to 25 species (McVaugh, 1958; Holst, 1993; Tropicos 2016). In this contribution, a new species of *Calyptranthes* from lowland forests of Tocache, San Martín, is described and illustrated.

***Calyptranthes mcvaughii*** M. L. Kawas. & D. Santam., *sp. nov.* TYPE: PERU. San Martín: Tocache Province, Tocache District (Mariscal Cáceres, Tocache Nuevo on label), trail to Santa Rosa, right margin of Río Mishollo, 350–370 m, 5 August 1973 (fl), *J. Schunke Vigo 6706* (Holotype: MICH; Isotypes: F, MO). Fig. 1.

Differs from other species of *Calyptranthes* by the combination of the following characters: subsessile, ovate to lanceolate leaves, obtuse to subcordate at base and flowers in spiciform panicles.

*Shrubs* 1.5–5 m high, the trichomes on leaves, inflorescences and flowers dibrachiate, yellowish to yellowish-brown; branchlets terete to compressed in cross section. *Leaf blades* subsessile, ovate to lanceolate, subcoriaceous, (14–) 16–24.5 × (6–) 7–9 cm, the upper surface glabrous, drying olive-green, the lower surface

puberulous, yellowish-green; glands punctiform, indistinct on both surfaces or impressed above; midvein impressed above, convex below; lateral veins 13–17 pairs, slightly impressed above, salient below; marginal veins 2, the innermost arched, 5–10 mm from blade margin, similar to the lateral veins in prominence; apex abruptly acuminate, the acumen to ca. 5 mm long; base obtuse to subcordate; petioles to 5 mm long, channeled, glabrous, dark. *Inflorescences* subterminal, of paired spiciform, narrow panicles, 13–17 cm long, puberulous, the lower branches to 2 cm long; bracts and bracteoles not seen, early deciduous. *Flower buds* closed, obovoid, 3–4 mm long, gland-dotted, sessile; hypanthium prolonged ca. 2 mm beyond the ovary, appressed-pubescent to puberulous, somewhat furfuraceous at the base; calyx calyptriiform, obtuse to minutely apiculate, puberulous to glabrous, deciduous; petals not seen; disk ca. 2 mm diam., glabrous; stamens numerous, the filaments ca. 5–7 mm long, the anthers ca. 0.5 mm long; style ca. 1 cm long, the stigma punctiform; ovary 2-locular, with 2 ovules per locule. *Fruit* (immature, only one seen) globose, reddish, crowned by a circular scar, ca. 8 mm diam., glabrous, gland-dotted; seed coat membranous; embryo myrcioid, the cotyledons leafy and folded, the radicle elongate, equaling the cotyledons in length.

*Calyptranthes mcvaughii* is characterized by the subsessile (petioles to 5 mm long), ovate to lanceolate leaves, 14–24.5 cm long, that are obtuse to subcordate at base and by the spiciform panicles. Among the Peruvian species, *Calyptranthes mcvaughii* could be misidentified as *C. sessilis* McVaugh or *C. plicata* McVaugh. In these two species, however, the leaves are sessile and cordate at base; in *C. sessilis*, the leaves are ovate, usually smaller (to 19 cm long), and the flower buds are fusiform and larger, 6–7 mm long (vs. obovoid, 3–4 mm long); in *C. plicata*, the leaves are obovate to oblanceolate, larger (30–55 cm long), with 20–25 (vs. 13–17) pairs of lateral veins, and

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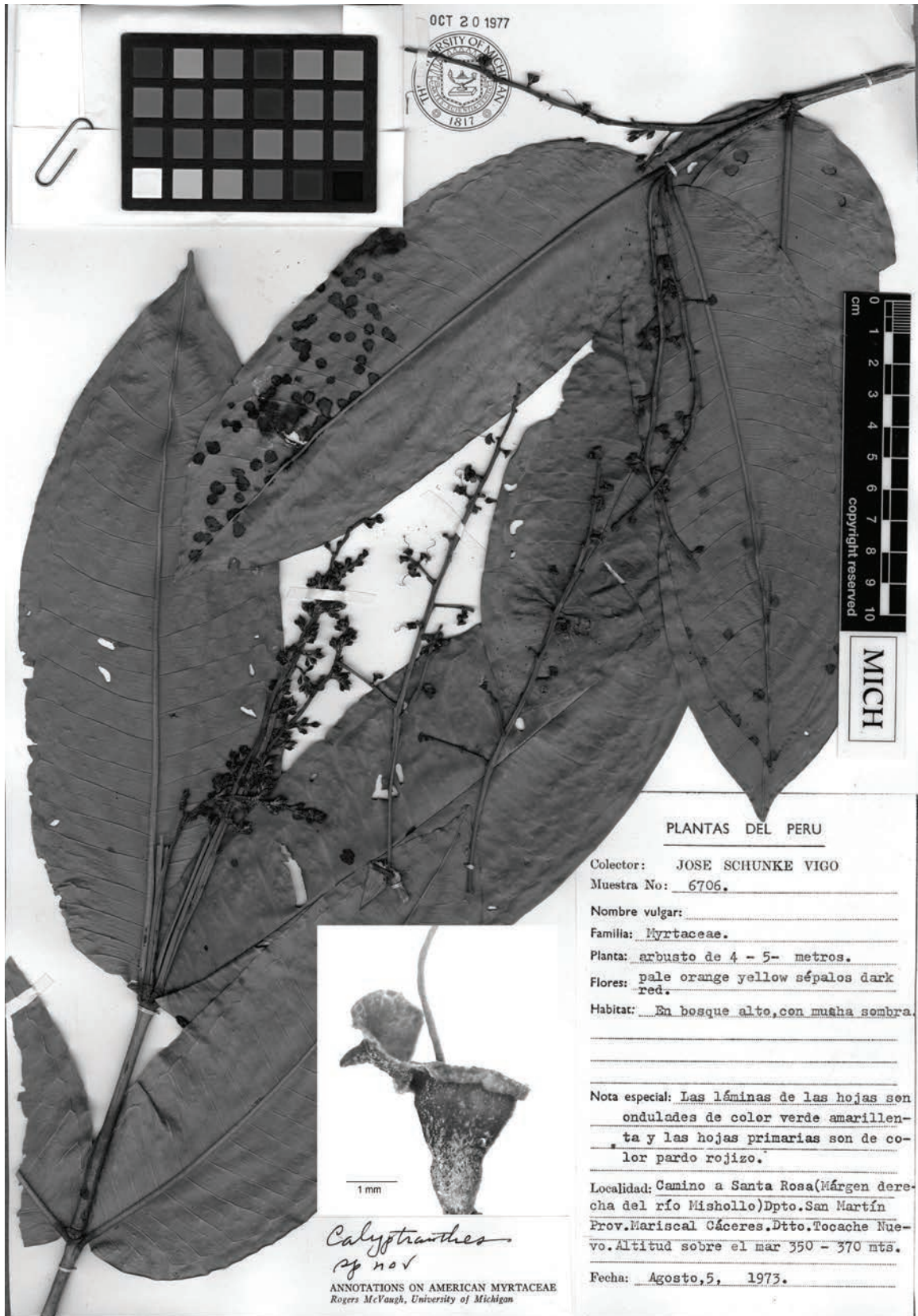


FIGURE 1. *Calyptanthes mcvaughii* M. L. Kawas. & D. Santam. Photograph of the holotype, *Schunke Vigo 6706* (MICH). Inset, flower after anthesis with calytra attached, from isotype at F.

the inflorescences are shorter (to 7 cm long vs. 13–17 cm long), on leafless nodes (vs. subterminal). *Calyptranthes brevispicata* McVaugh, a species from Peru and Ecuador, is similar to *C. mcvaughii* in the spiciform panicles, but it differs in the petiolate (petioles 5–10 mm long), narrowly elliptic to elliptic leaves, obtuse to cuneate at base.

**Eponymy:** Named in memory of Dr. Rogers McVaugh (1909–2009), who first recognized this species as new (annotated on specimens at F, MICH, and MO). Dr. McVaugh's outstanding work on Myrtaceae established the contemporary basis for taxonomic studies on the family in the Neotropics.

**Additional Specimens Examined:** PERU. San Martín: Tocache Prov., Tocache Distr. (Mariscal Cáceres, Tocache

Nuevo on label), Tananta, left margin of Río Huallaga, 5 October 1970 (fl), *J. Schunke Vigo 4474* (F, US); Río Canuto, "Curarelandia," property of José Schunke Vigo, near km 23 along road from Tocache Nuevo to Puerto Pizana, ca. 8°06'S, 76°36'W, 475 m, 19 December 1981 (fr), *T. Plowman & J. Schunke Vigo 11507* (F).

**Distribution and habitat:** In lowland forests (350–475 m) in the region of Tocache, San Martín.

**Phenology:** Collected with flowers in August and October and with fruits in December.

**Conservation Status:** Known only from three collections made 35 to 45 years ago in the same region; it is evaluated as Vulnerable [VU: B2ab(iii)] according to the IUCN Red List (IUCN, 2001).

#### LITERATURE CITED

- BERG, O. 1855–1856. Revisio Myrtacearum Americae. *Linnaea* 27: 1–472.
- HOLST, B. K. 1993. Myrtaceae. Pages 736–750 in L. BRAKO AND J. L. ZARUCCHI, EDS. Catalogue of the Flowering Plants and Gymnosperms of Peru. Monogr. Syst. Bot. Missouri Bot. Gard. 45.
- IUCN. 2001. IUCN Red List Categories and Criteria, Version 3.1. Prepared by the IUCN Species Survival Commission. IUCN Gland, Switzerland, and Cambridge, United Kingdom.
- MCVAUGH, R. 1958. Myrtaceae. *Fl. Peru. Publ. Field Mus. Nat. Hist., Bot. Ser.* 13(4/2): 569–818.
- TROPICOS 2016. Tropicos.org. Missouri Botanical Garden. <http://www.tropicos.org> (accessed June 17, 2016).



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# ICONES STELIDARUM (ORCHIDACEAE) COLOMBIAE II<sup>1</sup>

CARLYLE A. LUER<sup>2</sup>

**Abstract.** An additional fifty new species of *Stelis* from Colombia are described and illustrated in this the second of a series, of fifty species at a time, that includes those not identified when compared with any of the previously known species.

**Keywords:** Colombia, Orchidaceae, Pleurothallidinae, *Stelis*

While continuing to revise the genus *Stelis* Sw. for Colombia, an additional 50 new species are described and illustrated.

All species of the genus *Stelis* Sw. are distinguished by a short column that is closely surrounded by the petals and the lip into a compact unit, referred to herein as the “central apparatus.” The column bears two stigmas, sometimes confluent, and the anther with two pollinia; two short petals flank the column; and the lip below is closely associated with the undersurface of the column.

When describing species based on collections not gathered by the author, I add my illustration number to the protologue.

***Stelis aggregata*** Luer & R. Escobar, *sp. nov.* TYPE: COLOMBIA. Chocó: Urrao, south of the pass between Urrao and Carmen de Atrato, 2700 m, 20 May 1995, C. Luer, J. Luer, R. Escobar et al. 17632 (Holotype: MO). Fig. 1.

This medium-sized, caespitose species is characterized by numerous, simultaneous, many-flowered inflorescences about as long as an elliptical leaf; a five-veined dorsal sepal; three-veined petals; and an obtuse lip with the dorsum descending 45°.

*Plant* medium in size, epiphytic, densely caespitose. Ramicauls erect, slender, 13–15 cm long, with a close, tubular sheath from near the middle, another 2 sheaths below and at the base. *Leaf* erect, coriaceous, elliptical, acute, 9–10 cm long, with an ill-defined petiole, 2 cm wide in the dry state, cuneate below to the base. *Inflorescence* 3–12; 5–12 cm long, the racemes erect, strict, subcongested, distichous, many-flowered; floral bracts oblique, acute, 3.5 mm long; pedicels 2.5 mm long; ovary 1.5 mm long; the peduncle ca. 2 cm long, subtended by a fugacious spathe, from a node at the apex of the ramicaul; flowers rose-colored; *sepals* glabrous, expanded, ovate, connate below the middle, the dorsal sepal acute, 4 mm long, 3 mm wide, 5-veined, the lateral sepals oblique, 2.5 mm long, 3 mm wide, 4-veined; *petals* transversely semilunate, 1 mm long, 1.75 mm wide, 3-veined, concave, the apex broadly rounded, thickened, with a transverse carina; *lip* ovoid-triangular, 1 mm long, 1 mm wide, 0.5 mm deep, slightly concave below a thick bar without a glenion, the apex rounded with margin thick, the dorsum smooth, acutely descending to the base, the base connate to the base of the column; *column* stout, ca. 1 mm

long and wide, the anther and the stigmatic lobes apical.

**Etymology:** From the Latin *aggregatus*, “clustered,” referring to the fascicle of racemes.

This medium-sized, caespitose species is remarkable for the large number of simultaneous racemes about as long as the leaf. The dorsal sepal is five-veined and the petals are three-veined. The dorsum of the obtuse lip descends 45°.

***Stelis ambrosia*** Luer & R. Escobar, *sp. nov.* TYPE: COLOMBIA. Putumayo: between La Cocha and Sibundoy, 2700 m, 30 July 1978, C. Luer, J. Luer, R. Escobar et al. 3071 (Holotype: SEL). Fig. 2–3.

This medium to large species is distinguished by a repent rhizome of various lengths, and a long, successively flowered raceme that far exceeds the leaf; an elliptical, three-veined dorsal sepal; lateral sepals connate into a deeply concave synsepal; semilunate, three-veined petals; and a subquadrate lip with an acute apex and a glenion.

*Plant* medium to large, epiphytic, short- to long-repent, scandent, the rhizome slender, 1–7 cm long between ramicauls; roots slender. Ramicauls ascending, erect, 3–5 cm long, with a tubular sheath from near the middle and another 1–2 sheaths below and at the base. *Leaf* erect, coriaceous, elliptical, subacute, 4.5–7.5 cm long including a petiole 0.5–1 cm long, the blade 1–2.5 cm wide in the dry state. *Inflorescence* single; 8–14 cm long, the raceme erect, strict, congested, more or less secund, successively flowered, with many flowers open simultaneously; floral bracts oblique, acute, 2–2.5 mm long; pedicels 1 mm long; ovary 1 mm long; peduncle 2–3 cm long, from a node at the apex of the ramicaul; *sepals* glabrous, the dorsal sepal erect, elliptical, obtuse to round at the tip, 4–5 mm long, 3 mm wide, 3-veined, connate ca. 1 mm, the lateral sepals red-brown or yellow, oblique, connate to the tip into a deeply concave synsepal, 2 mm long, 4.5 mm wide; *petals* orange or purple, transversely semilunate, concave, the apex rounded, 0.6 mm long, 0.8–1 mm wide, 3-veined, with a transverse callus; *lip* orange or purple, subquadrate, 0.5 mm long, 0.8 mm wide, 0.5 mm deep, concave below a bar cleft with a glenion, the apex broadly obtuse with an acute, triangular apiculum, the dorsum convex with an low, ill-defined callus, the base truncate, hinged to the base of the column; *column* clavate, ca. 1 mm wide and long, the anther and the bilobed stigma apical.

The author is grateful to the staff of MO and SEL for making their specimens available for study, to S. Dalström for inking the figures presented herein, all based on pencil drawings by the author, and to the generosity of the Pleurothallid Alliance for making the inking possible.

<sup>1</sup> Part one of this series was published in Luer (2016).

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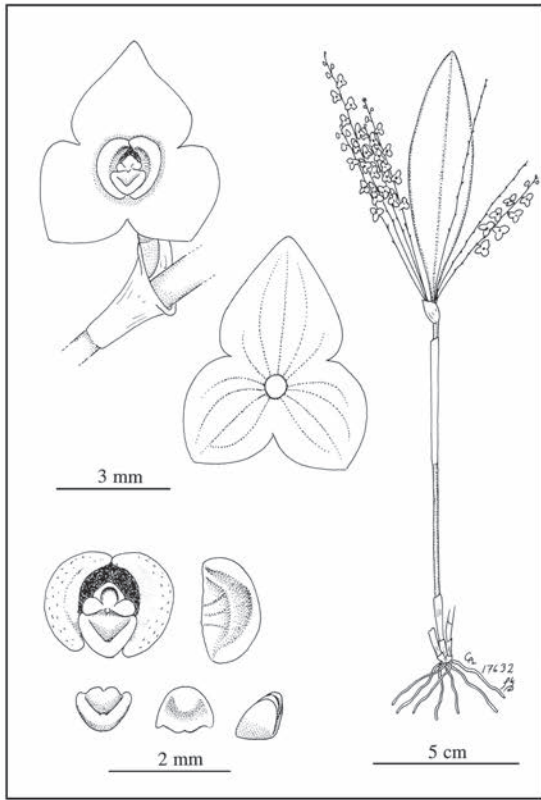


FIGURE 1. *Stelis aggregata* Luer & R. Escobar

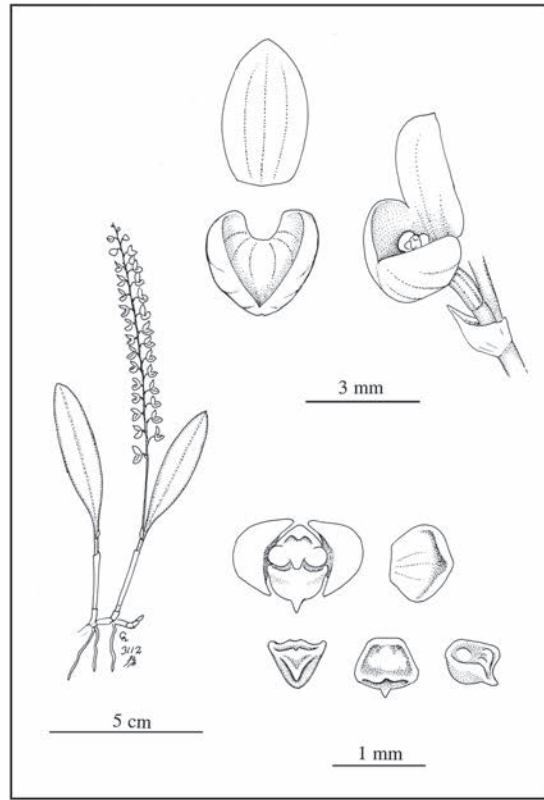


FIGURE 2. *Stelis ambrosia* Luer & R. Escobar

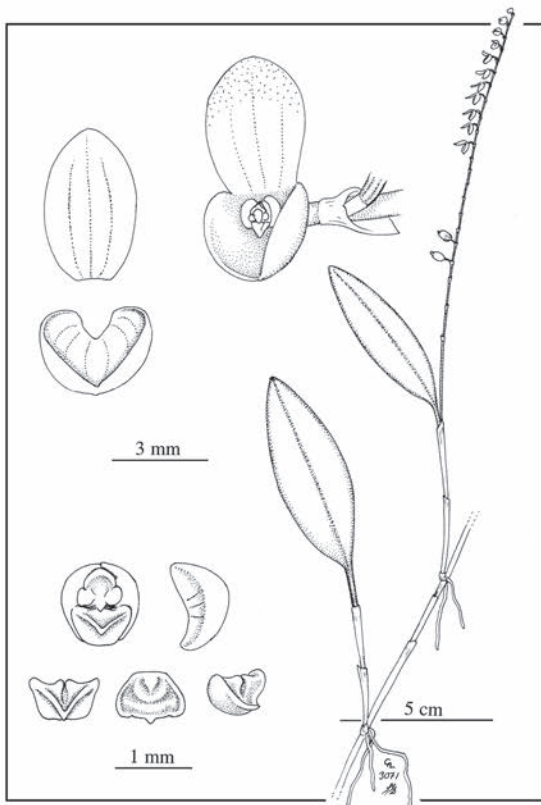


FIGURE 3. *Stelis ambrosia* Luer & R. Escobar

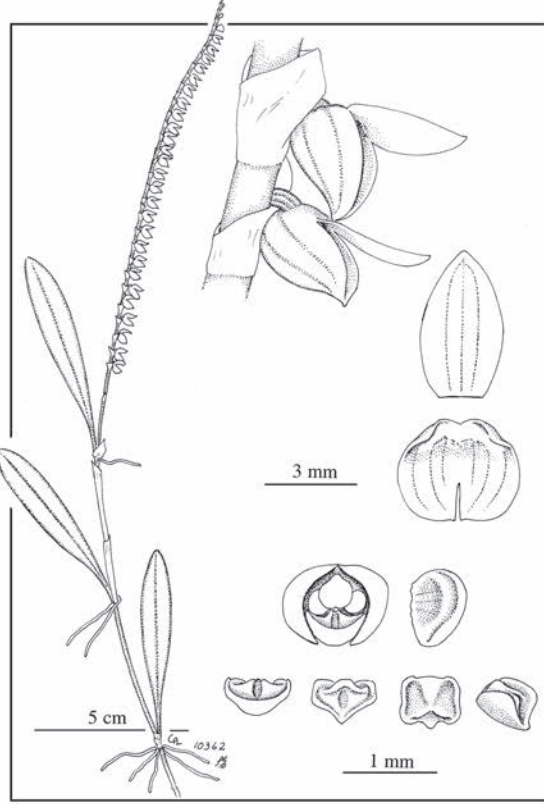


FIGURE 4. *Stelis arrecta* Luer & R. Escobar

**Etymology:** From the Latin *ambrosius*, “lovely,” referring to the appearance of a flowering plant.

**Additional specimens examined:** COLOMBIA. Putumayo: between La Cocha and Sibundoy, 2700 m, 30 July 1978, *C. Luer, J. Luer, R. Escobar et al.* 3075 (Holotype: SEL); same locality and date, *C. Luer, J. Luer, R. Escobar et al.* 3073, 3084, 3112 (Holotype: SEL); Santiago, San Antonio de Bellavista, Páramo de Bordoncillo, 3240 m, 18 March 1999, *S.M. Pasmíño & M.R. Posso* 013 (MO, PSO).

This species is repent, the lengths of the rhizome apparently influenced by local conditions, but details of the inflorescence remain the same. Flowers are produced slowly in a long raceme. Capsules are appearing low in the raceme, while many flowers persist above. The dorsal sepal is three-veined and elliptical with a rounded apex; the petals are three-veined; and the lip is short, broader than long, with an acute, triangular tip, and a deep glenion.

***Stelis arrecta*** Luer & R. Escobar, *sp. nov.* TYPE: COLOMBIA. Cundinamarca: between Une and Gutiérrez, south of Bogotá, 2200 m, 19 May 1984, *C. Luer, J. Luer & R. Escobar* 10362 (Holotype: MO). Fig. 4.

This species is distinguished by erect, prolific, branching ramicauls; racemes to twice longer than an elliptical leaf; a three-veined, dorsal sepal and a concave synsepal; thick, three-veined petals; and a short, broad lip with a glenion.

*Plant* medium in size to large, epiphytic, erect, prolific, branching, slender; roots slender from the node at the base of the leaf. Ramicauls erect, stout, 5–6 cm long, producing another ramicaul from the node at the base of the leaf, with an evanescent, tubular sheath from below the middle, and 1–2 other sheaths about the base. *Leaf* erect, coriaceous, elliptical, subacute, 6–7 cm long including a petiole ca. 1 cm long, the blade 1–1.5 cm wide in dry state, cuneate below into the petiole. *Inflorescence* single; 12–15 cm long, the raceme erect, secund, crowded, simultaneously many-flowered, floral bracts tubular, subacute, 3–4 mm long; pedicels 2 mm long; ovary 1.5 mm long; the peduncle ca. 2 cm long, from a fugacious spathe ca. 5 mm long at the apex of the ramicaul; flowers yellow; *sepals* glabrous, the dorsal sepal ovate, subacute, 4.5 mm long, 2.75 mm wide, 3-veined, connate 1 mm to the lateral sepals. the lateral sepals connate above the middle into a deeply concave, ovoid, synsepal, 3.5 mm long, 4 mm wide, 6-veined, the rounded apex shortly cleft with the tips minutely acuminate; *petals* transversely elliptical, concave, the apex broadly rounded with a thick margin, and with an indistinct, transverse carina, 0.75 mm long, 1.2 mm wide, 3-veined; *lip* thick, subquadrate, 0.5 mm long, 0.8 mm wide, 0.6 mm deep, shallowly concave below a thick bar with a glenion, the apex broadly obtuse with a short, obtuse tip, the dorsum with a low, rounded, central callus, the base truncate, hinged to the base of the column; *column* clavate, ca 1 mm wide and long, the anther and the bilobed stigma apical.

**Etymology:** From the Latin *arrectus*, “upright,” referring to the habit of the plant.

This species is characterized by an erect, more or less strict succession of prolific ramicauls. From each abscission layer at the base of a leaf, the next ramicaul, the

inflorescence, and roots emerge. A solitary, simultaneously many-flowered, raceme far surpasses the elliptical leaf. The lateral sepals form a deeply concave synsepal, the petals are three-veined, and the broader than long lip has a glenion and short, obtuse apiculum.

***Stelis bracteolenta*** Luer & R. Escobar, *sp. nov.* TYPE: COLOMBIA. Cundinamarca; above Gutiérrez S of Bogotá, 2700 m, 19 May 1984, *C. Luer, J. Luer & R. Escobar* 10369 (Holotype: SEL). Fig. 5.

This medium-sized, caespitose species is distinguished by a loosely multiflowered raceme that exceeds the leaf; conspicuous, floral bracts with dilated, more or less recurved margins; multiveined sepals with the lateral sepals connate into a concave synsepal; thick, three-veined petals; and an ovoid, obtuse lip concave below a bar.

*Plant* medium in size, epiphytic, caespitose; roots slender. Ramicauls erect, slender, 4–5 cm long, enclosed by a tubular sheath from below the middle and another 1–2 sheaths below and at the base. *Leaf* erect, coriaceous, elliptical, subacute to obtuse 7–9 cm long including a petiole 1.5 cm wide, the blade 1.5–2 cm wide in dry state, cuneate below to the petiole. *Inflorescence* single; to 14 cm long, the raceme erect, strict, distichous, loosely many-flowered; floral bracts infundibular, dilated with the tip acute, more or less reflexed, 3–4 mm long, 3–4 mm wide expanded; pedicels 2 mm long; ovary 2 mm long; peduncle ca. 2 cm long, with a spathe ca. 8 mm long, from a node below the apex of the ramicaul; flowers dark purple; *sepals* microscopically ciliate-pubescent, the dorsal sepal erect, ovate, obtuse, 10 mm long, 7 mm wide, 5-veined, with accessory veins to incompletely 7-veined; *petals* transversely elliptical, 1.5 mm long, 2 mm wide, the apical margin thick, 3-veined below a transverse carina; *lip* ovoid, 1.6 mm long, 1.6 mm wide, 1.2 mm deep, concave below a shallowly cleft bar, the apex obtuse with the margin thickened, the dorsum with 3 low, rounded calli, the base truncate, hinged to the base of the column; *column* stout, ca. 1.8 mm long and wide, the anther and bilobed stigma apical, the foot obsolescent.

**Etymology:** From the Latin *bracteolentus*, “well developed bracts” referring to the appearance of the floral bracts.

This medium-sized, caespitose species is distinguished by a loosely flowered raceme with rather large, dilated floral bracts with margins and tip more or less recurved. The flowers are dark purple and large with the sepals multiveined, the lateral sepals connate into a concave synsepal; the petals are thick, three-veined; the lip is type A with the three veins thickened on the dorsum as low, rounded calli.

***Stelis chalatantha*** Luer & Hirtz, *sp. nov.* TYPE: COLOMBIA. Nariño: above Ricaurte, 1600 m, 3 November 1979, *C. Luer, J. Luer & A. Hirtz* 4597 (Holotype: SEL). Fig. 6.

This large, caespitose species is characterized by one or three, loosely-flowered racemes that equal or exceed an elliptical leaf; ovate, shortly pubescent sepals; three-veined petals; and a lip with the center of the bar elevated with a glenion.



*Plant* large, epiphytic, densely caespitose. Ramicauls erect, slender, 5–9 cm long, with a tubular sheath from below the middle, and another 2 sheaths below and at the base. *Leaf* erect, coriaceous, elliptical, acute, 9–12 cm long including a petiole 1.5–2.5 cm long, the blade 1.2–1.5 cm wide in the dry state, cuneate below to the petiole. *Inflorescence* 1–3; 10–12 cm long, the raceme erect, lax, distichous, many-flowered; floral bracts oblique, acute, 2 mm long; pedicels 2 mm long; ovary 1.5 mm long; the peduncle ca 2 mm long, subtended by a slender spathe 1 cm long, from a node below the apex of the ramicaul; flowers yellow; *sepals* glabrous, shortly pubescent, ovate, obtuse, three-veined, connate basally, the dorsal sepal 3 mm long, 2 mm wide, the lateral sepals oblique, 2.5 mm long, 2 mm wide; *petals* transversely ovate, concave, obtuse, 0.75 mm long, 0.9 mm wide, 3-veined, the apical margin thickened, with a transverse carina; *lip* type A, subquadrate, 0.4 mm long, 0.6 mm wide, 0.5 deep, obtuse, shallowly concave below the bar that is elevated centrally with a glenion, the dorsum convex centrally, the base broadly truncate, hinged to the base of the column; *column* stout, ca. 1 mm long and wide, the anther and the stigmatic lobes apical.

**Etymology:** From the Greek *chalatanthos*, “with loose, relaxed flowers,” referring to the raceme.

This caespitose species is characterized by one to three, loosely flowered racemes equaling or slightly surpassing an acute, elliptical leaf. The sepals are narrowly obtuse, three-veined and shortly pubescent. The petals are also obtuse and three-veined. The lip is type A with the bar elevated centrally with a glenion.

***Stelis clematis*** Luer & R.Escobar, *sp. nov.* TYPE: COLOMBIA. Antioquia: Concepción, between Barbosa and Concepción, 2200 m, coll. by E. Valencia, 17 April 1988, *C. Luer 13261* (Holotype: MO). Fig. 7.

This small, branching, repent species is similar to *Stelis pusilla* Kunth, but differs in the morphology of the lip, which has a broadly rounded apex (without an apiculum), an entire bar (instead of cleft), and a descending dorsum.

*Plant* small, epiphytic, repent, branching; roots slender. Ramicauls erect, slender, 5–8 mm long, enclosed by a tubular sheath and another sheath at the base. *Leaf* erect, coriaceous, linear-elliptical, acute, 2–3 cm long, 1–2.5 mm wide, narrowed below to the base. *Inflorescence* single; 4–8 cm tall, the raceme erect, strict, successively many-flowered with many flowers open simultaneously; floral bracts oblique, acute, 1 mm long, pedicels 1 mm long; ovary 1 mm long; the peduncle ca. 2 cm long, from a node at the apex of the ramicaul; flowers light yellow; *sepals* similar, glabrous, ovate, obtuse, connate in lower third, 1.5 mm long, 1.2 mm wide, 3-veined; *petals* thin, semilunate, broadly rounded at the apex, slightly thickened on the margin, without a transverse callus, 0.5 mm long, 0.6 mm wide, 1-veined; *lip* subquadrate, 0.4 mm long, 0.6 mm wide, 0.4 mm deep, shallowly concave below a slightly curved, entire bar, the apex broadly rounded with thickened margins, the dorsum descending, slightly convex and microscopically pubescent, the base hinged to the base of the column; *column* clavate,

ca. 0.5 mm long and wide, the anther and the stigmatic lobes apical.

**Etymology:** From the Greek *clematis*, “a small, branching plant,” referring to the habit.

This small, branching, repent species is similar to the hoard of other, vegetatively variable species treated as variations of the ubiquitous *Stelis pusilla* Kunth, but *Stelis clematis* differs in the morphology of the lip. The lip is wider than long with the apex entire and broadly rounded, and with a smooth, curved bar. The dorsum is descending, slightly convex and microscopically pubescent.

***Stelis climacella*** Luer & R.Escobar, *sp. nov.* TYPE: COLOMBIA. Antioquia: Alto de Cuevas, above Nutibara, 2050 m, 3 May 1983, *C. Luer, J. Luer, R. Escobar et al. 8959* (Holotype: SEL). Fig. 8.

This tall, slender, caespitose species is characterized by acute, narrowly elliptical, long-petiolate leaves and a much longer, strict raceme with protruding dorsal sepals of nutant flowers; antrorse lateral sepals; single-veined petals; and a short lip with an obtuse, triangular tip.

*Plant* medium or large, epiphytic, densely caespitose. Ramicauls erect, slender, 6–10 cm long, with a close, tubular sheath from near the middle, and another 1–2 sheaths below and at the base. *Leaf* erect, coriaceous, narrowly elliptical, acute, 8–10 cm long including a slender petiole 2.5–3 cm long, 1–1.3 cm wide in the dry state, cuneate below into the petiole. *Inflorescence* single; 12–20 cm tall, the raceme erect, strict, congested, distichous, many-flowered with many flowers open simultaneously, floral bracts tubular, obtuse, 2 mm long, pedicels 1.5 mm long; ovary 1 mm long; the peduncle 3–5 cm long, subtended by a spathe 6–7 mm long, from a node near the apex of the ramicaul; flowers light green; *sepals* glabrous, the dorsal sepal suffused with rose, erect, elliptical, obtuse to rounded at the lip, 4.5 mm long, 2.25 mm wide, 3-veined, connate basally to the lateral sepals, the lateral sepals antrorse, ovate, subacute, oblique, 4 mm long, 2.6 mm wide, 3-veined, connate 1 mm; *petals* transversely ovate, concave, 0.75 mm long, 0.9 mm wide, 1-veined, the apical margin rounded and thickened, without a transverse carina; *lip* subquadrate, 0.5 mm long, 0.8 mm wide, 0.5 mm deep, with a shallow, semicircular depression below the bar, the apex truncate with an obtuse, triangular tip, the dorsum with a central, suborbicular callus, the base truncate, connate to the base of the column; *column* stout, ca. 1 mm long and wide, the anther and the stigmatic lobes apical.

**Etymology:** From the Latin *climacella*, “a little ladder,” referring to the long, erect raceme with protruding dorsal sepals like steps.

This slender, caespitose species is distinguished by narrowly elliptical, long-petiolate leaves, far exceeded by a long, distichous, many-flowered raceme with evenly spaced, nutant flowers with conspicuous, horizontally oriented dorsal sepals. The petals are single-veined. The lip is a modified type A with a broadly subtruncate apex with an obtuse, marginal triangle.

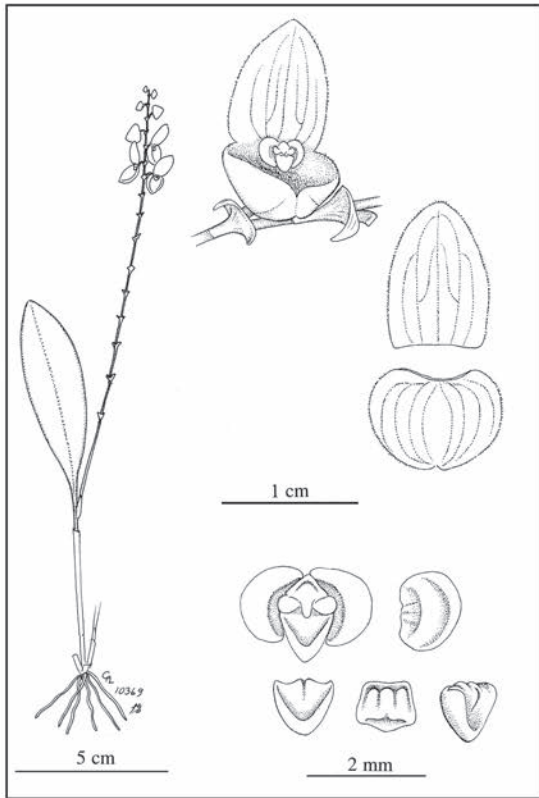


FIGURE 5. *Stelis bracteolenta* Luer & R. Escobar

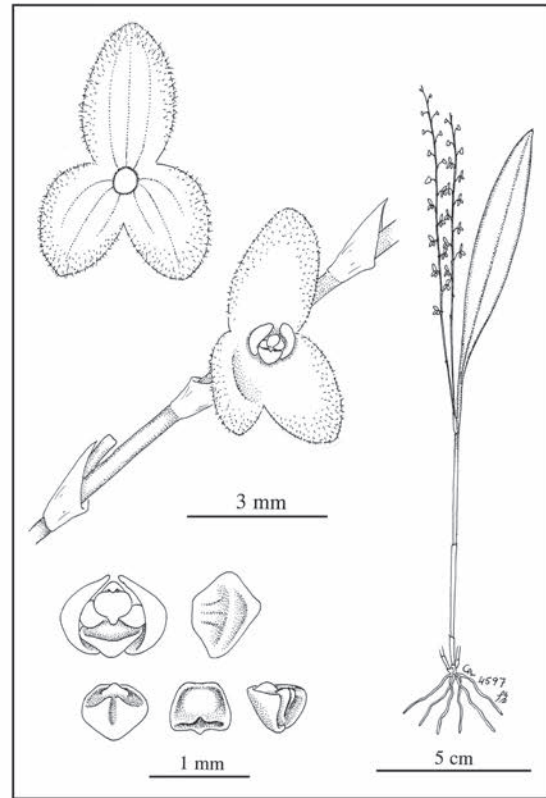


FIGURE 6. *Stelis chalatantha* Luer & Hirtz

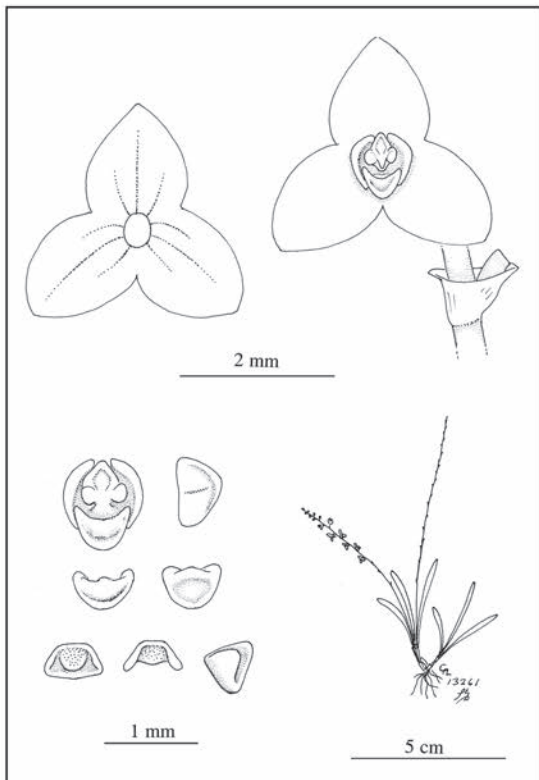


FIGURE 7. *Stelis clematis* Luer & R. Escobar

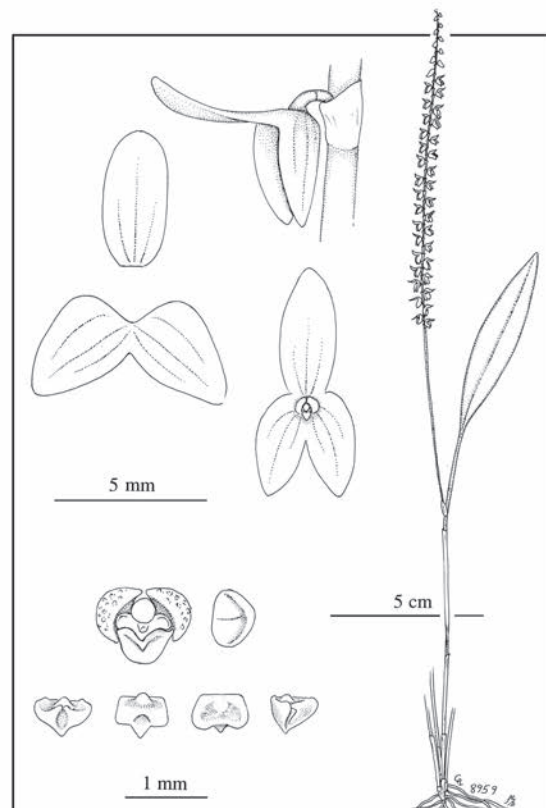


FIGURE 8. *Stelis climatella* Luer & R. Escobar

**Stelis colossus** Luer & R.Escobar, *sp. nov.* TYPE: COLOMBIA. Valle del Cauca: Alto de Los Galápagos, below the pass between Valle del Cauca and Chocó, 1750 m, 13 May 1993, C. Luer, J. Luer & R. Escobar 16812 (MO). Fig. 9.

This huge, caespitose species is characterized by a tall ramicaul; a large, elliptical leaf; a long, many-flowered raceme with imbricating floral bracts; obtuse, multiveined sepals; three-veined petals; and a lip with a cleft bar and an obtuse apex.

*Plant* large, epiphytic, densely caespitose. Ramicauls erect, stout, 20–22 cm tall, with a loose tubular sheath on the upper third, another two sheaths below at the base. *Leaf* erect, coriaceous, ovate, subacute, 15 cm long including a petiole 1.5 cm long, the blade 4 cm wide in the dry state, cuneate below to the petiole. *Inflorescence* single; to 45 cm tall, the raceme erect, congested, distichous, many-flowered; floral bracts imbricating, oblique, acute, 6–7 mm long; pedicels 3 mm long; ovary 2 mm long; the peduncle 5–7 cm long, subtended by a spathe 17 mm long, from a node below the apex of the ramicaul; flowers bright yellow-green; *sepals* glabrous, transversely ovate, obtuse, connate to near the middle, the dorsal sepal 3.5 mm long, 4.5 mm wide, 5-veined, with an accessory pair, the lateral sepals 3.5 mm long, 4.5 mm wide, 5-veined; *petals* transversely elliptical, 1.5 mm long, 1.75 mm wide, 3-veined, concave below a thick, rounded apex, without an obvious transverse carina; *lip* type A, subquadrate, 1 mm long, 1.5 mm wide, 1 mm deep, shallowly concave below the bar, cleft with a deep glenion, broadly obtuse at the apex, the dorsum convex with a row of three, rounded calli, the base broadly truncate, hinged to the base of the column; *column* stout, 1.5 mm long and wide, the anther and the stigmatic lobes apical.

**Eponymy:** Named for the Colossus of Rhodes, the gigantic monument, one of the Seven Wonders of the Ancient World.

The bright yellow-green flowers of this huge species are produced on a tall raceme of large, imbricating floral bracts. Only one loose sheath is present on the upper third of a nearly naked ramicaul, the other sheaths being at the base. The leaf is large and petiolate. The sepals are transversely ovate, obtuse and five-veined, and the type A lip is obtuse with a deep glenion and with three rounded calli on the dorsum.

This species is similar to *Stelis purdiaei* Lindl. with the large leaf borne by a tall ramicaul with a loose sheath above the middle, but instead of a few, slender racemes with small floral bracts, the single raceme is stout with large, imbricating floral bracts.

**Stelis cyathochila** Luer & R.Escobar, *sp. nov.* TYPE: COLOMBIA. Norte de Santander: Alto de San Francisco, above Villacaro, 2600 m, 11 May 1984, C. Luer, J. Luer & R. Escobar 10257 (Holotype: MO). Fig. 10.

This large species is characterized by a many-flowered raceme that far exceeds an elliptical, petiolate leaf; medium-sized flowers with three-veined, subacute, ovate sepals; three-veined petals; and a smooth, spoon-shaped lip with a thick base.

*Plant* large, epiphytic, densely caespitose. Ramicauls erect, stout, 10–16 cm long, with a close, tubular sheath from below the middle, another two below and at the base. *Leaf* erect, coriaceous, elliptical, acute to subacute, 11–12.5 cm long including a petiole, 2–2.5 cm long, the blade 1.5–2 cm wide in the dry state, narrowly cuneate below to the petiole. *Inflorescence* single; to 25 cm tall, the raceme erect, congested, distichous, many-flowered with most flowers open simultaneously, floral bracts tubular, close, obtuse, 3 mm long; pedicels 2 mm long; ovary 2.5 mm long; peduncle 8 cm long, subtended by a spathe 1.5 cm long, from a node below the apex of the ramicaul; flowers pale green; *sepals* suffused with rose, glabrous, ovate, subacute, connate below the middle, 4 mm long, 3 mm wide, 3-veined, the lateral sepals oblique, antrorse; *petals* transversely obovate, 1.5 mm long, 1.5 mm wide, 3-veined, concave below the rounded apex, with a transverse carina; *lip* oblong, 2 mm long, 1.5 mm wide, 0.6 mm deep at the base, the apex and sides rounded with thin margins, concave, smooth, the base transversely thickened, truncate, connate to the base of the column; *column* stout, ca. 1.5 mm long and wide, the anther and the stigmatic lobes apical.

**Etymology:** From the Greek *cyathochilos*, “spoon-shaped lips,” referring to the smooth, concave lip.

While searching for the long-lost *Masdevallia mastodon* Rchb.f., this species was collected 30 years ago at a remote location in the Eastern Cordillera. It is characterized by a large habit with stout ramicauls; an elliptical, petiolate leaf; and a long raceme of medium-sized flowers. The sepals are ovate with the lateral sepals antrorse. The spoon-shaped lip is smooth and rounded with narrow margins, but a thick, transverse callus occupies the base.

**Stelis dasysepala** Luer & R.Escobar, *sp. nov.* TYPE: COLOMBIA. Antioquia: W of Medellín, E of Boquerón. 2380 m, 22 April 1983, C. Luer, J. Luer, R. Escobar *et al.* 8749 (Holotype: SEL). Fig. 11.

This small, caespitose species is distinguished by narrowly elliptical leaves exceeded by a distichous, subflexuous raceme; ovate, coarsely pubescent, three-veined sepals; three-veined petals; and a rounded lip with a callus that extends over the bar from the dorsum to descend into a glenion.

*Plant* small, epiphytic, densely caespitose, roots slender. Ramicauls erect, fasciculate, stout, 1–1.5 cm long, with a loose, tubular sheath from below the middle and another sheath at the base. *Leaf* erect, coriaceous, narrowly elliptical, subacute, 2.5–3 cm long, 0.4–0.5 cm wide in the dry state, narrowed below to the base with an indistinct petiole ca. 0.5 cm long. *Inflorescence* single; 6–8 cm tall, the raceme erect, subflexuous, distichous, many-flowered, with several flowers open simultaneously; floral bracts oblique, acute, 2 mm long; pedicels 3 mm long; ovary 1.5 mm long; the peduncle ca. 3 cm long, from a node at the tip of the ramicaul, with a spathe ca. 3 mm long; flowers purple; *sepals* coarsely pubescent, expanded, ovate, subacute, 3-veined, connate to near the middle, the dorsal sepal 2 mm long, 2.5 mm wide, the lateral sepals 2.5 mm long, 2.5 mm wide; *petals* transversely elliptical, thin, concave, narrowly thickened

on the margin of a subtruncate apex, without a transverse carina, 1 mm long, 1.4 mm wide, veined; *lip* subquadrate, 1 mm long, 1.3 mm wide, 0.7 mm deep, shallowly concave below the bar with an elevated callus that descends over the bar into a glenion, the apex rounded, the dorsum with the central callus that descends forward, the base truncate, hinged to the base of the column; *column* clavate, ca. 1 mm wide and long, the anther and the bilobed stigma apical.

**Etymology:** From the Greek *dasysepalá*, “with shaggy sepals,” referring to the pubescence.

This little, caespitose species is characterized by fasciculate, loosely sheathed ramicauls with narrowly elliptical leaves; a much longer, subflexuous raceme; broadly ovate, three-veined, coarsely pubescent sepals; thin, three-veined petals; and a type C lip with an elevated callus that descends from the dorsum over bar into a glenion.

***Stelis divaricans*** Luer & R.Escobar, *sp. nov.* TYPE: COLOMBIA. Putumayo: between La Cocha and Sibundoy, 2700 m, 30 July 1978, C. Luer, J. Luer, R. Escobar et al. 3161 (Holotype: SEL). Fig. 12.

This large, caespitose species is distinguished ramicauls much longer than acute, elliptical leaves; two long, loosely flowered racemes; ovate, three-veined sepals; three-veined petals; and a lip with an acutely descending dorsum.

*Plant* large, epiphytic, densely caespitose; roots slender. Ramicauls erect, slender, 15–20 cm tall, with a relatively short, tubular sheath from near the middle, another sheath below the middle, and another at the base. *Leaf* erect, coriaceous, elliptical, acute, 12–13 cm long including a petiole 2 cm long, the blade 1.5–2 cm wide in the dry state, cuneate below into the petiole. *Inflorescence* 2 simultaneous; 15–18 cm long, the racemes erect, strict, lax, distichous, many-flowered with many flowers open simultaneously; floral bracts oblique, acute, 3–4 mm long; pedicels 1.5 mm long; ovary 3 mm long; the peduncle 3–4 cm long, subtended by a slender spathe 1 cm long, from a node below the apex of the ramicaul; flowers dark purple; *sepals* glabrous, expanded, ovate, 3-veined, connate in lower quarter, the dorsal sepal subacute, 5 mm long, 4.5 mm wide, the lateral sepals obtuse, 3.5 mm long, 4 mm wide; *petals* transversely ovate, 1 mm long, 1.75 mm wide, 3-veined, the apex broadly rounded with a thickened margin, concave with an obscure transverse carina; *lip* type A, 0.8 mm long, 1.3 mm wide, 1 mm deep, concave below a narrow, protruding bar with a distinct glenion, concave within a thickened, obtuse margin, the dorsum acutely descending, with a low, central callus, the base truncate, attached to the base of the column; *column* stout, ca. 1 mm long and wide, the anther and the stigmatic lobes apical.

**Etymology:** From the Latin *divaricans*, “spreading out,” referring to the loosely flowered raceme.

This large, caespitose species is characterized by long ramicauls with acute, elliptical leaves and a pair of long racemes from each of the four stems of the present collection. The racemes are loosely flowered all the way to the tip. The flowers are dark purple and relatively large with three-veined sepals and petals. The lip is triangular in lateral view with the acutely descending dorsum being the hypotenuse.

***Stelis glochochila*** Luer & R.Escobar, *sp. nov.* TYPE: COLOMBIA. Antioquia: Frontino, Alto de Cuevas. above Nutibara, 2050 m, 3 May 1983, C. Luer, J. Luer, R. Escobar et al. 8962 (Holotype: SEL). Fig. 13–14.

This medium-sized to large species is characterized by an acute, elliptical leaf exceeded by a congested, distichous raceme of large, purple, totally glabrous flowers with transversely ovate sepals; a five-veined dorsal sepal; proportionately large, thick petals; and a totally glabrous lip with an acute, triangular apex.

*Plant* medium to large in size, epiphytic, caespitose. Ramicauls erect, slender, 5–13 cm long, with a close, tubular sheath from below the middle, and another 1–2 sheaths below and at the base. *Leaf* erect, coriaceous, elliptical, acute, 8–13 cm long including a petiole 1.5–2 cm long, the blade 1–1.5 cm wide in the dry state, narrowly cuneate below into the petiole. *Inflorescence* single; to 18 cm long, the raceme erect congested, distichous, many-flowered with many flowers open simultaneously, floral bracts oblique, acute, 3–4 mm long; pedicels 1.5–2.5 mm long; ovary 1–1.5 mm long; the peduncle 2–3 cm long, subtended by a slender spathe 12 mm long, from a node at the apex of the ramicaul; flowers purple; *sepals* glabrous, transversely ovate, obtuse, connate to near the middle, the dorsal sepal 5 mm long, 5.75 mm wide, 5-veined, the lateral sepals oblique, 3 mm long, 4.75 mm wide, 4-veined; *petals* thick, transversely semilunate with the angles rounded, the apex round with a broad, convex margin, shallowly concave, deeply concave below a transverse carina, 1 mm long, 1.25 mm wide, 3-veined; *lip* subquadrate, concave below a shallowly notched bar, 0.75 mm long, 0.75 mm wide, 1 mm deep, the apex triangular, acute, the base truncate, hinged to the base of the column; *column* stout, ca. 1 mm long and wide, the anther and the stigmatic lobes apical.

**Etymology:** From the Greek *glochochilus*, “an arrow-headed lip,” referring to the pointed labellum.

**Additional specimens examined:** COLOMBIA. Antioquia: Frontino, Alto de Cuevas. above Nutibara, 2050 m, 3 May 1983, C. Luer, J. Luer, R. Escobar et al. 8940 (SEL); Yarumal, road to El Cedro, 1650 m, 15 March 1989, C. Luer, J. Luer, S. Dalström & W. Teague 14155 (MO).

This large species is characterized by a crowded, distichous raceme of large purple flowers, transverse sepals with the dorsal sepal 5-veined, and thick, proportionately large, semilunate petals. The lip is concave below a shallowly notched bar with the apex triangular and acute.

*Stelis glochochila* is related to *Stelis barbuda* O.Duque, but differs with leaves half the width; short, close, cauline sheaths instead of long and loose; and totally glabrous sepals and lip in all three cited collections, instead of sepals with villous edges and papillose-villous within, and lip without “a tuft of short hairs.”

***Stelis hercules*** Luer & R.Escobar, *sp. nov.* TYPE: COLOMBIA. Cauca: La Vega, Páramo de Las Barbillas, 3150 m, 13 November 1982, C. Luer & R. Escobar 8360 (Holotype: SEL). Fig. 15.

This large, robust, repent species is characterized by a thick rhizome; erect ramicauls; large, petiolate leaves



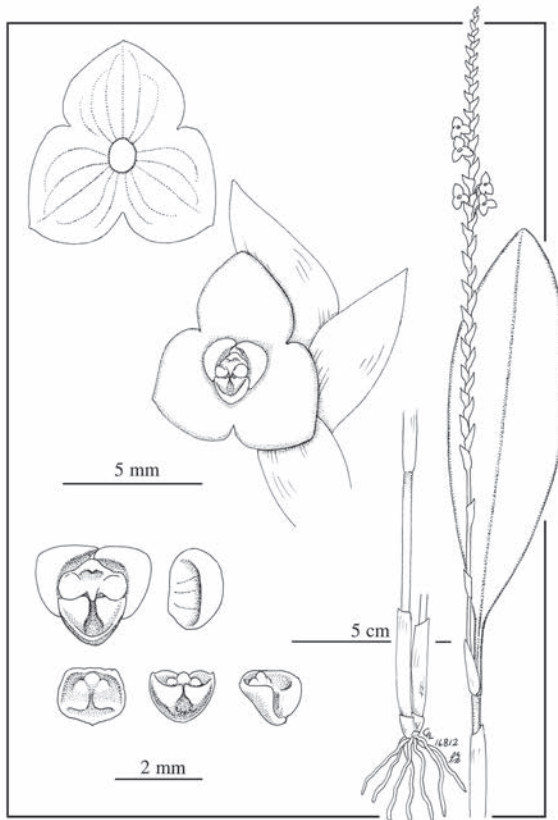


FIGURE 9. *Stelis colossus* Luer & R. Escobar

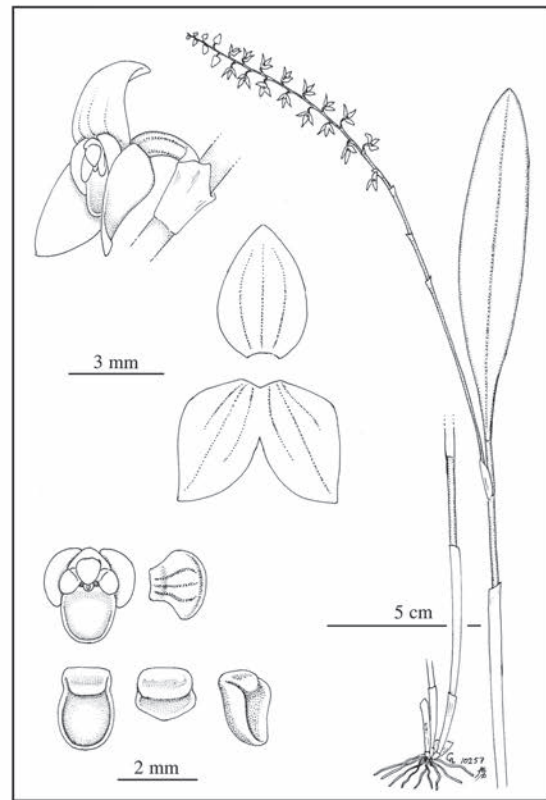


FIGURE 10. *Stelis cyathochila* Luer & R. Escobar

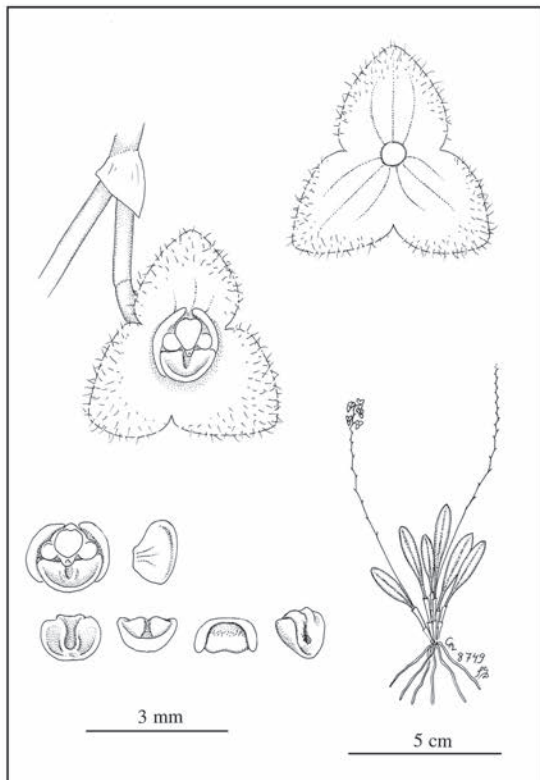


FIGURE 11. *Stelis dasysepala* Luer & R. Escobar

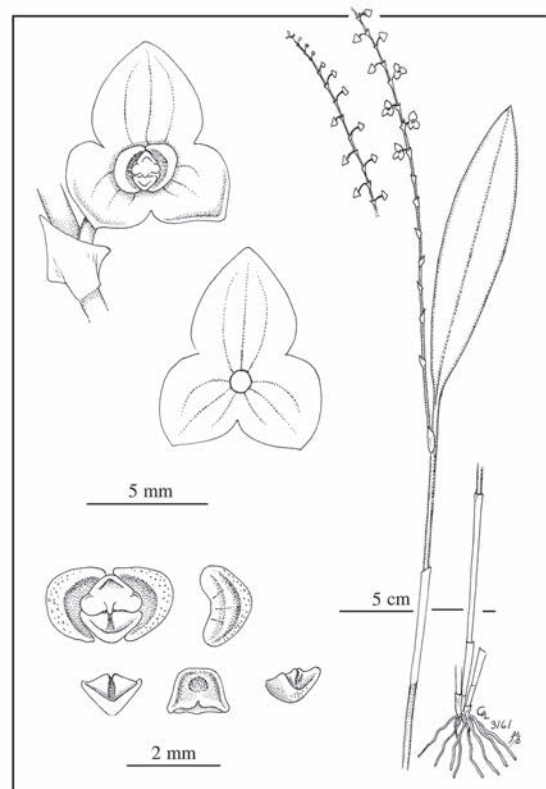


FIGURE 12. *Stelis divericans* Luer & R. Escobar

exceeded by a much longer raceme with medium-sized flowers with three-veined, long-pubescent sepals; three-veined petals; and an ovoid lip with a rounded apex.

*Plant* large, epiphytic, repent, the rhizome stout, 3 mm thick, 3–5 cm long between ramicauls. Ramicauls erect, stout, 9–11 cm long, with a tubular sheath from below the middle, and another 1–2 sheaths below and at the base. *Leaf* erect, coriaceous, elliptical, subacute, 9–11 cm long including a petiole 2–2.5 cm long, the blade 2.5–3.5 cm wide in the dry state, cuneate below into the petiole. *Inflorescence* single; 18–25 cm tall, the raceme erect, loose, distichous, many-flowered; floral bracts oblique, acute, 3–4 mm long; pedicels 2 mm long; ovary 2 mm long; the peduncle 10–12 cm long, subtended by a slender spathe 1.3–1.8 mm long, from a node below the apex of the ramicaul; *sepals* dull yellow, pubescent, ovate, 3-veined, connate below the middle, concave in the basal quarter, the dorsal sepal subacute, 5 mm long, 4 mm wide, the lateral sepals obtuse, 3 mm long, 5 mm wide; *petals* yellow-green, transversely oblong, the apex rounded with a narrowly thickened margin, concave, with a minimal transverse carina, 2 mm long, 2.5 mm wide, 3-veined; *lip* yellow-green, ovoid, 2 mm long, 2 mm wide, 1.5 mm deep, concave below a thick bar with a thick-rimmed glenion, the apex broadly obtuse apex, the dorsum convex, pubescent, the base truncate, hinged to the base of the column; *column* clavate, ca. 2.5 mm long, 2 mm wide, connate to the base of the column, the anther and the stigmatic lobes apical.

**Eponymy:** Named for Hercules, a mythological character with great strength, referring to the robust habit.

Vegetatively, this large, robust, repent species of the Central Cordillera of the department of Cauca, is indistinguishable from *Stelis samson* Luer & R.Escobar, published herein, of the Eastern Cordillera, but it differs with long-pubescent, instead of glabrous sepals, and a lip with a smooth, obtuse apex; a thickly margined glenion; and a convex, pubescent dorsum.

***Stelis hiatilabia*** Luer & R.Escobar, *sp. nov.* TYPE: COLOMBIA. Tolima: N of Ibaqué, southern slope of Mt. Tolima. 2600 m, 21 April 1982, C. Luer, J. Luer & R. Escobar 7501 (Holotype: SEL). Fig. 16.

This medium-sized, caespitose species is characterized by narrowly elliptical leaves surpassed by a many-flowered, distichous raceme; glabrous, ovate, obtuse, three-veined sepals; thick, convex, three-veined petals; and a thick, obtuse lip with a deeply cleft bar.

*Plant* medium in size, epiphytic, densely caespitose. Ramicauls erect, 3–4 cm long, with a tubular sheath from below the middle, and another 1–2 sheaths below and at the base. *Leaf* erect, coriaceous, narrowly elliptical, subacute to obtuse, 5–7 cm long including the petiole 1–1.5 mm long, the blade 0.9–1.2 cm wide in the dry state, cuneate below to the petiole. *Inflorescence* single; 9–11 cm tall, the raceme, distichous, congested, many-flowered with many flowers open simultaneously; floral bracts oblique, acute, 2 mm long; pedicels 2 mm long; ovary 2 mm long; the peduncle 3–5 cm long, subtended by a spathe ca. 4 mm long, from a node at the apex of the ramicaul; *sepals* light yellow with

rose, central stripe, glabrous, ovate, narrowly obtuse at the tip, connate basally, 3-veined, the dorsal sepal 4.5 mm long, 2.5 mm wide, the lateral sepals, 4 mm long, 3.5 mm wide; *petals* yellow, reniform, thick, convex, 1 mm long, 1.4 mm wide, 3-veined below an ill-defined transverse carina; *lip* subovoid, 1 mm long, 1 mm wide, 1 mm deep, deeply concave below a deeply cleft bar, the sides with obtusely angled margins to either side, the apex thick, obtuse, the dorsum cleft with the bar, slightly convex, the base connate to the base of the column; *column* stout, ca. 1 mm long and wide, the anther and the stigmatic lobes apical.

**Etymology:** From the Latin *hiatilabia*, “with an opening in the lip,” referring to deep cleft of the bar of the lip.

This medium-sized, caespitose species is characterized by narrow leaves and a longer many-flowered raceme of medium-sized flowers. The sepals are glabrous, ovate, three-veined and more or less rounded at the apex; the petals are thickly reniform and convex. The lip is thick and concave beneath a deeply cleft bar.

***Stelis hypsitera*** Luer & R.Escobar, *sp. nov.* TYPE: COLOMBIA. Antioquia: La Union, Sonsón, coll. by E. Valencia, fl. in cult. at Colomborquídeas, 23 May 1995, C. Luer 17571 (Holotype: MO). Fig. 17.

This tall, caespitose species is characterized by ramicauls much longer than large, elliptical-ovate, petiolate leaves; three or four racemes twice longer than the leaf; ovate, pubescent sepals; thick, three-veined petals; and a short lip with rounded apex and a single, round callus on the dorsum.

*Plant* large, epiphytic, caespitose; roots slender. Ramicauls erect, slender, 28–34 cm long, with a close, tubular sheath above the middle, and another 2 sheaths below and at the base. *Leaf* erect, coriaceous, multiveined, elliptical-ovate, acute, petiolate, 13–15 cm long including a petiole 3–3.5 cm long, the blade 3.5–4.5 cm wide in the dry state, cuneate below into the petiole. *Inflorescence* 3–4 simultaneous; 15–22 cm long, the racemes erect, distichous, strict, many-flowered, with many flowers open simultaneously; floral bracts tubular, obtuse, 2 mm long; pedicels 1 mm long; ovary 1 mm long; the peduncle 2–3 cm long, subtended by a spathe 1.5–1.8 cm long, from a node below the apex of the ramicaul; flowers light yellow; *sepals* expanded, pubescent, more or less convex, subacute to obtuse, connate below the middle, the dorsal sepal, 4.5 mm long, 3.5 mm wide, 5-veined, the lateral sepals oblique, 3.5 mm long, 3 mm wide, 4-veined; *petals* thick, transversely semilunate, the apex rounded with the corners acuminate, 0.8 mm long, 1.4 mm wide, 3-veined, concave below the thickened margin, and concave below a transverse carina; *lip* obovoid, 0.75 mm long, 0.8 mm wide, 0.5 mm deep, shallowly concave below the bar and within the obtuse apex with a thickened margin, the dorsum with a single, central, rounded callus, the base truncate, hinged to the base of the column; *column* stout, ca. 1 mm long and wide, the anther and the stigmatic lobes apical.

**Etymology:** From the Greek *hypsiteros*, “higher,” referring to the inflorescences being taller than those of vegetatively similar species.

The flowers of this large, tall, caespitose species are

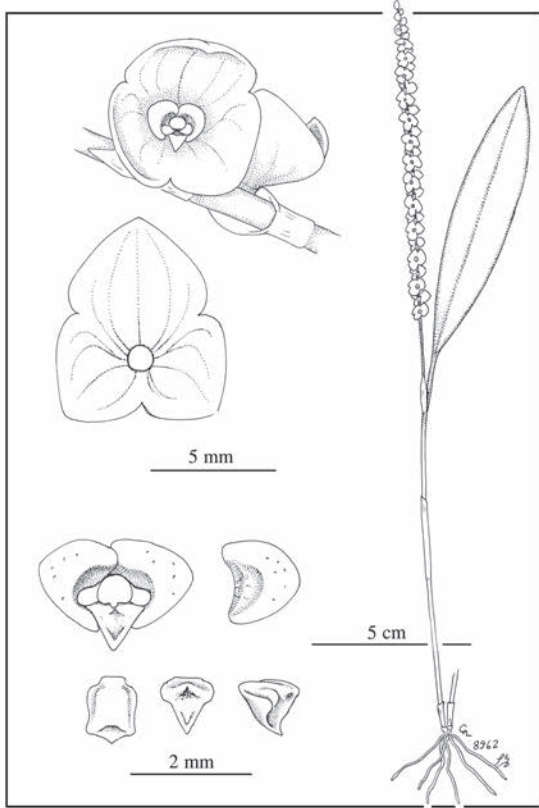


FIGURE 13. *Stelis glochochila* Luer & R. Escobar

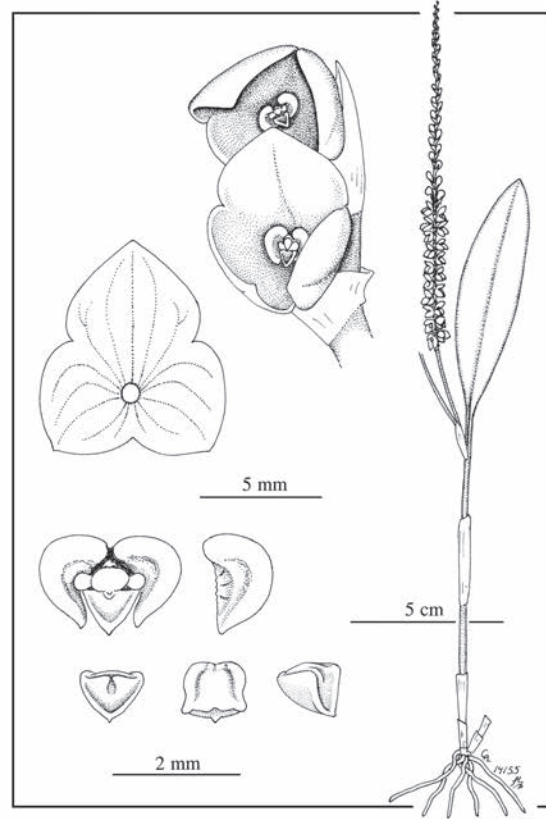


FIGURE 14. *Stelis glochochila* Luer & R. Escobar

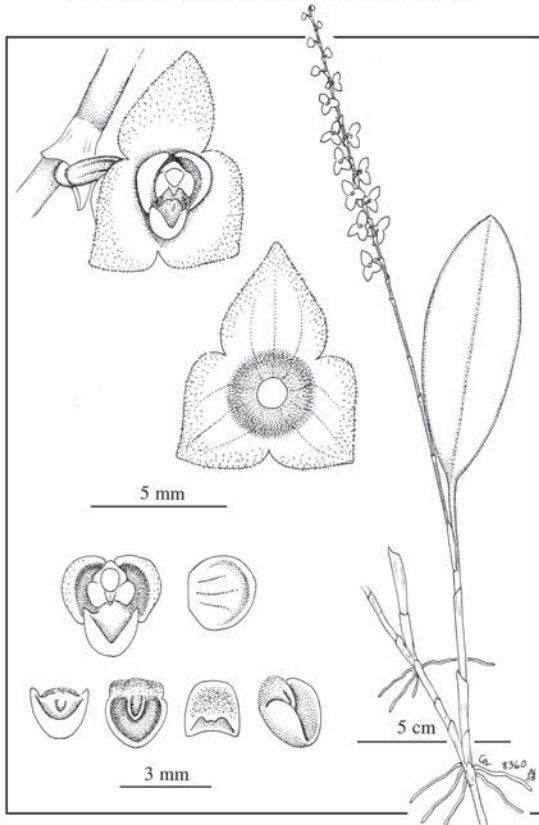


FIGURE 15. *Stelis hercules* Luer & R. Escobar

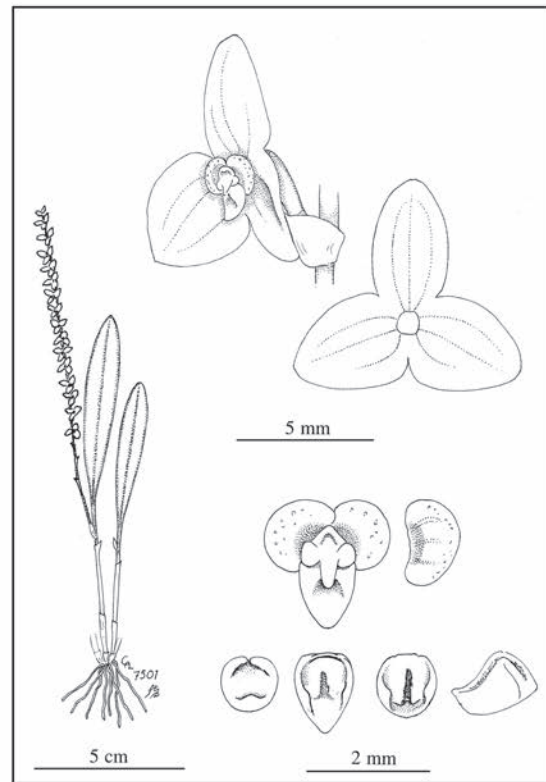


FIGURE 16. *Stelis hiatilabia* Luer & R. Escobar



similar to those of *Stelis grandiflora* Lindl., but distinguished by proportionately much longer ramicauls, about thrice longer than broad, multiveined leaves; three to four simultaneous racemes much longer than the leaf; ovate, multiveined, pubescent sepals; thick, three-veined petals; and a type A lip with a solitary, round callus on the dorsum.

***Stelis lacertina*** Luer & R. Escobar, *sp. nov.* TYPE:

COLOMBIA. Risaralda: Fl. in cult. by S. Tsubota at Ran Orchids, Pereira, 10 May 1993, *C. Luer 16761* (Holotype: MO). Fig. 18.

This large, caespitose species is characterized by three or four long, many-flowered racemes of flowers with an antrorse dorsal sepal that is connate nearly a third of its length into a mentum; a synsepal formed by semiconnate lateral sepals; and a shallow lip with a short, broadly and deeply cleft bar.

*Plant* large, epiphytic, densely caespitose; roots slender. Ramicaul erect, stout, 5–14 cm long, with a loose, tubular sheath from below the middle, and another 1–2 sheaths below and about the base; *Leaf* erect, coriaceous, elliptical-ovate, obtuse to rounded at the tip, 9–12 cm long including a petiole 1.5–2 cm long, the blade 1–2.3 cm wide in the dry state, cuneate below into the petiole. *Inflorescence* 3–4; 12–18 cm tall, the raceme erect, strict, secund, congested, simultaneously flowered; floral bracts tubular, obtuse, 2 mm long; pedicels 2 mm long; ovary 1 mm long; the peduncle 2–3 cm long, subtended by a slender spathe 1.5–2 cm long, from a node below the apex of the ramicaul; flowers green; *sepals* glabrous, the dorsal sepal ovate, subacute, 5 mm long, 2.75 mm wide, 3-veined, connate 1.5 mm to the synsepal, the lateral sepals ovate, acute, oblique, connate to the middle into a concave, ovoid synsepal with recurved margins, 5 mm long, each 2.75 mm wide, 3-veined; *petals* transversely ovate, 0.5 mm long, 1 mm wide, 3-veined, concave within the rounded, thickened apical margin, with an indistinct transverse callus; *lip* subquadrate, 0.5 mm long, 0.7 mm wide, 0.5 mm deep, concave below a shortly but widely cleft bar with a concave glenion, the apex rounded, the margins thin, the dorsum with a rounded, midline callus; the base truncate, hinged to the base of the column; *column* ca. 0.75 mm broad and long, the anther and stigmatic lobes apical.

**Etymology:** From the Latin *lacertinus*, “like a lizard,” referring to the flower resembling the head of a lizard.

This large, caespitose species is characterized by stout ramicauls clad in long, loose, tubular sheaths, elliptical-ovate leaves, and three or four longer racemes of numerous, green flowers. The dorsal sepal is connate to the lateral sepals for nearly two millimeters to form the roof of a retrorse chin of the synsepal. The synsepal is formed by semiconnate lateral sepals with recurving margins. The petals are three-veined. The lip is a variation of type A with a short, rounded apex, a deeply concave glenion descending from a broad cleft in the bar, and a round callus in the center of the dorsum.

***Stelis lagarantha*** Luer & R. Escobar, *sp. nov.* TYPE: COLOMBIA. Santander: W of Velez, road to Landázuri, 2000 m, 4 May 1984, *C. Luer, J. Luer & R. Escobar 10146* (Holotype: MO). Fig. 19.

This small to medium-sized, caespitose species is characterized by loose racemes longer than acute, narrowly ovate leaves; obtuse, three-veined sepals; thick, three-veined petals; and a subquadrate, obtuse lip with an orbicular callus on the dorsum.

*Plant* small to medium in size, epiphytic, densely caespitose; roots slender. Ramicauls slender, erect, 4–7 cm long, enclosed by a close, tubular sheath from below the middle, and another 1–2 sheaths below and at the base. *Leaf* erect, coriaceous, narrowly ovate, acute, 5–6 cm long including a petiole ca. 1.5 cm long, the blade 0.5–0.8 cm wide in the dry state, narrowly cuneate below to the petiole. *Inflorescence* 1–2; 5–11 cm tall, the racemes erect, strict, distichous, loosely many-flowered; floral bracts oblique, acute, 2 mm long and wide; pedicel 1.5 mm long; ovary 1.5 mm long; peduncle 2–3 cm long, from the apex of a ramicaul with a spathe ca. 5 mm long; flowers purple; *sepals* glabrous, broadly ovate, obtuse, 3-veined, the dorsal sepal 4 mm long, 4 mm wide, the lateral sepals 3 mm long, 3 mm wide; *petals* transversely ovate, 1 mm long, 1.6 mm wide, 3-veined, concave, the apical margin rounded, thickened, with a transverse carina; *lip* subquadrate, 0.6 mm long, 1 mm wide, 0.5 mm deep, shallowly concave below the bar, the apex obtuse with thickened margin, the dorsum with a central, orbicular callus, the base truncate, hinged to the column-foot; *column* stout, ca. 1 mm long and wide, the anther and small stigmatic lobes apical.

**Etymology:** From the Greek *lagarantos*, “loosely flowered,” referring to the raceme.

Both medium-sized and small, caespitose variations of this species grow together. They are characterized by loosely flowered racemes of purple flowers that exceed narrowly ovate, acute leaves. The sepals are broadly ovate and three-veined; the petals are thick and three-veined; and the lip is type A with a spherical callus on the dorsum.

***Stelis laplanadensis*** Luer & Escobar, *sp. nov.* TYPE: COLOMBIA. Nariño: near Ricaurte, 1800 m, fl. in cult. at the La Planada Orquiarario, 25 January 1987, *C. Luer 12515* (Holotype: MO). Fig. 20.

This caespitose species is distinguished by a congested, secund raceme of small flowers that exceeds the leaf; three-veined sepals with the lateral sepals antrorse to form a concave synsepal; three-veined petals; and a lip with a broadly obtuse apex.

*Plant* medium in size, epiphytic, densely caespitose; roots slender. Ramicaul erect, slender, 7–8 cm long, with a close, tubular sheath on the middle third, and another 2 sheaths below and about the base. *Leaf* erect, coriaceous, elliptical, acute to subacute, 9–11 cm long including a petiole 1.5–2 cm long, the blade 1.5–2 cm wide in the dry state, cuneate below into the petiole. *Inflorescence* single; 11 cm tall, the raceme erect, secund, congested, simultaneously many-flowered; floral bracts tubular, obtuse, 2 mm long; pedicels 1 mm long; ovary 1 mm long; the peduncle 2 cm long, subtended by a slender spathe 1 cm long, from a node below the apex of the ramicaul; flowers yellow; *sepals* glabrous, the dorsal sepal elliptical-oblong, convex, with the apex obtuse, 4 mm long, 2 mm wide, 3-veined, the lateral sepals ovate,



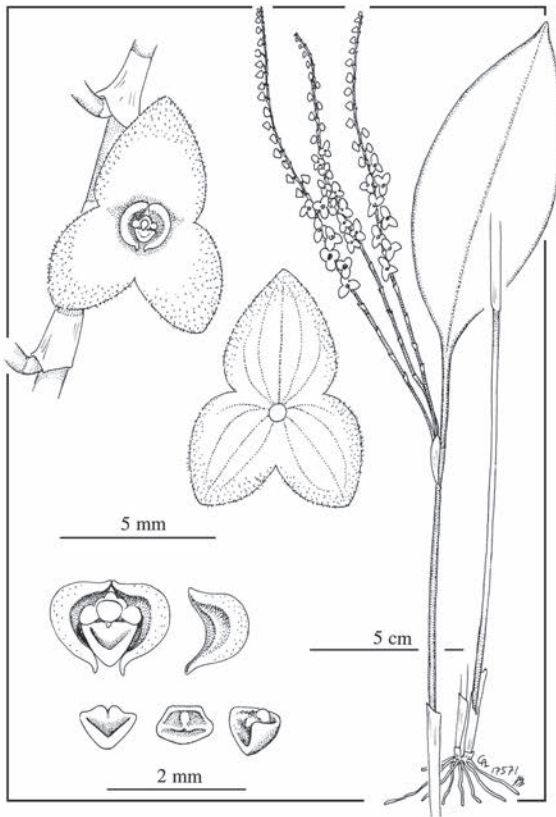


FIGURE 17. *Stelis hypsitera* Luer & R. Escobar

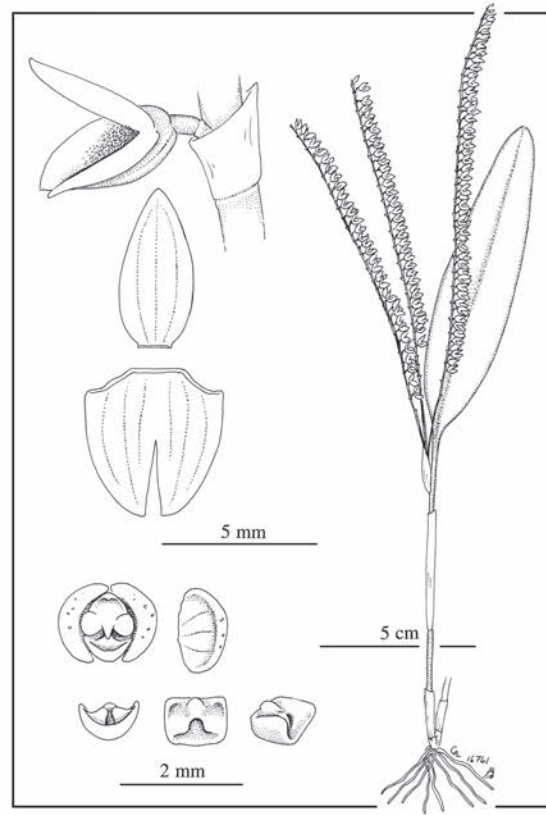


FIGURE 18. *Stelis lacertina* Luer & R. Escobar

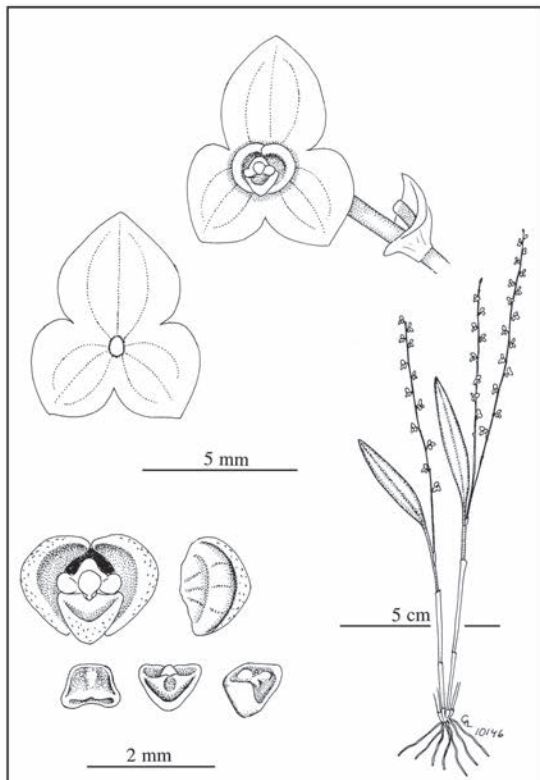


FIGURE 19. *Stelis lagarantha* Luer & R. Escobar

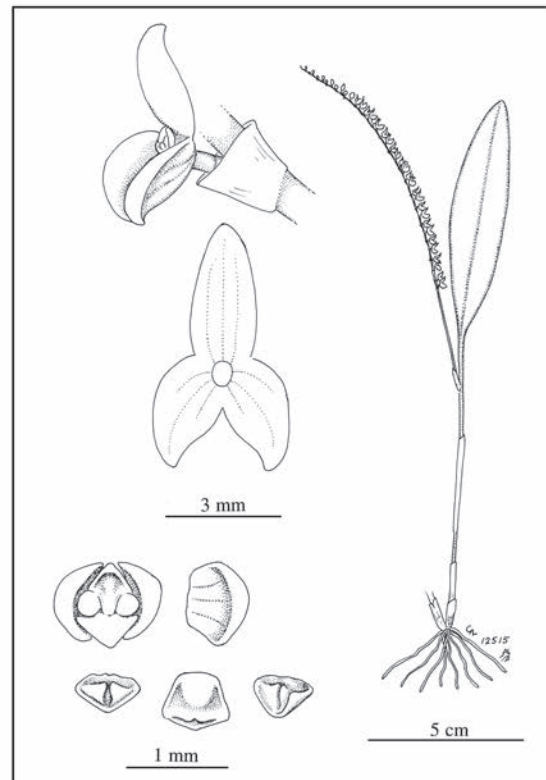


FIGURE 20. *Stelis laplanadensis* Luer & R. Escobar

oblique, concave, connate in the basal fourth, antrorse, with the tips in apposition, forming a concave synsepal, with the margins recurved, each 2.5 mm long, 2 mm wide, 3-veined; *petals* concave, transversely ovate, 0.5 mm long, 0.75 mm wide, 3-veined, with the rounded apical margin thickened, without an indistinct transverse carina; *lip* subquadrate, 0.5 mm long, 0.75 mm wide, 0.3 mm deep, shallowly concave below a cleft bar with a glenion, the apex broadly obtuse, the dorsum thickened with a low, rounded callus; the base truncate, hinged to the base of the column; *column* ca. 0.75 mm broad and long, the anther and stigmatic lobes apical.

**Eponymy:** Named for the La Planada Research Center where this species was discovered and cultivated.

This caespitose species, cultivated by the La Planada Research Center, is distinguished by a congested, secund raceme of small flowers that exceeds the leaf. The sepals are three-veined with the lateral sepals shallowly connate and antrorse to form a concave synsepal. This is one of many that are not clearly defined as belonging to section *Humboldtia*. The petals are three-veined, and the lip is type A with a broadly obtuse apex.

**Stelis leprina** Luer & R.Escobar, *sp. nov.* TYPE: COLOMBIA. Risaralda: Pereira, Ucumarí, Regional Reserve, 2100 m, flowered at La Pastora, April 1992, A. de Wilde 005 (Holotype: MO), C. Luer illustr. 21920. Fig. 21.

This small, caespitose species is distinguished by numerous deposits of a granular substance in all floral and vegetative parts; minute flowers produced in a crowded, secund raceme; elliptical sepals; ovate petals; and a lip with a cleft bar and an obtuse, apiculate tip.

*Plant* small, epiphytic, densely caespitose; roots slender. Ramicauls erect, slender, 2–2.5 cm long, enclosed by a tubular sheath from below the middle, and another sheath at the base. *Leaf* erect, coriaceous, narrowly elliptical, acute, 3–5 cm long including a petiole ca. 1 cm long, 0.5 mm wide when dry, narrowed below into the petiole. All floral parts infested with irregular, granular deposits of an unidentified substance: *Inflorescence* solitary; 8 cm long, the raceme erect, congested, many-flowered, secund with most flowers open simultaneously; floral bracts oblique, acute, 1.5–2 mm long; pedicels 1 mm long; ovary 1 mm long; the peduncle ca. 2 cm long, from a node at the apex of the ramicaul; *sepals* probably yellow or white, similar, glabrous, elliptical, subacute, connate basally, 1.5 mm long, 1 mm wide, indistinctly 3-veined, the lateral sepals antrorse; *petals* thin, ovate, obtuse, 0.4 mm long, 0.4 mm wide, without a visible vein; *lip* subquadrate, obscurely 3-lobed, 0.5 mm long, 0.5 mm wide, 0.3 mm deep, concave below a channeled bar, the apex triangular, subacute, with acute basal angles or lateral lobes, the dorsum truncate, deeply cleft, densely short-pubescent, the base connate to the base of the column; *column* ca. 0.5 mm long and wide, the anther and the stigmatic lobes apical.

**Etymology:** From the Latin *leprinus*, “having leprosy (*lepra*),” referring to the substance within the floral parts that are superficially similar to diseased tissue of leprosy.

This little, caespitose species is distinguished by a congested, secund raceme of minute flowers. Most

vegetative and floral parts contain irregular particles of an unknown substance, similar to what is seen in the similar *Stelis coralloides* Luer & Hirtz. From the latter, *Stelis leprina* is distinguished by extremely small petals and lip, the lip being half as large as a sepal of *S. coralloides*. The petals and lip disappear in older flowers, but near the tip of the raceme they persist without invasion by the mysterious substance.

**Stelis leptorhiza** Luer & R.Escobar, *sp. nov.* TYPE: COLOMBIA. Antioquia: El Retiro, coll. above Colomborquídeas by unknown collector, ca. 1500 m, fl. in cult. at Colomborquídeas. 16 May 1993, C. Luer 16919 (Holotype: MO). Fig. 22.

This large, slender-repent species is characterized by a slender, long-creeping rhizome; long, slender ramicauls; broad, acuminate, petiolate leaves; one or two long, many-flowered racemes; and a five-veined dorsal sepal above a concave synsepal.

*Plant* large, epiphytic, long-repent, the rhizome slender, 1.5–2 cm long between ramicauls; roots slender. Ramicaul erect, slender, 12–20 cm long, with a close, tubular sheath on the middle third from below the middle, and another 1–2 sheaths about the base. *Leaf* erect, thinly coriaceous, broadly elliptical, acute, acuminate, 9–14 cm long including a petiole 1.5–3 cm long, the blade 3–4.5 cm wide in the dry state, cuneate below into the petiole. *Inflorescence* 1–2; 13–20 cm tall, the raceme erect, strict, secund, subdense, simultaneously many-flowered with many flowers open simultaneously; floral bracts infundibular, acute, 2 mm long; pedicels 1 mm long; ovary 1 mm long; the peduncle 6–8 cm long, subtended by a slender spathe 1 cm long, from a node below the apex of the ramicaul; *sepals* yellow-green, glabrous, the dorsal sepal ovate, subacute, 5.5 mm long, 4 mm wide, 5-veined, the lateral sepals connate to the tips into a concave, subcircular synsepal with recurved margins, 4 mm long, 6 mm wide, expanded, 8-veined; *petals* yellow-green with brown edges, semilunate, 0.75 mm long, 1 mm wide, 3-veined, with the rounded, apical margin thickened, with an indistinct transverse callus; *lip* subquadrate, 0.5 mm long, 0.75 mm wide, 0.6 mm deep, concave below an elevated bar with a glenion, the apex subacute, with a triangular apiculum, the margins thick, the dorsum with a rounded callus; the base truncate, hinged to the base of the column; *column* ca. 0.75 mm broad and long, the anther and stigmatic lobes apical.

**Etymology:** From the Greek *leptorhiza*, “with thin rhizome,” for obvious reasons.

This large species is long-repent with a thin, creeping rhizome that produces a tall, slender ramicaul about every two centimeters. The leaf is large, thinly coriaceous, elliptical, acuminate at the tip and long-petiolate at the base. One or two racemes of medium-sized flowers far surpass the leaf. The dorsal sepal is five-veined, the petals are three-veined, and the lip is a modified type A.

**Stelis marginata** Luer & R.Escobar, *sp. nov.* TYPE: COLOMBIA. Cauca: Popayán, Páramo de Barbillas, SE of Popayán, 3150 m, 13 November 1982, C. Luer, J. Luer & R. Escobar 8359 (Holotype: SEL). Fig. 23.

This long-repent species is similar to *Stelis scansor* Rchb.f., but differs with a larger habit, longer floral bracts, larger flowers with narrowly thickened margins, and a lip with a pubescent, basal callus.

*Plant* small, epiphytic, scandent, long-repent, the rhizome stout, 0.5-1 cm between ramicauls; roots slender. Ramicauls ascending, slender, 3-4 cm long, enclosed by a tubular sheath from below the middle and 1-2 other sheaths below and at the base. *Leaf* erect, coriaceous, elliptical, subacute to obtuse, 4-6 cm long including the petiole 1.5 cm long, the blade 1-1.5 cm wide in dry state, cuneate below into the petiole. *Inflorescence* solitary; 10-13 cm long, the raceme erect, strict, congested, distichous, many-flowered; floral bracts oblique, acute, 4 mm long; pedicels 1.5 mm long; ovary 1 mm long; the peduncle 5 mm long, from a node below the apex of the ramicaul; *sepals* light green above the middle, purple below the middle, glabrous, elliptical-ovate, obtuse, with narrowly thickened margins, 3-veined, connate basally, the dorsal sepal 3.5 mm long, 2.5 mm wide, the lateral sepals 3 mm long, 2.2 mm wide; *petals* green, thin, transversely elliptical, 1 mm long, 1.25 mm wide, 1-veined, concave, the apex broadly rounded with the margin slightly thickened, without a transverse callus; *lip* green, subquadrate, 0.6 mm long, 1 mm wide, 0.75 mm deep, shallowly concave below a longitudinally grooved bar without a glenion, the apex broadly obtuse, the dorsum with a semiorbicular, minutely pubescent callus at the base, the base truncate, hinged to the base of the column; *column* clavellate, elongated, 1 mm long and wide, the anther and the bilobed stigma apical.

**Etymology:** From the Latin *marginatus*, "marginated," referring to the narrowly thickened margins of the sepals.

This small, scandent species is superficially similar to the relatively frequent and sympatric *Stelis scansor* Rchb.f., but *S. marginata* is a larger plant with a stout rhizome with a shorter distance between ramicauls. A longer raceme with much longer floral bracts bears medium-sized flowers with obtuse, three-veined sepals with narrowly thickened margins. The petals are similarly single-veined, and the lip is type A with a rounded, pubescent callus at the base.

**Stelis menippe** Luer & R. Escobar, *sp. nov.* TYPE: COLOMBIA. Antioquia: Frontino, above Frontino toward Nutibara, 1900 m, 5 May 1983, C. Luer, J. Luer, R. Escobar *et al.* 9025 (Holotype: SEL). Fig. 24.

This small species is distinguished by a crowded raceme barely surpassing a narrowly linear leaf; an acutely reflexed, convex dorsal sepal; much larger, concave, antrorse lateral sepals; small, thin, three-veined petals; and a concave lip with an acute, triangular apex.

*Plant* small, epiphytic, caespitose; roots slender. Ramicauls erect, 1.5-3 cm long, enclosed by a tubular sheath from below the middle, and another 1-2 sheaths at the base. *Leaf* erect, coriaceous, narrowly linear, subacute, 3-4 cm long, 0.3-0.4 cm wide, narrowed below to the base. *Inflorescence* solitary; 2.5-5 cm long, the raceme erect, congested, distichous, successively many-flowered raceme, with several flowers open simultaneously, flowering from the base, floral bracts oblique, acute, 1.5-2 mm long;

pedicel 1 mm long; ovary 1 mm long; the peduncle subnil, the few-millimeter base subtended by a spathe 7 mm long, from a node below the apex of the ramicaul; flowers greenish white; *sepals* glabrous, the dorsal sepal ovate, obtuse, convex, acutely reflexed, 2.5 mm long, 2 mm wide, 3-veined, free from the lateral sepals, the lateral sepals, ovate, oblique, obtuse, concave, parallel, antrorse, 3 mm long, 2.5 mm wide, 3-veined; *petals* transversely elliptical, concave, the rounded margin slightly thickened, 0.5 mm long, 0.75 mm wide, 3-veined; *lip* trilobed, 1.25 mm long, 0.75 mm wide, 0.5 mm deep, the bar broad, thick, between the erect, rounded, lateral lobes, the apical lobe triangular, acute, the disc filled with the bar as a smooth callus, the base truncate, hinged to the column-foot; *column* stout, 0.75 mm long and wide, the anther and stigmatic lobes apical.

**Eponymy:** Named for *Menippe*, a genus of crabs, with some species reminiscent of this species.

This small, caespitose species is characterized by a narrowly linear leaf and a congested, distichous, successively flowered raceme about as long, with several flowers open simultaneously. The dorsal sepal is convex and reflexed, the lateral sepals, considerably larger than the dorsal sepal, are concave, parallel and antrorse, vaguely suggesting a pair of stone-crab claws. The petals are 3-veined, and the lip is 3-lobed with the apical lobe triangular and acute.

**Stelis miranda** Luer & R. Escobar, *sp. nov.* TYPE: COLOMBIA: Norte de Santander: Páramo de Jurisdicciones, 3150 m, 30 April 1982, C. Luer, J. Luer & R. Escobar 7633 (Holotype: SEL). Fig. 25.

This very small, caespitose species is distinguished by narrowly elliptical leaves; a long, filamentous peduncle with a series long-pedunculate flowers; single-veined petals abruptly contracted into slender tails; and an ovate, concave lip with a basal callus that is bifurcated above the middle.

*Plant* small, epiphytic, densely caespitose, roots slender. Ramicauls erect, slender, 10-20 mm long, with a tubular sheath from below the middle and another above the base. *Leaf* erect, coriaceous, narrowly elliptical, acute to subacute, 8-30 mm long, with a petiole 0.5-1 mm long, the blade 3-5 mm wide in the dry state, gradually narrowed below into the petiole. *Inflorescence* single; 4-8 cm long, the peduncle and rachis filamentous, weak, more or less arching, the raceme lax with 5-8 long-pedicellate flowers, the pedicels decreasing in length toward the tip; floral bracts acute, oblique, 1.5 mm long; pedicels 12-4 mm long; ovary 1.5 mm long; peduncle 3-5 cm long, from a node at the tip of the ramicaul; *sepals* translucent lavender, glabrous, antrorse, 3-veined, connate basally, the dorsal broadly ovate, obtuse, 2 mm long, 2.3 mm wide, the lateral sepals oblong, obtuse, oblique at the apex, 3 mm long, 1.3 mm wide, connate midway; *petals* purple, the blade subquadrate to oblong, 1.3 mm wide and long excluding the tail, 1-veined, the apex truncate, abruptly contracted into a slender process 1.3 mm long; *lip* green, obovate 1.5 mm long, 1.3 mm wide, dilated and shallowly concave above the middle, the apex obtuse to rounded, the basal third oblong, thick, minutely pubescent, bifurcated near the middle at the base of the concavity, the base truncate, connate to the base of the column; *column*



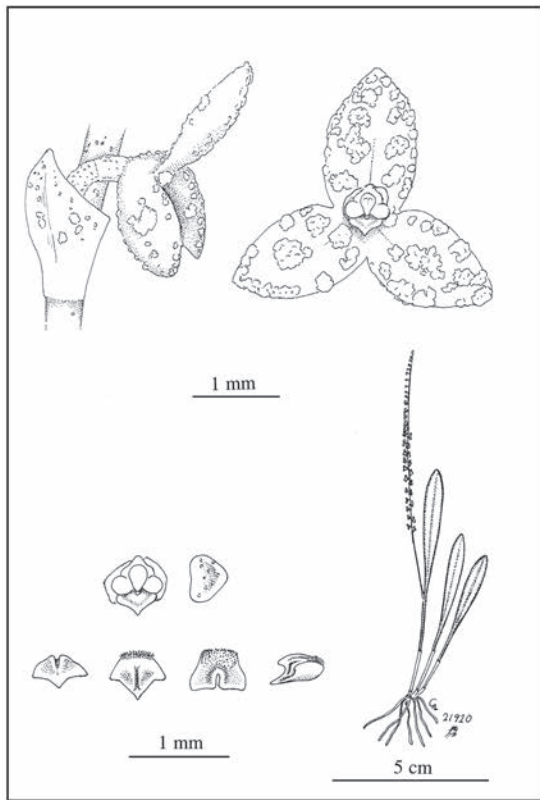


FIGURE 21. *Stelis leprina* Luer & R. Escobar

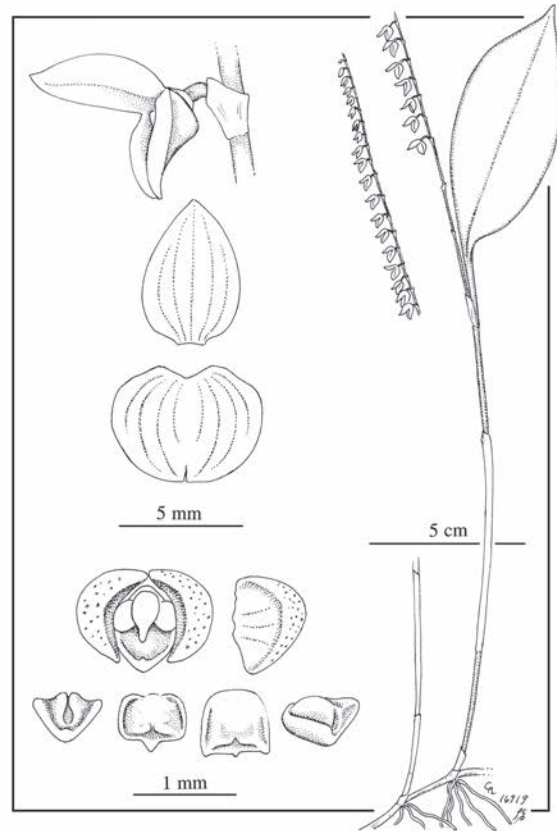


FIGURE 22. *Stelis leptorhiza* Luer & R. Escobar

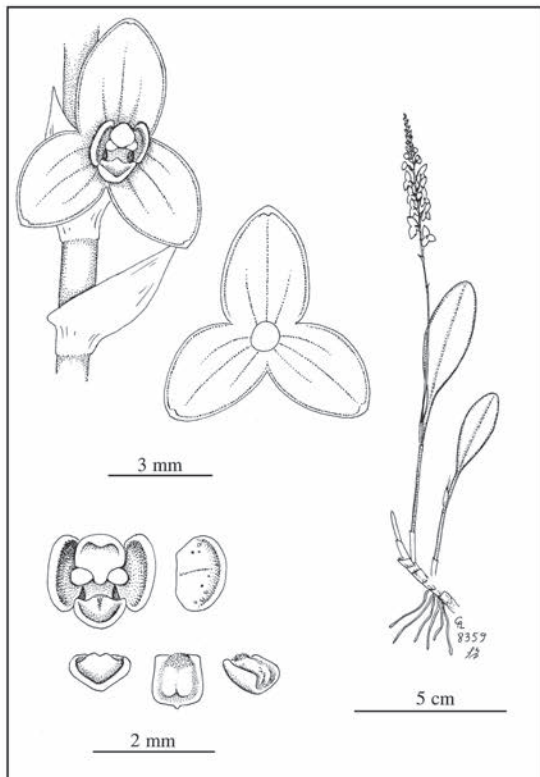


FIGURE 23. *Stelis marginata* Luer & R. Escobar

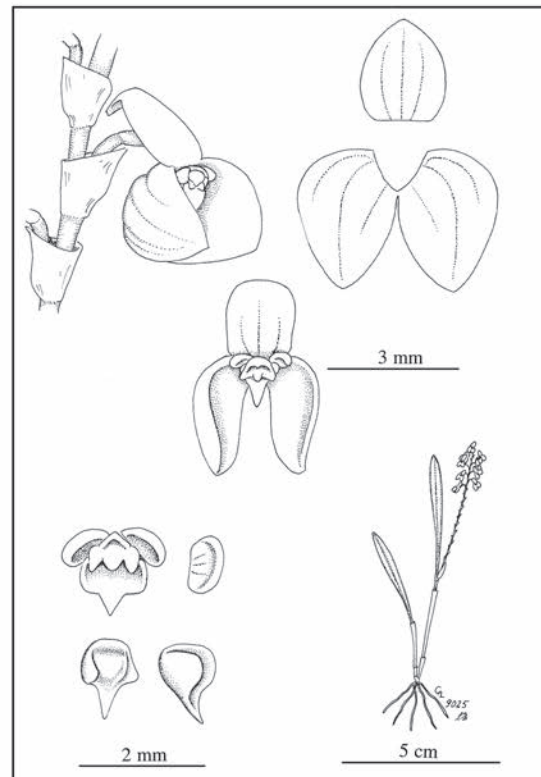


FIGURE 24. *Stelis menippe* Luer & R. Escobar



semiterete, 1.3 mm long, 0.75 mm wide, the anther and the bilobed stigma apical.

**Etymology:** From the Latin *mirandus*, "strange," referring to the unusual, floral morphology.

This unusual species is similar to three, small Bolivian species distinguished by a filamentous peduncle and rachis, and long-pedicellate flowers: *Stelis antennata* Garay, *Stelis ballatrix* Luer & R.Vásquez and *Stelis saltatrix* Luer & R.Vásquez. *Stelis miranda* differs from all of them by a smaller habit with narrowly elliptical leaves, single-veined petals abruptly contracted into filamentous tips, and a concave lip with a bifid callus.

**Stelis molecula** Luer & R.Escobar, *sp. nov.* TYPE: COLOMBIA. Norte de Santander: below Páramo de Jurisdicciones, 2600 m, 10 May 1904, *C. Luer, J. Luer & R. Escobar 10218* (Holotype: MO). Fig. 26.

This very small, caespitose species is distinguished by elliptical leaves; a twice longer, subflexuous, successively-flowered raceme of tiny flowers; subacute sepals about one millimeter long; single-veined petals; an ovate lip with a large central callus; and stigmatic surfaces within the clinandrium.

*Plant* very small, epiphytic, caespitose, sometimes forming large clumps, roots slender. Ramicauls erect, slender, 5–8 mm long, enclosed by 2 close, tubular sheaths. *Leaf* erect, coriaceous, elliptical, acute, 5–12 mm long, 2–3 mm wide in the dry state, narrowed below to the subpetiolate base. *Inflorescence* single; 3–4 cm long, the raceme erect, subflexuous, successively many-flowered with several flowers open simultaneously; floral bracts oblique, acute, 1 mm long; pedicels 1 mm long; ovary 0.5 mm long; the peduncle 1–1.5 mm long, from the apex of a ramicaul; flowers purple; *sepals* glabrous, expanded, ovate, obtuse, 3-veined, connate basally, 1 mm long, 1 mm wide; *petals* broadly ovate, thin, slightly thickened on the rounded margin, 0.75 mm long, 0.75 mm wide, 1-veined; *lip* ovoid, 0.5 mm long, 0.5 mm wide, 0.5 mm deep, concave surrounding a rounded, central callus within the obtuse, thickened margin of the obtuse apex, thickened and microscopically pubescent at the base of the callus, the base truncate, hinged to the base of the column; *column* clavate, 0.5 mm long and wide, the anther apical, the stigmatic lobes narrow, within the margin of the clinandrium.

**Etymology:** From the Latin *molecula*, diminutive *moles*, "a mass that cannot be divided," referring to the minute size.

This very small, caespitose species is characterized by elliptical leaves and a twice longer, subflexuous raceme of tiny, purple flowers. The sepals are one millimeter long and wide; the petals are thin and single-veined; and the lip has a rounded callus surrounded by a moatlike cavity. The stigmatic lobes are within the margins of the clinandrium.

**Stelis mordica** Luer & R.Escobar, *sp. nov.* TYPE: COLOMBIA. Cauca: Páramo de Guanacas, between Totoró and Inza, 2850 m, 15 November 1982, *C. Luer & R. Escobar 8411* (Holotype: SEL). Fig. 27.

This slender, medium-sized, caespitose species is characterized by one or two long, many-flowered racemes of flowers

with an antrorse dorsal sepal connate a third of its length to a synsepal formed by the inflated base of the synsepal; and a subquadrate lip with a truncate, three-lobed apex.

*Plant* medium in size, epiphytic, densely caespitose; roots slender. Ramicaul erect, slender, 4–6 cm long, with a tubular sheath on the middle third, and another 1–2 sheaths below and about the base; *Leaf* erect, coriaceous, narrowly elliptical, acute, 5–7 cm long including a petiole 1.5 cm long, the blade 0.5–0.8 cm wide in the dry state, cuneate below into the petiole. *Inflorescence* 1–2; 13–15 cm tall, the racemes erect, strict, secund, congested, multiflowered with many flowers open simultaneously, floral bracts tubular, subacute, 3 mm long; pedicels 2 mm long; ovary 2.5 mm long; the peduncle ca. 3 cm long, subtended by a slender spathe 1 cm long, from a node below the apex of the ramicaul; flowers purple; *sepals* glabrous, the dorsal sepal antrorse, oblong-ovate, subacute, 5 mm long, 2 mm wide, 3-veined, connate ca. 2 mm to the synsepal, the lateral sepals connate to the tip into a suborbicular synsepal, 4.5 mm long, 4.5 mm wide unexpanded, each 3-veined; *petals* transversely ovate, 0.75 mm long, 1.3 mm wide, 3-veined, concave within the obtuse, thickened apical margin, with an indistinct transverse callus; *lip* subquadrate, 1.25 mm long, 0.75 mm wide, 0.75 mm deep, concave below a widely cleft bar near the middle of the lip with an incomplete glenion, the apex truncate, indistinctly 3-lobed, the lateral angles obtuse, the middle lobe being an obtuse triangle, the dorsum convex centrally; the base truncate, hinged to the base of the column; *column* ca. 0.8 mm broad and long, the anther and stigmatic lobes apical.

**Etymology:** From the Latin *mordicus*, "biting, snapping," an allusion to the fancied appearance of the flower.

This medium-sized, caespitose species is characterized by slender ramicauls, an elliptical leaf less than one centimeter wide, and one or two longer multiflowered racemes of purple, bilabiate flowers. The dorsal sepal is connate to the lateral sepals for nearly two millimeters to form the roof of the retrorse mentum at the base of the inflated synsepal. The petals are three-veined. The lip is a variation of type A with the bar forked near the middle, and a trilobed-truncate apex, a low, obtuse, marginal triangle being the middle lobe between obtusely angled corners.

**Stelis nexosa** Luer & R.Escobar, *sp. nov.* TYPE: COLOMBIA. Tolima: terrestrial on the road cut to the TV antenna, La Linea, between Ibagué and Armenia, 3500 m, 20 October 1982, *C. Luer & R. Escobar 8491* (Holotype: SEL). Fig. 28.

This small, species is distinguished by clusters of branching, overlapping rhizomes; narrowly elliptical leaves about as long as the ramicaul, and surpassed by a loose, several-flowered raceme; obtuse, three-veined sepals; single-veined petals; and a lip with a raised callus across the bar.

*Plant* small, terrestrial, epiphytic, repent, the rhizome branching, slender, 2–5 mm long between ramicauls; roots slender. Ramicauls ascending, slender, branching, 1–1.5 cm long, enclosed by a tubular sheath and another sheath at the base. *Leaf* erect, coriaceous, narrowly elliptical, acute, 1–2 cm long including an ill-defined petiole, 2–3 mm wide dry,

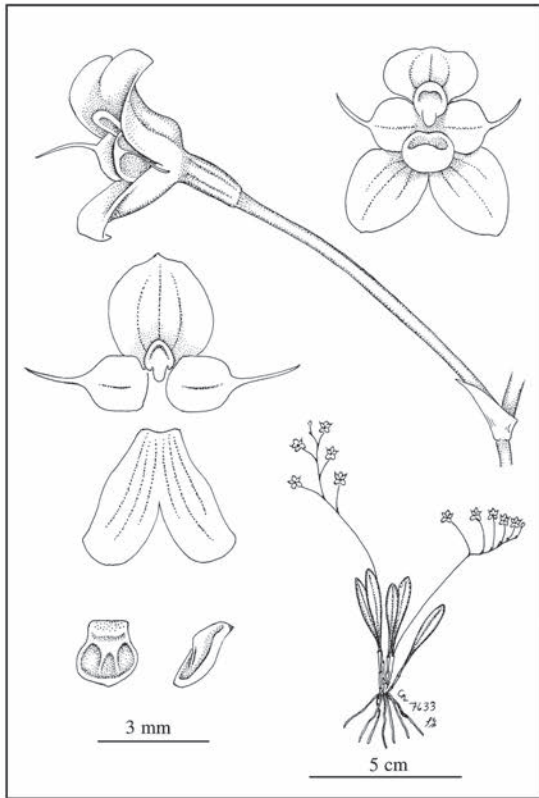


FIGURE 25. *Stelis miranda* Luer & R. Escobar

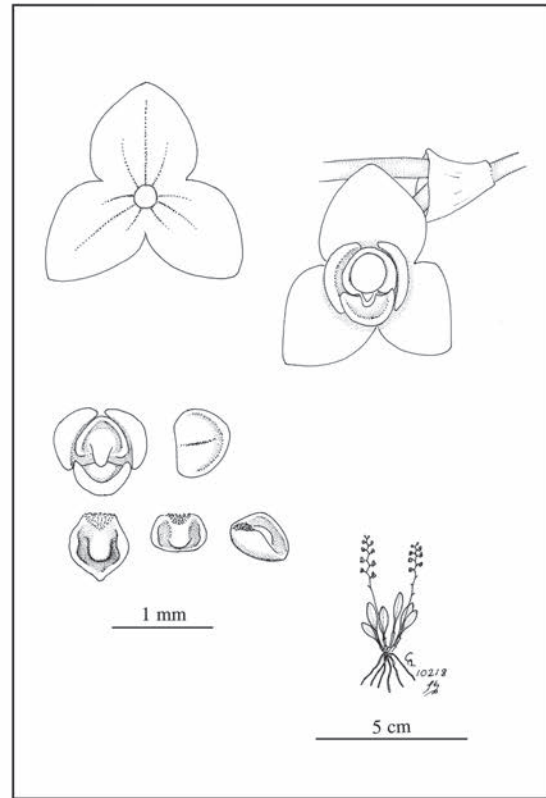


FIGURE 26. *Stelis molecula* Luer & R. Escobar

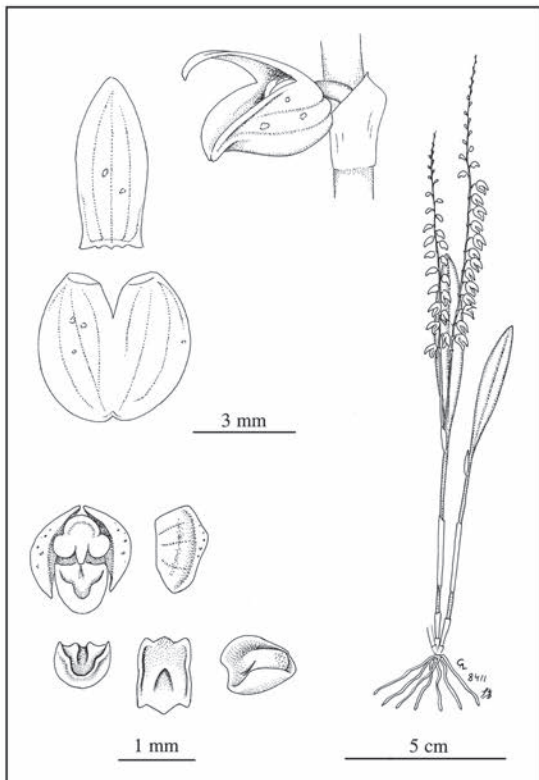


FIGURE 27. *Stelis mordica* Luer & R. Escobar

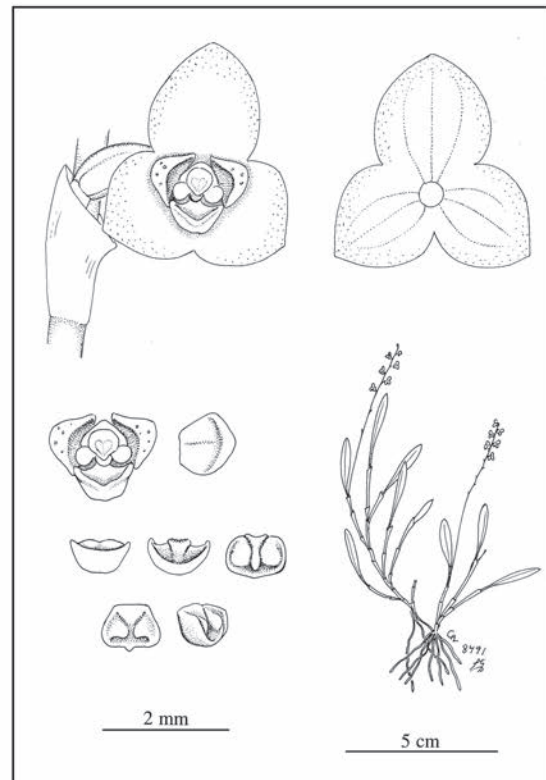


FIGURE 28. *Stelis nexosa* Luer & R. Escobar

gradually narrowed below to the base. *Inflorescence* single; 2–4 cm long, the raceme erect, loosely 6– to 10–flowered, with several flowers open simultaneously; floral bracts tubular, acute, 1.5 mm long; pedicels 0.5 mm long; ovary 1–2 mm long; the peduncle ca. 1 cm long, from a node at the apex of the ramicaul; *sepals* light green, expanded, similar, glabrous, broadly ovate, obtuse, connate below the middle, 3-veined, the dorsal sepal 2.2 mm long, 2 mm wide, the lateral sepals 1.75 mm long, 2 mm wide; *petals* yellow-brown, transversely obovate, concave, 0.5 mm long, 0.9 mm wide, 1-veined, the apex broadly obtuse; *lip* dark brown, subquadrate, 0.6 mm long, 0.9 mm wide, 0.5 mm deep, concave within the broadly rounded apex, the dorsum with a flat, raised callus that begins at the base, narrows at the middle as it curves downward and descends, the base truncate, hinged to the base of the column; *column* stout, ca. 1 mm long and wide, the anther and the bilobed stigma apical.

**Etymology:** From the Latin *nexusus*, “tangled,” referring to the mass of overlapping, intertwined, branching habit.

This small species was found growing in great clumps of overlapping, branching rhizomes on the road embankment at a high altitude. A several-flowered, loose raceme of little flowers exceeds the leaf about twice its length. The sepals are obtuse and three-veined, and the petals are single-veined. The lip is a modified type C with a flat, elevated callus from across the base, then narrowed as it curves over the rounded bar.

**Stelis oblector** Luer & R.Escobar, *sp. nov.* TYPE: COLOMBIA. Putumayo: between La Cocha and Sibundoy. 2700 m, 30 July 1978, C. Luer, J. Luer, R. Escobar et al. 3087 (Holotype: SEL). Fig. 29.

This medium-sized, caespitose species is distinguished by an erect, loosely and successively flowered raceme; a rounded, three-veined dorsal sepal; a suborbicular synsepal; single-veined petals; and a lip with a triangular apiculum.

*Plant* medium in size, epiphytic, caespitose; roots slender. Ramicaul erect, slender, 6–7 cm long, with a loose, tubular sheath on the middle third from below the middle, and another 1–2 sheaths about the base. *Leaf* erect, coriaceous, elliptical-ovate, subacute, 7–8 cm long including a petiole 1.5 cm long, the blade 1.6–1.7 cm wide in the dry state, cuneate below into the petiole. *Inflorescence* single; 13–15 cm tall, the raceme erect, distichous, loose, successively flowered with 4–5 flowers open simultaneously; floral bracts infundibular, acute, 5 mm long; pedicels ca. 2 mm long; ovary 1.5 mm long; the peduncle 8–15 cm long, subtended by a slender spathe 1–1.5 cm long, from a node below the apex of the ramicaul; flowers yellow; *sepals* glabrous, the dorsal sepal elliptical, convex, with the apex rounded, 3.3 mm long, 2.3 mm wide, 3-veined, the lateral sepals concave, connate to the tips into a suborbicular synsepal, 2.5 mm long, 3 mm wide, unexpanded, 6-veined; *petals* thin, concave, subcircular, 0.75 mm long, 1 mm wide, 1-veined, with the apical margin narrowly thickened, without a transverse carina; *lip* obovoid, 0.4 mm long, 0.6 mm wide, 0.3 mm deep, concave below a narrow, arched bar, the apex with a subacute, triangular apiculum, the dorsum thickened with a low, rounded callus; the base truncate, hinged to the

base of the column; *column* ca. 0.75 mm broad and long, the anther and stigmatic lobes apical.

**Etymology:** From the Latin *oblector*, “a charmer,” referring to pleasing qualities of the plant.

This caespitose species is distinguished by a long, loosely flowered raceme with a peduncle longer than an elliptical leaf. A convex dorsal sepal stands above a suborbicular synsepal created by connate, concave lateral sepals. The petals are single-veined, and the apex of the lip is a subacute, triangular apiculum.

**Stelis ocreosa** Luer & R.Escobar, *sp. nov.* TYPE: COLOMBIA. Cauca: Páramo de Puracé, terrestrial on the road cut W of the pass, 3200 m, 14 November 1982, C. Luer & R. Escobar 8391 (Holotype: SEL). Fig. 30.

This small, caespitose species is distinguished by purple floral bracts longer than obtuse, three-veined sepals in a raceme that exceeds the leaf; single-veined petals; and an obtuse lip with a large glenion.

*Plant* small, epiphytic, caespitose; roots slender. Ramicauls erect, slender, 5–15 mm long, enclosed by a loose, tubular sheath from near the middle and another 1–2 sheaths below and at the base. *Leaf* erect, coriaceous, elliptical, acute to subacute, 10–28 mm long including the petiole 5–8 mm long, the blade 3–6 mm wide in the dry state, cuneate below to the petiole. *Inflorescence* single; 6–7 mm long, the raceme erect, strict, distichous successively many-flowered; floral bracts purple, acute, oblique, 3–4 mm long; pedicels 1.5–2 mm long; ovary 1 mm long; the peduncle 2–3 cm long, from a node at the apex of the ramicaul; *sepals* yellow, brown centrally, glabrous, ovate, obtuse, 3-veined, connate basally, the dorsal sepal 2.5 mm long, 2.25 mm wide, the lateral sepals 2.5 mm long, 2 mm wide; *petals* yellow-green, transversely elliptical, 1 mm long, 1.3 mm wide, 1-veined, concave, the apex rounded with the margin narrowly thickened; *lip* yellow-green, type-A, subquadrate, 0.8 mm long, 1 mm wide, 0.5 mm deep, concave below a thick, cleft bar with a deep glenion, the apex truncate, with a short, low apiculum, the dorsum cleft, the base truncate, hinged to the base of the column; *column* clavate, ca. 1 mm long and wide, the anther and the bilobed stigma apical.

**Etymology:** From the Latin *ocreosus*, “with well-developed sheaths,” referring the large, purple floral bracts.

This little, caespitose species differs from the numerous variations allowed in *Stelis pusilla* Kunth by having larger flowers; conspicuous, large, purple floral bracts; and a lip with a cleft bar and large glenion.

**Stelis ophiodontodes** Luer & R.Escobar, *sp. nov.* TYPE: COLOMBIA. Antioquia: Unión, 2400 m, coll. by E. Valencia, 1991. fl. in cult. at Colomborquídeas, 27 December 1992, R. Escobar 5142 (Holotype: SEL), C. Luer illustr. 21914. Fig. 31.

With long stigmatic processes this species is similar to the Ecuadorian *Stelis odobenella* Luer, but differs with a strict raceme, instead of flexuous, and with details of the lip, which lacks the pair of mammiliform calli, and possesses a single callus on the acutely descending, concave dorsum.

*Plant* small, epiphytic, caespitose; roots slender.



Ramicauls erect, slender, 13 mm long, enclosed by 2–3 thin, tubular sheaths. *Leaf* erect, coriaceous, elliptical, subacute to obtuse, 35 mm long including a petiole ca. 10 mm long, 6 mm wide, cuneate below into the petiole. *Inflorescence* single; 7 cm long including a peduncle 3 cm long, the raceme erect, strict, lax, several-flowered with 3–4 flowers open simultaneously, the peduncle from an annulus below the apex of the ramicaul; floral bracts oblique, acute, 1.5 mm long; pedicels 1.5 mm long; ovary 1 mm long; *sepals* glabrous, the dorsal sepal red, erect, broadly ovate, obtuse, 5 mm long, 5 mm wide, 3-veined, connate basally to the synsepal for 1 mm, the lateral sepals white, connate into a broadly ovoid, deeply concave synsepal, 6 mm long, 6 mm wide expanded; *petals* red, transversely ovate, 0.5 mm long, 1.25 mm wide, 3-veined, concave basally, thickened transversely across the middle, the apex broadly rounded, thickened on the margin; *lip* red, subtriangular, 0.75 mm long, 0.75 mm wide, 0.5 mm deep, the bar elevated and thin between narrow sides, the anterior surface featureless behind an obtuse, thickened, broadly obtuse, apical margin, the dorsum, or posterior surface, acutely descending and concave with a central callus, prominently 3-veined to the truncate base, hinged to the base of the column; *column* stout, ca. 0.5 cm long and wide, the anther and the bilobed stigma apical, each stigma with a fang-like process 1 mm long.

**Etymology:** From the Greek *ophiodontodes*, “like fangs (snake teeth),” referring to the elongated stigmatic processes.

This species is allied to *Stelis odobonella* Luer which is frequent in southeastern Ecuador. Except for a trivial difference of a strict, instead of a flexuous rachis, the plants are very similar, but the lips differ. The pair of mammillate calli found in *S. odobonella* are absent. The dorsum, or steeply sloping posterior surface of the lip, is concave with a central callus.

**Stelis oreibator** Luer & R.Escobar, *sp. nov.* TYPE: COLOMBIA. Nariño: near the pass between Pasto and La Cocha, 3150 m, 27 January 1987, *C. Luer, J. Luer & C. Dodson 12549* (Holotype: MO). Fig. 32.

This medium to large, coarsely repent species is characterized by a thick rhizome; stout ramicauls bearing elliptical leaves and a longer raceme of flowers with ovate, three-veined, pubescent sepals; three-veined petals; and a subquadrate lip with a large callus filling the disc.

*Plant* medium to large, epiphytic, coarse, ascending-repent, the rhizome stout, branching, 4–5 mm thick, 1–2 cm long between ramicauls; roots coarse. Ramicauls ascending, stout, 5–6 cm long, enclosed by tubular sheath from below the middle, and 1–2 sheaths about the base. *Leaf* erect, coriaceous, elliptical, acute to subacute, 6–7 cm long including a petiole 1–1.5 mm long, the blade 1.5–2.5 cm wide in the dry state, cuneate below into the petiole. *Inflorescence* single; 15–18 cm tall, the raceme strict, erect, congested, distichous, simultaneously many-flowered; floral bracts tubular, obtuse, 3 mm long; pedicels 2 mm long; ovary 1.5 mm long; the peduncle 3–4 cm long, subtended by a spathe 12 mm long, from a node below the apex of the ramicaul; *sepals* yellow with rose pubescence, ovate, connate below the middle, 3-veined, the dorsal sepal

acute, 5.5 mm long, 3 mm wide, the lateral sepals oblique, obtuse, 2.5 mm long, 3.75 mm wide; *petals* yellow, thin, concave, subcircular, thickened on the apical margin, 1.3 mm long, 1.3 mm wide, 3-veined; *lip* yellow, subquadrate, 1.5 mm long, 1.4 mm wide, 1.3 mm deep, the apex broadly rounded, thin, concave below a thick, shallowly cleft callus that occupies ca. 75% of the disc, the base truncate, hinged to the base of the column; *column* ca. 1 mm long and wide, the anther and the stigmatic lobes apical.

**Etymology:** From the Greek *oreibator*, “a mountain climber,” referring to the repent habit.

**Additional specimens examined:** COLOMBIA. Nariño: near the pass between Pasto and La Cocha, 3000 m, 21 January 1979, *C. Luer & J. Luer 3765, 3768* (SEL).

This robust, repent species is characterized by a thick, branching rhizome that bears single ramicauls as well as pairs or clusters of a few ramicauls, each bearing an elliptical, petiolate leaf and a tall, strict raceme. The sepals are three-veined and yellow with a rose-colored pubescence. The lateral sepals are antrorse, short, oblique and obtuse in contrast to the acute, erect dorsal sepal. The lip is filled with a large, shallowly grooved callus that extends from near the base to the cavity within the rounded apex.

**Stelis otara** Luer & R.Escobar, *sp. nov.* TYPE: Antioquia: Frontino, Alto de Cuevas, 2050 m, 4 May 1983, *C. Luer, J. Luer, R. Escobar et al. 8961A* (Holotype: SEL). Fig. 33.

This large, densely caespitose species is distinguished by a many-flowered, flexuous, large-flowered raceme that exceeds the leaf; a five-veined dorsal sepal; an ovoid synsepal; proportionately large, three-veined petals; and a suborbicular lip with a thick, rounded apex.

*Plant* large, epiphytic, densely caespitose; roots slender. Ramicaul erect, slender, 10–14 cm long, with a close, tubular sheath on the middle third, and another 1–2 sheaths below and about the base. *Leaf* erect, coriaceous, elliptical, acute at the tip, 8–10 cm long including a petiole 1.5 cm long, the blade 1.5–2 cm wide in the dry state, cuneate below into the petiole. *Inflorescence* single; 10–20 cm tall, the raceme erect, distichous, flexuous, many-flowered, flowering from near the base; floral bracts oblique, acute, 3–4 mm long; pedicels 3 mm long; ovary 1.5 mm long; the peduncle subnil, subtended by a spathe 6–7 mm long, from a node near the apex of the ramicaul; *sepals* glabrous, the dorsal sepal purple, elliptical, obtuse, 9 mm long, 5 mm wide, 5-veined, the lateral sepals white, light purple along the veins, concave, antrorse, connate less than midway into an imperfect, ovoid synsepal, 7 mm long, each 5 mm wide, 6- to 7-veined; *petals* dark purple, transversely semilunate, 0.75 mm long, 1.75 mm wide, 3-veined, with the apical margin rounded, thickened, and with a transverse callus; *lip* dark purple, suborbicular, 0.75 mm long, 0.8 mm wide, 0.5 mm deep, concave within the broad, rounded apical margin, concave below the basal margin, the base truncate, hinged to the base of the column; *column* ca. 1 mm broad and long, the anther and stigmatic lobes apical.

**Etymology:** From the Greek *otaros*, “large-eared,” referring to the proportionately large petals.

This large, densely caespitose species is distinguished by



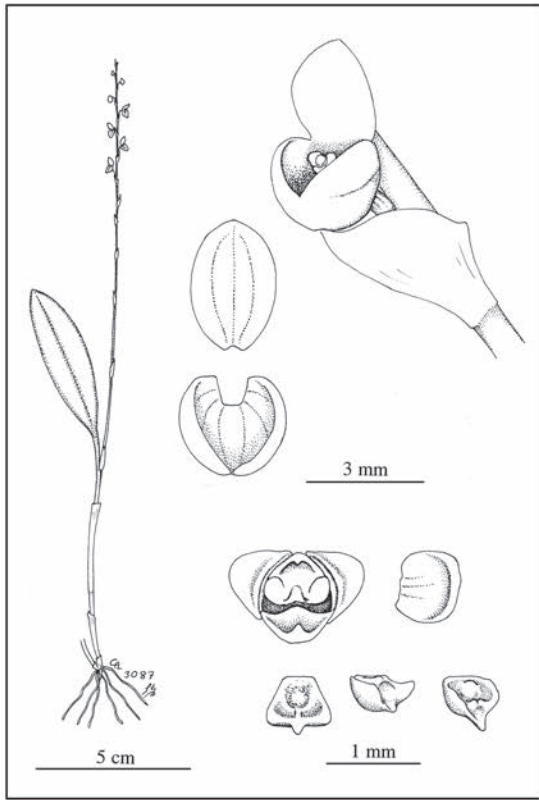


FIGURE 29. *Stelis oblector* Luer & R.Escobar

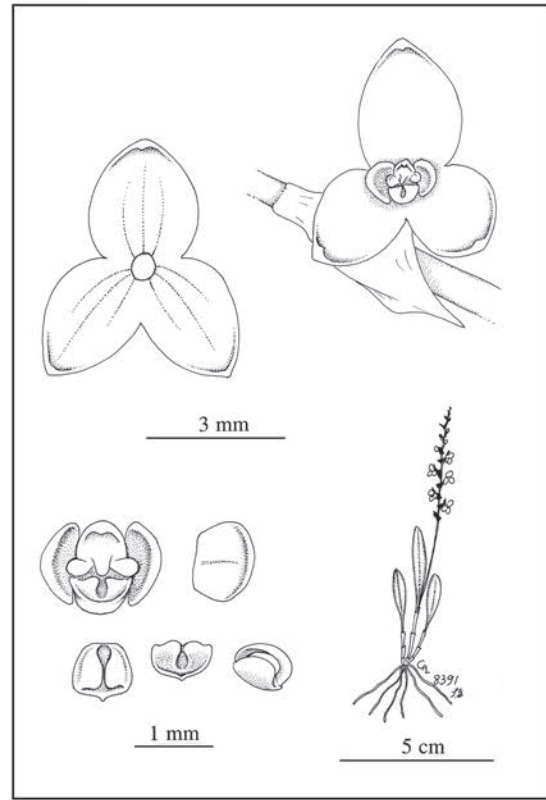


FIGURE 30. *Stelis ocreosa* Luer & R.Escobar

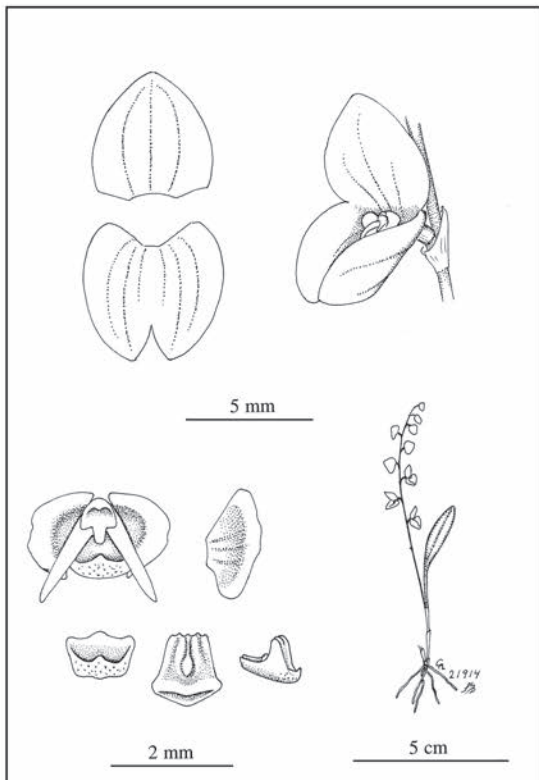


FIGURE 31. *Stelis ophiodontodes* Luer & R.Escobar

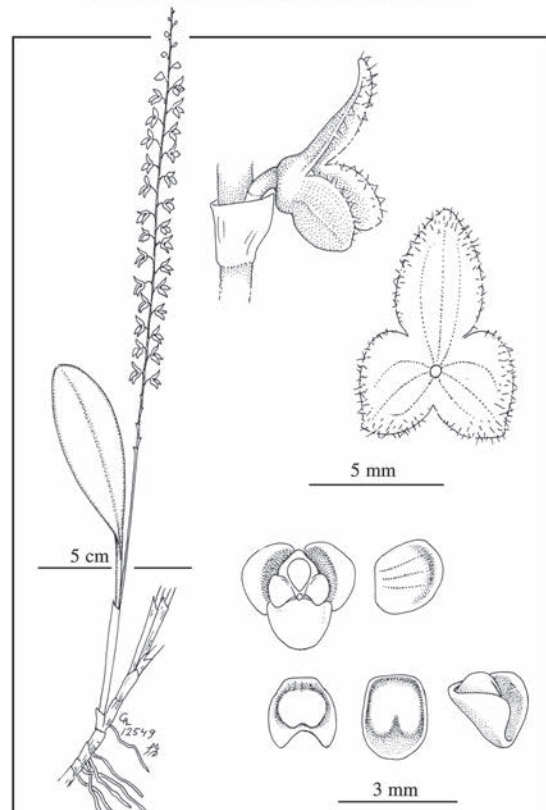


FIGURE 32. *Stelis oreibator* Luer & R.Escobar

a flexuous, many-flowered raceme of large, bilabiate flowers that exceeds an acute, elliptical leaf. The dorsal sepal is five-veined; the partially connate, multiveined lateral sepals are antrorse to form an imperfect synsepal; the petals are thick, three-veined, and proportionately large, dominating the central apparatus. The lip is suborbicular and concave within a broadly rounded apex.

**Stelis ozota** Luer & R. Escobar, *sp. nov.* TYPE: COLOMBIA. Putumayo: between La Cocha and Sibundoy, 2700 m, 30 July 1978, C. Luer, J. Luer, R. Escobar et al. 3107 (Holotype: SEL). Fig. 34.

This species is distinguished by prolific ramicauls; oblong, obtuse leaves; a many-flowered, subflexuous raceme; three-veined, dark purple flowers with obtuse, three-veined sepals; three-veined petals; and an obovoid, broadly obtuse lip with a thin, shelf-like bar.

*Plant* medium in size to large, epiphytic, caespitose; roots slender. Ramicauls erect, slender, 5–16 cm long, with a tubular sheath from below the middle, and 1–2 other sheaths below and at the base. *Leaf* erect, coriaceous, oblong, obtuse, 4.5–8 cm long, including a petiole 1–2 cm long, the blade 1.5–2.5 cm wide in dry state, cuneate below into the petiole. *Inflorescence* single; 7–12 cm long, the raceme erect, subflexuous, distichous, simultaneously many-flowered; floral bracts oblique, inflated, acute, acuminate, 3 mm long; pedicels 1.5 mm long; ovary 1.5 mm long; the peduncle 3–4 cm long, from a spathe 1 cm long near the apex of the ramicaul; flowers dark purple; *sepals* expanded, shortly pubescent, ovate, 3-veined, connate above the base, the dorsal sepal, 5 mm long, 6 mm wide, the lateral sepals 4 mm long, 4 mm wide; *petals* transversely ovate, 1 mm long, 2 mm wide, 3-veined, the apex broadly rounded with a thick margin, concave, without a transverse carina; *lip* obovoid, 1.5 mm long, 1.5 mm wide, 1 mm deep, concave below a curved, shelf-like bar slightly below the middle, the apex broadly obtuse with a thin margin, the dorsum smooth, the base truncate, hinged to the base of the column; *column* clavate, ca. 1 mm wide and long, the anther and the bilobed stigma apical.

**Etymology:** From the Greek *ozotos*, “branched,” referring to the prolific habit.

This species with prolific ramicauls is distinguished by a subflexuous raceme of dark purple flowers that exceeds an oblong, obtuse leaf. The sepals and petals are three-veined. The lip is concave below a thin, transverse bar.

**Stelis pachoi** Luer & R. Escobar, *sp. nov.* TYPE: COLOMBIA. Antioquia: Altos de Fitzebad, coll. by Pacho Lopez, fl. in cult. at Colomborquídeas, 23 May 1995, C. Luer 17603 (Holotype: MO). Fig. 35.

This medium-sized, caespitose species is distinguished by an erect, subclax, subflexuous many-flowered raceme that exceeds a narrowly elliptical leaf; a five-veined dorsal sepal spread ca. 180° from an eight-veined synsepal; three-veined petals; and a rounded lip with protruding bar and tricallous dorsum.

*Plant* medium in size, epiphytic, densely caespitose; roots slender. Ramicaul erect, slender, 7–10 cm long, with

a tubular sheath from below the middle, and another 1–2 sheaths below and about the base. *Leaf* erect, coriaceous, elliptical, acute, 10–13 cm long including a petiole 2–3 cm long, the blade 1.2–1.5 cm wide in the dry state, narrowly cuneate below into the petiole. *Inflorescence* 1–2; 12–20 cm tall, the racemes erect, distichous, subclax, subflexuous, many-flowered; floral bracts oblique, acute, 2–4 mm long; pedicels 2 mm long; ovary 1 mm long; the peduncle 3–5 cm long, subtended by a slender spathe ca. 8 mm long, from a node below the apex of the ramicaul; *sepals* glabrous, the dorsal sepal purple, ovate, with the apex obtuse to rounded, 6 mm long, 5 mm wide, 5-veined, the lateral sepals purple with the mid-third light green, connate to the tips into an ovate synsepal, shallowly concave above the middle, 5 mm long, 5 mm wide, unexpanded, 8-veined; *petals* purple, transversely semilunate, 1 mm long, 1.75 mm wide, 3-veined, with the apical margin broadly rounded, thickened, with a transverse carina; *lip* purple, subquadrate, 0.6 mm long, 1 mm wide, 0.75 mm deep, concave below a protruding, shallowly sulcate bar, the apex broadly rounded, the dorsum with a central, hemispherical callus flanked by a smaller calli on either side; the base truncate, hinged to the base of the column; *column* ca. 1 mm broad and long, the anther and stigmatic lobes apical.

**Eponymy:** Named in honor of Francisco “Pacho” Lopez, curator of orchids at Colomborquídeas, who discovered this species.

This slender, caespitose species is distinguished by one or two subflexuous racemes that eventually surpass narrow leaves. The dorsal sepal spreads about 180° from a synsepal that is concave near the apex. The petals are three-veined, and the apex of the lip is broadly rounded, the bar is protuberant, and a row of three calli is present on the dorsum.

**Stelis pachytrix** Luer & R. Escobar, *sp. nov.* TYPE: COLOMBIA. Santander: W of Velez, road to Landázuri, 2150 m, 5 May 1984, C. Luer, J. Luer & R. Escobar 10114 (Holotype: MO). Fig. 36.

This species is characterized by an elongated rhizome; ramicauls with loose, tubular sheaths; a many-flowered inflorescence that far exceeds the leaf; broadly ovate, three-veined sepals with a sparse pubescence of long, thick, trichomes; round, three-veined petals; and a rounded lip with a small, central callus.

*Plant* medium in size, epiphytic, repent, the rhizome stout, to at least 15 cm long, 1–3 cm long between ramicauls. Ramicauls ascending, erect, 4–5 cm long, with a loose, tubular sheath from below the middle, and another sheath at the base. *Leaf* erect, coriaceous, elliptical, acute, 5–6 cm long, 0.8–1.1 cm wide in the dry state, cuneate below into a subpetiolate base. *Inflorescence* single; 12–14 cm long, the raceme erect, subcongested, distichous, many-flowered with several flowers open simultaneously; floral bracts oblique, acute, 2.5 mm long; pedicels 1.5 mm long; ovary 1.5 mm long; the peduncle 3–7 cm long, subtended by a spathe ca. 5 mm long, from a node at the apex of the ramicaul; flowers light yellow; *sepals* glabrous externally, with a sparse pubescence of thick trichomes within, mostly toward the margins, connate below the middle, 3-veined,

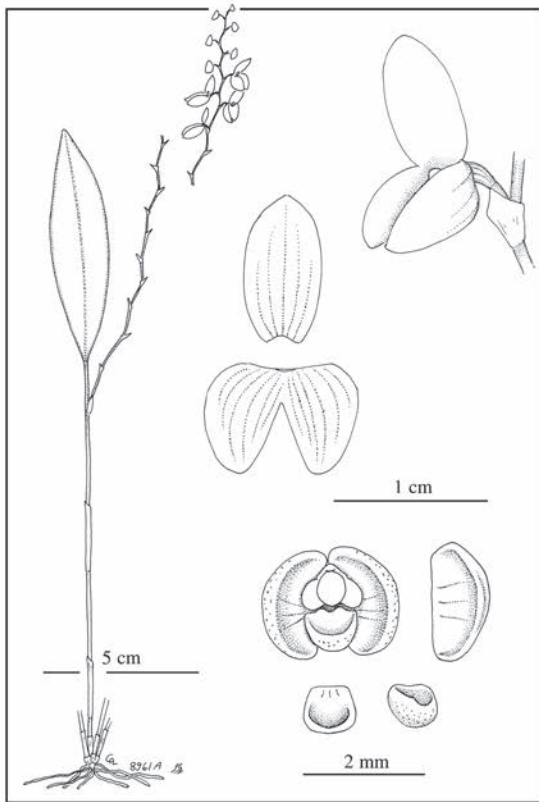


FIGURE 33. *Stelis otara* Luer & R.Escobar

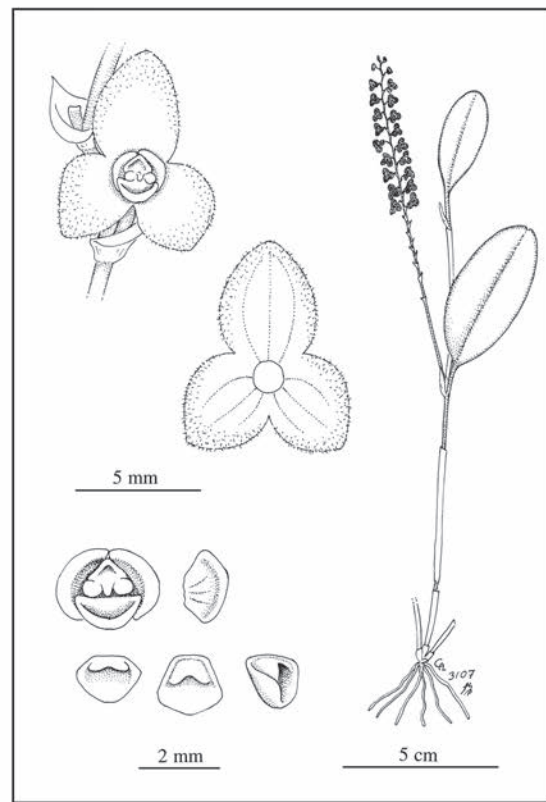


FIGURE 34. *Stelis ozota* Luer & R.Escobar

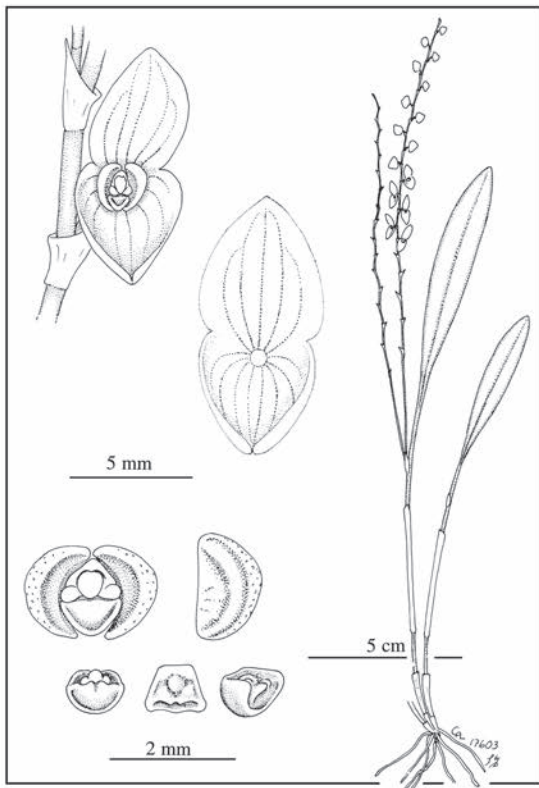


FIGURE 35. *Stelis pachoi* Luer & R.Escobar

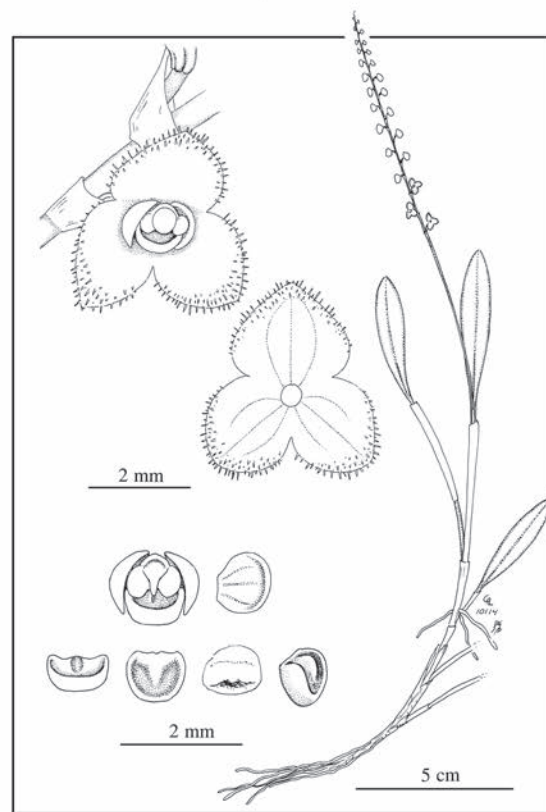


FIGURE 36. *Stelis pachythrix* Luer & R.Escobar

the dorsal sepal transversely ovate, broadly obtuse, 2 mm long, 2.5 mm wide, the lateral sepals broadly ovate, obtuse, subcircular, 2 mm long, 2 mm wide; *petals* thin, subcircular, broadly obtuse, narrowly thickened on the margin, shallowly concave, without a transverse carina, 1 mm long, 1 mm wide, 3-veined; *lip* subhemispherical, 0.75 mm long, 1 mm wide, 0.5 mm deep, shallowly concave below a round bar with an obscure glenion, the apex rounded, concave within a thin margin, the dorsum narrow, featureless, the base broadly truncate, connate to the base of the column; *column* stout, ca. 1 mm long and wide, the anther and the stigmatic lobes apical.

**Etymology:** From the Greek *pachythrinx*, “thick hair,” referring to the pubescence.

This creeping, climbing species with a long, many-flowered raceme is distinct with a sparse pubescence of conspicuously thick hairs toward the margins of broadly ovate sepals. The petals are thin, circular and three-veined. The lip is a variation of type C, and shallowly concave within a smooth, thin, rounded margin.

***Stelis paradoxa*** Luer & R. Escobar, *sp. nov.* TYPE: COLOMBIA. Antioquia: Betania, Farallones, 2200 m, fl. in cult. by Marta and Oscar Robledo at La Ceja, 19 March 1989, *C. Luer 14263* (Holotype: MO). Fig. 37.

This small, pendent species is characterized by a successively flowered raceme of relatively large, white, pubescent sepals and dark purple petals and lip; five-veined sepals; thick three-veined petals; and a rounded lip.

*Plant* small, epiphytic, pendent, repent, the rhizome stout, descending, enclosed by loose sheaths, 0.5–1 cm long between ramicauls; roots slender. Ramicauls descending, relatively stout, 1–2 cm long, enclosed by a loose, tubular sheath and another loose sheath at the base. *Leaf* descending, coriaceous, elliptical, obtuse, 2–4 cm long, 1.5–1.8 mm wide, narrowed below to a subpetiolate base. *Inflorescence* single, pendent, 4–7 cm long, the raceme strict, lax, successively flowered with few, non-resupinate flowers open simultaneously; floral bracts oblique, acute, 3 mm long; pedicels 3–5 mm long; ovary 5–7 mm long; the peduncle 1–2 cm long, from a node at the apex of the ramicaul; *sepals* white, widely expanded, microscopically pubescent, ovate, obtuse, connate in lower third, the middle sepal 7 mm long, 7.5 mm wide, 5-veined, the lateral sepals 6 mm long, 7 mm wide, 4-veined; *petals* dark purple, semilunate, 1.5 mm long, 1.9 mm wide, 3-veined, the apex broadly obtuse with a thick margin 1 mm wide; *lip* dark purple, thickly triangular, 1.8 mm long, 1.5 mm wide, 1 mm deep, shallowly concave below a minutely notched bar, smooth, the apex broadly rounded with thickened margins, the dorsum descending, glabrous, slightly concave with the three veins thick and obscure at the base, the base hinged to the base of the column; *column* stout, ca. 1 mm long and wide, the anther and the stigmatic lobes apical.

**Etymology:** From the Latin *paradoxus*, referring to the strange behavior of the species.

This small, pendent species is similar to *Stelis pendulata* O. Duque, but differs with smaller, elliptical leaves and shorter ramicauls produced along a descending rhizome.

The pendent raceme exceeds the leaf, and bears relatively large flowers with widely spread, white sepals and dark purple petals and lip.

***Stelis pollerecta*** Luer & R. Escobar, *sp. nov.* TYPE: COLOMBIA. Huila: Páramo de Puracé, E of the pass, 3050 m, 14 November 1982, *C. Luer & R. Escobar 8393* (Holotype: SEL) Fig. 38.

This large, repent species, related to *Stelis elongata* Kunth, is distinguished by a secund, simultaneously flowered raceme with proportionately long, erect, dorsal sepals, an inflated synsepal, and a similar, trilobed lip with a long-acuminate tip.

*Plant* large, epiphytic, repent, the rhizome stout, 1–2 cm long between ramicauls; roots slender. Ramicauls erect, 3–8 cm long, with a tubular sheath from below the middle third, and another 2–3 sheaths below and at the base. *Leaf* erect, coriaceous, elliptical, acute, 8–11 cm long, including a petiole 1.5–2 cm long, the blade 1–1.8 cm wide in the dry state, cuneate below to the petiole. *Inflorescence* solitary; 15–17 long, the raceme erect, secund, many-flowered, with many flowers produced simultaneously; floral bracts oblique, acute, acuminate, 5–7 mm long; pedicels 2 mm long; ovary 1.5–2 mm long; the peduncle 5–7 cm long, from a node near the abscission layer, with a spathe 1 cm long; *sepals* glabrous, the dorsal sepal purple with apex yellow, erect, narrowly obovate, obtuse to rounded at the apex, 8–10 mm long, 3 mm wide, 3-veined, connate basally 2 mm to the synsepal, the lateral sepals yellow, ovate, oblique, obtuse, with recurved tips, adherent to near the tip, 5–6 mm long, 4–6 mm wide, 3-veined; *petals* orange, transversely elliptical, concave, broadly rounded at the apex with the margin thick with numerous, irregular crystals, without a transverse carina, 0.75 mm long, 1 mm wide, 3-veined; *lip* orange, obscurely 3-lobed, 1.5 mm long, 0.5 mm wide, 0.5 mm deep, subquadrate in the basal third with rounded lateral lobes, constricted below the basal third into a narrowly ovate, acute, acuminate, protruding midlobe, the dorsum slightly convex, the base truncate, hinged to the base of the column; *column* semiterete, ca. 0.5 mm long and wide, the anther and the bilobed stigma apical.

**Etymology:** A literal translation into Latin for “with thumbs up,” *pollicibus erectibus*, “with erect thumbs,” an allusion to the appearance of a column of numerous, erect dorsal sepals.

**Paratype:** COLOMBIA. Putumayo: between La Cocha and Sibundoy, 2700 m, 30 July–5 August 1978, *C. Luer, J. Luer, R. Escobar et al. 3103* (Holotype: SEL).

This species is the king of the elongata clan, those repent species with a distinctive lip that appear to be variations of a common ancestor. *Stelis pollerecta* is distinguished by large flowers with erect, narrowly obovate dorsal sepals that are aligned in a row in a crowded raceme. The long, narrow dorsal sepal stands above the free but opposed lateral sepals creating a deep bucket-like synsepal; the petals are three-veined with a markedly rough margin, and the long, pointed lip is similar to that of the widely distributed and variable *Stelis elongata* Kunth.



**Stelis prionota** Luer & R.Escobar, *sp. nov.* TYPE: COLOMBIA. Antioquia: Cerro Padre Amaya, 2400 m, coll. by E. Acevedo, fl. in cult. at Colomborquídeas. 5 May 1993, *C. Luer 16696* (Holotype: MO). Fig. 39.

This caespitose species is distinguished by a narrow, linear-elliptical leaf far surpassed by a crowded, distichous raceme with protruding floral bracts; three-veined sepals concave and connate in their basal thirds; three-veined petals, and a lip concave below a notched bar.

*Plant* medium to large, epiphytic, densely caespitose, roots slender. *Ramicauls* erect, slender, 5–9 cm long, with a loose, tubular sheath from near the middle, another sheath from above the base, and another at the base. *Leaf* erect, coriaceous, linear-elliptical, subacute, 10–12 cm long including a petiole ca. 1.5 cm long, the blade 0.8–1.2 cm wide in dry state, narrowly cuneate below into the petiole. *Inflorescence* single; to 25 cm long, the raceme erect, congested, strict, distichous, with many flowers open simultaneously; floral bracts oblique, acuminate, acute, 8 mm long below to 5 mm long toward the tip; pedicels 2–3 mm long; ovary 1 mm long; peduncle ca. 10 cm long, from a node near the apex of the ramicaul; *sepals* greenish-white, minutely pubescent, rigid, ovate, obtuse, concave and connate in basal third, 3-veined, the dorsal sepal 3 mm long, 3.5 mm wide, the lateral sepals 3 mm long, 4 mm wide; *petals* purple, transversely ovate, concave below the broadly obtuse, thickened and minutely verrucose apical margin, 1.25 mm long, 1.5 mm wide, 3-veined; *lip* purple, subhemispherical with the apex rounded, 1.8 mm long, 1.8 mm wide, 1.6 mm deep, concave and smooth below a thin, deeply notched bar, the dorsum smooth, connate to the base of the column; *column* stout, ca. 1 mm long and wide, the anther and the stigmatic lobes apical.

**Etymology:** From the Greek *prionotos*, “jagged like a saw,” referring to the floral bracts in the raceme.

**Paratype:** COLOMBIA. Putumayo: Valley of Sibundoy, Sibundoy, 2225–2300 m, 29 May 1946, *R.E. Schultes & M. Villarreal 7685* (AMES), *C. Luer* illustr. 21958.

This caespitose species is distinguished by an elongated, distichous raceme that far surpasses narrow, linear-elliptical, subacute leaves. Acuminate floral bracts protrude on both sides beyond the flowers. The sepals are obtuse and connate in their basal thirds to create a cavity for the central apparatus. The petals are small and three-veined. The lip is subhemispherical and deeply concave below a transverse, notched bar.

**Stelis radicans** Luer & R.Escobar, *sp. nov.* TYPE: COLOMBIA. Cauca: Páramo de Las Delicias, 3250 m, 17 November 1982, *C. Luer & R. Escobar 8469* (Holotype: SEL). Fig. 40.

This medium-sized, ascending species is distinguished by a more or less erect, thick rhizome with numerous roots; erect ramicauls with acute, narrowly elliptical leaves; subacute sepals; three-veined petals; and a subquadrate lip with a flat, nonconcave, anterior surface, and a hemispherical callus on the dorsum.

*Plant* medium-sized, epiphytic, ascending-repent, the rhizome erect, stout, ca. 4 mm thick, roots numerous,

ramicauls adjacent to 1 cm apart. Ramicauls erect, slender, 5–6 cm long, enclosed by a close, tubular sheath from below the middle and another 1–2 sheaths below and at the base. *Leaf* erect, coriaceous, narrowly elliptical, acute, 7–9 cm long including the petiole ca. 2 cm long, the blade 1–1.2 cm wide dry, narrowly cuneate below into the petiole. *Inflorescence* 1–2; 4–5 cm. tall, the racemes erect, congested, distichous, many-flowered, with many flowers open simultaneously; floral bracts oblique, acute, 3 mm long; pedicels 1.5 mm long; ovary 1.5 mm long; the peduncle ca. 1 cm long, from a node below the apex of the ramicaul; flowers purple; *sepals* similar, diffusely cellular, broadly ovate, subacute, connate in lower quarter, 3.5 mm long, 3.5 mm wide, 3-veined; *petals* transversely elliptical, the apex broadly rounded with a thickened margin, 1 mm long, 1.25 mm wide, 3-veined, with a transverse carina; *lip* thick, subquadrate, 0.75 mm long, 1 mm wide, 0.6 mm deep, the bar thick between obtuse, marginal angles, the anterior surface smooth without a glenion, the apex broadly obtuse with an erect margin against the smooth surface, the dorsum with a central, hemispherical callus, the base truncate, hinged to the base of the column; *column* stout, ca. 1 mm long and wide, with the rostellum elongated, the anther and the bilobed stigma apical.

**Etymology:** From the Latin *radicans*, “producing roots,” referring to the rhizome with roots.

This species is distinguished by a thick, more or less erect rhizome with numerous roots; slender, erect ramicauls with acute, narrowly elliptical leaves; one or two, distichous racemes slightly shorter than the leaf; and three-veined sepals and petals. The lip is an unusual variation of type A without being concave below the bar. The anterior surface is smooth without a glenion, but with a rounded callus on the dorsum.

**Stelis rectangularis** Luer & R.Escobar, *sp. nov.* TYPE: COLOMBIA. Antioquia: Frontino, near airport below El Plateado, 1820 m, 3 May 1983, *C. Luer, J. Luer, R. Escobar et al. 9052* (Holotype: SEL). Fig 41.

This large, caespitose species is distinguished by long, distichous racemes with nutant flowers; ovate, subacute, pubescent sepals; three-veined petals with a right-angled apex; and a lip with a deep glenion, and a right-angled apex.

*Plant* large, epiphytic, densely caespitose; roots slender. Ramicauls erect, slender, 4–8 cm long, with a close tubular sheath above the middle and another 1–2 sheaths below and about the base. *Leaf* erect, coriaceous, elliptical, subacute, 7–12 cm long including a petiole 1.5 cm long, the blade 1.5–2 cm wide in dry state, cuneate below into the petiole. *Inflorescence* 2–3; 12–14 cm tall, the racemes erect, strict, subcongested, distichous, with many simultaneous, nutant flowers; floral bracts oblique, acute, 3 mm long; pedicels 2 mm long; ovary 1 mm long; the peduncle ca. 3 cm long, from a node near the apex of the ramicaul, with a slender spathe 8 mm long; flowers yellow; *sepals* pubescent, ovate, subacute, connate near the base, 3-veined, the dorsal sepal 3.5–4 mm long, 2 wide, the lateral sepals antrorse, 3.5 mm long, 2 mm wide; *petals* transversely ovate to triangular, 0.6 mm long, 1 mm wide, 3-veined, concave, the apex

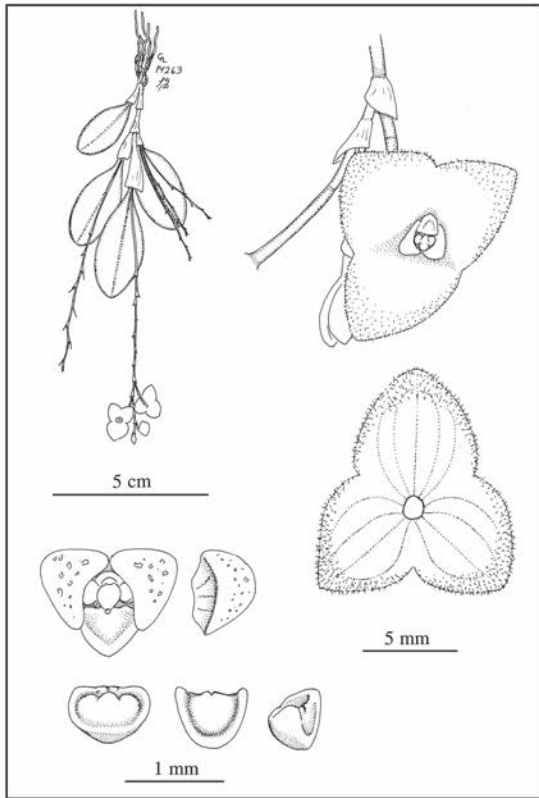


FIGURE 37. *Stelis paradoxa* Luer & R. Escobar

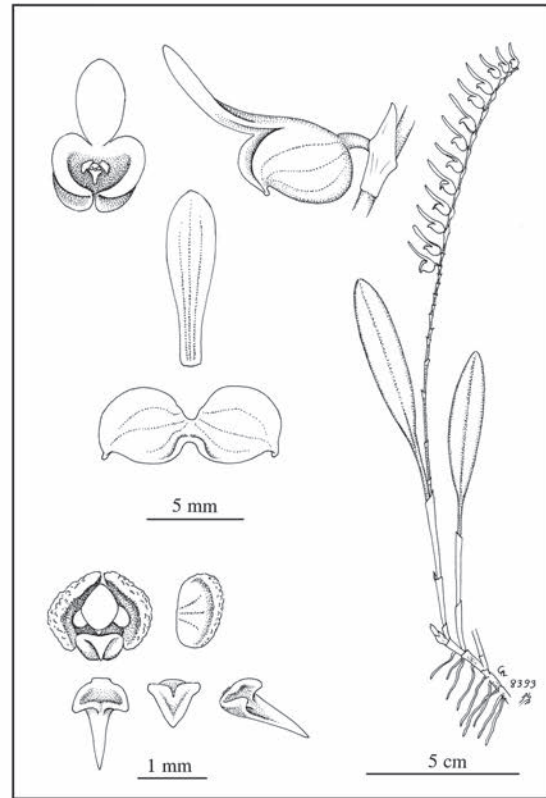


FIGURE 38. *Stelis pollerecta* Luer & R. Escobar

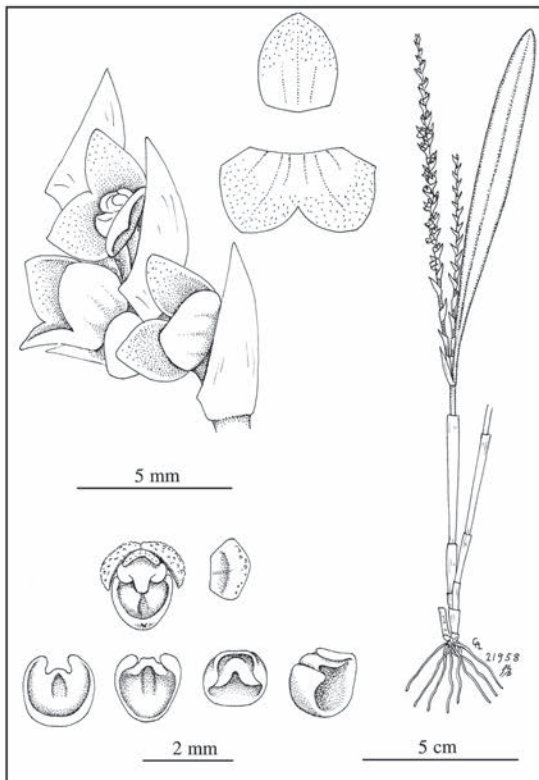


FIGURE 39. *Stelis prionota* Luer & R. Escobar

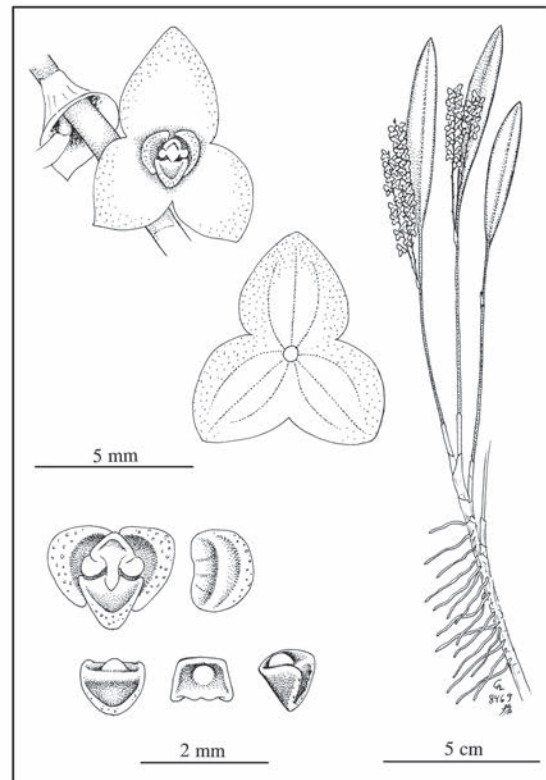


FIGURE 40. *Stelis radicans* Luer & R. Escobar

subacute or right-angled, with the margin thickened, with an indistinct transverse carina; *lip* subquadrate, 0.8 mm long, 0.8 mm wide, 0.6 mm deep, shallowly concave below the bar with a deep glenion, the apex subacute or right-angled, the dorsum slightly and widely convex, the base truncate, hinged to the base of the column; *column* clavate, ca. 0.8 mm long and wide, the anther and the stigmatic lobes apical.

**Etymology:** From the Latin *rectangularis*, "with right angles," referring to the 90 degree angle of the tips of the petals and lip.

This large, caespitose species is distinguished by two or three long racemes of nutant flowers. The sepals are pubescent with the lateral sepals antrorse. Most distinctive are the right-angled apices of both petals and lip.

**Stelis silvestris** Luer & R.Escobar, *sp. nov.* TYPE: COLOMBIA. Nariño: forest surrounding the crater lake, E slope of Volcán Galeras, 3200 m, 21 January 1979, C. Luer, J. Luer & R. Escobar 3706 (Holotype: SEL). Fig. 42.

This small, long-repent species is similar to *Stelis scansor* Rchb.f., but differs with a very slender rhizome with ramicauls spaced farther apart; an inflorescence twice longer than an elliptical leaf; larger, nodding flowers; and a lip with a single, central callus.

*Plant* small, epiphytic, scandent, long-repent, the rhizome very slender, 2–3 cm between ramicauls; roots slender, sparse. Ramicauls ascending, slender, 1.5–3 cm long, enclosed by a 2 tubular sheaths and another at the base. *Leaf* erect, coriaceous, elliptical, subacute to rounded at the tip, 2–3.5 cm long including the petiole 0.5–0.7 cm long, the blade 0.8–1 cm wide in the dry state, cuneate below into the petiole. *Inflorescence* single; 5–10 cm long, the raceme erect, lax, secund, many-flowered with several, downward-facing flowers open simultaneously; floral bracts oblique, acute, 3 mm long; pedicels 3 mm long; ovary 1.5 mm long; the peduncle 2.5–4 cm long, subtended by a spathe 3 mm long, from a node below the apex of the ramicaul; flowers green, suffused and minutely dotted with purple, nutant; *sepals* glabrous, three-veined, connate above the base, the dorsal sepal ovate, acute to subacute, 3 mm long, 2.5 mm wide, the lateral sepals broadly ovate, oblique, obtuse, 2.5 mm long, 2.6 mm wide; *petals* broadly ovate, obtuse, with a narrowly thickened margin, 1.6 mm long, 1.6 mm wide, 3-veined, without transverse carina; *lip* ovate, obtuse to subacute, 1.6 mm long, 1.3 mm wide, 1 mm deep, concave below the bar modified into a central, erect, subquadrate callus, the base truncate, hinged to the base of the column; *column* stout, 1.3 mm long and wide, the anther and the bilobed stigma apical.

**Etymology:** From the Latin *silvestris*, "of the forest," referring to the habitat.

This apparently uncommon, little species is similar to the relatively frequent and widely distributed *Stelis scansor* Rchb.f. *Stelis silvestris* is distinguished by a slender, long-repent rhizome, with elliptical, obtuse leaves that are surpassed by an erect, loosely flowered raceme with larger flowers facing downward. The sepals and the petals are three-veined; and the lip is ovate and shallowly concave with a central, erect, subquadrate callus.

**Stelis stipitata** Luer & R.Escobar, *sp. nov.* TYPE: COLOMBIA. Antioquia: NE of La Ceja, 2400 m, 29 April 1983, C. Luer, J. Luer, R.Escobar et al. 8856 (Holotype: SEL). Fig. 43.

This large species with long, slender ramicauls produced in a dense fascicle is characterized by one or two congested, small-flowered racemes that exceed the leaf; ovate, shortly pubescent sepals; three-veined petals; and a subquadrate lip with a small, obtuse apiculum at the truncate apex.

*Plant* large, epiphytic, densely caespitose; roots slender, numerous. Ramicaul erect, slender, 7–14 cm long, produced in tight clusters, with a close, tubular sheath from near the middle and another 1–2 sheaths below and about the base. *Leaf* erect, coriaceous, elliptical, acute, 6–10 cm long including a petiole ca. 1 cm long, the blade 1.2–1.6 cm wide in the dry state, cuneate below into the petiole. *Inflorescence* 1–2; 7–15 cm long, the racemes erect, strict, distichous, densely and simultaneously many-flowered with many flowers open simultaneously; floral bracts oblique, obtuse, 2 mm long; pedicels 1.5 mm long; ovary 1 mm long; the peduncle 2–3 cm long, subtended by a slender spathe ca. 1 cm long, from a node below the apex of the ramicaul; flowers purple; *sepals* shortly pubescent, ovate, subacute, 3-veined, connate below the middle, the dorsal sepal 2 mm long, 2 mm wide, the lateral sepals 1.75 mm long, 2 mm wide; *petals* transversely elliptical, 0.75 mm long, 1 mm wide, 3-veined, concave, obtuse with the margin thickened, without an obvious transverse callus; *lip* subquadrate, 1 mm long, 0.8 mm wide, 0.5 mm deep, concave below an shallowly sulcate bar with a glenion, the apex subtruncate, with a short, obtuse, triangular apiculum, the dorsum slightly convex, minutely pubescent; the base truncate, hinged to the base of the column; *column* ca. 1 mm broad and long, the anther and stigmatic lobes apical.

**Etymology:** From the Latin *stipitatus*, "crowded together," referring to fasciculate ramicauls.

This tall, slender species is densely caespitose, the slender ramicauls growing in a tight cluster. The acute, elliptical leaves are exceeded by one or two densely many-flowered racemes with small flowers. The sepals are shortly pubescent, the petals are three-veined, and the lip is type A with a small, obtuse apiculum and with the dorsum minutely pubescent.

**Stelis straminea** Luer & R.Escobar, *sp. nov.* TYPE: COLOMBIA. Cauca: Páramo de Las Delicias, 3380 m, 17 November 1982, C. Luer & R. Escobar 8477 (Holotype: SEL). Fig. 44.

This species is characterized by proliferating, stoloniferous ramicauls; elliptical leaves exceeded by a multi-flowered raceme; ovate, obtuse sepals; single-veined petals; and an obtuse, ovoid lip concave below a retuse, fleshy bar.

*Plant* large, epiphytic, densely caespitose, producing stolons, roots slender. Ramicauls erect, slender, 15–20 cm below to 0–5 cm long above, with 1–2 close, tubular sheaths below and at the base. *Leaf* erect, coriaceous, acute, narrowly elliptical, 6–7 cm long including a petiole, 1.5 cm long, the



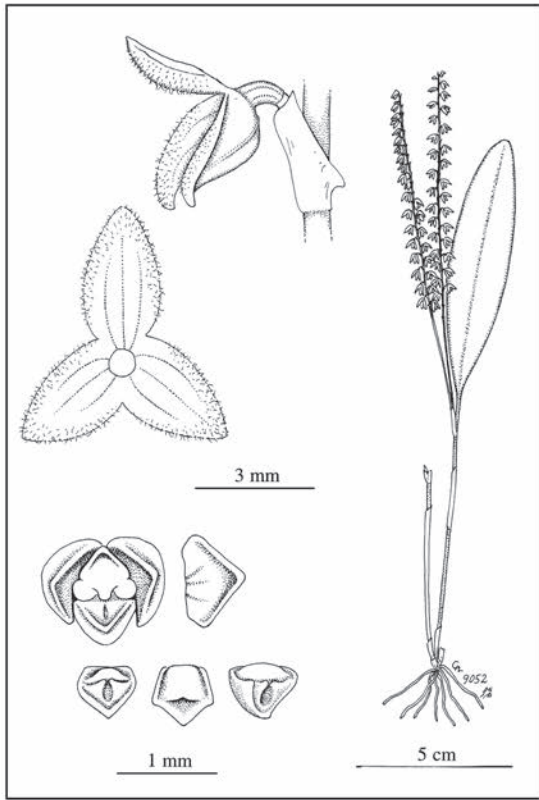


FIGURE 41. *Stelis rectangularis* Luer & R. Escobar

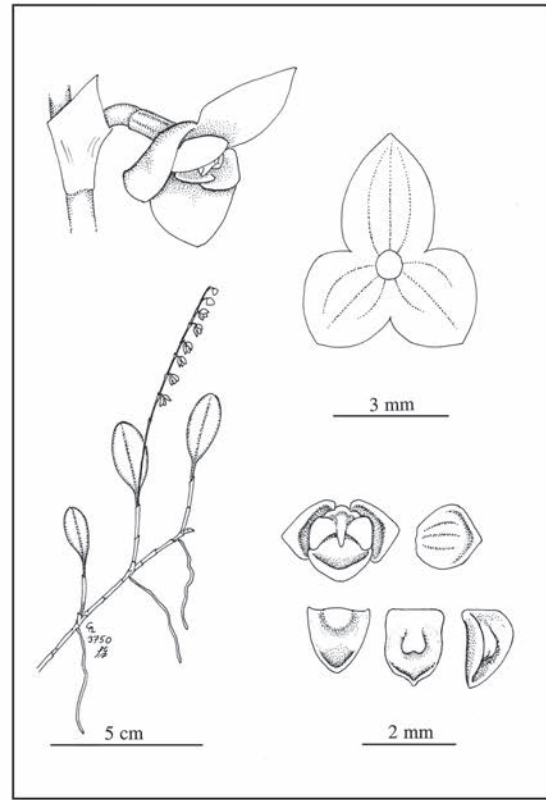


FIGURE 42. *Stelis silvestris* Luer & R. Escobar

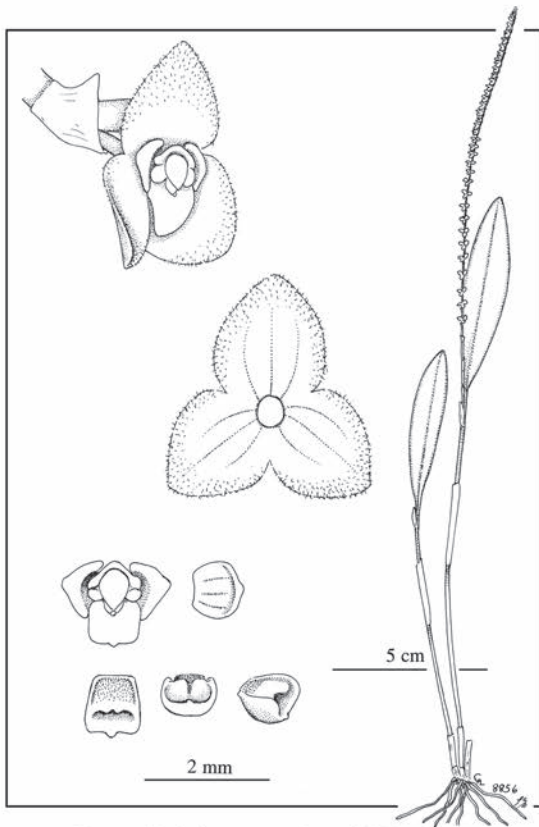


FIGURE 43. *Stelis stipitata* Luer & R. Escobar

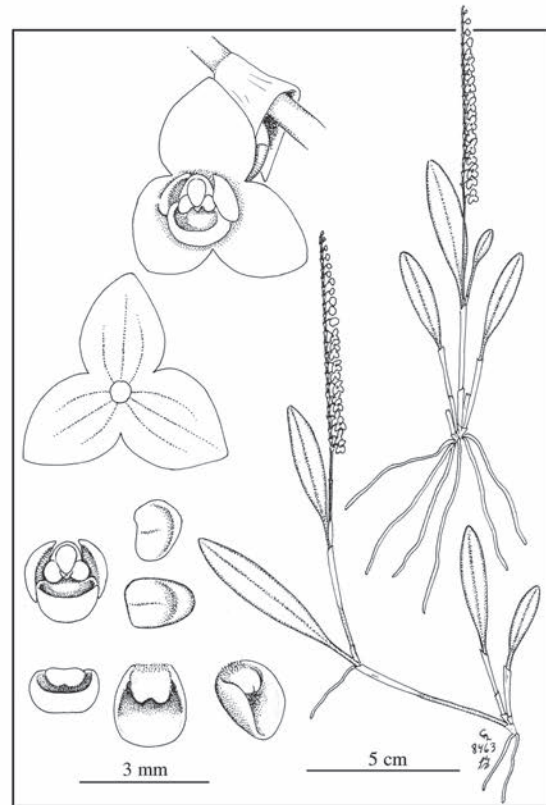


FIGURE 44. *Stelis straminea* Luer & R. Escobar



blade 1–1.3 cm wide in the dry state, cuneate below into the petiole. *Inflorescence* single; 8–12 cm long, the raceme erect, congested, distichous, many-flowered with many flowers open simultaneously; floral bracts oblique, acute 3 mm long; pedicels 2 mm long; ovary 1.5 mm long; the peduncle 3–4 cm long, subtended by a spathe 5–7 cm long, from a node below the apex of the ramicaul; *sepals* yellow, brown toward the base, glabrous, ovate, obtuse, 3-veined, connate below the middle, 3-veined, the dorsal sepal 2.75 mm long, 2.75 mm wide, the lateral sepals 2.5 mm long, 2.3 mm wide; *petals* yellow, subcircular, thin, concave, 1 mm long, 1.1 mm wide, 1-veined, without a transverse carina; *lip* yellow, ovoid, obtuse, concave below a thick, shallowly cleft bar, the dorsum slightly convex, the base truncate, connate to the base of the column; *column* stout, ca. 1 mm long and wide, the anther and the stigmatic lobes apical.

**Etymology:** From the Latin *stramineus*, “like straw,” referring to the bundles of proliferating ramicauls.

**Paratypes:** COLOMBIA. Cauca: Páramo de Las Delicias, 3380 m, 17 November 1982, *C. Luer & R. Escobar 8463, 8479* (SEL).

This species has densely caespitose components as well as stolons, but mostly propagating ramicauls that sometimes accumulate into elongated clusters, like a bundle of straw. A raceme exceeds the leaf about twice the length; the sepals are ovate, obtuse and three-veined; and the petals are rounded and single-veined. The lip is ovoid and concave below a thick, retuse bar.

**Stelis sublesta** Luer & R. Escobar, *sp. nov.* TYPE: COLOMBIA. Putumayo: between La Cocha and Sibundoy, ca. 2700 m, 30 July 1978, *C. Luer, J. Luer, R. Escobar et al 3085* (Holotype: SEL). Fig. 45.

This little species is characterized by an elongated, many-flowered raceme with a peduncle exceeding an elliptical leaf; ovate, obtuse, three-veined sepals; proportionally large, single-veined petals; and an obtuse, ovoid lip concave below a thick, sulcate bar.

*Plant* small, epiphytic, densely caespitose; roots slender. Ramicauls erect, slender, 1–2.5 cm long, with a tubular sheath from below the middle and another sheath at the base. *Leaf* erect, coriaceous, elliptical, obtuse to narrowly rounded at the apex, 2–3 cm long including a petiole, 4–5 mm long, the blade 0.7–1 cm wide in the dry state, cuneate below into the petiole. *Inflorescence* single; 12–15 cm long, the raceme erect, congested, distichous, many-flowered with many flowers open simultaneously; floral bracts oblique, acute 3 mm long; pedicels 2 mm long; ovary 1.5 mm long; the peduncle 4–6 cm long, subtended by a spathe 5 mm long, from a node below the apex of the ramicaul; flowers tan; *sepals* glabrous, ovate, obtuse, 3-veined, connate below the middle, the dorsal sepal 2.5 mm long, 2 mm wide, the lateral sepals 2 mm long, 1.5 mm wide; *petals* transversely elliptical, 0.6 mm long, 0.9 mm wide, 1-veined, thin, concave, the apex rounded with a narrowly thickened margin, without a transverse carina; *lip* ovoid, 0.6 mm long, 0.6 mm wide, 0.4 mm deep, concave below a thick, sulcate bar, the apex subtruncate with a slightly acuminate tip, the dorsum convex, shallowly channeled, the base truncate,

connate to the base of the column; *column* stout, ca. 0.7 mm long and wide, the anther and the stigmatic lobes apical.

**Etymology:** From the Latin *sublestus*, “slight, trivial,” referring to the small habit similar to many others.

This small, caespitose species is distinguished by an elongated, many-flowered raceme with the peduncle longer than the elliptical leaf. Except for being about twice larger, the obtuse, three-veined sepals and the single-veined petals are similar to those of *Stelis pusilla* Kunth. The lip is also a type A with a thick, sulcate bar.

**Stelis tauroculus** Luer & R. Escobar, *sp. nov.* TYPE: COLOMBIA. Putumayo: E of the pass E of San Francisco toward Mocoa, 2350 m, 27 Jan. 1987, *C. Luer, J. Luer, R. Escobar et al. 12541* (Holotype: MO). Fig. 46.

This small species is distinguished by a crowded raceme of medium-sized flowers that are dull gray within, but with bright purple petals and lip like the bullseye of a target; an elliptical leaf about as long as the inflorescence; obtuse, three-veined sepals; three-veined petals; and an ovoid lip with a bigibbous bar.

*Plant* small, epiphytic, densely caespitose; roots slender. Ramicauls erect, slender, 4–7 cm long, with a close, tubular sheath from below the middle and another 1–2 sheaths below and at the base. *Leaf* erect, coriaceous, elliptical, acute, 7–8 cm long including a petiole 1.5 mm long, the blade 1–1.3 cm wide in the dry state, cuneate below into the petiole. *Inflorescence* single; 7–8 cm long, the raceme erect, congested, many-flowered in two rows, with many flowers open simultaneously; floral bracts oblique, inflated, obtuse, 3 mm long, 2 mm wide; pedicels 2 mm long; ovary 1 mm long; the peduncle ca. 2 cm long, subtended by a spathe 5–7 mm long, from a node below the apex of the ramicaul; *sepals* glabrous, purple externally, dull gray within, broadly ovate, obtuse, 3-veined, connate to near the middle, the dorsal sepal 3.5 mm long, 3.3 mm wide, the lateral sepals 2.5 mm long, 2.2 mm wide; *petals* bright purple, transversely elliptical, 0.8 mm long, 1.4 mm wide, 3-veined, thin, concave, the apex broadly rounded with a narrowly thickened margin, without a transverse carina; *lip* ovoid, 0.6 mm long, 0.8 mm wide, 0.5 mm deep, concave below a thick, bigibbous bar, the apex rounded, the base truncate, connate to the base of the column; *column* stout, ca. 0.8 mm long and wide, the anther and the stigmatic lobes apical.

**Etymology:** From the Latin *tauroculus*, “a bull’s eye,” referring to the bright color of the central apparatus, probably the target of a pollinator.

This small, caespitose species is distinguished by the bright purple central apparatus in the center of a dull gray flower. The flowers are produced in two crowded, opposite-facing rows in a raceme that equals an elliptical leaf; the sepals are broadly obtuse; the petals are three-veined; and the bar of the lip is bigibbous without a glenion.

**Stelis titanica** Luer & R. Escobar, *sp. nov.* TYPE: COLOMBIA. Antioquia: Yarumal, road to El Cedro, 1850 m, 15 March 1989, *C. Luer, J. Luer, S. Dalström & W. Teague 14172* (Holotype: MO). Fig. 47.

This immense, caespitose species is similar to the Ecuadorian *Stelis maxima* Lindl., but with leaves about twice as long; ramicauls not prolific; and thick, five-veined petals.

*Plant* very large, epiphytic, densely caespitose, roots slender. Ramicauls erect, stout, 10–28 cm long, with a tubular sheath from below the middle and 1–2 sheaths below and at the base. *Leaf* erect, coriaceous, elliptical, subacute, petiolate, 15–17 cm long including a petiole 3 cm long, the blade 2.5–3.5 cm wide in dry state, cuneate below into the petiole. *Inflorescence* single; 25–30 cm long, the raceme erect, strict, lax, distichous, many-flowered; floral bracts oblique, acute, more or less undulating, 10 mm long to 5 mm long toward the tip; pedicels 4–5 mm long; ovary 4 mm long; the peduncle ca. 10 cm long, from a node below the apex of the ramicaul with a spathe 1.5 cm long; *sepals* light purple, glabrous, the dorsal sepal ovate-triangular, acute, 11-veined, connate basally, 11 mm long, 9 mm wide, the lateral sepals connate to the tip into an ovoid, concave synsepal, 9 mm long, 10 mm wide unexpanded, 12-veined; *petals* purple, transversely elliptical, the apical margin thick, the apex broadly rounded, concave below a transverse carina, 1.5 mm long, 2.5 mm wide, 5-veined; *lip* purple, subquadrate, 1 mm long, 1.5 mm wide, 1 mm deep, concave below the bar with a narrow glenion, the apex rounded with thickened margin, the dorsum convex, the base truncate, hinged to the base of the column; *column* clavate, 1.5 mm wide and long, the anther and the bilobed stigma apical.

**Eponymy:** From the Greek *titanicos*, “belonging to the Titans,” referring to the huge size.

This robust species, one of the largest in the genus, is distinguished by long, stout, nonprolific ramicauls and a large, elliptical, petiolate leaf, often accompanied by fragments of older ramicauls. The long, more or less undulating floral bracts are similar to those of *Stelis purpurea* (Ruiz & Pav.) Willd. Except for the petals, the flowers are similar to those of *Stelis maxima* Lindl. The veins of the dorsal sepal of *S. maxima* originate at the base, while those of *S. titanica* originate by branching. Instead of three veins in the petals, five, strong veins are present.

***Stelis torulosa*** Luer & R. Escobar, *sp. nov.* TYPE: COLOMBIA. Antioquia: Yarumal, near Yarumalito, NE of Santa Rosa, 2350 m, 15 May 1985, C. Luer, R. Escobar & E. Valencia 11390 (Holotype: MO). Fig. 48.

This medium-sized, caespitose species is characterized one or two racemes slightly shorter than an acute, narrowly elliptical leaf; broadly ovate, three-veined, minutely pubescent sepals; three-veined petals; and an ovoid, projecting callus on the dorsum of the lip.

*Plant* medium-sized, epiphytic densely caespitose, roots slender. Ramicauls erect, slender, 4–6.5 cm long, with a close, tubular sheath from below the middle and 1–2 sheaths below and at the base. *Leaf* erect, coriaceous, narrowly elliptical, acute, petiolate, 7–10 cm long including a petiole 1–2 cm long, the blade 0.6–1.1 cm wide in dry state, cuneate below into the petiole. *Inflorescence* 1–2; 5–7 cm tall, the raceme erect, strict, congested, distichous, many-flowered; floral bracts oblique, acute, 1.5 mm long; pedicels 1 mm

long; ovary 1.5 mm long; the peduncle ca. 1 cm long, from a node from near the apex of the ramicaul; flowers purple; *sepals* expanded, minutely pubescent, broadly ovate, obtuse, 3-veined, connate below the middle, the dorsal sepal 2.5 mm long, 3 mm wide, the lateral sepals 2 mm long, 2.5 mm wide; *petals* transversely ovate, round at the apex with the inferior angle acuminate, concave, thickened on the margin, with a transverse carina, 1 mm long, 2.25 mm wide, 3-veined; *lip* subquadrate, 0.75 mm long, 1 mm wide, 0.75 mm deep, concave below a thick bar, the apex obtuse, thickened, the dorsum with a thick, ovoid callus that extends from the base to projecting over the bar, the base truncate, hinged to the base of the column; *column* clavate, ca. 1 mm wide and long, the anther and the bilobed stigma apical.

**Etymology:** From the Latin *torulus*, “a little, projecting knob,” referring to the callus on the dorsum of the lip.

This caespitose species is characterized by very slender ramicauls with acute, narrow, petiolate leaves and one or two racemes nearly as long. The sepals and petals are three-veined. The lip is a modified type A with an ovoid callus that extends from the base to projecting over the bar.

***Stelis trifoliacea*** Luer & R. Escobar, *sp. nov.* TYPE: COLOMBIA. Chocó: Alto de Baudo, 400 m, fl. in cult. by A. de Wilde above Pereira, 15 May 1993, A. de Wilde 3877 (Holotype: MO), C. Luer illustr. 16853. Fig. 49.

This small, caespitose species bears a congested raceme of flowers with three subcircular, three-veined sepals resembling a clover; three-veined petals; and a lip with a rounded callus curving from the base to the apex.

*Plant* small, epiphytic, densely caespitose; roots slender. Ramicauls erect, slender, 2.5 cm long, with a tubular sheath from below the middle third, and another sheath below and at the base. *Leaf* erect, coriaceous, elliptical, acute, 6.5 cm long including a petiole ca. 1 cm long, the blade 1.2 cm wide in dry state, cuneate below into the petiole. *Inflorescence* single; 9 cm long, the raceme erect, distichous, congested, mostly simultaneously many-flowered; floral bracts oblique, acute, 1.5 mm long; pedicels 1.5 mm long; ovary 1 mm long; the peduncle ca. 3 cm long, from a node below the abscission layer; *sepals* light yellow, minutely short-pubescent, expanded, transversely ovate, or subcircular, broadly obtuse, 3-veined, connate in basal third, the dorsal sepal 2.5 mm long, 3.5 mm wide, the lateral sepals 2.25 mm long, 3 mm wide; *petals* yellow, transversely ovate, concave, the broadly obtuse apex thickened, 1.2 mm long, 1.8 mm wide, 3-veined; *lip* yellow with purple margin, type C, subquadrate, with apex rounded, 0.8 mm wide, 0.6 mm long, 0.6 mm deep, shallowly concave within the margins surrounding an elevated, rounded callus that begins at the base, then curves forward and downward to within the apex, the base hinged to the base of the column; *column* clavate, ca. 0.8 mm wide and long, the anther and stigmatic lobes apical.

**Etymology:** From the Latin *trifoliaceus*, “like a clover, or a trifolium,” referring to the three, subcircular sepals.

This small, densely caespitose species occurs at a low altitude in western, coastal Colombia. It is characterized by an acute, elliptical leaf surpassed by a congested, many-

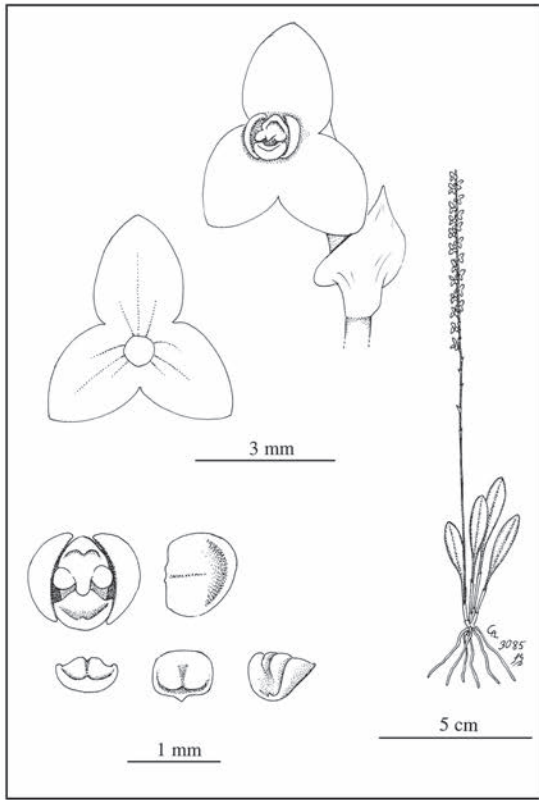


FIGURE 45. *Stelis sublesta* Luer & R. Escobar

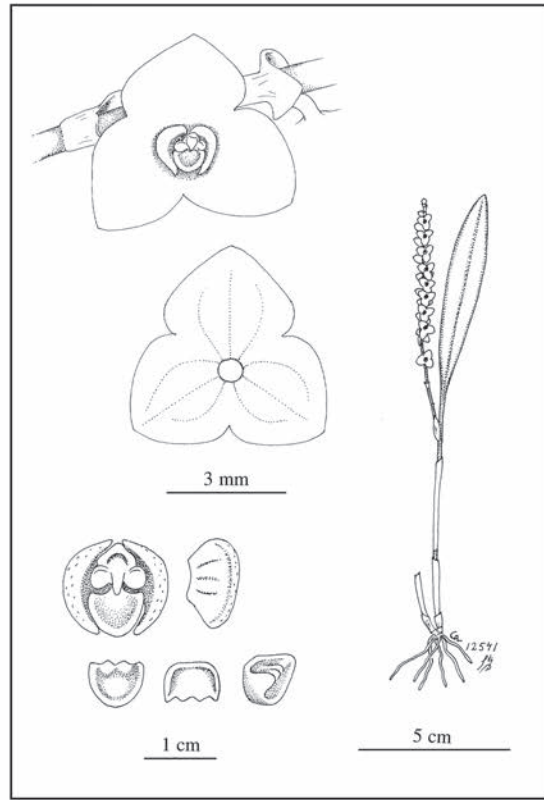


FIGURE 46. *Stelis tauroculosa* Luer & R. Escobar

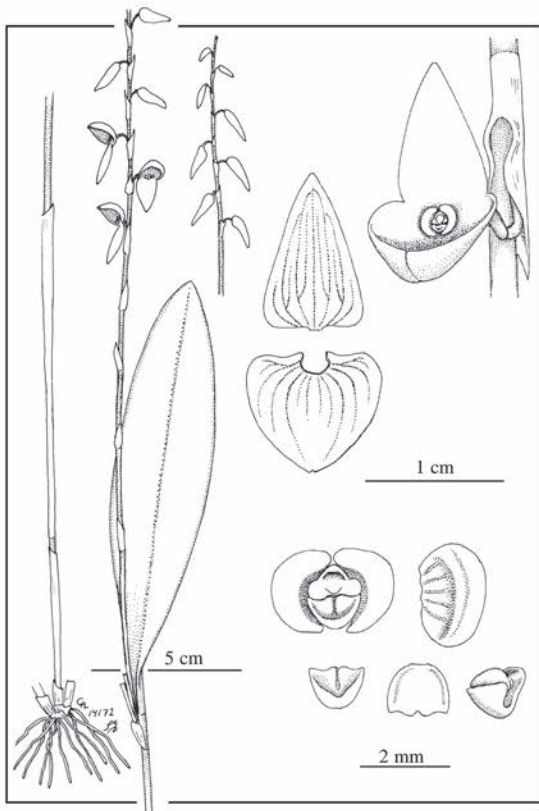


FIGURE 47. *Stelis titanica* Luer & R. Escobar

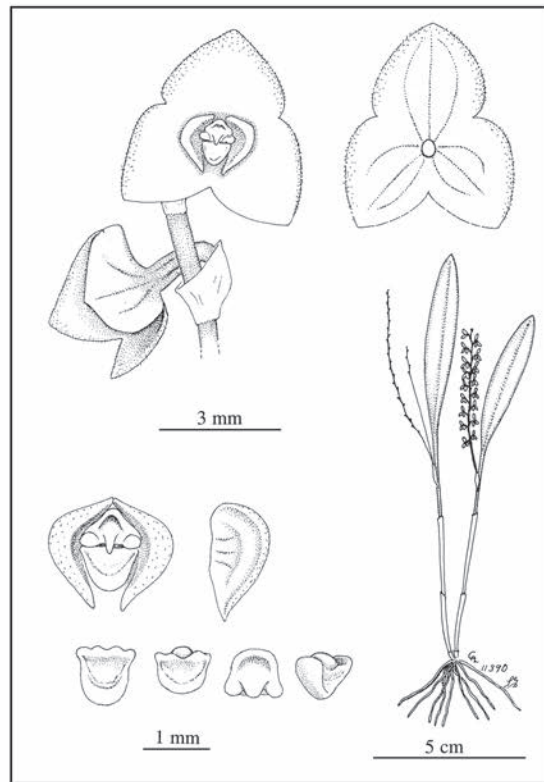


FIGURE 48. *Stelis torulosa* Luer & R. Escobar



flowered raceme of flowers with rounded sepals, reminiscent of the three leaves of clover. The lip is most distinctive with a rounded, elevated callus (a modified bar) that extends from the base and curving forward and downward to the apex, a type C similar to that of *Stelis argentata* Lindl., but without an apiculum.

***Stelis trochophora*** Luer & R. Escobar, *sp. nov.* TYPE: COLOMBIA. Santander: Bucaramanga, between Bucaramanga and Berlin, 2800 m, 27 April 1982, *C. Luer, J. Luer & R. Escobar 7583* (Holotype: SEL). Fig. 50.

This densely caespitose species with ovate, minutely pubescent sepals is distinguished by a hemispherical callus on the anterior surface of the lip.

*Plant* medium to large, epiphytic, densely ascending-caespitose, roots slender. Ramicauls erect, slender, 6–12 cm long, with a tubular sheath on the middle third, and another sheath below and at the base. *Leaf* erect, coriaceous, elliptical, acute, 8–11 cm long including a petiole 1.5 cm long, the blade 1.5–2.5 cm wide in the dry state, cuneate below into the petiole. *Inflorescence* 10–12 cm long, the raceme erect or arching, secund, mostly simultaneously many-flowered, the peduncle ca. 3 cm long, from a node below the abscission layer; floral bracts dilated, obtuse, 2 mm long, 2 mm wide; pedicels 1 mm long; ovary 1 mm long; *sepals* light green, suffused with purple along the veins, minutely short-pubescent, expanded, ovate, slightly convex, 3-veined, connate below the middle, 4 mm long, 4 mm wide, the dorsal sepal acute with the tip rounded, the lateral sepals obtuse; *petals* green, transversely ovate, concave, the broadly obtuse apex thickened, 1 mm long, 1.5 mm wide, 3-veined; *lip* green, subquadrate, 1 mm wide, 0.75 mm long, 0.5 mm deep, concave within the rounded apex, the bar elevated, shallowly channeled, with a spherical callus on the anterior surface, the dorsum descending, featureless, hinged to the base of the column; *column* clavate, ca. 1 mm wide and long, the anther and stigmatic lobes apical.

**Etymology:** From the Greek *trochophorus*, “ball bearing,” referring to the callus of the lip.

This densely caespitose-ascending species is characterized by a many-flowered, secund raceme that barely surpasses an acute, elliptical leaf borne by a slender ramicaul. The sepals are ovate and minutely pubescent; the petals are three-veined; and on the anterior surface of the minute, subquadrate lip is a central, orbicular callus.

***Stelis tsubotae*** Luer & R. Escobar, *sp. nov.* TYPE: COLOMBIA. Risaralda: without locality, possibly collected near Pereira, fl. in cult. by Tsubota, 15 May 1993, *C. Luer 16859* (Holotype: MO). Fig. 51.

This large species is characterized by stout ramicauls; obtuse, elliptical leaves surpassed by a many-flowered raceme; an acute, three-veined dorsal sepal; obtuse lateral sepals; three-veined petals; and a thick, obtuse lip with a cleft bar and glenion.

*Plant* large, epiphytic, densely caespitose. Ramicauls erect, stout, 6–7 cm long, with a loose tubular sheath from below the middle, another two sheaths below and at the base. *Leaf* erect, coriaceous, elliptical, obtuse to rounded at

the tip, 9–12 cm long including a petiole 2.5–3 cm long, the blade 2.5–3.5 cm wide in the dry state, cuneate below to the petiole. *Inflorescence* single; 15–20 cm tall, the raceme erect, subax, distichous, many-flowered; floral bracts oblique, acute, 3–4 mm long; pedicels 2 mm long; ovary 1–1.5 mm long; the peduncle ca. 6 cm long, subtended by a spathe 2.5 cm long, from a node below the apex of the ramicaul; *sepals* dark purple, glabrous, the dorsal sepal ovate, acute, 4 mm long, 3 mm wide, 3-veined, the lateral sepals broadly ovate, oblique, obtuse, 2.75 mm long, 3.5 mm wide, 3-veined; *petals* purple, transversely ovate, 1.3 mm long, 1.8 mm wide, 3-veined, concave below a thick, rounded apex, with a transverse carina; *lip* greenish purple, subquadrate, 1.3 mm long, 1.3 mm wide, 1.3 mm deep, concave below a thick, elevated, callus-like bar, with a shallow cleft and glenion, the apex rounded, the dorsum filled with a thick callus that extends from a minutely pubescent base to include the bar, to within the space above the apex, the base truncate, hinged to the base of the column; *column* stout, ca. 1.5 mm long and wide, the anther and the stigmatic lobes apical.

**Eponymy:** Named for Shigenobu Tsubota, proprietor of Ran Orchids, Pereira, who cultivated this species.

This caespitose species is characterized by a subax raceme that exceeds a petiolate leaf. The acute dorsal sepal is longer than the obtuse lateral sepals. The petals are three-veined. The lip is type A with a bar shallowly cleft through the dorsum to a pubescent base.

***Stelis uberis*** Luer & R. Escobar, *sp. nov.* TYPE: COLOMBIA. Santander: Bucaramanga, between Bucaramanga and Berlin, 2800 m, 27 April 1982, *C. Luer, J. Luer & R. Escobar 7582* (Holotype: SEL). Fig. 52.

This tall, caespitose species is distinguished by a long, secund, successively flowering raceme of flowers that commonly bear capsules; pubescent, three-veined sepals; single-veined petals; and an obtuse lip with a cleft bar.

*Plant* medium to large, epiphytic, densely caespitose; roots slender. Ramicauls erect, slender, 4–10 cm long, with a tubular sheath from below the middle, and 1–2 other sheaths below and at the base. *Leaf* erect, coriaceous, narrowly elliptical, acute, 5–7 cm long, including a petiole 1.5–2 cm long, the blade 0.8–1.3 cm wide in the dry state, narrowly cuneate below into the petiole. *Inflorescence* single; 9–20 cm long, the raceme erect, strict, secund, nearly simultaneously many-flowered, with most ovaries swollen or bearing capsules; floral bracts oblique, erect, acute, 4 mm long; pedicels 2 mm long; ovary 1–3 mm long; peduncle 5–9 cm long, from a node below the abscission layer; flowers light yellow-green; *sepals* usually not expanded, pubescent, broadly ovate to subcircular, broadly obtuse to rounded at the apex, 3-veined, connate below the middle, the dorsal sepal 1.75 mm long, 1.5 mm wide, the lateral sepals 1.5 mm long, 1.5 mm wide; *petals* thin, transversely oblong, concave, slightly thickened on the margin of a rounded apex, 0.75 mm long, 1 mm wide, 1-veined; *lip* subquadrate, type A, 0.8 mm long, 1 mm wide, 0.7 mm deep, shallowly concave below a thick, cleft bar, the apex rounded with a narrow margin, the dorsum slightly convex, minutely pubescent, the base truncate, hinged to the base of



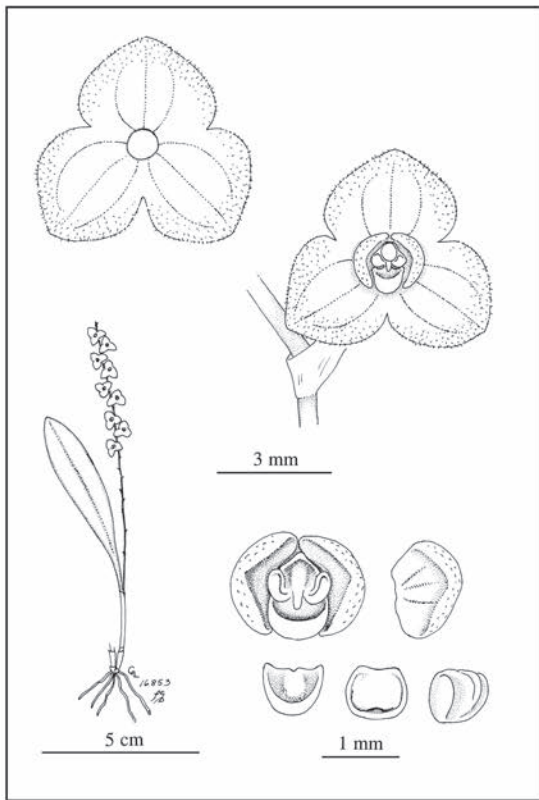


FIGURE 49. *Stelis trifoliacea* Luer & R. Escobar

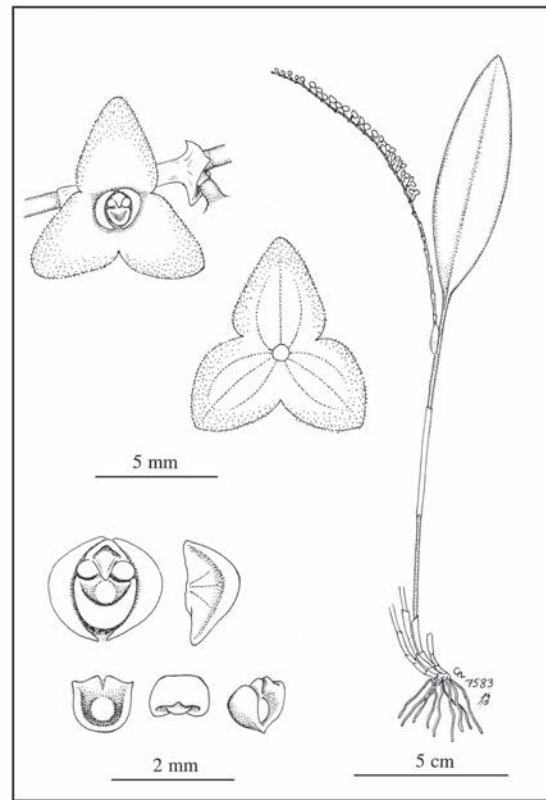


FIGURE 50. *Stelis trochophora* Luer & R. Escobar

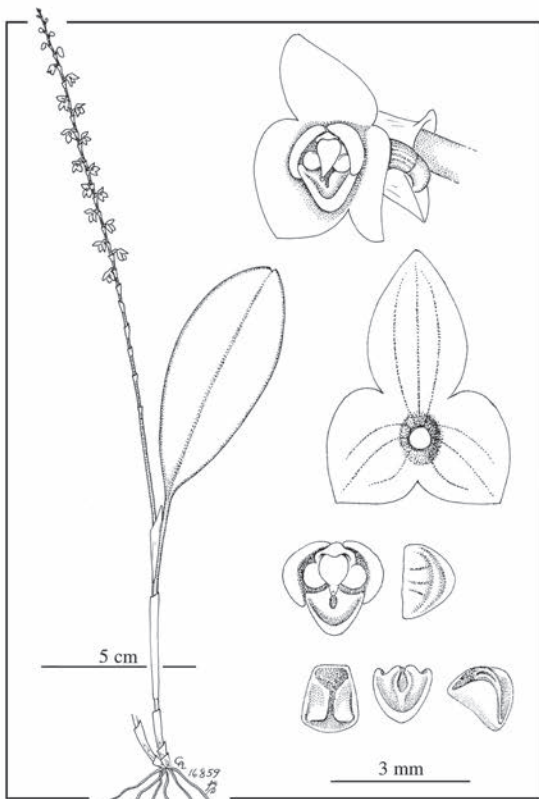


FIGURE 51. *Stelis tsubotae* Luer & R. Escobar

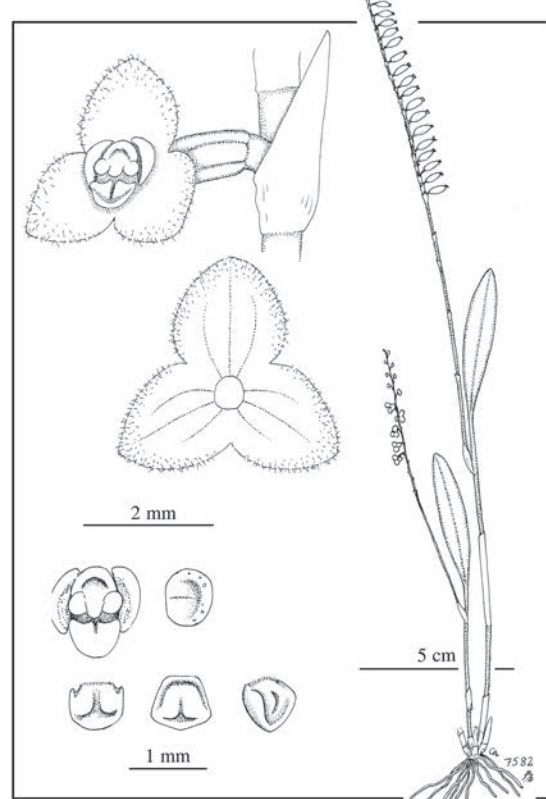


FIGURE 52. *Stelis uberis* Luer & R. Escobar

the column; *column* clavate, ca. 0.6 mm wide and long, the anther and the bilobed stigma apical.

**Etymology:** From the Latin *uberis*, “fertile,” referring to the abundant production of capsules.

**Additional specimen examined:** COLOMBIA. Santander: Bucaramanga, terrestrial on the road embankment E of Bucaramanga, 2370 m, 3 November 1981, *C. Luer & R. Escobar 6553* (Holotype: SEL).

This tall, slender, caespitose species is characterized by a long, secund, successively many-flowered raceme with most flowers developing capsules. Very few flowers remain open between buds and closed flowers with swollen ovaries. The sepals are pubescent and three-veined; the petals are single-veined; and the lip is type A with a round apex, a cleft bar, and a minutely pubescent dorsum.

#### LITERATURE CITED

LUER, C. A. 2016. *Icones Stelidarum (Orchidaceae) Colombiae*. Harvard Papers in Botany 21, No. 1: 59–92.

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# SALVIA ALI-ASKARYI (LAMIACEAE), A NEW SPECIES FROM KURDISTAN, IRAQ

SAMAN A. AHMAD<sup>1,2</sup>

**Abstract.** *Salvia ali-askaryi* (Lamiaceae), a new species from Kurdistan Iraq, is described and illustrated, and its distinguishing characters are discussed. It is easily separated from *S. microstegia* by having broadly ovate or elliptic-oblong (vs. ovate to oblong), irregularly serrate or dentate (vs. obtusely lobed) leaves, 12–23- (vs. 4–6)-flowered verticillasters, shortly bilobed or emarginate (vs. shortly tridentate, and median tooth much shorter) upper lip, and globose (vs. ovoid) nutlets 3–4 mm in diameter (vs. 3 × 2.5 mm). It differs from *S. argentea* by having usually eglandular lanate (vs. not lanate) lower stems, irregularly serrate or dentate (vs. irregularly erose) leaf margins, and white (vs. white, with a violet tinged) upper corolla lip.

**Keywords:** Lamiaceae, *Salvia*, Azmar-Goihza Mts., Kurdistan, Iraq

During the past two years, the Kurdistan Botanical Foundation conducted extensive floristic study on the Azmar-Goizha Mountain (Kurdistan, Iraq). This mountain, which is part of the extensive Zagros Mountain Range, overlooking Sulaimani City, occupies an area of about 250 km<sup>2</sup> between 35°29' to 35°42'N and 45°26' to 46°33'E.

During recent studies in Hawraman region (Ahmad, 2013a), the author discovered four species new to science (Ahmad, 2013b–c, 2014a–b) and 18 new to the flora of Iraq (Ahmad, 2013d). The present botanical survey of the Azmar-Goizha Mountain also yielded several additional novelties and additions to the flora of Iraq, including the following species of *Salvia* L.

***Salvia ali-askaryi*** S.A.Ahmad, *sp. nov.* TYPE: IRAQ. Kurdistan, Sulaimani Province, Azmar Mt., near Harwta forest station, eroded places, sandy soil, pine forest, 25–35% slope with sun exposure SE to NW, 1238 m, 35°35'47"N, 45°28'36"E, 15 May 2015, S. A. Ahmad, A. Hama & S. Babarasul 14–818 (Holotype: KBFH). Fig. 1.

The new species is easily separated from *S. microstegia* Boiss. & Balansa by having broadly ovate or elliptic-oblong (vs. ovate to oblong), irregularly serrate or dentate (vs. obtusely lobed) leaves, 12–23- (vs. 4–6)-flowered verticillasters, broadly cordate (vs. broadly ovate) bracts 15–21 × 10–15 mm (vs. 9–17 × 8–14), broadly campanulate or campanulate-infundibular (vs. campanulate) calyx, shortly bilobed or emarginate (vs. shortly tridentate, and median tooth much shorter) upper lip, and globose (vs. ovoid) nutlets 3–4 mm in diameter (vs. 3 × 2.5 mm). From *S. argentea* L., the new species differs by having usually eglandular lanate (vs. not lanate) lower stems, irregularly serrate or dentate (vs. irregularly erose) leaf margins, white (vs. white with a violet-tinged) upper corolla lip.

**Herb** perennial with a woody rootstock. **Stems** erect, 35–50 cm, densely pilose-villous glandular, often eglandular lanate below. **Leaves** mostly basal, broadly ovate, elliptic-oblong, 15–27 × 8–20 cm, adaxial surface densely pilose-

villous, abaxial surface scattered pilose, irregularly serrate or dentate; petiole 1–8.5 cm. **Inflorescence** panicle, sometimes widely spreading; verticillasters 12–23-flowered, very dense; bracts broadly cordate, 1.5–2.1 × 1–1.5 cm, sessile, dense short glandular hairy; pedicels 1–2 mm. **Calyx** broadly campanulate or campanulate-infundibular, 8–10 × 5–7 mm, to 12–15 × 9–11 mm in fruit, with widely diverging lips, densely villous, glandular; corolla white, 18–23 mm; tube 7.5–9.5 mm, ventricose, squamulate; upper lip compressed, shortly bilobed or emarginate, falcate, capitate glandular hairy; stamens squamulate; filaments ca. 4 mm; connective 16–18 mm; anthers yellow, 24 × 0.7–0.9 mm; style 23–24 mm, stigma lobes 12 mm. **Nutlets** globose, pale green, 3–4 mm in diameter, villous, glandular.

**Eponymy:** This novelty is named after Dr. Ali A. Askary in recognition of his extensive field collection and research in the field of medicinal botany of Iraq.

**Distribution:** Known only from Azmar Mt., where it is restricted to a small area near Harwta forest station, where it grows on sandy soil in eroded places of a pine forest on 25–35% slope with sun exposure SE to NW.

**Additional specimens examined:** Goizha Mt., 1500 m, 35°34'56"N, 45°29'03"E, 21 May 2015, S. A. Ahmad, A. Hama, R. Ali & S. Babarasul 15-1202 (KBFH); Azmar Mt., 1601 m, 35°34'41"N, 45°29'38"E, 07 June 2014, S. A. Ahmad, A. Hama, R. Ali & S. Babarasul 14-1725 (KBFH); Azmar Mt., 1652 m, 35°34'55"N, 45°29'43"E, 01 June 2015, S. A. Ahmad, A. Hama, R. Ali, S. Babarasul & S. R. Fayaq 15-1150 (KBFH).

**IUCN Red List Category:** *Salvia ali-askaryi* is extremely rare; its IUCN Red List category (IUCN, 2001) remains uncertain and is currently assessed as Data Deficient (DD).

*Salvia ali-askaryi*, is somewhat related to the Iranoturanian *S. microstegia*, and to *S. argentea* of S. Europe, N.W. Africa, and Mediterranean Region. From the former, it differs by having broadly ovate or elliptic-oblong (vs. ovate to oblong), irregularly serrate or dentate (vs. obtusely lobed) leaves, 12–23- (vs. 4–6)-flowered verticillasters, broadly

I am profoundly grateful to Dr. Ihsan A. Al-Shehbaz (MO and Board member of Kurdistan Botanical Foundation) for his advice and help throughout this study. I am equally grateful to Dr. Sarbagh Salih (President, Kurdistan Botanical Foundation) for her continuous support and to Mr. Fayaq Kollak for providing funds for the fieldwork. The affiliation and support of the American University of Iraq, Sulaimani (AUIS) are greatly appreciated.

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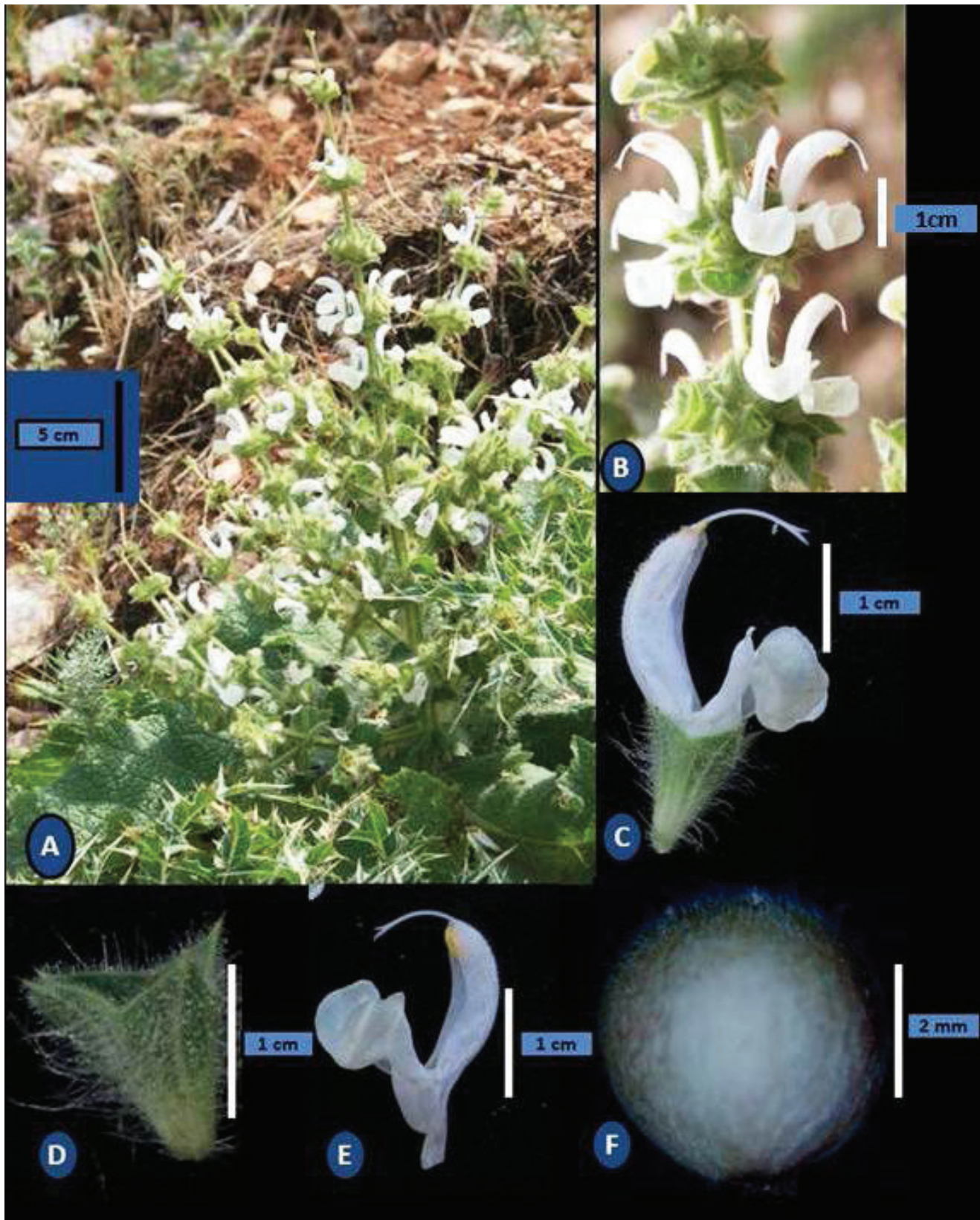


FIGURE 1. *Salvia ali-askaryi* S.A.Ahmad. A, plant; B, part of inflorescence; C, flower; D, calyx; E, corolla; F, nutlet. Scales: A = 5 cm; B–E = 1 cm; F = 2 mm. Photographs by Saman A. Ahmad, based on the collection: Azmar Mt., 1238 m, 35°35'47"N, 45°28'36"E, 15 May 2015, S. A. Ahmad, A. Hama & S. Babarasul 14–818 (KBFH).

cordate (vs. broadly ovate) bracts 15–21 × 10–15 mm (vs. 9–17 × 8–14), broadly campanulate or campanulate-infundibular (vs. campanulate) calyx, shortly bilobed or emarginate (vs. shortly tridentate, and median tooth much shorter) upper lip, and globose (vs. ovoid) nutlets 3–4 mm

in diameter (vs. 3 × 2.5 mm). From *S. argentea*, the new species differs by having usually eglandular lanate (vs. not lanate) lower stems, irregularly serrate or dentate (vs. irregularly erose) leaf margins, white (vs. white with a violet tinged) upper corolla lip.

## LITERATURE CITED

- AHMAD, S. A. 2013a. Vascular plants of Hawraman region in Kurdistan Iraq. Ph.D. dissertation, Faculty of Agricultural Sciences, Sulaimani University, Iraq.
- . 2013b. *Ferula shehbaziana* (Apiaceae), a new species from Kurdistan, Iraq. Harvard Pap. Bot. 18: 99–100.
- . 2013c. *Onosma hawramanensis* (Boraginaceae), a new species from Kurdistan, Iraq. Harvard Pap. Bot. 19: 201–202.
- . 2013d. Eighteen species new to the flora of Iraq. Feddes Reper. 124: 65–68.
- . 2014a. *Petrorrhagia sarbaghia* (Caryophyllaceae), a new species from Kurdistan, Iraq. Willdenowia 44: 35–38.
- . 2014b. *Scrophularia sulaimanica* (Scrophulariaceae), a new species from Kurdistan, Iraq. Kew Bulletin 69: 9509.
- HEDGE, I. C. 1982. *Salvia*. Pages 403–475 in K. H. RECHINGER, ED. Flora Iranica, Vol. 150. Akademische Druck- u. Verlagsanstalt, Graz.
- . 1982. *Salvia*. Pages 400–460 in P. H. DAVIS, ED. Flora of Turkey and the East Aegean Islands. Vol. 7. University Press, Edinburgh.
- IUCN. 2001. IUCN Red List Categories and Criteria, Version 3.1. Second edition. Prepared by the IUCN Species Survival Commission. IUCN, Gland, Switzerland, and Cambridge, United Kingdom. <http://www.iucnredlist.org/technicaldocuments/categories-and-criteria/2001-categories-criteria> (accessed August 14, 2015).

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# NEOTROPICAL ORCHID MISCELLANEA

PAUL ORMEROD<sup>1</sup>

**Abstract.** Literature and herbarium studies of various orchid taxa that occur in the New World leads to the recognition of four new species, epitypification, lectotypification, and synonymisation of some neglected names, and the transfer of three names. Furthermore, reviews are presented on the synonymy and identity of the red-orange flowered *Fernandezia* species in Colombia and Venezuela, and the circumscription of *Odontorrhynchus chilensis* in Chile. The new species proposed are *Aspidogyne jussariensis*, *Liparis vasquezii*, *L. yanachagae*, and *Microchilus tunquianus*; new combinations are *Bulbophyllum pinelianum*, *Maxillaria humilis*, and *Microstylis* section *Chrysanthera*; new lectotypifications and synonymy are *Epidendrum acinacifolium* (= *Tolumnia variegata*), *E. calcaratum* (= *Ionopsis utricularioides*), *E. minimum* (= *Polystachya foliosa*), and *E. obtusifolium* (= *E. nocturnum*); *Polystachya extinctoria* (= *P. concreta*) is neotypified; new synonyms are *Centropetalum lanceolatum* (= *Fernandezia sanguinea*), *Fernandezia aurantiaca*, *F. ortiziana* (both = *F. myrtillus*), *Fernandezia tica* (= *F. sanguinea*), *Gomesa stricta* (= *Pleurothallis quadrifida*), *Nasonia hartwegii* (= *Fernandezia myrtillus*), *Odontorrhynchus domeykoanus*, *O. erosus*, *O. variabilis* (all = *O. chilensis*), and *Pachyphyllum favosifolium* (= *Fernandezia sanguinea*).

**Keywords:** Neotropics, new orchids, synonymy, typification

This paper came about partly through research on the Brazilian orchids described by J. M. C. Vellozo (1831–1881) and the incidental encounters with various names not accounted for in the literature. Another part arose from preliminary studies of the genus *Fernandezia* Ruiz & Pavon, where great confusion was found among the identities of the larger, orange-red flowered taxa in Colombia and Venezuela. Still another component arose from an effort to continue studies of the genus *Gavilea* Poepp., which led to a check of undetermined specimens in the related genus *Chloraea* Lindl., where there was found a Chilean collection of *Odontorrhynchus* Correa, and thus an examination of

the circumscription of *O. chilensis* (A. Rich.) Garay. The new taxa proposed in *Aspidogyne* Garay and *Liparis* L.C. Rich. are of course a continuation of previous work (e.g., Ormerod 2013a, b) on those two genera and their relatives.

Another source of inspiration was Ackerman's (2014) *Orchid Flora of the Greater Antilles*. This publication is the most comprehensive treatment of the orchids of that region, and will likely remain so for a long time to come. As such it will be a very influential work and one that will be readily followed by its users. A number of orchid names absent from Ackerman's account are here lectotypified and synonymised.

## ASPIDOGYNE GARAY

In the broad sense (including *Ligeophila* Garay, *Platythelys* Garay, *Rhamphorhynchus* Garay, and *Stephanothelys* Garay) this is a genus of about 71 species distributed from the southeastern United States of America to Argentina. Among the neotropical Goodyerinae it may be recognised by the entire (vs. bifid) rostellum that ruptures or breaks off apically when the pollinarium is removed. Ackerman (2014) has treated the *nomen nudum* *Satyrium latifolium* L. [basis for name: JAMAICA. *Brown s.n.* (LINN 1055.6)] as a synonym of *Microchilus plantagineus* (L.) D. Dietr. based purely on its leaf width. However I have examined the actual specimen and find it is unequivocally *Aspidogyne querceticola* (Lindl.) Meneguzzo (see Ormerod 2013b for synonymy).

The new taxon described below was found among material collected for the Flora of Bahia project. Currently Brazil has about 24 species of *Aspidogyne* but only five of these belong to a small subset centered around *A. argentea* (Vellozo) Garay, to which the novelty is also a member. This group often has leaves with colored reticulation, sometimes with a pale to bright white median band, and flowers with

one to three wine-red stripes on the sepals and petals

*Aspidogyne jussariensis* Ormerod, *sp. nov.* TYPE: BRAZIL. Bahia: Jussari. RPPN Serra do Teimoso, Jussari to Palmira road, c. 7.5 km from Jussari, branch on the left, entry to Fazenda do Teimoso, 21 August 2003, *P. Fiaschi, S.C. Sant'Ana & J.L. Paixao 1580* (Holotype: AMES). Fig. 1.

*Affinis* *A. metallescens* (Barb. Rodr.) Garay *sed lobis lateralibus labello evolutis (vs. absentis) et epichilo late unguiculatis, subpanduratis (vs. sessilis et rectangularis) differt.*

*Rhizome* creeping, terete, rooting at nodes, to 85 mm long, 1–2 mm thick; internodes 12–21 mm long. *Stem* erect, terete, 3–4 leaved in upper half, 32–72 mm long, c. 1.5 mm thick; internodes 9–21 mm long. *Leaves* obliquely ovate, acute to subacuminate, above strongly discolored with obscure green variegation [pale white reticulation was also observed when checked with a microscope], glaucous below, 21–48 mm long, 17–26 mm wide; petiole and sheath 4–13 mm long. *Inflorescence* terminal, pubescent, immature, 8–10 cm long; peduncle 60–80 mm long; sheathing bracts 6–7,

I wish to thank the herbarium and library staff at the Harvard University Herbaria for their help and hospitality during the preparation of this paper, especially Anthony Brach, Kanchi Gandhi, and Gustavo Romero-Gonzalez. Jonathon Gregson and Jacek Wajer kindly located and sent images of material held at the Natural History Museum, London (BM). Sven Koeltz is thanked for providing the publication date of the Malaxidinae revision published by Koeltz Scientific Books. Finally I am grateful to BM, F, K, MO, NY, SEL, and US for loaning specimens for this study.

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pubescent, the lowermost one sometimes subfoliaceous, up to 9 mm long, 3 mm wide; rachis densely many flowered, 20 mm long; floral bracts lanceolate, acute, laxly pubescent, to 8 mm long, 2.5 mm wide. *Flowers* sparsely pubescent externally, pedicellate ovary pure green, sepals and petals white with a wine-red stripe along the midvein. *Pedicellate ovary* clavate, laxly pubescent, 8.5–9.0 mm long. *Dorsal sepal* oblong, obtuse, concave, forming with the petals a galea, 4.75 mm long, 1.85 mm wide. *Lateral sepals* obliquely oblong-lanceolate, obtuse, 5.6 mm long (along midvein), 6.6 mm long along basal margin, 2.1 mm wide. *Petals* obliquely ligulate-semirhombic, acute to subacute, 4.5–4.7 mm long, 1.35–1.50 mm wide. *Labellum* spurred, trilobed, joined to column and apex of ovary for 3 mm; spur fusiform, subacute, throat internally pubescent, 4.5 mm long, 0.95–1.00 wide laterally; hypochile elliptic-ovate, concave joined to column for 1.7 mm, at apex each side with ovate, obtuse sidelobes, 9 veined, 3 mm long, *c.* 1.7 mm wide in basal half, free part 1.3 mm long, 2.15 mm

wide; epichile shortly and broadly clawed, subquadrate, subpandurate, apiculate, 1.6 mm long, 1.2 mm wide, claw *c.* 0.7 mm long. *Column* stoutly clavate, 2.5 mm long.

**Distribution:** Brazil (Bahia).

**Etymology:** Named after the town of Jussari and its eponymous district from where the type was collected.

This species is a member of the *A. argentea* (Vellozo) Garay complex. It is most similar to *A. metallescens* (Barb. Rodr.) Garay, sharing with that species dark green leaves that appear to lack colored reticulation, and flowers with a rectangular to squarish epichile. However *A. metallescens* differs from *A. jussariensis* in having a labellum hypochile that lacks free tips or sidelobes, the epichile is sessile (not clawed) and ends in a broad triangular apex (vs. truncate with rounded sides, between which is a small apiculus). Another similar species is *A. decorus* (Rchb.f.) Garay & Romero-Gonzalez [Syn.: *Physurus bicolor* Barb. Rodr.] since it has a labellum with free sidelobe tips and a clawed epichile. However the epichile of *A. decora* is transversely elliptic-suborbicular.

#### BULBOPHYLLUM THOUARS

A genus of about 2200 pantropical species, with most in southeast Asia and Malesia. In the New World about 62 species (Smidt et al. 2011) have been recorded. The orchid genus *Pachyrhachis* A. Rich. has been overlooked in all accounts of the Brazilian flora. Analysis of the generic and specific description provided by Achille Richard clearly shows the plant is a species of *Bulbophyllum*, to which genus it is here transferred.

***Bulbophyllum pinelianum*** (A. Rich.) Ormerod, *comb. nov.*  
Basionym: *Pachyrhachis pineliana* A. Rich., Herb. Gen.

Amat. 3: 23, 1843. TYPE: BRAZIL. Rio de Janeiro: without locality, April 1840, cult. Medical Faculty Paris, ex *C. Pinel s.n.* (Holotype: P?, not located).

**Distribution:** Brazil.

Study of the protologue of this plant indicates that it is an earlier name for *B. granulosum* Barb. Rodr., however since the holotype has not yet been located it is perhaps somewhat premature to make a formal reduction of the latter.

#### EPIDENDRUM L.

This genus is confined to the New World and comprises about 2000 species. In the 1700's nearly all epiphytic orchids were placed in *Epidendrum*. The name *E. obtusifolium* would seem to be unidentifiable because it is a composite of an *Epidendrum* plant and flowers of another, possibly non-orchidaceous entity. I here suggest that the vegetative element represents *E. nocturnum* Jacq. and that the floral element can be considered a construct.

***Epidendrum nocturnum*** Jacq., Enum. Syst. Pl. Carib. 29. 1760. TYPE: MARTINIQUE. Without locality, *N. Jacquin s.n.* (Holotype: lost).

Heterotypic synonym: *Epidendrum obtusifolium* Willd., Sp. Pl. ed. 4, 1: 118, 1805 *syn. nov.*

Lectotype (here designated): t.180, f. 2 (vegetative element only, excluding buds and flowers) in Plumier, Pl. Amer.: 175, 1758, as “*Helleborine amplissimo flore vario*,” based on a plant of unknown origin (possibly Haiti).

**Distribution:** United States of America (Florida);

Caribbean Islands; Mesoamerica; South America (to Brazil and Bolivia).

**Specimens examined:** CUBA. Oriente: near base of Loma Menqura, 680 m, 1–3 February 1910, *J.A. Shafer 3788* (AMES). JAMAICA. Salt Hill, 1 September 1906, *N.L. Britton 28* (AMES); Portland, near Mill Bank, 200–300 m, 16–17 February 1920, *W.R. Maxon & E.P. Killip 200* (AMES).

The stout stem and short, elliptic, obtuse leaves depicted for *E. obtusifolium* occur in some specimens (three such examples are cited above) seen of *E. nocturnum*. Furthermore the short, fractiflex pseudoterminal inflorescence of *E. obtusifolium* is identical to that of *E. nocturnum*. The “flowers” of *E. obtusifolium* should be considered either a partly or wholly fanciful construct, as these do match any other known Caribbean plant.

Ackerman (2014) provides a list of the nomenclatural synonyms of *E. nocturnum* and cites Ames, Hubbard, and Schweinfurth (1936) as lectotypifying that name. However there is no lectotypification provided in the place cited.

#### FERNANDEZIA RUIZ & PAVON

When treated in the traditional sense, this is a genus of six or seven species, distributed from Bolivia to Costa Rica. Recently however Chase and Whitten (2011), using molecular data, expanded *Fernandezia* to include *Pachyphyllum* Kunth and *Raycadenco* Dodson. They argued that *Fernandezia*

and *Pachyphyllum* are interdigitated, and that shifts from larger, brightly colored (orange to red) flowers to smaller whitish to greenish flowers occurred a number of times. The molecular data supporting their statements was published by Neubig et al. (2012). I am not, however, prepared to accept

*Raycadenco* within a broad *Fernandezia*, and believe it is better treated as a sister genus to *Fernandezia*, as the authors themselves intimated. An alternative view was proposed by Kolanowska and Szlachetko (2014), who whilst accepting *Fernandezia*, *Pachyphyllum* and *Raycadenco* as separate genera, also recognised *Orchidotypus* Kraenzl. and a new genus *Valdiviesoa* Szlach. & Kolanowska (Type: *Pachyphyllum debedoutii* P. Ortiz).

I have however preferred to adopt an expanded *Fernandezia* (including *Orchidotypus*, *Pachyphyllum*, and *Valdiviesoa*), thus resulting in a genus of about 50 species distributed from Mexico to Bolivia. Recent studies suggest at least another 40 taxa require description, with many novelties found in Bolivia and Peru. The plants are generally small monopodial epiphytes with flowers that vary from comparatively large and brightly coloured in shades of red to orange, to white and greenish, tiny flowers. A review of the large flowered (sepals 6 mm or more long) species of *Fernandezia* in Colombia and Venezuela reveals that there are so far only two species, rather than the five reported by Kolanowska and Szlachetko (2013). Revision of the

smaller flowered species that were previously included in *Pachyphyllum* is however a much more difficult task.

One final problem regards the typification of *Fernandezia*. It has been completely overlooked that when Ruiz and Pavon (1794) established the genus, they validly described a single species, *F. laxa*. This taxon was the only orchid species described by them in 1794, whilst all the other taxa were published in 1798. This taxon, *F. laxa*, is thus the nomenclatural type of *Fernandezia*. Therefore the choice by Dunsterville and Garay (1972) of *F. subbiflora* Ruiz & Pavon as lectotype of the genus is superfluous and must be rejected. *Fernandezia laxa* is a species of *Dichaea*, an illustration of the type can be found in Pupulin (2012). It therefore will be necessary to propose conservation of the type of *Fernandezia* otherwise the genus will likely be rejected if a choice has to be made against its junior synonym *Dichaea* Lindl. (an uncontroversial, stable name), furthermore the genus *Pachyphyllum* would have to be expanded to cover the previous broad concept of *Fernandezia*. For the time being I use *Fernandezia* in the wide sense of recent authors, pending its conservation.

#### KEY TO LARGE FLOWERED SPECIES OF *FERNANDEZIA* IN COLOMBIA AND VENEZUELA

1a. Leaves thin, flat. Labellum with a concave base less than one third of total length; callus with a linear base diverging apically into two thin lamellate keels. . . . . *F. myrtillos*

1b. Leaves thick, fleshy, canaliculate to flat. Labellum with a concave base about half of total length; callus somewhat rectangular-subpandurate, of two thickly lamellate keels . . . . . *F. sanguinea*

***Fernandezia myrtillos*** (Rchb.f.) Garay & Dunsterv., Venez. Orch. Illustr. 5: 126, 1972.

Basionym: *Nasonia myrtillos* Rchb.f., Bonplandia 3: 239, 1 Sep. 1855.

TYPE: COLOMBIA. Nariño: woods near Pasto, September 1845, W. Jameson 442 (Holotype: W-R 19244, image seen; Isotypes: BM; G, 2 sheets; K, images seen). Fig. 2.

Homotypic synonym: *Centropetalum myrtillos* (Rchb.f.) Pfitz., Grund. Vergl. Morph. Orch.: 16, 1882.

Heterotypic synonyms: *Nasonia hartwegii* Rchb.f., Xenia Orch. 1: 97, 14 Dec. 1855 *syn. nov.*

TYPE: COLOMBIA. Cauca: between Huambia and Pitayo, T. Hartweg 1416 (Holotype: W-R 19211, 19242, images seen; Isotypes: BM, E, G, K, 2 sheets, K-L, P, 2 sheets, images seen).

*Centropetalum hartwegii* (Rchb.f.) Kraenzl., in Engl., Pflanzenz. IV, 50, 83: 30, 1923.

*Fernandezia hartwegii* (Rchb.f.) Garay & Dunsterv., Venez. Orch. Illustr. 5: 126, 1972.

*Fernandezia aurantiaca* Senghas, J. Orchideenfr. 10, 3: 258, 2003 *syn. nov.*

TYPE: ECUADOR. Without locality or collector, cult. Kurpfalz Bot. Gard., Orch.-985 (Holotype: HEID, not seen).

*Fernandezia ortiziana* Kolan. & Szlach., Ann. Bot. Fenn. 50: 68, 2013 *syn. nov.*

TYPE: COLOMBIA. Antioquia: Municipio Bello, Corregimiento San Felix, Alto de las Baldias, 3150 m, 2 October 2004, *Estudiantes Herbario MEDEL 459*, lower left hand plant (Holotype: MEDEL, not seen).

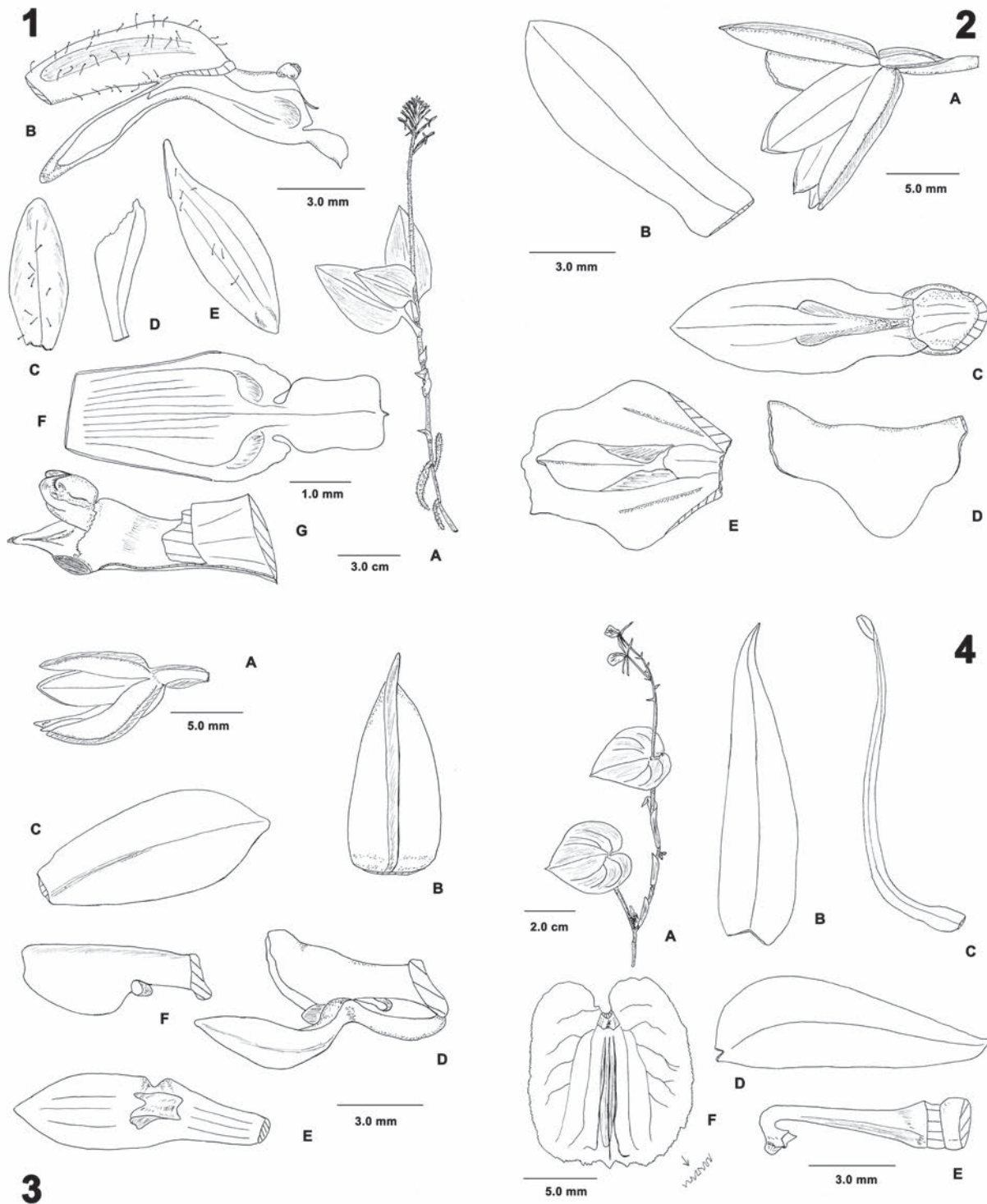
Usage synonyms: *Centropetalum sanguineum* auct. non (Lindl.) Kraenzl., Foldats, Fl. Venez. 5: 419, f. 906, 1970.

*Fernandezia lanceolata* auct. non (L.O. Williams) Garay & Dunsterv., Dunsterv. & Garay, Venez. Orch. Illustr. 5: 124, f., 1972; Escobar (Ed.), Nat. Colomb. Orch. 2: 187, no. 204, 1991.

*Fernandezia sanguinea* auct. non (Lindl.) Garay & Dunsterv., Fernandez, Orquid. Nat. Tachira: 102, 2003.

**Distribution:** Ecuador; Colombia; Venezuela.

Epiphytic herb. Stems erect to pendulous, simple to occasionally branching, leafy near apex to throughout, 4.5–11.0 cm long. Leaves oblong, oblanceolate to obovate, apiculate, thinly fleshy, green to silvery green, occasionally purple-suffused, 5–23 mm long, 2.0–6.5 mm wide. Inflorescences axillary, 2.5–7.0 mm long, one, rarely two-flowered; peduncular sheath to 5.5 mm long; floral bract 2.5–4.0 mm long. Flowers coral red, red, vivid red, rose-red, bright orangish-red, orangey-yellow, yellowish-red, base of lip orange, lip yellowish with purple tip, pollinia blue, fragrance like fruit of orange. Pedicellate ovary clavate, tripartite, 6–8 mm long. Dorsal sepal oblong-ligulate, acute, midvein with a lamellate keel, 8–11 mm long, 2.75–3.00 mm wide. Lateral sepals obliquely oblong to ligulate-lanceolate, acute, midvein with a lamellate keel, 9.7–11.9 mm long, 2.15–2.90 mm wide. Petals oblong to oblong-lanceolate, acute to subacute, 7.5–10.7 mm long, 3.15–3.30 mm wide. Labellum oblong-lanceolate, acute, basal 2.2–3.5 mm saccate, 9.70–11.25 mm long, 3.0–3.4 mm wide; callus with a short linear base that diverges into two thin lamellae. Column broadest medially, 6.0–7.2 mm long, 2.0–2.7 mm wide laterally.



FIGURES 1–4. 1, *Aspidoogyne jussariensis* Ormerod. A, plant; B, flower minus tepals; C, dorsal sepal; D, petal; E, lateral sepal; F, labellum; G, column. Drawn from holotype. 2, *Fernandezia myrtilillus* (Rchb.f.) Garay & Dunsterville. A, flower; B, petal; C, labellum; D, column, profile; E, column, ventrally spread out (minus pollinarium). A from *Drew E-252* (AMES), B–C from *Fosberg 2022* (AMES), D from *Bristol 375* (AMES), E from *Schultes s.n.* (AMES). 3, *Fernandezia sanguinea* (Lindl.) Garay & Dunsterville. A, flower; B, dorsal sepal; C, petal; D, column and labellum; E, labellum; F, column. A–E from *Lehmann 8588* (AMES, holotype of *Centropetalum lanceolatum*), F from *Prieta P-273* (AMES). 4, *Liparis vasquezii* Ormerod. A, plant; B, dorsal sepal; C, petal; D, lateral sepal; E, column; F, labellum. Drawn from holotype.



**Additional Specimens examined:** ECUADOR. Carchi: El Mirador, El Playón de San Francisco to Julio Andrade, 3400 m, June 1991, *A. Hirtz & Quito Orch. Soc.* 5568 (SEL). Azuay: S of Cumbe, farm road from new road to Giron, 3000–3100 m, 27 February 1982, *C. Luer & A. Pozo 7044* (SEL); near Cajas National Park, 25 km W of Cuenca, 3400 m, cult. *A. Pozo* in Cuenca, 20 November 1989, *C.H. Dodson, N. Williams, E. Hagsater & M. Whitten 17716* (SEL). Imbabura: Cordillera Oriental, Alegria, E of Volcan de Cayambe, 2865 m, 12 May 1944, *W.B. Drew E-252* (AMES); same data, 10 May 1944, *W.B. Drew E-250* (AMES). COLOMBIA. Narino: KM 11 along road from Incano, on W margin of Laguna Cocha, 2750 m, 23 July 1989, *C.H. Dodson & R. Escobar 18112* (SEL). Putumayo: Tabanel, above La Cocha, 3350 m, 31 October 1946, *M.B. & R. Foster 2022* (AMES); Valle de Sibundoy, 5 km NE of Sibundoy, 2760 m, 28 November 1962, *M.L. Bristol 375* (AMES, US); between La Cocha and Sibundoy, 2700 m, 30 July to 5 August 1978, *C. Luer, J. Luer, J. Kuhn, R. Escobar & D. Welisch 3113* (SEL); Pasto to Sibundoy, beyond Laguna de Pasto and over the pass, 2750 m, 24 January 1987, *C.H. & P.M. Dodson 17012 p.p.* (SEL, lhp). Valle: Cordillera Occidental, Los Farallones, NW slope, Quebrada da del Raton, Mina El Diamante, 2950–3000 m, 30 July 1946, *J. Cuatrecasas 21767* (AMES, F, US). Cauca: W slopes of Central Cordillera of Popayan, near Pitayo, 2 September 1881, *F.C. Lehmann 964* (BM); on the Penon de Pitayo, 3000 m, 20 October 1882, *F.C. Lehmann 2072* (BM, K); El Tambo, Munchique, July 1948, *S. Yepes Agredo 419* (F); above Munchique, W of Popayan, 2750 m, 26 July 1978, *C. Luer, J. Luer, J. Kuhn & R. Escobar 2994* (SEL); Paramo de las Barbillas, 3150 m, 13 November 1982, *C. Luer & R. Escobar 8372* (SEL); between Totoro and Inza, Paramo de Guanacas, 3150 m, 15 November 1982, *C. Luer & R. Escobar 8434* (SEL). Caldas: Cordillera Central, “Pinares,” above Salento, 2600–2800 m, 2–10 August 1922, *F.W. Pennell 9274a* (AMES). Risaralda: Municipio de Santa Rosa de Cabal, royal road between Termales Santa Rosa and Hacienda la Sierra, Finca Berlin, 2970 m, 22 January 1986, *J. Wolf 657* (SEL). Antioquia: Quirama, Rio Negro, 2200 m, 13 July 1973, *R.E. Schultes s.n.* (AMES); Municipio Bello, vereda San Felix, 7.2 km from Medellin to San Pedro road, on road to communication towers, 3000 m, 8 May 1988, *J.L. Zarruchi & M.M. Correa 6339* (MO, SEL); Municipio Bello, Corregimiento San Felix, Cerro San Felix (communication towers), 3000–3100 m, 22 May 1991, *R. Fonnegra 3774* (MO, US); Altas de Barbacoa, c. 15 km W of Medellin, entering from San Felix, near TV repeater tower, 3150 m, 15 September 1984, *C. Dodson, R. Escobar & E. Valencia 15293* (MO); Municipio Belmira, finca El Paramo, 3000–3130 m, 21 April 1993, *R. Fonnegra & D. Tuberquia 4575* (MO, SEL); Municipio Belmira, Belmira to Vereda El Yerbal, KM’s 6–8, Vereda El Yerbal to Alto de Sabanazos, 2500–3100 m, 24 April 1991, *F.J. Roldan, J. Betancur, S. Churchill, A. Arbelaez & D.L. Echeverry 1563* (MO); Santa Rosa [Rosa?] and Belmira, 3000–3200 m, November 1891, *F.C. Lehmann 8586* (K); mountains between Belmira and Santa Rosa de Asos, 3000–3200 m, *F.C. Lehmann 8586* (K); Municipio El Boqueron, Alto de los Baldios, 3150 m, 9 April 1958, *J. Cuatrecasas, M. Llano & G. Gutierrez 24230* (US); Municipio Jardin, Alto de Ventanas, 15 km SW of Jardin, on the way to Riosucio, 2400–2800 m, 9 June 1987, *R. Callejas, O. Marulanda, F.J. Roldan & H. Correa 3889* (MO, NY, SEL); Alto de Ventanas, on road to Riosucio, 2800–2850 m, 25–26 May 1983, *R. Escobar 2694* (SEL); vereda Ventanas, Jardin to Ventanas to Riosucio road, c. 19.3 km SSE of Jardin, at border with Caldas, 2830 m, 4 May 1989, *J.L. Luteyn & O. Escobar 12749* (NY); S of Jardin in S part of department, 2750 m, 19 October 1988, *J.L. Zarucchi, F.J. Roldan & G. McPherson 12896* (MO); Municipio de Medellin, along road to Cerro de Padre Amaya, 10 km from Medellin to Santa Fe de Antioquia road, 2970 m, 15 September 1987, *J.L. Zarucchi & A.E. Brant 5322* (MO); on Cerro Padre Amaya, W of Medellin, 2900 m, 16 January 1979, *C. Luer, J. Luer & R. Escobar 3691* (SEL); Cerro Padre Amaya, 2800 m, 22 April 1983, *C. Luer, J. Luer, M. Webb, R. Escobar, A. Pridgeon & E. Hagsater 8770* (SEL); Cerro de Padre Amaya, 10.2 km from Medellin to Santa Fe de Antioquia highway, on road to summit, 2990 m, 18 March 1987, *J.L. Zarucchi & B. Madrigal 4805* (MO). Cundinamarca: Paramo de Guerrero, between Zipaquira and Pacho, 2600–3000 m, *F.C. Lehmann 8587* (K); Zipaquira, 2600–3000 m, *F.C. Lehmann 8587* (K); Rio Blanco Valley, 8 km E of Choaci, 2380 m, 18 May 1944, *M.L. Grant & F.R. Fosberg 9221* (US); 12 km WSW of Junin, on the Rio Blanco, a small tributary of the Rio Piedra de Sal, drainage of Rio Sueva, 19 February 1944, *F.R. Fosberg 21474* (US); Los Andes, E slopes of the Rio Blanco, 14 km WSW of Junin, 40 km NE of Bogota, 2900 m, 19 April 1944, *M.L. Grant 9058* (US); Municipio Guasca, Paramo de Guasca, E slope, 3000–3500 m, 11 October 1939, *H. Garcia-Barriga 8097* (US); Paramo de Guasca, toward Gacheta, 1921, *Brother Ariste-Joseph s.n.* (AMES, US); Paramo de Guasca, 21 December 1919, *Brother Ariste-Joseph A487* (AMES, US); same area, 2850–3340 m, 22 January 1942, *R.E. Schultes & R. Jaramillo M. 3177* (AMES); Paramo de Guasca, forest in Junquin, Quebrada Amarilla, 2840 m, 2 June 1940, *J. Cuatrecasas 9458* (F, US); Pysagura, 2900 m, 28 May 1942, *G. Huertas Gonzalez s.n.* (AMES); Represa de Sisga, 2745 m, 2 March 1953, *R.E. Schultes 18808* (AMES); Choconta, El Sisga, high part of La Represa, 2700–2900 m, 14 January 1962, *H. Garcia-Barriga 17376* (AMES, NY, US); Choconta, El Sisga, 2700–2800 m, 21 February 1962, *H. Garcia-Barriga 17421* (AMES); same area, 2600–2750 m, 16 April 1963, *H. Garcia-Barriga 18024* (AMES, NY, US); El Sisga, road to Choconta, 2 km to the N of del Fuente, 2800 m, 12 October 1972, *H. Garcia-Barriga 20357* (US); road between Choconta and “Sisga,” E side, 2900–3000 m, *M. Ospina-Hernandez 169* (AMES); S of Bogota, above Gutierrez, 2700 m, 19 May 1984, *C. Luer, J. Luer & R. Escobar 10374* (MO); Municipio de Usaquen, Quebrada de Santa Barbara, 2900 m, 6 June 1948, *M. Schneider 738* (AMES); same area, 3000 m, 21 November 1943, *M. Schneider 738* (AMES). Santander: near Las Vegas, 2600–3000 m, 21–23 December 1926, *E.P. Killip & A.C. Smith 15889* (AMES). Santander del Sur: E of Bucaramanga, toward Berlin, 3250 m, 3–5 November 1981, *C. Luer & R. Escobar 6583* (SEL). Norte de Santander: N of



Toledo, Paramo de Mefue, 2440 m, 25 May 1982, *C. Luer, R. Escobar & D. Portillo 7963* (SEL); Alto de Mefue, N of Toledo, 2600 m, 12 May 1984, *C. Luer, J. Luer, E. Escobar & E. Valencia 10300* (MO). VENEZUELA. Tachira: head of Rio Quinimar, sloping side of El Banco, below the Cerro Las Copas (below the Paramo de Judio), 20 km S of San Vicente de la Revancha, 35 km S of Alquitrana, SE of Santa Ana, 2500–2700 m, 15 January 1968, *J.A. Steyermark, G.C.K. Dunsterville & E. Dunsterville 100963* (VEN, image seen); same area, 13 January 1968, *J.A. Steyermark, G.C.K. Dunsterville & E. Dunsterville 100837* (AMES, GH); same area, 11 January 1968, *J.A. Steyermark, G.C.K. Dunsterville & E. Dunsterville 100676* (AMES, GH); Distrito Junin, S slope of Cerro San Isidro, directly N of El Reposo, above Hacienda Vista, Quebrada Agua Caliente and tributaries, 2000 m, 13–14 November 1982, *G. Davidse & A.C. Gonzalez 22229* (MO, SEL). LOCALITY UNCERTAIN: Boqueron de Bogota, 2800 m, 21 October 1871, *E.F. Andre 742* (K); La Vejo, forest of Chorillo, “Incenta de Puvillan,” 22 November 1888 (or 1880?), *E.F. Andre 802* (K).

This species is a common and widespread alpine orchid. In the southwestern part (N Ecuador and SW Colombia) of its range the leaves tend to be smaller and a little more obovate, but intermediates occur throughout its distribution, furthermore the flowers are identical in all these specimens. Flower color is reported to be orange to crimson, the column with orange wings, and the lip orange to crimson with purple apices to the keels. The column wings seem to clasp the sides of the callus (and thus appear to holding the lip up), and in some cases it would appear that the column wings are actually united to the sides and back of the callus.

When Garay and Dunsterville (1972) transferred *Centropetalum lanceolatum* to *Fernandezia* they unfortunately misapplied the name to material that represents *F. myrtilus*. The Ecuadorian *F. aurantiaca* is in no way different from *F. myrtilus*, a taxon Senghas overlooked. Another taxon, *F. ortiziana*, is the result of an unfortunate error where the authors have mistaken the spread out column for the labellum.

***Fernandezia sanguinea*** (Lindl.) Garay & Dunsterv., Venez. Orch. Illustr. 5: 126, 1972. TYPE: COLOMBIA. Tolima: slopes of Volcan Tolima, 1830 m, February 1843, *J. Linden 1274* (Holotype: K–L, image seen). Fig. 3. Basionym: *Nasonia sanguinea* Lindl., Orch. Linden.: 18, 1846.

Homotypic synonym: *Centropetalum sanguineum* (Lindl.) Kraenzl., in Engl., Pflanzenr. IV, 50, 83: 30, 1923.

Heterotypic synonyms: *Nasonia robusta* Schltr., Rep. Sp. Nov. Regni Veg., Beih. 8: 109, 1921.

TYPE: ECUADOR. Chimborazo: Mt. Chimborazo, 3000 m, September 1881, *A. Sodiro s.n.* (Holotype: B, destroyed).

*Fernandezia robusta* (Schltr.) Senghas, in Schltr., Die Orchideen ed. 3, I/B 31: 1926, 1995 *nom. illeg.* (non Batem. 1866).

*Pachyphyllum favosifolium* Kraenzl., in Engl., Pflanzenr. IV, 50, 83: 23, 1923 *syn. nov.*

TYPE: COLOMBIA. Antioquia: near Sonson, 3300 m, *W. Kalbreyer 1935* (Holotype: B, destroyed).

*Fernandezia favosifolia* (Kraenzl.) M.W. Chase,

Phytotaxa 20: 30, 2011.

*Centropetalum lanceolatum* L.O. Williams, Lilloa 3: 480, 1937 *syn. nov.*

TYPE: COLOMBIA. Cauca: Andes of Popayan, Paramo de Guanacas, 3300–3500 m, *F. C. Lehmann 8588* (Holotype: AMES; Isotypes: K, 2 sheets; NY, image seen).

*Fernandezia lanceolata* (L.O. Williams) Garay & Dunsterv., Venez. Orch. Illustr. 5: 124, 1972.

*Pachyphyllum steyermarkii* Foldats, Acta Bot. Venez. 3, 1–4: 369, 1968.

TYPE: VENEZUELA. Tachira: Paramo de Tama, 2475–2550 m, 18–20 May 1967, *J.A. Steyermark, G.C.K. Dunsterville & E. Dunsterville 98345* (Holotype: VEN, image seen; Isotypes: AMES, 2 sheets).

*Fernandezia tica* Mora-Retana & J.B. Garcia, Brenesia 39–40: 164, 1993 *syn. nov.*

TYPE: COSTA RICA. Heredia: carretera a Vara Blanca, 2000 m, 27 October 1992, *J.T. Atwood & O. Rodriguez 4181* (Holotype: USJ, not seen).

Usage synonyms: *Fernandezia “costaricensis* (Ames & Schweinf.) Garay & Dunsterv.” R.L. Rodriguez Caballero, D.E. Mora, M.E. Barahona & N.H. Williams, Orquid. Costa Rica: 252–253, 1986.

*Fernandezia* sp.: Escobar (Ed.), Nat. Colomb. Orch. 2: 187, no. 203, 1991.

*Fernandezia hartwegii* auct non (Rchb.f.) Garay & Dunsterv., Escobar (Ed.), Nat. Colomb. Orch. 5: 780–781, no. 922–923, 1994.

Epiphytic herb. Stems simple to occasionally branching, terete, erect to pendulous, leafy throughout or in upper half to third, 7–52 cm long, branches to 20 cm long. Leaves ligulate to oblong-lanceolate, acute, fleshy, deep green above, sometimes purple suffused, dull green to purple-black below, 9–28 mm long, 3.0–13.5 mm wide. Inflorescence axillary, c. 8 mm long, one to two-flowered; peduncular sheath infundibuliform, 4–5 mm long. Flowers rose, red, orange-red, purplish, pinkish-red, rarely yellow, callus yellow. Pedicellate ovary clavate, trilocate, to 11 mm long. Dorsal sepal ovate to lanceolate, acute, base concave, midvein with a lamellate keel, 6.9–9.0 mm long, 2.5–3.1 mm wide. Lateral sepals obliquely lanceolate, acute, base concave, midvein with a lamellate keel, 6.0–10.9 mm long, 2.8–3.8 mm wide. Petals obliquely oblong-elliptic to oblong-oblancheolate, acute to subacute, 6.0–9.3 mm long, 2.9–4.3 mm wide. Labellum oblong, entire, acute, basal third concave-saccate, upper third to half with an ovate to lanceolate, acute “midlobe,” in total 7.1–10.9 mm long, 1.8–3.4 mm wide; callus subquadrate-subpandurate with two thickly lamellate keels, placed medially on lip. Column broadly winged in upper half, 4.2–6.0 mm long, 1.5–2.2 mm wide laterally.

**Distribution:** Costa Rica; Ecuador; Colombia; Venezuela.

**Additional specimens examined:** ECUADOR. Azuay: “Oriente” border, Paramo del Castillo and area (crest of the E Cordillera, on trail between Sevilla de Oro and Mendez), 2745–3350 m, 18 August 1945, *W.H. Camp E-4796* (AMES, NY); “Oriente” border, E Cordillera, between Ona and the Rio Yacuambi, 2440–2895 m, 10–19

September 1945, *F. Prieto P-273* (AMES, NY). Imbabura: Alturas de Cayachupa, c. 5 km NW of Pinan village, 3200 m, 18 June 1980, *C.R. Sperling & R. Bleiweiss 5139* (NY). Zamora-Chinchipe, Cerro Colorado, S of Nambija, 2700 m, 17–20 February 2002, *A. Hirtz, D. Neill, T. Delings, C. Cole, M. Manzanares, A. Ergas & W. Quishpe 7965* (SEL). COLOMBIA. Putumayo: Paramo de Tambillo, NE of the Valle de Sibundoy, 2700–2800 m, 13–14 December 1942, *R.E. Schultes & C.E. Smith 3118* (AMES); Pasto to Sibundoy, beyond Laguna de Pasto and over the pass, 2750 m, 24 January 1987, *C.H. & P.M. Dodson 17012 p.p.* (SEL, rhp). Cauca: central Andes of Popayan, Paramo de Guanacas, 3000–3500 m, November, *F.C. Lehmann 6756* (AMES, K); Paramo de Maras, 3000–3500 m, 29 October 1882, *F.C. Lehmann 2066* (BM, K); Cordillera Central, W slope, head of the Rio Palo, quebrada del Rio Lopez, Alto Duende, on paramo, 3300–3350 m, 1–2 December 1944, *J. Cuatrecasas 18889* (AMES); Cordillera Occidental, “La Gallera,” Micay Valley, 2200–2500 m, 1 July 1922, *E.P. Killip 8001* (AMES, NY); Valle de las Papas, trail between Valencia and San Sebastian, 3200 m, 20 October 1958, *H.G. Barclay & P. Juajibioy 6086* (MO). Valle: Cordillera Central, W slope, Hoya del Rio Bugalagrande, Barragan, Quebrada de la Chorrera, 3000–3080 m, 22 April 1946, *J. Cuatrecasas 20986* (AMES); border of Valle & Choco, Rio Minrido (?), 3100 m, September 1941, *E. Dryander 2538* (US). Valle/Cauca (?): without locality, West Cordillera Observatio, 2700 m, August 1941, *E. Dryander 2514* (US). Huila: Caqueta, Cordillera Oriental, Gabinete, 2300–2450 m, 21 March 1940, *J. Cuatrecasas 8443* (US). Tolima: Vulcan Tolima, 1220 m, August 1917, *Mrs. Tracey 238* (K). Risaralda: Municipio Santa Rosa de Cabal, royal road between Termales de Santa Rosa and Hacienda La Sierra, finca Berlin, 3190 m, 15 May 1986, *J. Wolf 941* (K, MO, NY, SEL). Caldas: Cordillera Central, “Pinares,” above Salento, 2600–2800 m, 2–10 August 1922, *F.W. Pennell 9274* (AMES). Antioquia: without locality, May 1873, *C. Patin s.n.* (K); Alto de Alegrias, 2600–3000 m, October 1884, *F.C. Lehmann 4195* (K); Municipio Belmira, Vereda El Paramo, El Paramo and area of the Alto de Santa Ines, 6 hrs by road NE of Belmira, 2900–3100 m, 8 August 1995, *R. Callejas, R. Fonnegra & F.J. Roldan 11597* (MO, SEL); Municipio Ituango, road between El Retiro and Cerro Paramillo, 3000–3100 m, 25 February 1993, *H. Cuadros 4953* (MO, SEL); Municipio de Urrao, Paramo de Frontino, Llano Grande and hill to N, 3320–3450 m, 2 March 1989, *J.M. MacDougal, F.J. Roldan & J. Betancur 4421* (MO). Cundinamarca: Cordillera Oriental, Montes de Guasca, in “Los Gaques,” 2000 m, 24 April 1932, *J. Cuatrecasas 3033* (K); Choconta, El Siga, high part of La Represa, 2700–2900 m, 14 January 1962, *H. Garcia-Barriga 17371* (AMES); El Siga, road to Choconta, 2 km N of del Puente, 2800 m, 12 October 1972, *H. Garcia-Barriga 20356* (US, left hand plant). Boyaca: Duitama, carretera de Virolin, near KM 32, down on the river, 2900–3000 m, 2 September 1967, *L. Uribe Uribe 5953* (MO, US); between Duitama and Virolin, 3360 m, 1 June 1982, *C. Luer, R. Escobar & J. Portillo 8022* (SEL); Sierra Nevada del Cocuy, near Colugun (?), 2900 m, 16 August 1957, *P.J. Grubb, B.A.B. Curry & A. Fernandez-Perez 529* (US). Santander del Sur,

roadside N of La Laguna toward Pamplona, 2850 m, 8 May 1984, *C. Luer, J. Luer, E. & E. Valencia & R. Escobar 10186* (MO); E of Bucaramanga toward Berlin, 2550 m, 7 May 1984, *C. Luer, J. Luer, E. & E. Valencia & R. Escobar 10205* (MO). Santander del Norte/Cesar: border, between Abrego and Las Jurisdicciones (Cerro de Oroque), 3440–3750 m, 22–23 May 1969, *H. Garcia-Barriga & R. Jaramillo M. 19844* (AMES); below Paramo de Jurisdicciones; between Ocana and Pamplona, 3130 m, 10–11 November 1981, *C. Luer, J. Luer, R. Escobar & D. Portillo 6654* (SEL). Cesar: Sierra Nevada de Santa Marta, San Lorenzo ridge, 2285 m, 10 March 1899, *H.H. Smith 2840* (NY). LOCALITY UNCERTAIN: Cocha..., “Incenta de Puvillan,” *E.F. Andre 1010* (K [label damaged]).

In herbarium specimens (when compared to *F. myrtilus*) this species is readily identified by its fleshy leaves but this may not be a character instantly recognised from photographs or drawings. The variability observed in habit (stem 7 cm, leaves dense, to 15 mm long vs. stem 40 cm, leaves lax, to 28 mm long) of some of the specimens cited may be an artefact of exposure to high light levels, as there appears to be no differences in the flowers. The pollinarium is said to have a single stipe (vs. two stipes in *F. myrtilus*) but I only find it this way in immature flowers, and even then the upper third of the stipe has a medial line of division. It would seem as the flower ages that the stipe then begins to divide, but not wholly so. The flowers vary in color from orange to crimson, with orange column wings, and yellow to orange calli on the lip.

I agree with Kraenzlin (1923) in the reduction of *Nasonia robusta* to *Fernandezia sanguinea*. The description of *Pachyphyllum favosifolium* agrees completely with *F. sanguinea*, whilst *Centropetalum lanceolatum* represents the larger end of vegetative variation. The latter name has been misapplied to material of *F. myrtilus* (see above). Foldats (1968) cited *J.A. Steyermark et al. 100963* (VEN, image seen) in the protologue of *Pachyphyllum steyermarkii* but that specimen would seem to be a fruiting collection of *F. myrtilus*. I had wanted to treat *Pachyphyllum steyermarkii* as a separate taxon due to its black drying, deeply pitted, usually narrower leaves. However an examination of numerous specimens showed that intermediates occurred between typical “*steyermarkii*” and *Fernandezia sanguinea* and, furthermore, no differences could be found in the flowers.

*Fernandezia tica* Mora-Retana & Garcia-Castro from Costa Rica is in my opinion no different from *F. sanguinea*, it has slightly larger flowers than is typical for the latter (sepals c. 10 mm long vs. 6–8 mm long) but there are occasional collections of *F. sanguinea* with flowers this size [e.g., *MacDougal et al. 4421* (MO) from Antioquia]. It is therefore reduced to synonymy.

The collection *Garcia-Barriga & Jaramillo 19844* from the border of Santander del Norte and Cesar in Colombia may represent a natural hybrid between *F. myrtilus* and *F. sanguinea* since the callus on the labellum is more V-shaped (vs. subquadrate) and the column is less distinctly stalked, with the wings more like *F. myrtilus* in shape. The leaves are fleshy like in *F. sanguinea*, but perhaps more oblong and blunter like in *F. myrtilus*.

SMALL FLOWERED *FERNANDEZIA* (*PACHYPHYLLUM*).

Christenson (2008) provided a synopsis of this group under the name *Pachyphyllum* Kunth. He recognised 41 species distributed from Mexico to Bolivia. However one species (*P. favosifolium*) has since proved to be a synonym of *F. sanguinea* (see above). *Orchidotypus vareschii*, which has been considered a synonym of *F. hispidula* (Rchb.f.) M.W. Chase, is here considered to be a synonym of *F. schultesii*.

*Fernandezia schultesii* (L.O. Williams) Carnevali & Dorr, Smithsonian Contr. Bot. 100: 159, 2014.

Basionym: *Pachyphyllum schultesii* L.O. Williams, *Caldasia* 1, 3: 15, 1941.

TYPE: COLOMBIA. Cundinamarca: SE of Bogota, Paramo de Chipaque, 3200 m, 25 September 1941, R.E. Schultes 1020 (Holotype: AMES).

Heterotypic synonym: (?) *Orchidotypus vareschii* Foldats, *Acta Biol. Venez.* 2, 4: 28, 1957.

TYPE: VENEZUELA. Tachira: Paramo el Batallon, 3200 m, V. Vareschi 4527B (Holotype: VEN, not seen).

**Distribution:** Ecuador; Colombia; Venezuela (?).

**Specimen examined:** ECUADOR. Azuay: Gualaceo to Limon road, KM 13, 3200–3300 m, 4 March 1985,

G. Harling & L. Andersson 22704 p.p. (AMES).

Dunsterville and Garay (1965) included *Orchidotypus vareschii* in the synonymy of *Pachyphyllum hispidulum* (Rchb.f.) Garay & Dunsterville. However, *O. vareschii* lacks the conspicuously ciliate margins of the leaves and the sheaths of the latter, agreeing much better with *Fernandezia schultesii* in having short, obtuse (vs. lanceolate, acute) leaf sheath lobules. A detailed examination of the holotype of *O. vareschii* is however needed to fully confirm its place within the synonymy of *Fernandezia schultesii*, because there are a number of similar taxa in this group. Gordon Dillon's drawing of the type in the protologue of *Pachyphyllum schultesii* is somewhat misleading in that the lobulate nature of the leaf sheaths is not depicted. Another problem is that Dunsterville and Garay (1965) recorded *P. schultesii* from Venezuela but Dunsterville's drawing shows a plant with fleshier leaves that have truncate leaf sheaths, and flowers that have obtuse (vs. acute) sepals. I have seen collections of a similar entity from Colombia.

The record for Ecuador is new, it was found mixed in with material of *Fernandezia hispidula* (Rchb.f.) M.W. Chase *sensu lato*.

*IONOPSIS* KUNTH

A genus of two or three species distributed from Central America to Paraguay. The plants produce elongate panicles with attractive white flowers, often lined and tinted with violet, the lateral sepals form a short spur at the base, and the lip is prominent, broadly dilated and bilobed.

*Ionopsis utricularioides* (Sw.) Lindl., *Coll. Bot.*: t.39A, 1826.

TYPE: JAMAICA. Without locality, O. Swartz s.n. [Lectotype (designated by Ackerman 2014: 219): BM; Isolectotypes: G, S, W none seen].

Basionym: *Epidendrum utricularioides* Sw., *Nov. Gen. Sp. Pl. Prodr.*: 122, 1788.

Heterotypic synonyms: *Epidendrum calcaratum* Sesse & Mocino, *Fl. Mexic. ed. 2*: 201, 1894 *nom. illeg.* (non Vellozo 1831 *nom. inval.*; Vellozo 1881).

TYPE: PUERTO RICO. Toa Alta, M. Sesse & J.M. Mocino s.n. (Lectotype, here designated: BM 000023376, image seen).

*Epidendrum sessei* Hoehne, *Arq. Bot. Est. Sao Paulo n.s. Form. Maior* 2: 143, 1952.

**Distribution:** United States of America (Florida); Caribbean Islands; Central America; South America (to Paraguay).

There appears to be no type material of *Epidendrum calcaratum* in MA, so the sheet in BM is designated as lectotype. This sheet appears to be one of many MA specimens that were sold by José A. Pavón to Aylmer B. Lambert. Ames et al. (1936) seem to have been the first to conclude that *E. calcaratum* was a synonym of *Ionopsis utricularioides*.

I do not believe that *Epidendrum calcaratum* Vellozo 1831 is validly published, since in my opinion the illustration lacks an analysis that aids identification [McNeill et al. (2012), *ICN Art.* 38.7–9]. However Vellozo's description published in 1881 does validly establish the name *E. calcaratum*, a synonym of *Bifrenaria harrisoniae* (W.J. Hook.) Rchb.f.

*LIPARIS* L.C. RICH.

Apantropical and circumboreal genus of about 480 species when considered in the broad sense. In the New World including about 30 species. The first species proposed here is member of the recently described section *Retusae* (Ormerod, 2013), now a group of six known taxa. Whilst the second is a member of section *Ramosae* Ridl., now a group of fourteen species.

*Liparis vasquezii* Ormerod, *sp. nov.* TYPE: BOLIVIA. Cochabamba: Chapare Prov., road to Tablas, 2500 m, 9 February 1980, C. Luer, J. Luer & R. Vasquez 5166 (Holotype: SEL). Fig. 4.

*Species nova in sectio singularis, labello basi auriculatis differt.*

Terrestrial herb. Rhizome creeping, terete, to 27 cm long, 0.15–0.20 cm thick; internodes c. 3 between pseudobulbs, 0.9–2.3 cm long. Roots terete, pubescent, sparsely singly appearing along the rhizome, 0.5–1.0 mm thick. Pseudobulbs 3.0–7.8 cm apart, enclosed by expanded base of leaf petiole, dimidiately cylindric-ovoid, 1 cm long, to 0.4 cm wide; subtended by a 2.1–2.5 cm long, whitish drying, papery sheath. Leaf single, basal, cordate, subacuminate, 7 veined, 3.1–4.7 cm long (including auricles), 2.5–3.3 cm wide; petiole



canaliculate, base expanded, 2.8–3.8 cm long. *Inflorescence* terminal, 6.7–10.1 cm long; peduncle usually enclosed by channel of leaf petiole, 4.5–5.3 cm long; rachis subclaxly 7–12 flowered, 2.2–4.8 cm long; floral bracts lanceolate, acute, to 4.8 mm long. *Flowers* with light green sepals and petals, lip light purple. *Pedicellate ovary* slenderly clavate, triangular in section, *c.* 11.5 mm long. *Dorsal sepal* oblong-lanceolate, acute, *c.* 9.75 mm long medially, 2.75 mm wide. *Lateral sepals* obliquely lanceolate, subacute, *c.* 8.75 mm long, 2.95 mm wide. *Petals* linear, subacute, 11.8 mm long, 1 mm wide. *Labellum* subquadrate, auriculate basally, margins minutely irregularly dentate-erose, medially with a smooth linear-oblongate strip, apex with a subacute apiculus, 9.1 mm long medially (12.1 mm long including auricles), to 10.9 mm wide; callus basal, transverse, shallowly retuse. *Column* slender, semiterete, apex incurved, 5 mm long unstretched (6 mm long stretched out).

**Distribution:** Bolivia.

**Habitat:** Cloud forest, 2500 m.

**Eponymy:** Named after the late Roberto Vasquez, expert illustrator, contributor to the orchid flora of Bolivia, and who participated in collecting the type.

This species is easily distinguished from all others in section *Retusae* by the broadly auriculate base of the lip. The plant misidentified as *L. retusa* by Vasquez and Dodson (1982) may be a sister species of *L. vasquezii*, since it too has an auriculate labellum. It seems to differ in having larger flowers with a more elliptic lip and more complicate basal callus.

*Liparis yanachagae* Ormerod, *sp. nov.* TYPE: PERU. Pasco: Oxapampa, Distrito Huancabamba, Parque Nacional Yanachaga-Chemillen, Sector Tunqui, 1800 m, 11 February 2008, R. Vasquez M. et al. 33359 (Holotype: SEL). Fig. 5.

*Affinis L. rusbyi* Rolfe *sed labello et callus quadrilobulatis* (vs. *bilobulatis*), *linea media incrassatis et sulcatis* (vs. *humilis et esulcatis*) *differt.*

#### MALAXIS SOL. EX SW.

As circumscribed by Margonska et al. (2012), this is a genus of about 90 species restricted to the Americas. Margonska et al. (2012) divided the genus into two sections, viz. section *Malaxis*, and section *Umbellulatae*. The latter is however pre-empted by *Microstylis* (Nuttal) Eaton section *Chrysanthera*, which is here transferred to *Malaxis*. Some nomenclatural issues related to the Caribbean flora may be of interest to students of that area. *Malaxis cazalensis* Marg. [Margonska et al 2012: 335 (March 2012, S. Koeltz pers. comm)] should be added to the synonymy of *M. dodii* Acevedo-Rodríguez & Ackerman (1 Jan. 2012), both names based on the homonym *M. megalantha* D.Dod. However the name *M. juventudensis* Marg. (Margonska et al. 2012: 338) should be accepted as the correct name for the homonym *M. insularis* (H. Dietr. & M.A. Diaz) Nir. Another problem is the conflicting typifications of the name *M. umbelliflora* Sw. in Ackerman (2014, citing O. Swartz collections) and Margonska et al. (2012, citing D.C. Solander collections),

Terrestrial(?) *herb.* *Rhizome* creeping, terete, 15.5–25.7 cm long, 0.2–0.3 cm thick; internodes 2.4–4.0 cm long; sheaths lax, loose-fitting, tubular, to 2.3 cm long. *Roots* emitted singly, pubescent. *Stems* none. *Leaves* in pairs, blade ovate-suborbicular, acute, black-drying, 3.6–5.5 cm long, 2.6–4.2 cm wide; petiole and sheath 3.7–4.5 cm long. *Inflorescence* terminal, 17–21 cm long; peduncle unsheathed, 10–14 cm long; rachis subclaxly flowered, 3–11 cm long; floral bracts lanceolate, acute, 6–10 mm long, 1.6–2.0 mm wide. *Flowers* with a lilac lip. *Pedicellate ovary* hexalate, 16–17 mm long. *Dorsal sepal* linear-ligulate, apex weakly cucullate, subacute, 1-veined, 11.5 mm long, 1.8 mm wide. *Lateral sepals* obliquely oblong-ligulate, subacute, 1-veined, 9.7 mm long, 2.1 mm wide. *Petals* linear, subacute, 1-veined, 10 mm long, 1 mm wide. *Labellum* obovate, apex quadrilobulate, margins minutely erose above basal third, 10.5 mm long medially (11.5 mm long to tips of lobes), 10.3 mm wide; basal callus erect, rounded, quadrilobulate; medial callus acuiiform, fleshy, sulcate in basal half, apex acute, 7 mm long. *Column* arcuate, basal half thickened, *c.* 3.5 mm long (incl. anther cap).

**Distribution:** Peru.

**Habitat:** Primary forest on the edge of a quebrada (stream), 1800 m.

**Etymology:** Named after the Yanachaga-Chemillen National Park.

This taxon is the seventh member of section *Ramosae* to be found in Peru, five of which are endemic taxa. It is closest to *L. rusbyi* Rolfe, sharing with that species a similar flower size, overall labellum shape, and in part form of the basal callus. It however differs from *L. rusbyi* in having a quadrilobulate (vs. bilobulate) apex to the labellum, a quadrilobulate (vs. bilobulate) basal callus, and thickened, acuiiform, sulcate medial callus. In all other *Liparis* species of section *Ramosae* this median callus is usually represented by a low, glossy linear strip that is often not evident in herbarium material.

an issue that will take detailed investigations to resolve.

Two other nomenclatural issues in Margonska et al. (2012) also concern neglected priority. Thus *M. luceroana* G. Gonzalez 1992 has priority over *M. abieticola* Salazar & Soto Arenas 2001, and *M. novogaliciana* R. Gonzalez & McVaugh 1985 has priority over *M. brachystachys* (Rchb.f.) Kuntze 1891 *nom. illeg.* [non (Lindl.) Rchb.f. 1861].

**Malaxis** section *Chrysanthera* (Link, Klotzsch & Otto) Ormerod, *comb. nov.*

Basionym: *Microstylis* section *Chrysanthera* Link, Klotzsch & Otto, Icon. Pl. Rar. 1: 11, 1841.

Type species: *Microstylis histionantha* Link, Klotzsch & Otto.

Homotypic synonyms: *Microstylis* section *Umbellulatae* Ridl., J. Linn. Soc., Bot. 24: 315, 1888.

*Malaxis* section *Umbellulatae* (Ridl.) F. Barros, Bol. Bot. Sao Paulo 15: 33, 1996.



## MAXILLARIA RUIZ &amp; PAVON

A genus said to have about 600 species in the classical sense. It has been divided into several genera based on molecular data, but recently Chase et al. (2015) found after the sampling of more species and using more coding regions that a broad *Maxillaria* was a more natural concept. One of the genera reintegrated into *Maxillaria* was *Brasiliorchis* Singer et al. It was proposed by Singer et al. (2007) to accommodate a group of 13 Brazilian, Paraguayan, and Argentinean species previously known as *Maxillaria* section *Bolbidium* (Lindl.) E.A. Christenson (Syn.: section *Repentes* Pfitz.). For the most part the plants can be recognised by their sulcate to ridged, bifoliate pseudobulbs, and long-lasting, campanulate, rewardless flowers. Though it should be noted that the pseudobulbs of *M. barbozae* Loeffgren are smooth and not ridged, and dry with a roughish surface. The overlooked generic name *Bolbidium* (Lindl.) Lindl. however is the earliest one for this group, and thus Singer et al. (2011) proposed that *Brasiliorchis* be conserved over *Bolbidium*. The proposal is likely to be successful (K. Gandhi pers. comm.) but it is only of relevance if one accepts these plants at the generic level, it would also mean that the sectional name *Repentes* would have to be reinstated for use in *Maxillaria*. The earliest name belonging to the current concept of *Brasiliorchis* is *Bletia humilis*, described in 1829.

According to Chiron and Bolsanello (2014) *Bletia humilis* is a synonym of *Brasiliorchis gracilis* (Lodd.) Singer et al. (*Maxillaria gracilis* Lodd. 1832), this is however a position I am not prepared to adopt just yet due to the difficulty in circumscribing species concepts in *Brasiliorchis*.

***Maxillaria humilis*** (Link & Otto) Ormerod, *comb. nov.*

Basionym: *Bletia humilis* Link & Otto, Icon. Pl. Rar. (Link & Otto): 53, t.27, 1829. TYPE: MEXICO. Without locality data, *F. Deppe s.n.* [likely BRAZIL: ex *H.K. Beyrich s.n.*] (Holotype: B, destroyed).

**Distribution:** Brazil.

The type of this species was likely one of H.K. Beyrich's live Brazilian plants that were cultivated in the Botanical Garden of Berlin, since species of section *Repentes* do not occur in Mexico, and Deppe did not collect in Brazil. According to the protologue *Bletia humilis* has leaves 10–15 cm long, 1.2–1.6 cm wide, the inflorescence 5.0–7.5 cm long, flowers with yellow sepals, a yellow lip with purple stripes on the sidelobes, three purple spots near the apex of each sidelobe, and a purple column. The sepals are 2.5 cm long, 0.8 cm wide, petals 0.6 cm wide, the lip 1.8 cm long, the midlobe 0.8 cm long and wide, and the column 1.2 cm long.

## MICROCHILUS PRESL

A genus of about 142 species found from Mexico to Argentina. Ackerman's (2014) treatment of *Microchilus* for the Greater Antilles includes a circumscription of *M. plantagineus* (L.) D. Dietr. that I strongly dispute. All three heterotypic taxa listed in synonymy by Ackerman belong to distinct species. As noted under above under *Aspidogyne*, the name *Satyrium latifolium* L. is a synonym of *Aspidogyne querceticola* (Lindl.) Meneguzzo. The other two entities, *Microchilus laticalcar* and *M. pimentelii*

Ormerod are not hard to recognise, indeed they can be detected in the dry state by simply looking for their distinctively broader epichiles which can be seen with the naked eye or a low-powered hand lens. Since *M. pimentelii* is already furnished with a published drawing (Ormerod, 2007) that shows its distinctive characters, I provide only a sketch and some notes on *M. laticalcar* to elucidate its features. Also described is a new taxon from Peru.

KEY TO ANTILLEAN *MICROCHILUS*.

- 1a. Sepals less than 4 mm long ..... 2  
 1b. Sepals more than 5 mm long ..... 3  
 2a. Leaves ovate; inflorescence densely flowered; lip lobules obliquely obovate; spur less than 1.5 mm long ..... 4  
 2b. Leaves lanceolate; inflorescence laxly flowered; lip lobules ligulate; spur 1.9–2.1 mm long ..... *M. familiaris*  
 3a. Lip epichile transversely oblong-ligulate, 2.6–4.0 mm wide ..... 5  
 3b. Lip epichile broadly triangular, less than 2.4 mm wide ..... *M. plantagineus*  
 4a. Lip hypochile semitubular, not bicarinate ..... *M. hirtellus*  
 4b. Lip hypochile thickly bicarinate ..... *M. glacensis*  
 5a. Lip hypochile semitubular, not bicarinate; epichile 4 mm wide ..... *M. pimentelii*  
 5b. Lip hypochile thickly bicarinate; epichile 2.6 mm wide ..... *M. laticalcar*

***Microchilus laticalcar*** (D. Dod) Ormerod, Lindleyana 17, 4: 217, 2003. TYPE: DOMINICAN REPUBLIC. Cordillera Septentrional, Santiago, Loma Diego de Ocampo, 1150 m, 10 August 1981, fl. in cult. April 1984, *D. Dod 1353* (Holotype: JBSD; Isotypes: AMES [not found], MO, NY, SEL, US, none seen). Fig. 6.

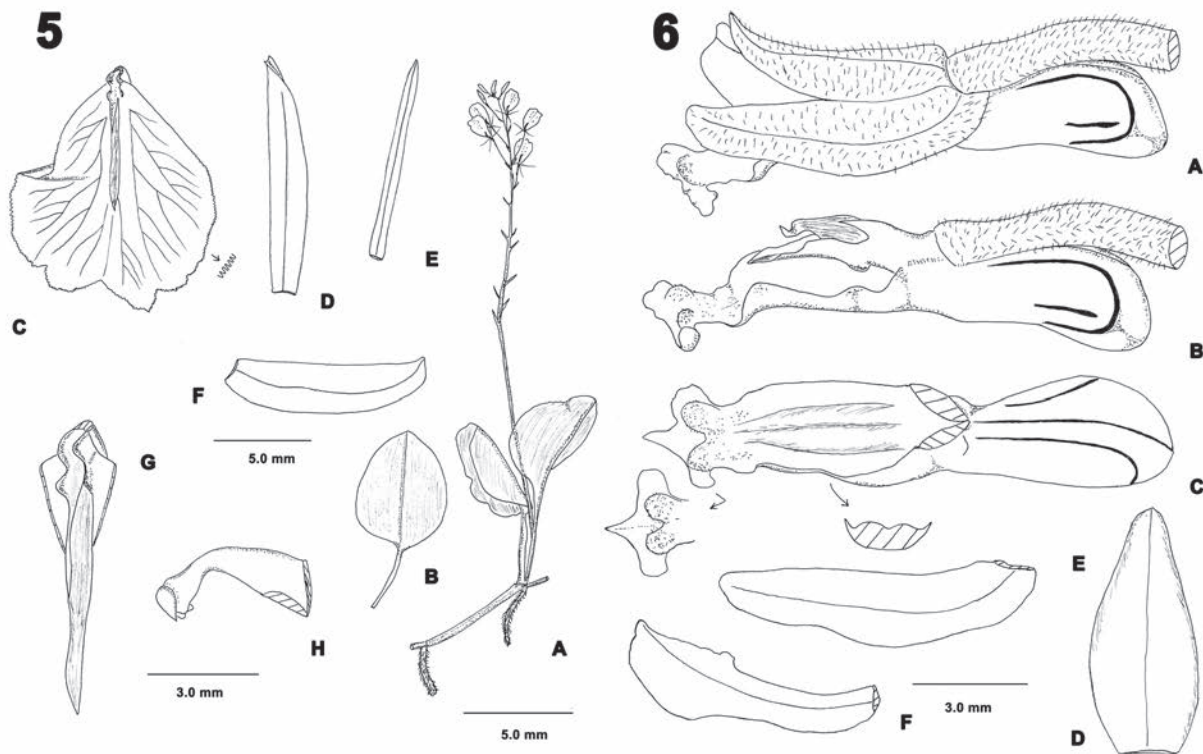
Basionym: *Erythrodes laticalcar* D. Dod, Moscosoa 5: 231, 1989.

Usage synonym: *Erythrodes paleacea* auct. non (Schltr.) Ames, Nir, Orch. Antill.: 146, f. 42c, 2000.

**Distribution:** Dominican Republic.

**Specimen examined:** DOMINICAN REPUBLIC. Liali, 100–500 m, 8–20 February 1923, *W.L. Abbott 2646* (AMES, US [photo AMES]).

The protologue of *Erythrodes laticalcar* supplies an unhelpful figure of the flower in profile, and in frontal view,



FIGURES 5–6. 5, *Liparis yanachgae* Ormerod. A, plant; B, leaf; C, labellum; D, dorsal sepal; E, petal; F, lateral sepal; G, labellum callus; H, column. Drawn from holotype. 6. *Microchilus laticar* (D. Dod) Ormerod. A, flower; B, flower minus tepals; C, labellum and spur; D, dorsal sepal; E, lateral sepal; F, petal. Drawn from *Abbott 2646* (AMES).

without showing details of the labellum. Furthermore the specific epithet “*laticar*” may lead to the impression that the broad spur is a diagnostic character when it is not, however Dod’s description is careful and accurate. Thus I think the unhelpful figure and misleading epithet in the protologue has led to some confusion about *M. laticar* and its relationship to *M. plantagineus*.

*Microchilus laticar* is readily distinguished from *M. plantagineus* by its transverse, 2.6 mm wide lip epichile, and thickly bicarinate lip hypochile. From *M. pimentelii* it is again distinguished by the thickly bicarinate lip hypochile, and less wider (2.6 vs. 4.0 mm) epichile.

***Microchilus tunquianus*** Ormerod, *sp. nov.* TYPE: PERU. Cuzco. La Convencion: Distrito Santa Ana, Tunqui Mayo, 1870 m, 2 November 2007, R. Vasquez, C. Davidson, E. Suelli, J. Farfan & A. Pena 33141 (Holotype: SEL; Isotype: MO, not seen). Fig. 7.

Affinis *M. atalayae* Ormerod *sed petalis floribus oblongis* (vs. *ligulato-spatulatis*), *hypochilo labello oblongo-subpanduratis* (vs. *ovato-lanceolatis*) *et calcar brevioribus* (2.7 vs. 4 mm) *differt*.

Terrestrial(?) herb to 1.2 m tall (fide collectors). *Rhizome* not seen. *Roots* terete, pubescent. *Stem* terete, rooting from lower nodes, laxly 7 leaved, 35 cm long, 0.4–1.0 cm thick; internodes 2.7–4.2 cm long. *Leaves* obliquely oblong to oblong-elliptic, subacuminate, 13.0–22.3 cm long,

4.40–6.25 cm wide; petiole and sheath 3.5–5.5 cm long. *Inflorescence* terminal, pubescent, 44.8 cm long; peduncle laxly to sublaxly 10 sheathed, 28.7 cm long; sheathing bracts 1.5–3.5 cm long; rachis subdensely many-flowered, 36.1 cm long; floral bracts ovate-lanceolate, acute, to 9 mm long, 2 mm wide. *Flowers* white, externally pubescent. *Pedicellate ovary* fusiform, pubescent, 7 mm long; capsules reddish. *Dorsal sepal* oblong-lanceolate, obtuse, 4.6 mm long, 2.1 mm wide. *Lateral sepals* obliquely oblong, obtuse, 5.2–5.5 mm long, 1.70–1.75 mm wide. *Petals* oblong, subacute, 2 veined, midvein branched, 4.8–4.9 mm long, 1.6–1.7 mm wide. *Labellum* spurred, joined to column for 1 mm; spur narrowly oblongoid, obtuse, 2.7 mm long; hypochile oblong-subpandurate, 3.7 mm long, 2 mm wide basally, 1.4 mm wide subapically; epichile transversely oblong, papillose-pubescent, 1 mm long, 2.7 mm wide, lobules ovate, obtuse, 0.9 mm long, 0.8 mm wide. *Column* slender, 2.9 mm long (to tips of pollinarium).

**Distribution:** Peru.

**Habitat:** Secondary forest, on the edge of a stream, 1870 m.

**Etymology:** Named after Tunqui Mayo, the type locality.

This species resembles its Peruvian congener *M. atalayae* Ormerod in being a large stout plant with numerous, relatively small flowers. However *M. tunquianus* differs in having oblong, biveined (vs. ligulate-spatulate, one veined) petals, an oblong-subpandurate (vs. ovate-lanceolate) labellum hypochile and shorter (2.7 vs. 4 mm) spur.

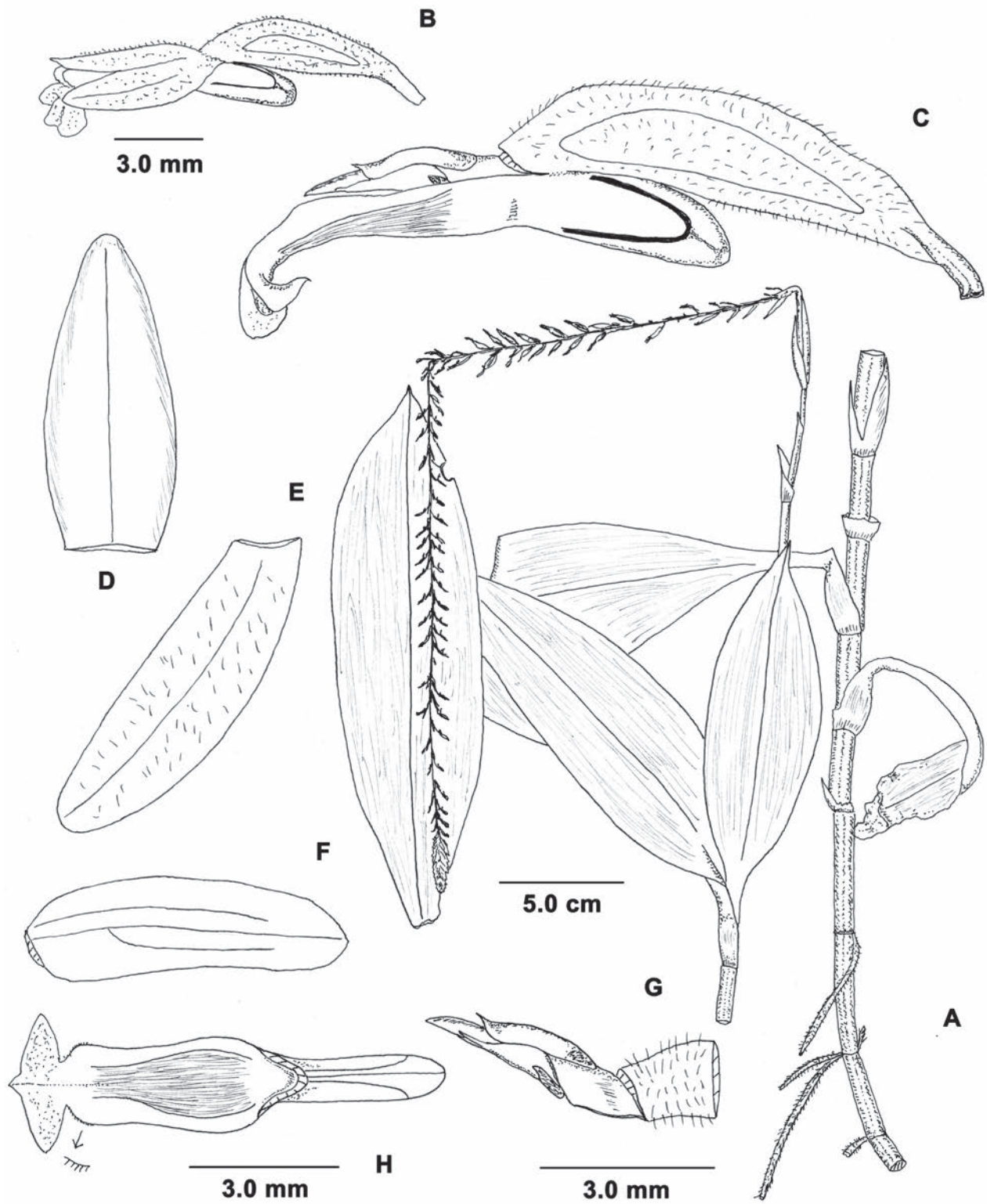


FIGURE 7. *Microchilus tunquianus* Ormerod. A, plant; B, flower; C, flower minus tepals; D, dorsal sepal; E, lateral sepal; F, petal; G, column; H, labellum and spur. Drawn from holotype.



*ODONTORRHYNCHUS* CORREA

A genus of *Spiranthinae* with perhaps three or four species. The plants occur in temperate climates of South America from Chile to Peru. After study of several Chilean specimens I have reached the conclusion that there is so far only one species found in that country rather than four different taxa. Further studies may also find that the Peruvian *O. alticola* Garay is a synonym of the Bolivian *O. chlorops* (Rchb.f.) Garay, thus leaving only three species in the genus.

*Odontorrhynchus chilensis* (A. Rich.) Garay, Bot. Mus. Leaff. Harv. Uni. 28, 4: 341, 1982. TYPE: CHILE. Chiloe: Cucao, C. Gay 118 (Holotype: P, image seen).

Basionym: *Spiranthes chilensis* A. Rich., in Gay, Fl. Chil. 5, 4: 475, 1852.

Homotypic synonym: *Gyrostachys chilensis* (A. Rich.) Kuntze, Rev. Gen. Pl. 2: 664, 1891.

Heterotypic synonyms: *Odontorrhynchus variabilis* Garay, Bot. Mus. Leaff. Harv. Uni. 28, 4: 287, 1982 *syn. nov.*

TYPE: CHILE. Chiloe: Cucao, 50 m, March 1924, E. Werdermann 303 (Holotype: AMES; Isotypes: BM, HBG, not seen).

*Odontorrhynchus domeykoanus* Szlach., Fragm. Fl. Geobot. 41, 2: 853, 1996 *syn. nov.*

TYPE: CHILE. Valparaiso: between Camino de la Polvora and Playa Andía, 28 April 1904, Scheduling *s.n.* (Holotype: HBG, image seen).

*Odontorrhynchus erosus* Szlach., Fragm. Fl. Geobot. 41, 2: 854, 1996 *syn. nov.*

TYPE: CHILE. Cordillera de San Fernando, *ex Herb. Santiago* 287 (Holotype: HBG, image seen).

**Distribution:** Chile.

**Specimens examined:** CHILE. Arauco: above Arauco, 50–100 m, 6 March 1925, F.W. Pennell 12955 (AMES). Chiloe: Dept. Llanquihue, side road between Hotel Ensenada and Volcan Osorno, 100 m, 20 March 1939, J.L. Morrison 17545 (AMES); Petrohue, slope of Volcan Osorno, 200–250 m, 13–15 February 1925, F.W. Pennell 12641 (AMES). Malleco: W of Angol, 300–400 m, 27–28 February 1925, F.W. Pennell 12834 (AMES). Ovalle: Parque Nacional de Fray Jorge, between el Cardoncito and Labranza, 550 m, 10 March 1947, C. Munoz P. 4032 (AMES). Santa Cruz:

Pichilem Cahuel, 10 m, 23 January 1929, G. Montero O. 773 (AMES). Valdivia: Cautin, Termuco, Cerro Nielol, 200 m, 20 March 1937, G. Montero O. 3094 (AMES); Termuco, La Barra ledo Sur, 3 m, 14 February 1937, G. Montero O. 3022 (AMES); Corral, Cordillera Pelada, 200 m, 21 March 1930, S. Looser 1284 (AMES); Quitaluto, 21 March 1937, H. Gunchen 15264 (AMES). Flowers from the following nine Chilean collections were also seen: Bridges 607, Eschscholtz *s.n.*, Hort. Kew *s.n.*, Lechler *s.n.*, 827, 1467, 1467A, Leibold 3011, McCrae *s.n.*

After examining several collections of this species it is evident to me that it is a fairly variable plant. There is a little variability in the habit, some plants are more slender with laxer inflorescences (e.g., Pennell 12834 and Montero 773), but these are connected to the stouter plants with dense spikes by intermediates. In one plant (Montero 773) the labellum epichile varied from broadly ovate, obtuse to transversely oblong. This variation in epichile shape may be linked to developmental (young flower vs. older flower) stage. I have also observed it in material of the Bolivian *O. chlorops*. Thus Garay's figure (1982) from the type of *Spiranthes chilensis* would represent a flower in which the labellum epichile hasn't fully developed, and this likely influenced him to propose *O. variabilis* which has a larger epichile. Another variable factor is flower size, I found the sepals and petals were from 5.5 to 8 mm long, without any disjunction.

The type form of *Odontorrhynchus chilensis* is supposed to be the smaller flowered plants, with which *O. domeykoanus* agrees very well. The protologue of the latter does not mention pubescent ridges on the lip, but pubescence frequently appears invisible under light microscopes when directly viewed from above. Another character used to discriminate species within *O. chilensis* is hypochile shape. This I find often varies depending on how much one can flatten the hypochile to make a drawing. Thus in *O. domeykoanus* the lip has flattened down quite well, but in the larger flowered samples (like *O. erosus*) this is a little more difficult. The latter cannot be distinguished from *O. chilensis* based on a "strongly arcuate and undulate hypochile" because all specimens have a somewhat arcuate lip in the natural position, which can become undulate only when one tries to flatten it.

*PLEUROTHALLIS* SW.

In the traditional sense this is a genus of about 2000 species, but it now has been divided into several segregate genera (see e.g., Luer 2004). The single species discussed here had been described in the unrelated genus *Gomesa* R. Br. in 1826, and then later transferred to *Rodriguezia* Ruiz & Pavon. Neither of these genera occur in the Greater Antilles, and since no later author recognised the identity of the plant, it was listed among the excluded species of the Antillean flora by Ackerman (2014).

*Pleurothallis quadrifida* (Lex.) Lindl., Bot. Reg. 21: sub t. 1797, 1836. TYPE: MEXICO. Michoacan: Vallisoletto (= Morelia), towards Jesus del Monte, P. La Llave & J. Lexarza *s.n.* (Holotype: lost).

Basionym: *Dendrobium quadrifidum* Lex., Nov. Veg. Descr., Orch. Opusc. 2: 40, 1825.

Homotypic synonyms: *Humboldtia quadrifida* (Lex.) Kuntze, Rev. Gen. Pl. 2: 668, 1891.

*Stelis quadrifida* (Lex.) Solano & Soto Arenas, Icon. Orch. 5–6: 11, 2002.

*Specklinia quadrifida* (Lex.) Luer, Monogr. Syst. Bot. Miss. Bot. Gard. 95: 263, 2004.

*Loddigesia quadrifida* (Lex.) Luer, Monogr. Syst. Bot. Miss. Bot. Gard. 105: 251, 2006.

*Lalexia quadrifida* (Lex.) Luer, Harvard Pap. Bot. 16, 2: 358, 2011.



Heterotypic synonyms: *Gomesa stricta* Spreng., Syst. Veg. ed. 16, 3: 710, 1826 *syn. nov.*

TYPE: JAMAICA. Without locality, 1821, *C. Bertero s.n.* (Holotype: B, destroyed).

*Rodriguezia stricta* (Spreng.) Steud., Nom. Bot. ed. 2, 2: 463, 1841.

**Distribution:** Caribbean; Mesoamerica; Colombia; Venezuela.

This pantropical genus of epiphytes was recently monographed by Mytnik-Ejmsont (2011). In the broad sense *Polystachya* contains about 235 species, most of which are in Africa, with about 13 in the neotropics. The notes below concern typification and synonymy of the two earliest known neotropical species of *Polystachya*, viz. *P. concreta* and *P. foliosa*.

***Polystachya concreta*** (Jacq.) Garay & H.R. Sweet, Orquideologia 9: 206, 1974. TYPE: MARTINIQUE. Without locality, *N.L. Jacquin s.n.* (Holotype: lost). Neotype (Mytnik-Ejmsont & Baranow 2010: 60): Martinique. Without locality, 2 August 1936, *Privault 136* [Neotype: P, image seen, as "*Polystachya flavescens* (Blume) J.J. Sm."]. Basionym: *Epidendrum concretum* Jacq., Enum. Syst. Pl.: 30, 1760.

Heterotypic synonyms: *Polystachya extintoria* Rehb.f., Ann. Bot. Syst. 6: 638, 1863.

TYPE: JAMAICA. Without locality or collector (Holotype: not found). Neotype (here designated): JAMAICA, Fairfield, *H.R. Wulfschlaegel 1055* (W, image seen).

*Dendroorkis extintoria* (Rehb.f.) Kuntze, Rev. Gen. Pl. 2: 658, 1891.

**Distribution:** Pantropical.

Reichenbach f. cited no collector in the protologue of *P. extintoria*, only cryptically mentioning that the type was a Jamaican specimen that had been misdetermined as *Cranichis luteola* Sw. No material has been located with this

The combination *Pleurothallis quadrifida* is often attributed to Lindley (1842), but he made it six years earlier in 1836. Cogniaux (1909) listed a Jamaican collection of Bertero as *P. longissima* Lindl. (a later synonym of *P. quadrifida*). This I believe was likely the unannotated type of *Gomesa stricta*, since the sparse description of the latter fits *P. quadrifida* very well.

#### POLYSTACHYA W.J. HOOK.

annotation. I have therefore chosen as neotype a Jamaican collection made by H.R. Wulfschlaegel in 1847–1849, that predates the protologue and also has present the character (an *extintoriform mentum*) that gives the species its name.

***Polystachya foliosa*** (W.J. Hook.) Rehb.f., Ann. Bot. Syst. 6: 640, 1863. TYPE: GUYANA. Without locality, *C.S. Parker s.n.* (Holotype: lost). Lectotype (Saulea & Adams 1979: 274): t. 17, in Ann. Mag. Nat. Hist. 2, 1839.

Basionym: *Stelis foliosa* W.J. Hook., Ann. Mag. Nat. Hist. 2: 330, 1839.

Homotypic synonym: *Dendroorkis foliosa* (W.J. Hook.) Kuntze, Rev. Gen. Pl. 2: 659, 1891.

Heterotypic synonym: *Epidendrum minimum* Aubl., Hist. Pl. Guiane 2: 825, 1775 *syn. nov.*

TYPE: t. 148, f.3 of *Viscum delphinii flore minimum* Sloane, Voy. Isl. Madeira, Barb., Nieves, St. Christoph. & Jamaica: 251, 1707. Epitype (here designated): Jamaica. Road to Guanaboa and Red Hills, *H. Sloane s.n.* (BM 000589993 = Herb. Sloane Vol. 7: 86, Sloane ID 522, image seen).

**Distribution:** Caribbean; Mesoamerica; South America (to Paraguay).

*Epidendrum minimum* is the earliest name for this species but the epithet is unavailable in the genus, having been used in 1895 for the African *Polystachya minima* Rendle. I have designated as epitype the specimen Sloane used to illustrate his *Viscum delphinii flore minimum*.

#### LITERATURE CITED

- ACKERMAN J. AND COLLABORATORS. 2014. Orchid Flora of the Greater Antilles. Mem. New York Bot. Gard. 109: 1–625.
- AMES, O., F. T. HUBBARD AND C. SCHWEINFURTH. 1936. The Genus *Epidendrum* in the United States and Middle America. Botanical Museum, Cambridge, Massachusetts.
- CHASE, M. W., M. C. CAMERON, J. V. FREUDENSTEIN, A. M. PRIDGEON, G. SALAZAR, C. VAN DEN BERG, AND A. SCHUITEMAN. 2015. An updated classification of Orchidaceae. *Bot. J. Linn. Soc.* 177: 151–174.
- CHASE, M. W. AND W. M. WHITTEN. 2011. Further taxonomic transfers in Oncidiinae (Orchidaceae). *Phytotaxa* 20: 26–32.
- CHIRON, G. AND R. X. BOLSANELLO. 2014. Orquideas du Bresil. As Orquideas da Serra do Castelo (Espírito Santo–Brasil) 4. Tropicalia, Voreppe, France.
- CHRISTENSON, E. A. 2008. A Synopsis of *Pachyphyllum* (Orchidaceae). *J. Bot. Res. Inst. Texas* 2, 1: 285–289.
- COGNIAUX, A. 1909. Orchidaceae. Symbolae Antillanae 6: 293–432.
- DUNSTERVILLE, G. C. K. AND L. A. GARAY. 1965. Venezuelan Orchids Illustrated 3. Andre Deutsch, London.
- . 1972. Venezuelan Orchids Illustrated 5. Andre Deutsch, London.
- FOLDATS, E. 1968. Contribuciones a la orquidoflora de Venezuela IV. *Acta Bot. Venez.* 3, 1–4: 305–426.
- GARAY, L. A. 1982. A Generic Revision of the Spiranthinae. *Bot. Mus. Leaflet. Harv. Uni.* 28, 4: 277–425.
- KOLANOWSKA, M. AND D. L. SZLACHETKO. 2013. *Fernandezia ortiziana* (Orchidaceae), a New Species from Colombia. *Ann. Bot. Fenn.* 50, 1–2: 68–70.
- . 2014. Notes on Pachyphyllinae (Vandoideae, Orchidaceae) with a description of a new genus. *l. Syst. Evol.* 301: 95–111.
- KRAENZLIN, F. 1923. Orchidaceae-Monandrae-Pseudomonopodiales in A. ENGLER, Pflanzenreich IV. 50, Heft 83: 1–66.
- LINDLEY, J. 1842. *Pleurothallis quadrifida* (Lex.) Lindl. *Edwards's Bot. Reg.* 27: 70.
- Luer, C. 2004. New Genera and combinations in the Pleurothallidinae. *Monogr. Syst. Bot. Missouri Bot. Gard.* 95: 253–265.

- MARGONSKA, H. B., A. K. KOWALKOWSKA, M. GORNIK, AND P. RUTKOWSKI. 2012. Taxonomic Redefinition of the Subtribe Malaxidinae (Orchidales, Malaxideae). Koeltz Scientific Books, Koenigstein.
- 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. 2012. International Code of Nomenclature for algae, fungi, and plants (Melbourne Code). *Regn. Veg.* 154: 1–208.
- MYTNIK-EJSMONT, J. AND P. BARANOW. 2010. Taxonomic Studies of *Polystachya* Hook. (Orchidaceae) from Asia. *Pl. Syst. Evol.* 290: 57–63.
- NEUBIG, K. M., W. M. WHITTEN, N. H. WILLIAMS, M. A. BLANCO, L. ENDARA, J. G. BURLEIGH, K. SILVERA, J. C. CUSHMAN, AND M. W. CHASE. 2012. Generic recircumscriptions of Oncidiinae (Orchidaceae: Cymbidieae) based on maximum likelihood analysis of combined DNA datasets. *Bot. J. Linn. Soc.* 168: 117–146.
- ORMEROD, P. 2007. Studies of Neotropical Goodyerinae (Orchidaceae) 2. *Harvard Pap. Bot.* 11, 2: 145–178.
- . 2013a. Notes on Neotropical Liparoids (Orchidaceae, Malaxidae). *Harvard Pap. Bot.* 18, 1: 39–49.
- . 2013b. Studies of Neotropical Goodyerinae (Orchidaceae) 5. *Harvard Pap. Bot.* 18, 1: 51–60.
- PUPULIN, F. 2012. The Orchidaceae of Ruiz & Pavon's "Flora Peruviana et Chilensis." A taxonomic study I. *Anales Jard. Bot. Madr.* 69, 1: 21–79.
- RUIZ, H. AND J. PAVON. 1794. Flora Peruviana et Chilensis Prodromus. Imprenta de Sancha, Madrid.
- SAULEDA, R. P. AND R. M. ADAMS 1979. The Taxonomic Status of *Polystachya foliosa* (Orchidaceae) in the Bahama Islands. *Brittonia* 31, 2: 294–297.
- SINGER, R., S. KOEHLER AND G. CARNEVALI. 2007. *Brasiliorchis*: A New Genus for the *Maxillaria picta* Alliance (Orchidaceae, Maxillariinae). *Novon* 17: 91–99.
- SINGER, R., M. BLANCO, G. CARNEVALI, AND S. KOEHLER. 2011. (2036) Proposal to conserve the name *Brasiliorchis* against *Bolbidium* (Orchidaceae). *Taxon* 60, 6: 1774–1775.
- SMIDT, E. C., E. L. BORBA, B. GRAVENDEEL, G. A. FISCHER AND C. VAN DEN BERG. 2011. Molecular phylogeny of the Neotropical sections of *Bulbophyllum* (Orchidaceae) using nuclear and plastid spacers. *Taxon* 60, 4: 1050–1064.
- VASQUEZ, R. AND C. H. DODSON. 1982. *Liparis retusa* Fawc. & Rendle. *Icon. Pl. Trop.* 1, 6: t. 540.
- VELLOZO, J. M. C. 1831. Florae Fluminensis 9: t. 1–65. Typographia Nationali, Flumine Januario [Rio de Janeiro].
- . 1881. Florae Fluminensis: Gynandria Diandra. *Arch. Mus. Nac. Rio Jan.* 5: 356–371.

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# *LEPANTHOPSIS KAYI* (PLEUROTHALLIDINAE, ORCHIDACEAE), A NEW SPECIES FROM EASTERN ECUADOR

LISA THOERLE<sup>1,2</sup> AND XAVIER CORNEJO<sup>3</sup>

**Abstract.** *Lepanthopsis kayi*, a new species from the Amazonas region in Ecuador, is described, illustrated, compared with similar species, and its generic placement discussed. *Lepanthopsis kayi* is distinguished from all other species in the genus by the combination of ramicauls shorter than the leaf, with glabrous sheaths with the ribs and ostia thickened, and a very congested inflorescence bearing many overlapping, simultaneous flowers arranged in two opposite-facing ranks, the flowers with a proportionally very large, densely pubescent lip, ca. 50 percent longer than the lateral sepals.

**Keywords:** Amazonas, Ecuador, *Lepanthopsis*, Orchidaceae, *Platystele*, Pleurothallidinae

The genus *Lepanthopsis* (Cogn.) Ames contains ca. 44 species (Karremans, 2016), ranging in distribution from southern Mexico and southern Florida (U.S.A.) to the north, through Central America and the Greater Antilles, and to Brazil and Bolivia in the south. The species are nearly evenly split between the American continents and the Greater Antilles, where many are Hispaniola endemics. In this paper, we describe a new species of *Lepanthopsis*, known from the province of Pastaza in the Amazonas natural region of Ecuador. Andreas Kay, noted nature photographer, guided the second author to these plants at Finca Ursula.

***Lepanthopsis kayi*** Thoerle & Cornejo, *sp. nov.* TYPE: ECUADOR. Pastaza: Finca Ursula, 18 km E of Puyo, on a ridge above the Bobonaza River, 650 m, 8 January 2016, X. Cornejo & H. A. Kay 8738 (Holotype: GUAY), L. Thoerle illustr. 305. Fig. 1–3.

*Lepanthopsis kayi* is distinguished from all other species in the genus by the combination of the plant with ramicauls shorter than the leaf, with glabrous sheaths with the ribs and ostia thickened, and a very congested inflorescence bearing many overlapping, simultaneous flowers arranged in two opposite-facing ranks, the flowers with a proportionally large, densely pubescent lip, ca. 50 percent longer than the lateral sepals.

*Plant* small, epiphytic, caespitose, roots slender. *Ramicauls* erect to horizontal, 5–7 mm long; enclosed by 2–3 sheaths with thickened ribs and ostia. *Leaf* erect to horizontal, coriaceous, 15–30 mm long including the petiole ca. 5 mm long, 6–8 mm wide, cuneate below into the petiole. *Inflorescence* a suberect to horizontal, very congested, simultaneously many-flowered raceme, with up to 40 or more flowers with the sepals overlapping, in two opposite-facing ranks, ca. 3.5–5 cm long including the capillary peduncle ca. 2.5–3.5 cm long, with a bract at about

the middle, emerging from a node below the apex of the ramicaul; *floral bracts* thin, acuminate, 1–1.25 mm long; *pedicels* 0.75 mm long, bending sharply after emerging from the floral bract; *ovary* ribbed, 0.3 mm long, bent sharply near the base. *Flowers* with sepals and petals translucent yellow-green, glabrous, sepals with external, irregular, red blotches; *sepals* externally carinate, broadly elliptical, obtuse, 1-veined, dorsal sepal 1.25 mm long, 1 mm wide, lateral sepals 1.2 mm long, 0.75 mm wide, connate 0.2 mm; *petals* narrowly elliptical, acute, 1 mm long, 0.2 mm wide; *lip* red with pale yellow margins, thick, densely pubescent, ovate-oblong with apex broadly rounded, basally concave between convex margins, apically convex, 1.75 mm long, 1 mm wide, the base subtruncate, fixed to the base of the column; *column* yellow-green, cucullate, stout, 0.3 mm long, 0.66 mm wide, stigma bilobed, lobes internally flushed with red, anther cap cream, pollinia not observed.

**Eponymy:** named for Andreas Kay, nature photographer, who discovered this species.

**Phenology:** observed in flower and in fruit January through June.

**Habitat and ecology:** *Lepanthopsis kayi* is found as an epiphyte in wet secondary forest, most commonly growing ca. 2 m high on tree trunks in the understory, and also in the upper canopy, favoring shady, windy areas. Plants were observed growing on liana stems of *Strychnos* L. (Loganiaceae), Menispermaceae, *Philodendron* Schott (Araceae), and unidentified dead trees. It is found alone or intermixed with other species of Pleurothallidinae, including *Platystele stenostachya* (Rchb. f.) Garay, *P. ornata* Garay, *Lepanthes ximena* Luer, *L. deleastes* Luer, *Dryadella gnoma* (Luer) Luer, and *Scaphosepalum rapax* Luer.

**Distribution:** known only from the type locality, where this species is locally frequent.

Some of the morphological characters of *Lepanthopsis*

We thank Ursula Gelchsheimer for encouraging the botanical exploration of her farm, and Andreas Kay, enthusiast and photographer of Ecuador's natural world, for guiding the explorations with the second author as well as allowing the use of his photographs; Adam Karremans of the Lankester Botanical Garden for sharing his recent research; the staff at the Harvard Botanical Libraries for providing essential references; and Bob Stewart for help with translation from the German.

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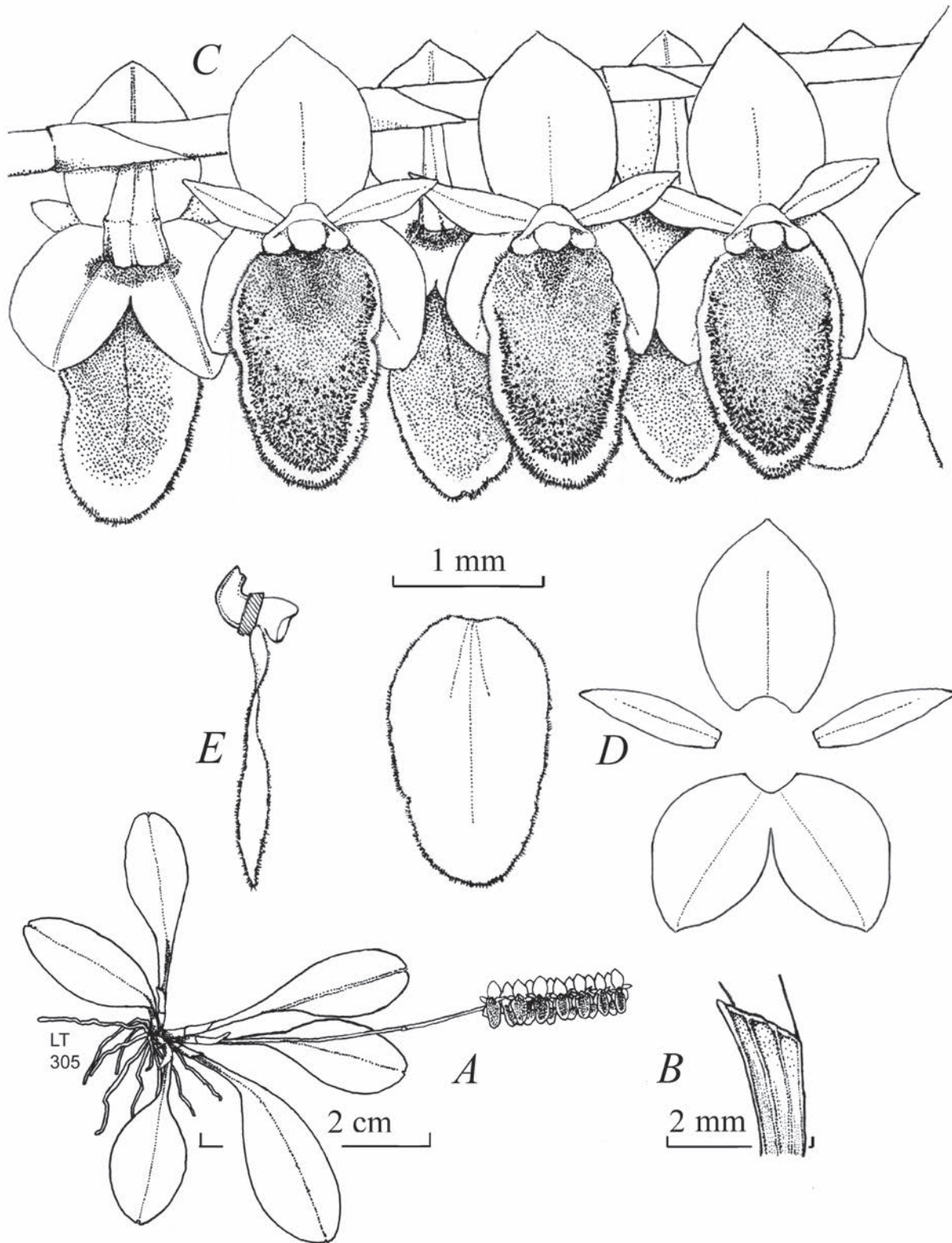


FIGURE 1. *Lepanthopsis kayi* Thoele & Cornejo. **A**, habit; **B**, detail of a basal sheath; **C**, partial inflorescence; **D**, dissected flower, lip expanded; **E**, ovary, lip, and column, lateral view. Drawing by L. Thoele, based on the Holotype.



FIGURE 2. *Lepanthopsis kayi* Thoele & Cornejo. Plant with inflorescence. Photographed *in situ* by Andreas Kay, from the type population.

*kayi* are intermediate between those associated with the genera *Lepanthopsis* and *Platystele* Schltr. Luer noted that the flowers of the two genera were “very similar to, if not indistinguishable from” one another, distinguishing *Lepanthopsis* by the plant with elongated ramicauls, usually longer than the leaves, with lepanthiform sheaths characterized by ciliate or scabrous ribs and ostia, with the ostia dilated (Luer, 1990, 1991). In spite of the floral similarities, a recent assessment of the phylogenetic relationships within the subtribe Pleurothallidinae places the two genera in different affinities: *Platystele* is part of the *Specklinia* Lindl. affinity; *Lepanthopsis*, the *Lepanthes* Sw. affinity (Karremans, 2016).

The ramicauls of *Lepanthopsis kayi* are much shorter than the leaves, 5–7 mm long vs. the 15–30 mm long leaf, and are clad with glabrous sheaths, but the sheaths of mature growths have the thickened veins and ostia associated with the genus *Lepanthopsis*. While the character of the inflorescence is not uniform in either genus, with some species of *Lepanthopsis*, such as *L. astrophora* (Rchb.f.

ex Kraenzl.) Garay, displaying the loose, flexuous raceme commonly associated with species of *Platystele*, while a few species of *Platystele* display the very congested inflorescence more often seen in the genus *Lepanthopsis*. The flowers of the former are arranged either in a dense cylinder, as in *Platystele densiflora* P. Ortiz, or in a raceme that is more or less umbellate, such as *P. dasyglossa* P. Ortiz. No species currently assigned to *Platystele* displays flowers in two opposite-facing ranks. The inflorescence of *L. kayi*, with overlapping flowers arranged in two ranks with most open simultaneously, is characteristic of *Lepanthopsis* sect. *Lepanthopsis*.

There are two similarly vegetatively anomalous species of *Lepanthopsis*. When Stenzel described *Platystele hyalina*, the glabrous sheaths of the ramicauls led to its generic placement, although he noted that the sheaths were ribbed and thickened, as in the genus *Lepanthopsis* (Stenzel, 2002). Recently, Karremans et al. (2016) transferred this species to *Lepanthopsis*, based largely on these sheaths. This species is readily differentiated from *L. kayi* by its lax inflorescence





FIGURE 3. *Lepanthopsis kayi* Thoele & Cornejo. Detail of inflorescence. Photographed *in situ* by Andreas Kay, from the type population.

(vs. very congested), bearing only 4–12 flowers (vs. up to 40 or more) with a shorter lip, ca. 75 percent of the length of the lateral sepals (vs. ca. 150 percent). Another species with short ramicauls clad in glabrous sheaths, *L. vellozicola* R. C. Mota, F. Barros & Stehmann, was described from a Brazilian collection (Mota et al., 2009). Although this

species shares flowers arrayed in 2 opposite-facing ranks, the inflorescence is lax (vs. very congested) and usually shorter, to 37 mm long, bearing 4–8 flowers (vs. 35–50 mm long, with up to 40 flowers) with a lip much smaller than the completely fused lateral sepals (vs. ca. 150 percent of the length of the shallowly connate lateral sepals).

#### LITERATURE CITED

- KARREMANS, A. 2016. *Genera Pleurothallidarum*: An updated phylogenetic overview of Pleurothallidinae. *Lankesteriana* 16(2): 219–241.
- KARREMANS, A., F. J. ALBERTAZZI, F. T. BAKKER, D. BOGARÍN, M. C. M. EURLINGS, A. PRIDGEON, F. PUPULIN, AND B. GRAVENDEEL. 2016. Phylogenetic reassessment of *Specklinia* and its allied genera in the Pleurothallidinae (Orchidaceae). *Phytotaxa* 272 (1): 1–36.
- LUER, C. A. 1990. *Icones Pleurothallidarum* VII: Systematics of the genus *Platystele* (Orchidaceae). *Monogr. Syst. Bot. Missouri Bot. Gard.* 38: 1–135.
- . 1991. *Icones Pleurothallidarum* VIII: Systematics of the genus *Lepanthopsis*. *Monogr. Syst. Missouri Bot. Gard.* 39: 1–78.
- MOTA, R. C., F. BARROS, AND J. R. STEHMANN. 2009. Two new species of Orchidaceae from Brazil: *Bulbophyllum carassense* and *Lepanthopsis vellozicola*. *Novon* 19(3): 380–387.
- STENZEL, H. 2002. New species of *Platystele* and *Pleurothallis* (Orchidaceae) from Cuba. *Willdenowia* 32: 99–104.

## SOBRALIA TURRIALBINA (ORCHIDACEAE: SOBRALIEAE): LONG CULTIVATED AND NOW DESCRIBED

ROBERT L. DRESSLER,<sup>1-3</sup> MARCO ACUÑA,<sup>4</sup> AND FRANCO PUPULIN<sup>1-3,5</sup>

**Abstract.** *Sobralia turrialbina* is described and illustrated from Costa Rica. The new species is compared with the morphologically similar *S. chrysostoma*, from which can be distinguished by the leaves restricted to the terminal third of the stem, the floral bracts twice longer, the flowers dusty pink or pale rose, and the lip with no keels, provided with a hazelnut-brown gorge and the apical margin finely striped with rose-purple. Notes on species distribution, habitat and ecology, and etymology are provided.

**Resumen.** Se describe y se ilustra *Sobralia turrialbina* de Costa Rica. Se compara la nueva especie con *S. chrysostoma*, morfológicamente similar, de la cual puede distinguirse por las hojas distribuidas solamente en el tercio apical del tallo, la bráctea floral el doble de largo, las flores de color rosa grisáceo o rosado pálido y el labelo sin quillas, con la garganta color café-avellana y el margen apical finamente estriado de rosado-purpúreo. Se provén notas sobre la distribución, hábitat, ecología y etimología de la especie.

**Keywords:** flora of Costa Rica, new species, *Sobralia*

Even though the orchids of the genus *Sobralia* Ruiz. & Pav. represent a common element in both pristine and disturbed landscapes in the tropical region of the Americas, they are still poorly understood as to their diversity and biology. With near 200 species, the genus is widely distributed in the Neotropics with the notable exception of the West Indies, but the ephemeral and gregarious flowering of most species, and the particular delicacy of the flower tissues, make *Sobralia* a difficult candidate for collection and study. In the last ten years, scientists at the Lankester Garden Botanical Garden, University of Costa Rica, focused in the diversity of *Sobralia*, building up a large *ex-situ* collection with literally hundreds of specimens from Costa Rica and abroad, to circumvent the inherent difficulties of studying *Sobralia* with the traditional technique of pressing and drying fertile field specimens (Dressler and Bogarín, 2007; Bogarín et al., 2008; Dressler and Pupulin, 2008; Dressler and Bogarín, 2010; Dressler and Pupulin, 2010; Dressler and Bogarín, 2011; Dressler et al., 2011; Dressler, 2012, 2013; Dressler and Pupulin, 2014; Dressler et al., 2014; Fernández et al., 2014; Dressler and Pupulin, 2015). Thanks to this effort, the flora of Costa Rica presents today a somewhat artificial peak in *Sobralia* diversity, with nearly 40 recorded species, a hundred times greater than Brazil and eight times greater than orchid-rich Ecuador in terms of diversity index. Still, new species of *Sobralia* frequently appear among cultivated plants, and we took this opportunity to describe one here.

There seem to be more plants of this puzzling species in gardens than in nature. The plants vary a good deal in both size and flower color, yet it is a very distinctive species and we feel that it must be recognized as such.

The species was first brought to our attention a couple of years ago by one of the authors (MA), who was trying to give a name to a *Sobralia* that he could not match with any documented species. When he sent us a photograph of the flower, we had to admit that it looked quite different from any other *Sobralia* that we already knew. The plant had been cultivated in a garden in the town of Turrialba, and even though the owner did not remember where it came from, he was kind enough to give a part of the plant to MA, who brought it to the Lankester Botanical Garden.

The plant flowered again at Lankester Garden in September 2015, and having then the opportunity to study a living flower, we could confirm that it was really distinct from the other species of *Sobralia* that we knew from Costa Rica. Instead of the shades of purple or bright pink, which are so common in Central American *Sobralia* species, the flowers of this particular specimen were of a somewhat dusty, dull rose, while at the same time having a depth reminiscent of nacre. On the same ground color, the lip presented a deep chestnut brown gorge, the color breaking down toward the apex into dense lines becoming fine rose-purple stripes on the ruffled edge of the midlobe. Surely, this was quite a novel and showy color combination. We carefully documented the plant and prepared vouchers, both dry and in alcohol, storing them under Dressler's number 7341. We were reluctant, however, to describe a new species from a plant coming from an unknown locality. In the following months, MA verified that plants of this species were indeed quite common in cultivation in the gardens of Turrialba, and he strongly suspected that the species was a native of that region. If this was the case, we hoped that,

We greatly thank Hugo Mata Díaz of Turrialba, and Alicia Arias Arias, of Venecia, who generously shared with us plants from their private gardens. All the wild plants studied and preserved for this study were obtained through scientific collection permits No. 36891 and subsequents, and the Scientific Passports No. 1281 and 1285, issued to the senior authors by the Costa Rican Ministry of Environment and Energy (MINAE) and the National System of Conservation Areas (SINAC), whose cooperation is deeply acknowledged.

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sooner or later, more information on its natural distribution would emerge.

By the end of the year, MA was informed that at least some of the plants cultivated in Turrialba (including the one growing at Lankester Garden) may have been collected in a property at Mata de Caña (“sugarcane plant”), not far from Turrialba, in a mountainous region formed by a series of deep valleys draining toward the Pacuare River, one of the largest rivers that flow the Talamanca range toward the Caribbean Sea. We contacted the caretaker of the *finca*, but it was quite clear that he was not willing to receive a group visit of botanists searching for a “*flor de un día*” (single-day-flower) plant, as Costa Ricans refer to *Sobralia*, on the property he supervised. Checking the coordinates of the *finca* on a satellite map, it was obvious however that a vast forested region could be explored in the nearby areas along the high basin of Río Pacuare. Searches there proved successful, and we now have at least one large plant that was collected in nature. As we feel that it is clearly a valid species, we can therefore describe the “new” *Sobralia* commonly grown in gardens at Turrialba as:

***Sobralia turrialbina*** Dressler, M. Acuña & Pupulin, *sp. nov.*  
 TYPE: COSTA RICA. Limón: Siquirres, Pacuarito, Alto Yolillal, 9°59'4.68"N, 83°32'47.59"W, 290m, path along the Pacuare river, wet tropical forest, epiphytic on the trunk of a fallen tree, originally at some 10 meters from the soil, 17 April 2016, flowered in cultivation at Lankester Botanical Garden, 13 May 2016, M. Acuña 8 (holotype, USJ; isotypes, JBL). Fig. 1–3.

*Species habito medio in magnitudine, Sobraliae chrysostomae Dressler similis in forma generali, sed caulibus foliatis in tertio terminalis tantum, bracteis floralis duplo majoribus, floribus rosaceo-pulverulentibus nacreis, rare pallets rosaceis, labello ecarinato fauce fusco-abellana in margine apicali fine rosato-purpureo striato recedit.*

A medium-sized species, morphologically similar to *Sobralia chrysostoma* Dressler, with the stems bearing leaves only in the apical third, the floral bracts twice longer, the flowers dusty pink or rarely pale rose, the lip with no keels, with a hazelnut-brown gorge and the apical margin finely striped with rose-purple.

Epiphytic, caespitose, large *herb*, to 150 cm tall. *Roots* coarse, flexuous, branched, finely tomentose, 6–9 mm in diameter, slightly flattened. *Stems* cylindric, round in section, 60–150 cm long, 0.6–0.7 cm in diameter, foliate in the upper third, covered by tightly imbricating, adpressed, green, sparsely subscarios sheaths, becoming dry-papyraceous with age, densely flecked with brown when old. *Leaves* plicate, broadly lanceolate-elliptic, acuminate, 15–20 × 6.5–9.0 cm. *Inflorescence* conical, successively several-flowered, to 12 cm long, the flowers usually produced singly, rarely in pairs, the bracts acuminate, 9–12.5 cm long, the lowest one shortly foliaceous. *Pedicellate ovary* 4.0–4.5 cm long including the pedicel. *Flowers* large, spreading, dusty pink or pale rose, paler toward the floral apices, the lip chestnut-brown within the gorge, pale pink or pinkish white along the margins, the apex with vivid pink-purple radiating stripes, the osmophores bright

yellow. *Sepals* similar, narrowly oblong-elliptic, obtuse to subacute, minutely apiculate, curved, 5.8–7.0 × 1.8–2.2 cm, distinctly conduplicate at the base, the *dorsal sepal* suberect to erect, the *lateral sepals* spreading almost horizontally. *Petals* narrowly obovate, broadly obtuse, 5.0–6.0 × 2.5–2.9 cm, the apex reflexed, with slightly undulate margin. *Lip* obscurely 3-lobed, obovate, 7 × 5 cm, the lateral lobes erect, encircling the column; the blade with 2 basal, divergent, bright yellow teeth, and 9 slightly prominent, dark brown veins from the base up to two-thirds of lip length, the lateral veins shorter; the midlobe deeply retuse, ruffled, spreading, reflexed. *Column* clavate, semiterete, 4.2–5.0 cm long, 0.8–1.0 cm wide distally, the apex provided with two acicular, upcurved wings about 0.8–1.2 cm long, free for 0.5–0.7 cm, anther and stigma ventral. *Anther cap* cucullate, elliptic, compressed, 2-celled, 7 × 5 mm. *Pollinia* 4, soft, mealy, in two symmetrical pairs of different size, not sharply distinct from the caudicles, each hemipollinarium 5 × 2 mm.

**Additional specimens examined:** COSTA RICA. Cartago: Turrialba, La Suiza, Jabillos, Mata de Caña, ca. 9°54'33"N, 83°35'46"W, approx. 900 m, cultivated at Lankester Botanical Garden, flowered and prepared 18 Sept. 2015, R.L. Dressler 7341 (JBL) (Fig. 4). Alajuela: San Carlos, Venecia, growing in the garden of the Catholic Church, ca. 10°22'00"N, 84°17'00"W, approx. 100 m, collected by M. Acuña and A. Arias Arias, cultivated at Lankester Botanical Garden, flowered and prepared 17 August 2015, R.L. Dressler 7342 (JBL) Fig. 5–6.

**Eponymy:** The specific epithet refers to the town of Turrialba in Costa Rica, where the species is frequently grown as a garden plant. Most of the specimens we know were also collected around Turrialba. Costa Rican orchidology has a long tradition of names dedicated to Turrialba, among which are species in the genera *Epidendrum* (Reichenbach 1871), *Goodyera* (Schlechter 1923), *Lepanthes* (Reichenbach 1855), *Maxillaria* (Schlechter 1918), *Notylia* (Schlechter 1923), *Oncidium* (Schlechter 1911), *Pleurothallis* (Luer 1991), and *Trichopilia* (Reichenbach 1863). The toponymic dedication has traditionally been spelled as “*turrialbae*” (also “*turialbae*” and “*turialvae*”), considering that the name of the volcano and the adjacent town are derived from the Latin *turris alba*, white tower, in reference to the white smoke coming out from the high volcano crater, or from the Aragonese patronym Torrealba (see. for example, Garita Hernández 1995). An alternative etymology of Turrialba has been proposed by other scholars (Gagini, 1917, Cleto González 1920), who consider the name derived from an indigenous root, as the word *Turru* or *Turu* is still found in several local toponyms, such as Turrúcares, Turrubares, and others. Gagini (1917) suggests that the name Turriarva is the huetar (a Chibchan language once spoken in Costa Rica and Panama) pronunciation of the word Toriáravac, or the “altar stone of the Toris.” This may perhaps explain why in old documents dating to the Spanish colonial occupation of Costa Rica, the name is cited as Turrialva or Turiarba (in the year 1569) or Zurriarba (in 1608), and in other documents of the seventeenth and eighteenth centuries it is recorded as Turi alba, Turriarva, and Torialba (Valerio 1953). When the toponym Turrialba is treated as a Latin compound, *turris-alba*,

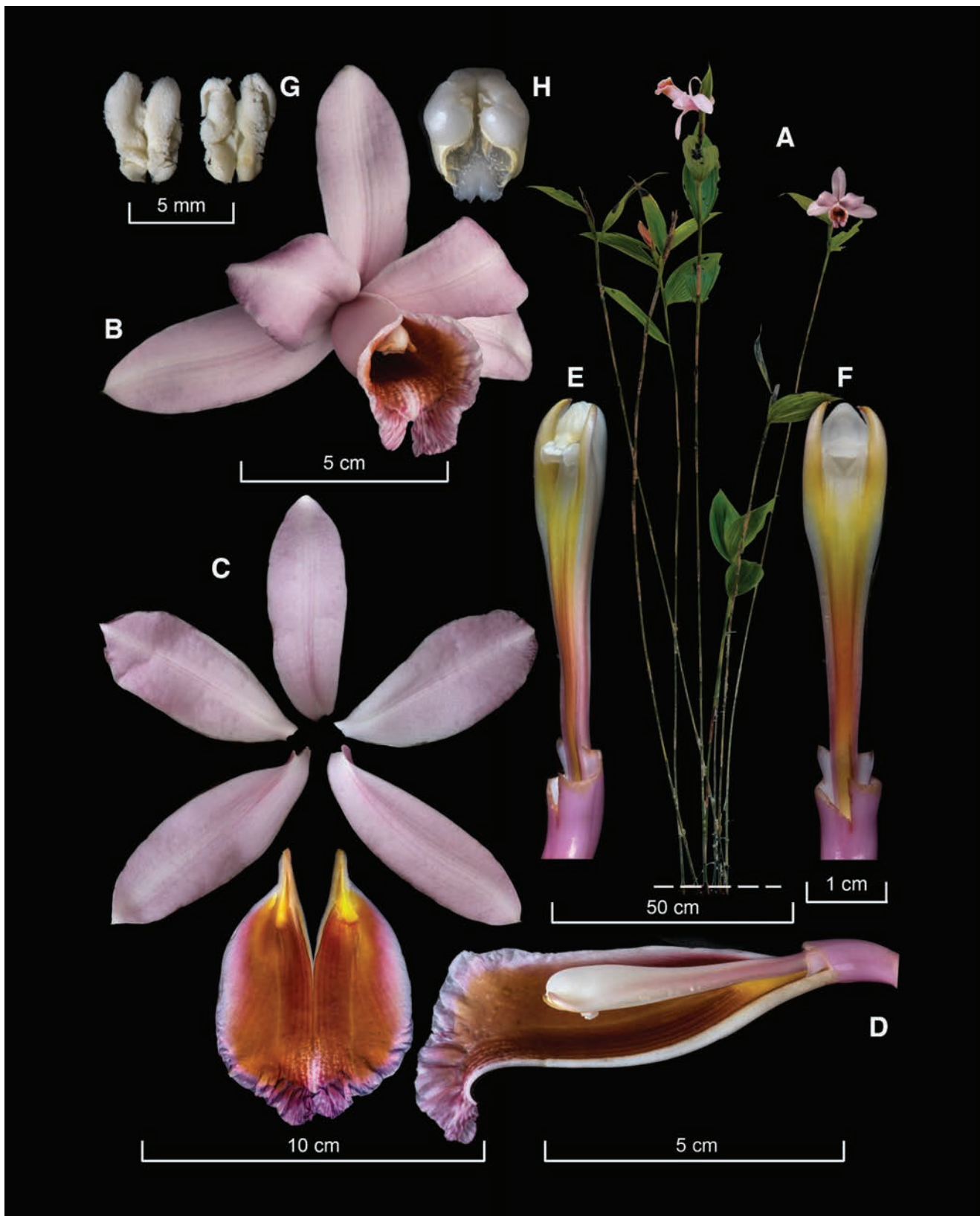


FIGURE 1. *Sobralia turrialbina* Dressler, M.Acuña & Pupulin. **A**, habit; **B**, flower; **C**, dissected perianth; **D**, column and lip, lateral view (the lip longitudinally sectioned); **E**, column, three quarters-view; **F**, column, ventral view; **G**, pollinarium, dorsal and ventral views; **H**, anther cap. Lankester Composite Digital Plate prepared by F. Pupulin based on the holotype.



FIGURE 2. The flower of *Sobralia turrialbina* Dressler, M. Acuña & Pupulin, from the plant that served as the holotype. Note the nacreous, dusty rose color of the flower. Photograph by F. Pupulin.



FIGURE 3. Frontal view of the flower of *Sobralia turrialbina* Dressler, M.Acuña & Pupulin, from the plant that served as the holotype. Photograph by F. Pupulin.





FIGURE 4. *Sobralia turrialbina* Dressler, M.Acuña & Pupulin, flower from *Dressler 7341*. Photograph by M. Fernández.

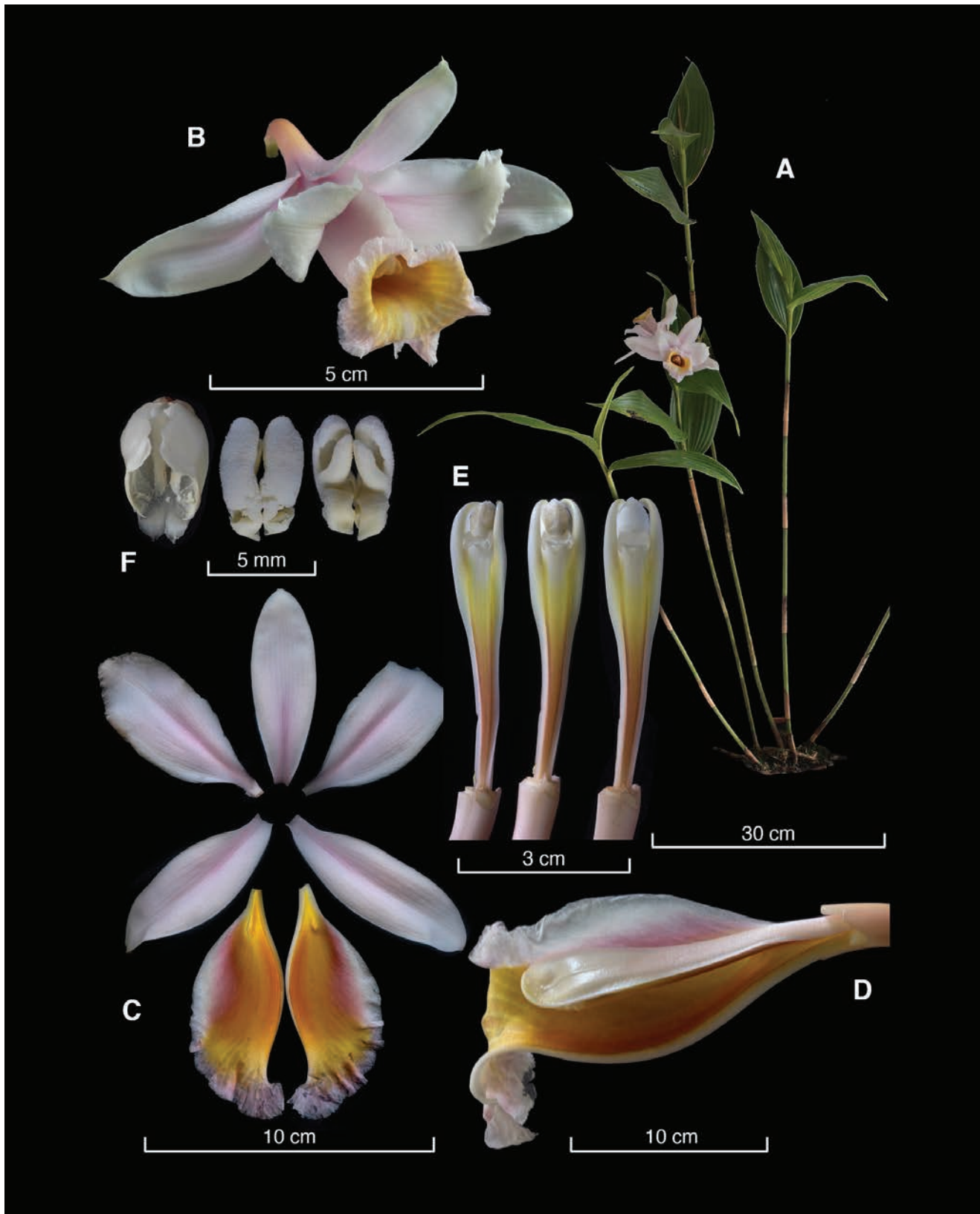


FIGURE 5. *Sobralia turrialbina* Dressler, M.Acuña & Pupulin. **A**, habit; **B**, flower; **C**, dissected perianth; **D**, column and lip, lateral view (the lip longitudinally sectioned); **E**, column, three quarters and ventral views (with and without anther); **F**, anther cap and pollinarium (dorsal and ventral views.). Lankester Composite Digital Plate based on *Dressler 7342*, prepared by F. Pupulin.



FIGURE 6. *Sobralia turrialbina* Dressler, M.Acuña & Pupulin (*Dressler 7342*). Note the pale rose flowers, produced in pairs. Photograph by F. Pupulin.



the genitive case is correctly *turris-albae*, or *turrialbae* (i.e., of the white tower). When, on the other hand, Turrialba is treated as a regular toponym ending in -a, according to recommendation 73D.1 of the Code of Nomenclature, the epithet derived from it should be *turrialb-ensis*, *turrialb-(a)na*, *turrialb-ina* or *turrialb-ica*.

**Distribution:** Known only from Costa Rica (Fig. 7).

**Habitat and ecology:** Plants of this species grow as large epiphytes on the trunks and primary branches of the lower canopy in tropical wet, premontane moist and premontane wet forests. Specimens have been recorded from the Caribbean watershed of the Cordillera de Talamanca and Cordillera Central in Costa Rica, at elevations between 100 and 900 meters.

Among the plants grown in the large collection of *Sobralia* at the Lankester Botanical Garden, we also identify as *S. turrialbina* a specimen originally collected in the plains

of San Carlos, north of the Central Cordillera in Costa Rica (Dressler 7342). This specimen is smaller in size (stems up to about 100 cm), and its flowers are of a very pale and delicate pink, with a bolder suffusion along the mid vein of sepals and petals. The lip base has bright yellow basal calli, but instead of the dark hazelnut brown blotch on the disc there is a deep rose and orange blotch, fading yellow toward the apex, with fine, pink, radiating stripes on the ruffled edge of the midlobe (Fig. 5–6). The details of plant habit, the lip without keels, and the column, are however indistinguishable from those of the darker forms of *S. turrialbina*, as recorded in the premontane forests of Talamanca. Such a disjunction in distribution may seem strange, but it is likely an artifact of undersampling, as it is not uncommon among Costa Rican *Sobralia* that species distributions span over two or three main chains of the continental divide, and often along both watersheds (Fig. 8).

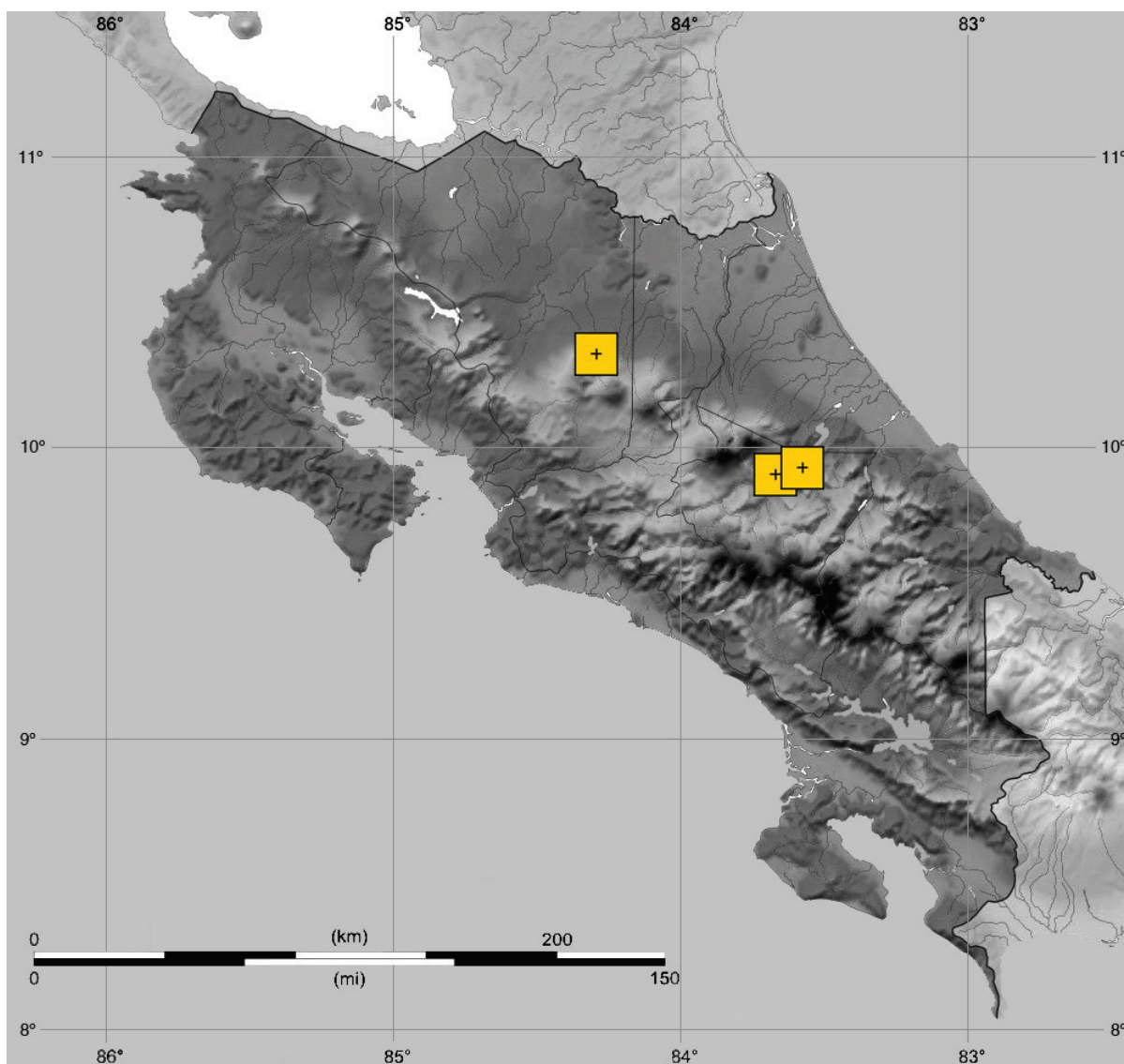


FIGURE 7. Distribution map of *Sobralia turrialbina* Dressler, M. Acuña & Pupulin.



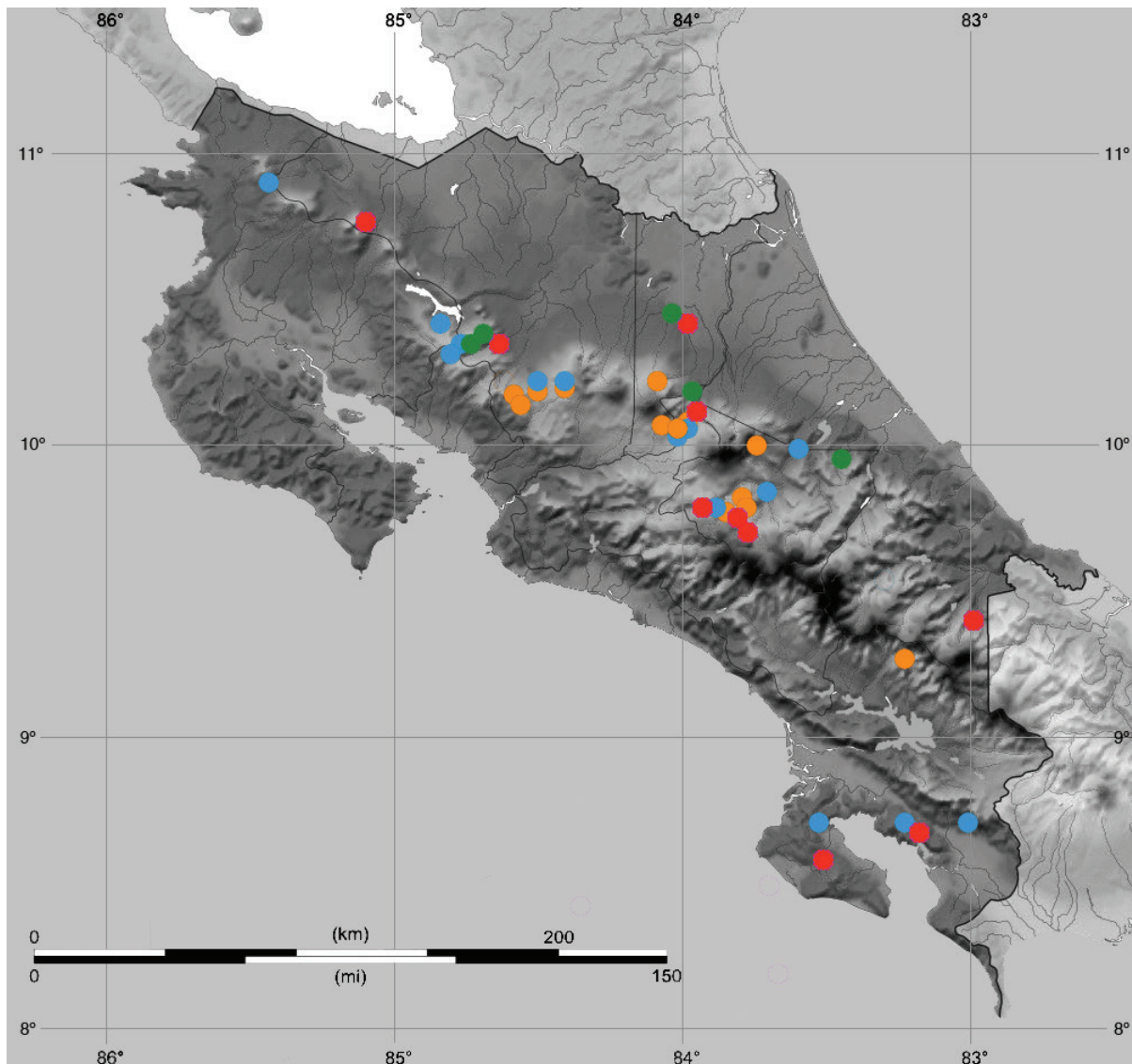


FIGURE 8. Distribution map of selected species of *Sobralia* in Costa Rica. Blue dots = *S. bletiae* Rchb.f.; orange = *S. carazoi* Lank. & Ames; red = *S. doremiliae* Dressler; green = *S. powellii* Schltr. Based on data from Lankester Botanical Garden databases. Digital cartography by Sofía Granados-Martínez.

#### LITERATURE CITED

- BOGARÍN, D., A. KARREMANS, AND F. PUPULIN. 2008. New species and records of Orchidaceae from Costa Rica. *Lankesteriana* 8(2): 53–74.
- DRESSLER, R. L. 2012. *Sobralia decora*. The species and its cousins in Mexico and central America. *Orchids* 81(5): 308–310.
- . 2013. *Sobralia warszewiczii* Rchb.f. Described in 1852, but still a bit muddled. *Orchids* 82(8): 499.
- DRESSLER, R. L. AND D. BOGARÍN. 2007. Two attractive new species of *Sobralia* from Panama. *Lindleyana in Orchids* (Bull. Amer. Orch. Soc.) 76(9): 696–701.
- AND ———. 2010. Some new *Sobralia*e from Costa Rica and Panama. *Lankesteriana* 9(3): 475–485.
- AND ———. 2011. *Sobralia sanctorum* and *Sobralia purpurella*: two elusive lost species are found. *Lindleyana in Orchids* (Bull. Amer. Orch. Soc.) 80(5): 307–310.
- DRESSLER, R. L., M. A. BLANCO, F. PUPULIN, AND K. M. NEUBIG. 2011. Proposal to conserve the name *Sobralia* (Orchidaceae) with a conserved type. *Taxon* 60(3): 907–908.
- DRESSLER, R. L., M. FERNÁNDEZ, AND F. PUPULIN. 2014. *Sobralia abel-arayae*, a new and scarce species from Costa Rica. *Orch. Digest* 78(3): 146–148.
- DRESSLER, R. L. AND F. PUPULIN. 2008. The identity of *Sobralia leucoxantha*, with three new species, two closely allied and one more distant. *Orquideología* 25(2): 152–158.
- . 2010. *Sobralia lacerata*, a new and attractive colombian species, with some long-standing confusion. *Orquideología* 27(1): 43–45.
- . 2014. Two new white-flowered species of *Sobralia* (Orchidaceae) from Costa Rica. *Harvard Pap. Bot.* 19(1): 117–220.

- . 2015. *Sobralia lentiginosa* (Orchidaceae: Sobralieae). An attractive new species from Costa Rica. *Lindleyana* in *Orchids* 84(5): 374–376.
- FERNÁNDEZ, M., D. BOGARÍN, A. P. KARREMANS, AND D. JIMÉNEZ. 2014. New species and records of Orchidaceae from Costa Rica III. *Lankesteriana* 13(3): 259–282.
- GAGINI, C. 1917. *Los aborígenes de Costa Rica*. Impr. Trejos Hermanos, San José, Costa Rica.
- GARITA HERNÁNDEZ, F. 1995. *Toponimia de la Provincia de Cartago*. Editorial de la Universidad de Costa Rica, San José.
- GONZÁLEZ VÍQUEZ, C. 1920. Nombres geográficos de Costa Rica. *Revista de Costa Rica* 1: 321–325.
- LUER, C. A. 1991. New species of *Pleurothallis* and a new combination. *Lindleyana* 6: 94–108.
- REICHENBACH, H. G. 1855. *Symbolae Orchidaceae*. *Bonplandia* 3: 212–227.
- . 1863. Über einige Garten-Orchideen. *Hamburg. Gart.-Blumenzeit.* 19: 10–14.
- . 1871. New garden plants: *Epidendrum turrialvae*, *Maxillaria reichenheimiana*, *Oncidium globuliferum costaricense*. *Gard. Chron.* 1871: 1678.
- SALAZAR OBANDO, O. 1970. *Monografía de Turrialba*. Municipalidad de Turrialba.
- SCHLECHTER, F. R. R. 1911. Orchidaceae novae et criticae. *Decas XVI–XVII*. *Repert. Sp. Nov. Regni Veg.* 9: 21–32.
- . 1918. Kritische Aufzählung der bisher aus Zentralamerika bekanntgewordenen Orchideen: D. Beschreibungen neuer Arten. *Beih. Bot. Centralbl.* 36: 371–421.
- . 1923. Beiträge zur Orchideenkunde von Zentralamerika, II. Additamenta ad Orchideologiam Costaricensem, II. Orchidaceae Bradeanae Costaricensis. *Repert. Sp. Nov. Regni Veg. Beih.* 19: 76–157.
- VALERIO, J. 1953. *Turrialba, su desarrollo histórico: recopilación y comentario de documentos relativos a población y desarrollo del cantón de Turrialba, publicado con motivo de su primer cincuentenario de vida cantonal*. Editorial Tormo, Cuenca.

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# ORCHIDACEAE TONDUZIANAE: TYPIIFICATION OF COSTA RICAN ORCHIDACEAE DESCRIBED FROM COLLECTIONS OF ADOLPHE TONDUZ

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**Abstract.** The Swiss botanist Adolphe Tonduz worked in Costa Rica from 1889 to 1920. For 20 years he carried out important activities as a plant collector and the curator of the largest Costa Rican herbarium beginning at the Instituto Físico-Geográfico Nacional, and later at the National Museum. A large number of new species of Orchidaceae are found among his collections, most of which were published by the German taxonomist Rudolf Schlechter between 1906 and 1923. The type specimens of most of these species were lost during a fire in the Berlin herbarium in 1943. The typification of the orchid species described on the basis of collections by Tonduz is a fundamental step for correct interpretation of Schlechter's and other authors' taxonomic concepts, and this paper follows the path of similar works aimed at typifying the orchid species originally collected in Costa Rica by M. A. Brenes, R. E. Endrés, and C. Wercklé. Previously lectotypified and neotypified taxa are recorded, including their bibliographical references. Here we formally designate lectotypes for *Brassavola scaposa*, *Bulbophyllum vinosum*, *Camaridium costaricense*, *C. dendrobioides*, *Chysis costaricensis*, *Cranichis nigrescens*, *Elleanthus tonduzii*, *Epidendrum abbreviatum*, *E. cardiophorum*, *E. henrici*, *E. octomerioides*, *E. pachycarpum*, *E. polychlamys*, *Goodyera ovatilabia*, *G. turrialbae*, *Habenaria endresiana*, *H. gymnadenioides*, *Maxillaria microphyton*, *M. pachyacron*, *Microstylis adolphii*, *M. microtoides*, *M. pandurata*, *M. tonduzii*, *Ornithocephalus tonduzii*, *Pittierella calcarata*, *Pleurothallis microtatantha*, *Scaphyglottis brachiata*, *Sobralia amparoeae*, *Spiranthes tonduzii*, *Stelis aemula*, *S. conmixta*, *S. effusa*, *S. longicuspis*, *S. sarcodantha*, *Stenoptera costaricensis*, and *Tetragamestus gracilis*. A new lectotypification is proposed for *Epidendrum adolphii*. Neotypes are designated for *Cynoches tonduzii* and *Epidendrum barbeyanum*, and epitypes are designated for *Pleurothallis microtatantha* and *Stelis aemula*. *Spiranthes tonduzii* is not typified, as we did not have access to any extant materials for study.

**Resumen.** El botánico suizo Adolphe Tonduz trabajó en Costa Rica desde 1889 hasta 1920. Durante 20 años llevó a cabo una importante actividad como recolector de plantas y curador de los mayores herbarios del país, antes en el Instituto Físico-Geográfico Nacional y después en el Museo Nacional. Entre sus recolectas se encuentran un gran número de especies de orquídeas descritas como nuevas para la ciencia, en su mayoría publicadas por el taxónomo alemán Rudolf Schlechter entre 1906 y 1923. Los especímenes tipo de la mayoría de estas especies se perdieron durante el incendio del herbario de Berlín en 1943. La tipificación de las especies de orquídeas descritas con base en recolectas de Tonduz representa un paso fundamental para una interpretación correcta de los conceptos taxonómicos de Schlechter y otros autores, y este artículo sigue la pauta de otras obras similares finalizadas a la tipificación de las especies de orquídeas originalmente recolectadas en Costa Rica por M. A. Brenes, R. E. Endrés y C. Wercklé. En esta contribución se registran los taxones previamente lectotipificados y neotipificados, y se referencias bibliográficas para las designaciones de lectotipos y neotipos. También, designamos formalmente aquí lectotipos para *Brassavola scaposa*, *Bulbophyllum vinosum*, *Camaridium costaricense*, *C. dendrobioides*, *Chysis costaricensis*, *Cranichis nigrescens*, *Elleanthus tonduzii*, *Epidendrum abbreviatum*, *E. cardiophorum*, *E. henrici*, *E. octomerioides*, *E. pachycarpum*, *E. polychlamys*, *Goodyera ovatilabia*, *G. turrialbae*, *Habenaria endresiana*, *H. gymnadenioides*, *Maxillaria microphyton*, *M. pachyacron*, *Microstylis adolphii*, *M. microtoides*, *M. pandurata*, *M. tonduzii*, *Ornithocephalus tonduzii*, *Pittierella calcarata*, *Pleurothallis microtatantha*, *Scaphyglottis brachiata*, *Sobralia amparoeae*, *Spiranthes tonduzii*, *Stelis aemula*, *S. conmixta*, *S. effusa*, *S. longicuspis*, *S. sarcodantha*, *Stenoptera costaricensis* y *Tetragamestus gracilis*. Se propone una nueva lectotipificación para *Epidendrum adolphii*. Se designan neotipos para *Cynoches tonduzii* y *Epidendrum barbeyanum*, así como epitipos para *Pleurothallis microtatantha* y *Stelis aemula*. No se tipificó *Spiranthes tonduzii* porque no tuvimos acceso a los materiales existentes para su estudio.

**Keywords:** Jean François Adolphe Tonduz, Costa Rica, Orchidaceae, typification

While several chapters of the long-term work devoted to the treatment of Orchidaceae for the *Flora Costaricensis* have been completed, or are now close to completion (Atwood and Mora-Retana, 1999; Pupulin, 2010a; Pupulin

and Bogarín, in prep; Pupulin et al., in prep), the need for a solid framework that allows a consistent application of names to the orchid species of our flora, as well as for a critical examination of previously synonymized names and

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their actual taxonomic status, has become more compelling. Large, systematic studies of a country's flora represent a great opportunity for the ultimate understanding of species identities, as they allow incorporation in species circumscriptions of those geographical variations and unique features that characterize local populations as definite taxa. To this extent, the evaluation of scientific names to be permanently associated with local orchid populations is crucial, as it is widely understood and accepted that loose specific circumscriptions and highly variable specific concepts, often used in the past, do not reflect the actual richness and evolutionary hyper-diversification of the family. It is from this perspective that the collation and cataloguing of the information on type designations for Costa Rican orchid names, as well as new designations when appropriate, has become a basic activity for those engaged in the project of producing a modern orchid flora of Costa Rica. This collation and cataloguing is aimed at promoting both firm identification of local species, and nomenclatural stability for the taxa to which the names must apply. This work is particularly important and critical in the case of the orchid species originally described by Rudolf (Friedrich Richard) Schlechter (1872–1925), as the main set of type specimens on which the German taxonomist based his concepts and the associated analytical drawings and notes were destroyed during the bombing of the Berlin herbarium in 1943 (Ames, 1943; Hiepko, 1987). It was fortunate that several of the Costa Rican orchid specimens sent to Schlechter for determination were conserved as duplicates in Costa Rican herbaria, and in some cases widely distributed to other herbaria both in Europe and the United States, making lectotypification possible and reducing the need for neotypification. Conscious of the

taxonomic importance of the analytical drawings prepared by Schlechter of his new species' holotypes that were left unpublished upon his premature death in 1925, the curator at the Botanical Museum in Berlin-Dahlem (and orchid specialist), Rudolf Mansfeld (1901–1960), published a large selection of Schlechter's floral analyses of orchid species between 1929 and 1934 (Mansfeld, 1929, 1930, 1931, 1932, 1934). In a few cases, these illustrations are invaluable in understanding Schlechter's taxonomic concepts, as they comprise the only extant evidence of the original materials. Of further help was the strong interest in the systematics of Central American orchids developed by Professor Oakes Ames (1874–1950) at the Botanical Museum of Harvard University during the first decades of the twentieth century (Sax, 1950; Plimpton and Ames Plimpton, 1979; Ossenbach, 2009). Ames had the opportunity to have the original drawings of Schlechter's holotypes traced under the supervision of the German botanist; he also acquired some isotypes before the incorporation of Schlechter's herbarium into the Botanical Museum of Berlin-Dahlem. Lists of Schlechter's remaining orchid types still conserved in Berlin (as well as those of Kränzlin and Mansfeld) were published by Butzin. However, no Costa Rican specimens survived the destruction of the herbarium during World War II (Butzin, 1978, 1980).

The present paper, dedicated to the typification of the orchid species based on Costa Rican material originally collected by Jean François Adolphe Tonduz (1862–1921; Fig. 1), is a further step towards the complete cataloguing of the orchid names based on Costa Rican material. This paper also follows previous contributions of this nature (Barringer, 1986; Pupulin, 2010b; Pupulin et al., 2011, 2012, 2013).

#### ADOLPHE TONDUZ IN COSTA RICA

During the last decades of nineteenth century, the still young Republic of Costa Rica, which had achieved its independence from Spain in 1821, began a decisive process of modernization and centralization of its education system as part of a general effort to pursue material progress, and to create an informed citizenry that could move the country towards a solid industrial and technological future (Eakin, 1999). To further this end, Costa Rican politicians turned to Europe in search of teachers and scientists to staff the newly designed secondary school system. As early as the 1860s, faculties of foreign teachers were created at the Colegio San Luis Gonzaga in Cartago and, a decade later, at the Instituto Nacional in San José. Eventually, in the late 1880s, the Minister of Education under the liberal government of President Bernardo Soto (1853–1931), the capable Mauro Fernández Acuña (1843–1905), created the Liceo de Costa Rica and the *Colegio Superior de Señoritas* (Fig. 2, A–B) in San José, the capital of the small republic. A group of European academics were hired to organize these institutions, the first two public high schools in Costa Rica. Among the teachers who responded to Fernández's call were several noted scientists, mostly of Swiss origin, who over the next few years not only laid the foundations of a

modern educational system, but also inspired a golden age of Costa Rican science. Between 1886 and 1889 Paul Biolley (1862–1908), who would work on botany and the zoology of invertebrates; the botanist Henri Pittier Dormond (1857–1950; Fig. 3); the chemist Gustav Michaud (1860–1924); the mathematician and astronomer Jean Rudin (1849–1932), Pittier's brother-in-law; the naturalist Adolphe Tonduz; the engineer Gustave Michaud (1860–1904), and Johann Sulliger (1830–?), another mathematician, came to Costa Rica attracted by the educational reforms enacted by Mauro Fernández and Bernardo Soto.

The first group of Swiss educators arrived in Costa Rica in 1886. In this group the name of Pablo Biolley stands out for his important contributions to the development of Costa Rican education. Among other works, Biolley published a Greek grammar and a compendium of natural history (Biolley, 1887, 1898). One year later, in 1887, the second group arrived, of which the great Henri Pittier was part. Mauro Fernández, the Secretary of Education, founded the National Museum by special decree in May of the same year. At Pittier's initiative, the National Meteorological Institute followed in April 1888. Finally, in June 1889, the Instituto Físico-Geográfico Nacional was founded, under



FIGURE 1. Adolphe Tonduz photographed in Costa Rica, *circa* 1895. Photo by Rudd Painter, courtesy of the Archives des Conservatoire et Jardines Botaniques de la Ville de Genève.



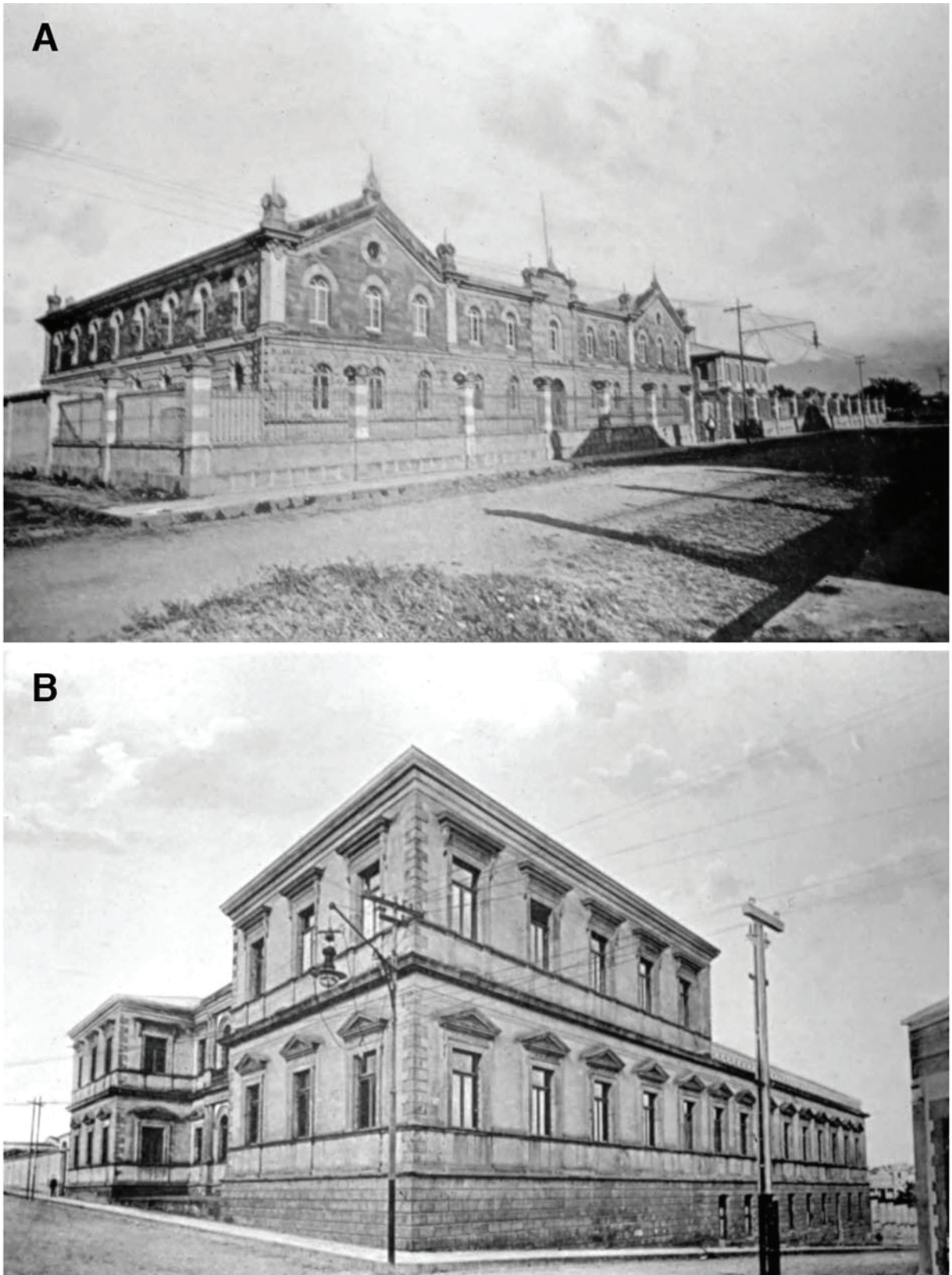


FIGURE 2. **A**, The installations of Liceo de Costa Rica in 1909; **B**, The building of Colegio Superior de Señoritas in 1909. Photos from the Album of Fernando Zamora, courtesy of the Centro de Investigaciones Históricas de América Central, Universidad de Costa Rica.



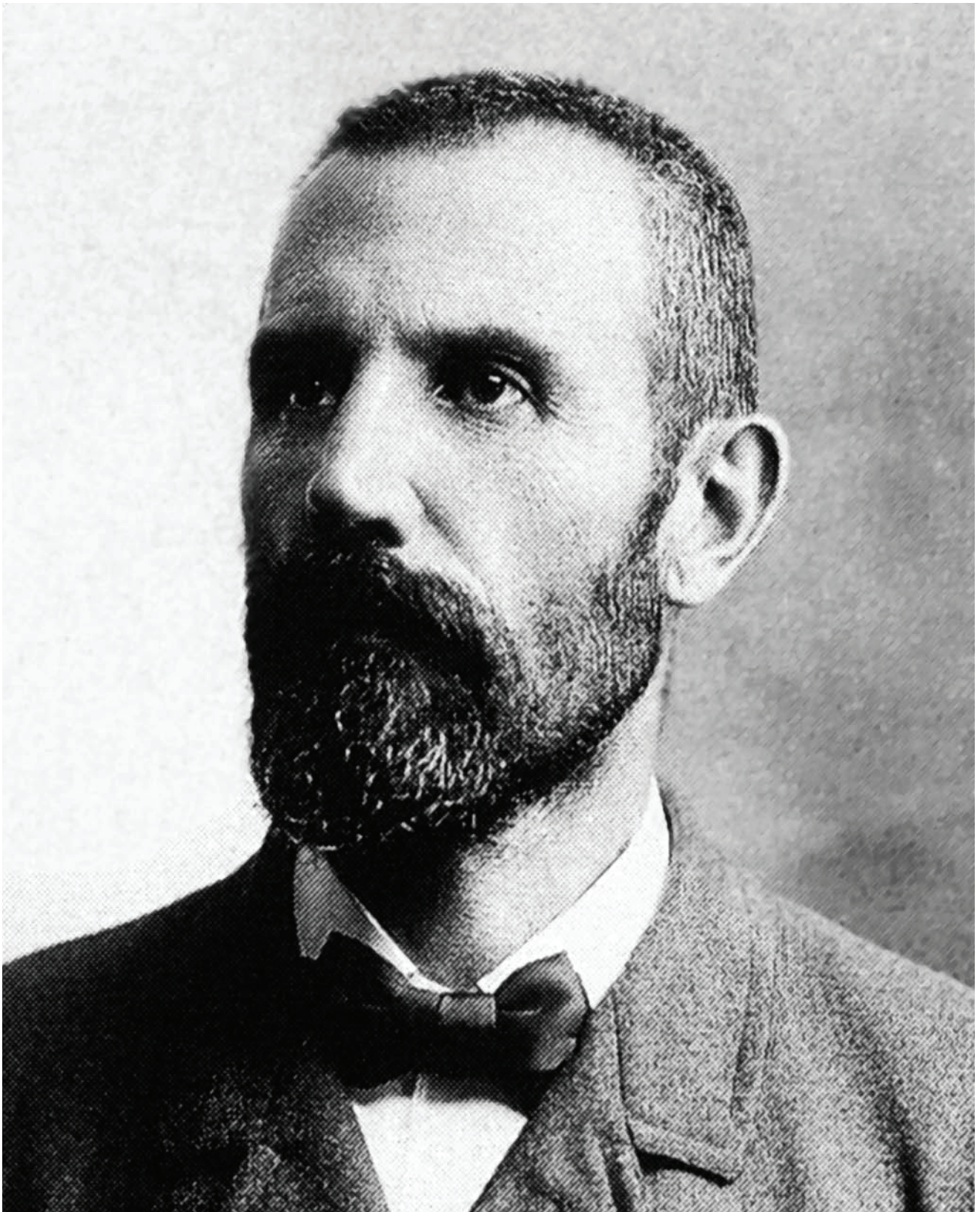


FIGURE 3. Henry Pittier photographed in Costa Rica, 1903. Courtesy of Rudolf Jenny.



the direction of Pittier, into which the National Museum, the Meteorological Institute and the Topographical Office were integrated.

Pittier divided the work of the Institute into three sections: Geography, Meteorology and Botany, reserving for himself the direction of the first and searching for competent persons to direct the other two.

Following the recommendation of one of his former professors, Jean-Balthazar Schnetzer (1823–1896), Pittier promoted Adolphe Tonduz to the staff of the Institute. At the time, Tonduz was working as a preparator at the herbarium in Lausanne, where he had studied but never graduated. Pittier obtained the necessary funding from the government and Tonduz was assigned to the botanical service (Häsler and Baumann, 2000) (Fig. 4). Tonduz, the youngest of the seven children of Paul Gustave Tonduz, was born on September 18, 1862 in Pully, Canton of Vaud. He arrived in Costa Rica on June 17, 1889 and soon became, as collector and preparator, an avid disciple and the right hand of Pittier, who wrote in the Institute's annual report in 1892: "...one arrives easily to the conclusion that the election of this active officer was by all means a happy one."

Tonduz would have liked, undoubtedly, to become more than just a notable collector, but his life turned into a vicious circle that he could never break because of two insurmountable obstacles. The first was his chronic alcoholism, which led him occasionally to abandon his work for days or even weeks. Pittier had to use all of his influence and friendship with the President of the Republic to prevent Tonduz being dismissed from his position. Although he was capable of working for hours on end, Tonduz often succumbed to the old temptation; as Otón Jiménez (1895–1988), his pupil and one of his best friends, recalls, "he would not go back to work, disregarded his personal hygiene and the tidiness of his clothing, did not eat, and his occupation was to roam along the streets, sometimes alone, sometimes in the company of doubtful friends, visiting the bars until his modest financial means and his credit were exhausted" (Jiménez, 1971).

In another sad anecdote, Otón Jiménez (1971: 63) remembers how don Guillermo Acosta (1878–1955) helped him during one of Adolphe Tonduz's "alcoholic journeys:" "Don Anastasio Alfaro, director of the National Museum, asked me to bring back Tonduz [who was in San Ramón], to avoid sanctioning him for abandoning his duties. A Roman enterprise! I had to ask the Political Chief of San Ramón, Guillermo Acosta Piepper, for help, and through his paternal intervention I managed to put him on a horse and in a ten-hour journey, step by step, we reached Grecia and from there, in another similar journey, Alajuela. It was then easy for me to bring him to the house of my neighbor, David Mora." Pittier had to ensure that the Swiss herbaria that bought Tonduz's botanical specimens had payments transferred to his own accounts so that he could administer them for his unfortunate protégé.

The second obstacle for Tonduz was, ironically, Pittier, his master and protector. Tonduz's personal circumstances,

and the despotic character of his mentor, created such a strongly dependent relationship that Tonduz could never escape the shadow of the great Pittier. Thus, the decline of Adolphe Tonduz began when Pittier abandoned the Instituto Físico-Geográfico in 1903 and left Costa Rica for good in 1905. For more than 14 years, Pittier's figure had overshadowed the unstable Tonduz. When Pittier left for Washington, Tonduz was left completely defenseless and would never be able to bring order to his life again without the support and guidance of his compatriot.

Tonduz briefly occupied the position of curator of the National Herbarium in 1904 and worked for the United Fruit Company until 1908. Following this, he managed to support himself thanks to the kindness of a few good friends like Charles Lankester (1879–1969) and Amparo López-Calleja de Zeledón (1863–1957) (Fig. 5), for whom he also collected and whose gardens he looked after for many years (Fig. 6, A–B). Thanks to the orchid specimens prepared by Tonduz for "Doña" Amparo, the great German orchidologist Rudolf Schlechter described an important number of new species for the flora of Costa Rica.

In his later years, Tonduz's life alternated between prosperity and misery, although he would continue collecting plants until shortly before his death. In vain he asked Pittier, already established in Venezuela, to take him to work with him. Pittier refused, knowing that Tonduz would be more of a hindrance than help.

Finally, in the first months of 1921, Adolphe Tonduz migrated to Guatemala, where he took the position of Director of the Section of Phytopathology in the Agricultural Service. A few months later he passed away, on December 20 of the same year, from alcoholic enterocolitis according to his death certificate.

In a letter to the American orchidologist Oakes Ames in 1922, in which he commented on his impressions about Tonduz and Carlos Wercklé, Charles Lankester wrote: "Poor Tonduz was also hopeless in this regard [alcoholism] and the possession of a small sum of money was immediately fatal. I kept him here 10 months during our previous stay in Cóncevas [Lankester's farm in Paraíso, near Cartago] and had him 'dry' the whole time, clothed and fed him... he became a new man, but a salaried position in Guatemala broke him completely."

After receiving news of his death, Pittier, at that time residing in Caracas, Venezuela, published in 1922 an obituary in the *Gazette* of Lausanne, Switzerland, in which he wrote: "...Thanks to his collections, studied by the most eminent specialists of two hemispheres, the vegetation of Costa Rica is today the best known of tropical America and we are greatly in debt to the scientific work of our friend Tonduz... He had the character of a countryman of the Gros de Vaud [a region of the Swiss Canton de Vaud]: sharpness of judgement, much of bonhomie and a heart of gold, somewhat bitter in the last years because of the vicissitudes of life. He has descended to his grave surrounded by the esteem and sorrow of all who knew him."

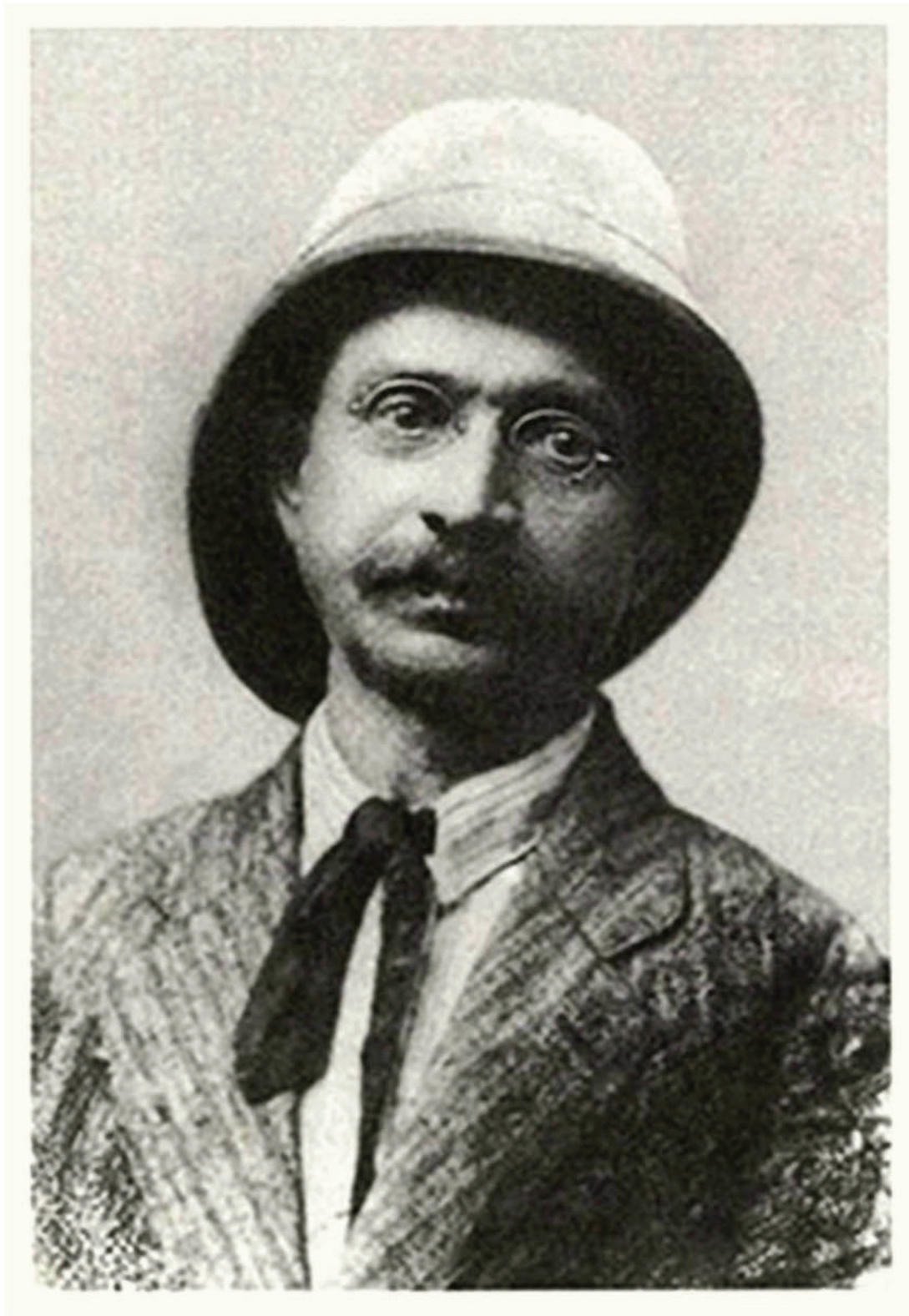


FIGURE 4. Adolphe Tonduz in a photograph from his passport, around 1905. Courtesy of Rudolf Jenny.





FIGURE 5. Amparo López-Calleja Basulto in a photograph of *circa* 1900.





FIGURE 6. The house of Costa Rican ornithologist José Cástulo Zeledón and his wife, Amparo López-Calleja de Zeledón, in San José (today La Sabana neighbor). **A**, View from the house front; **B**, Internal view of a *patio* from the gardens. Courtesy of Jaime García.



## TONDUZ' COSTA RICAN BOTANY

For a young naturalist interested in the study of botany, the Costa Rica of the last two decades of the nineteenth century was probably the best place in the world to be. Not only was the country one of the areas richest in biodiversity on the planet, but there was also an enlightened group of politicians seriously committed to understanding and using the diversity of the country's natural resources to make Costa Rica a modern and developed republic. A year before the arrival of Tonduz at the port of Puntarenas, the government had dispatched Anastasio Alfaro (1865–1951), a young lawyer (and self-taught naturalist and archaeologist), on a mission to the United States to learn about the best museographic techniques, and upon his return funded the creation of the Museo Nacional de Costa Rica. At the beginning of 1889, Pittier supervised the building of the four-story Instituto Meteorológico (Fig. 7), just across the road from the National Theatre, equipped with modern scientific instruments. At Pittier's behest, in the same month as Tonduz reached Costa Rica, the government consolidated the Museum and the Institute into a single scientific centre, the Instituto Físico-Geográfico Nacional (IFGN), of which Pittier assumed the directorship (Eakin, 1999).

Even though the merger of the botanical collections of the Museo Nacional into the newborn IFGN lasted only for a few months before the National Museum regained its full autonomy, it was enough time to create a botanical section within the Institute, and this was in need of a trained curator.

Hired as the head of IFGN's botanical section, Tonduz began his collecting activity almost immediately upon his arrival in his new home. His first documented Costa Rican collection bearing an unequivocal date is a specimen of *Piper* that he gathered in the neighborhood of San José on June 20, 1889, three days after his arrival. This plant eventually served as a syntype for the description of *Piper pseudopsis* C.DC. (Piperaceae, *Tonduz 1088*, G and US), published in 1898 in the *Anales del Instituto Físico-Geográfico y del Museo Nacional de Costa Rica*. His first Costa Rican orchid, a specimen of *Malaxis carnososa* (Kunth) C.Schweinf. (*Tonduz 1243*, US), was collected in August 1889. By December of that year, Tonduz had already prepared over 400 specimens, twenty of which would serve as the types for new plant species; the last collected, on December 28, was an isotype of *Eupatorium pittieri* Klatt (Asteraceae, *Tonduz 1698*, CR and US).



FIGURE 7. The building that hosted the original Instituto Físico-Geográfico Nacional, not far from the National Theater building (the roof of which is visible on the left) in San José.

Over the course of the ensuing decade, Tonduz became the inseparable companion of Pittier in most of his expeditions throughout the country (Fig. 8). He travelled with him, together with Anastasio Alfaro, to the border with Nicaragua, and in 1891, with Pablo Biolley, to the southern regions in the basin of the Río Grande de Térraba. Tonduz left a legacy of fascinating accounts of his explorations of Costa Rica in his publications *Expediciones botánicas efectuadas en la parte meridional de Costa Rica por los años 1891–1892* (Tonduz, 1893), *Exploraciones botánicas en Talamanca* (Tonduz, 1895a) and *Herborisations au Costa Rica* (Tonduz, 1895b, 1896, 1897a). In the foreword to his well-known *Ensayo sobre las plantas usuales de Costa Rica*, Pittier (1908) writes: “...during fourteen years he was my companion during my travels, sharing with me the hardships and dangers that generally are part of the explorations, as well as the delights offered to the naturalist by the marvelous sights of certain scenes hidden in ignored corners of the virgin forests, or in the discovery of new and never dreamed-about forms.” He was an indefatigable collector and a true artist who prepared his specimens with great care and skill (Jiménez, 1971). Tonduz travelled through all accessible regions of the country, from Guanacaste and the border with Nicaragua to the Atlantic and the southern regions. Cerro Tonduz (1930 m), to the North of San Vito de Coto Brus in southern Costa Rica, was named in his honor.

What made his botanical activity distinct from other collectors was the commitment that Tonduz, inspired by Pittier, assumed towards his adopted country. Unlike the foreign naturalists who had visited Costa Rica previously, working for foreign institutions and governments and pursuing their own agenda, Tonduz acted on the behalf of the Costa Rican government and for a Costa Rican institution (MacCook, 2002). During the field expeditions by Tonduz and other collectors of the IFGN, specimens were usually collected at least in duplicates (Eakin, 1999); one to be kept in the collections of the IFGN and the other for study and determination by appropriate specialists. These duplicates were mostly sent to Pittier’s main scientific correspondent, Théophile Durand (1895–1912) of the National Botanic Garden of Belgium in Brussels, who in turn distributed them to recognized specialists at the Boissier Herbarium in Geneva, the United States National Museum, the Botanical Museum Berlin-Dahlem, and the Muséum National d’Histoire Naturelle in Paris, among others. On the basis of the almost 10,000 specimens gathered in the botanical section of IFGN by 1895, and under Pittier’s supervision, these specialists also collaborated in subsequent years to produce the first attempt at a formal flora of Costa Rica, the *Primitiae florae costaricensis*, three volumes of which were published from 1891 to 1905 (Durand and Pittier, 1891, 1896; Pittier, 1898–1900, 1901, 1904, 1905) (Grayum et al., 2004). Unfortunately, the published portions of the *Primitiae* did not cover monocots (with the exception of Araceae and Iridaceae), and the orchid materials collected by Tonduz were not systematically studied.

The magnitude of Tonduz’s work is best expressed in the words of Pittier, who, in a 1915 letter to the botanist and historian John Barnard wrote: “*Adolphe Tonduz has been and is still, a laborious and painstaking collector, responsible for almost 60% of the 20,000 specimens of the Instituto Físico-Geográfico...*” And although Pittier complained that “...his collections contain again and again the same species and comparatively few new things,” the truth is that over 120 species new to science were discovered in Costa Rica by Tonduz and many of them are named after him (see Appendix).

One of Tonduz’s major successes was the rediscovery of *Oreomunnea pterocarpa*, a giant of Costa Rican forests, first discovered by the Dane, Anders Oersted in 1846, but not recorded again until Tonduz collected this species near Juan Viñas in 1914. Important also were his mycological studies. As a trained mycologist he published in 1897, for the types of the Instituto Físico Geográfico, a booklet on the sooty mold disease, or *fumagina*, which inhibits photosynthesis in coffee bushes (Tonduz, 1897b). He collaborated with the Argentinian Carlos Spegazzini in his work *Reliquiae Mycologicae tropicae et fungi costaricensis nonnulli* (1918) and prepared a work with Otón Jiménez entitled *Hongos de Costa Rica*, which he began in 1908 and left unfinished in 1914.

Under Pittier’s untiring and determined leadership of the Institute, field activities and preparation of botanical specimens for the herbarium of the IFGN and for distribution abroad were incessant during the last decade of XIX century. According to a survey of the collections made by Tonduz, deposited in ten of the world’s major herbaria (AMES, BM, BR, CR, F, G, MO, NY, P, US) between 1889 and 1899, he prepared some 10,000 specimens—the years of 1893 and 1898 being the most prolific (with 1075 and 1775 specimens respectively). In 1900 Tonduz’ activity was reduced to the herborization of a little more than 500 specimens. After 1901, the paucity of field activity clearly reflects the political and administrative troubles affecting the leadership of the Institute, which eventually drove Pittier to renounce his directorship in 1903, and the Institute to cease its activities in 1904.

Without the impulse of Pittier’s vision and deprived of the IFGN’s shelter, the first decades on the new century were the poorest for Tonduz in terms of botanical exploration and field collections. In the ten years, between 1902 and the end of 1911, Tonduz collected a little over a hundred specimens. From the last eight years he spent in Costa Rica, only 185 field collections are known to exist. This figure shows a somewhat anomalous and isolated peak of activity in 1913, when Tonduz was briefly hired by the French geographer, archaeologist, and explorer, Count Maurice de Périgny (1877–1935), to botanize during his exploratory trip to the northern Guatuso plains (Taladoire, 1995). Jiménez (1971) categorizes de Périgny’s expedition as “disastrous.” He reports that all the way up to the River San Juan and on the return via the River San Carlos it was impossible to make botanical collections. On the way back





FIGURE 8. Adolphe Tonduz (right) with Henry Pittier (center) and George K. Cherrie (left), taxidermist at the National Museum of Costa Rica. Courtesy of the late Luis Diego Gómez Pignataro.

to the capital, Tonduz decided to make a prolonged stay in the rich botanical area of San Ramón de Alajuela, where he collected specimens from the end of April until the middle of May 1913. He managed to collect 173 plant specimens before the Director of the Museum recalled him to his duties in San José. No collections at all are known by him between 1915 and 1917, or in 1919 (Fig. 9). The last plant he collected in Costa Rica, a specimen of cactus, *Epiphyllum thomsonianum* var. *costaricense* (F.A.C.Weber) Ralf Bauer (*Tonduz 18051*), is dated November 1920, and it was his only collection for that year. His last Costa Rican orchid, a plant of *Lycaste* cf. *brevispatha* (Klotzsch) Lindl. and Paxton, was a collection *sine numero* prepared in January 1914 from a cultivated specimen grown near his home in San Francisco de Guadalupe.

When he eventually left Costa Rica at the beginning of 1921, it was after more than thirty years spent botanizing in the country. A poor man deeply addicted to alcohol, Tonduz left behind an impressive botanical legacy of over 12,000 prepared specimens kept in the herbarium of the Museo Nacional and distributed to another 20 herbaria across the world.

After leaving Costa Rica, Tonduz collected plants again in Guatemala from the end of February until the end of September 1921, three months before his death. His documented collections from Guatemala comprise more than 1,100 specimens, which Tonduz numbered consecutively, beginning again with number 1 (*Cyathea costaricensis* [Mett. ex Kuhn] Domin, Cyatheaceae). Among the Guatemalan collections a few orchids are included

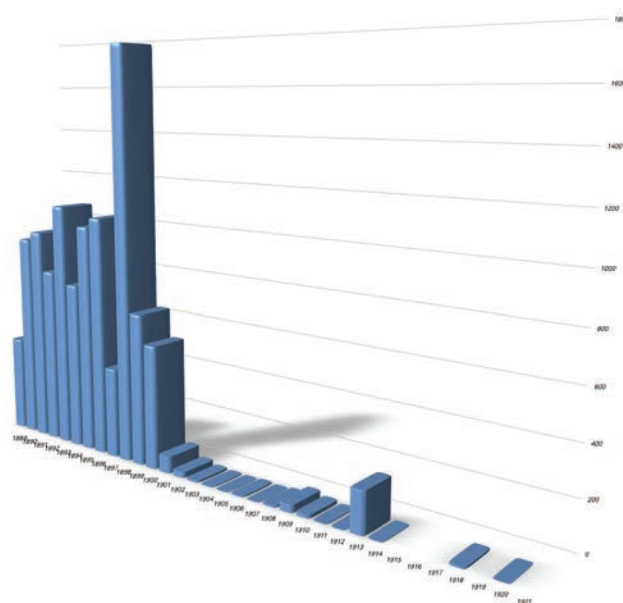


FIGURE 9. Number of Costa Rican collections made by Tonduz, 1889–1921.

[i.e., *Encyclia cordigera* (Kunth) Dressler, *Tonduz 180*; *Lycaste cruenta* (Lindl.) Lindl., *Tonduz 407*; *Cuitlauzina convallarioides* (Schltr.) Dressler and N.H. Williams, *Tonduz 523*; *Malaxis aurea* Ames, *Tonduz 894*], but none of them served as a type and they are of no interest for the purposes of this paper.

#### ORCHIDACEAE TONDUZIANAE

According to the evidence gathered from his extant collections, the orchid family was not one of Tonduz's favorite groups. Whilst roughly one in ten species of the Costa Rican flora is an orchid, and whilst epiphytic orchids represent a very common element in any of the Costa Rican landscapes, only 143 of the 5,100 known collections by Tonduz (or about 2.8%) represent species of Orchidaceae.

The Orchidaceae collected by Tonduz were scientifically described by Rudolf Schlechter, who published 56 species and 1 subspecies; Friedrich (Fritz) Wilhelm Ludwig Kränzlin (1837–1934), who authored 3 species; Oakes Ames (2 species); Alfred Barton Rendle (1865–1938), Alfred Cogniaux (1841–1916) and Florence Helen Woolward (1854–1936), who each authored a single species.

The descriptions by Schlechter, which greatly outnumber those by other authors, belong to four different groups of specimens defined by the periods and the origin of the materials. The first orchid collections by Tonduz to be described as new to science were published by Schlechter from 1906 to 1911, in his series of *Orchidaceae novae et criticae* (Schlechter, 1906, 1907, 1910, 1911). The specimens upon which the 30 new taxa were described were received at the Botanical Museum Berlin-Dahlem, as part of the materials that the IFGN sent for identification to

the National Botanic Garden of Belgium in Brussels, and distributed by them to the specialists of other recognized European botanical institutions. They correspond to plants collected by Tonduz in several Costa Rican localities during his golden age as a botanical collector, between 1890 and 1900, and most bear quite specific collecting data.

A second group of orchids, described from 1918 and 1921, belong to materials received at Berlin from the Herbarium of the Museo Nacional de Costa Rica, where Tonduz deposited his collections after the dissolution of the IFGN in 1904, and where he was briefly hired as director that same year. He worked intermittently as the curator of the herbarium under the directorship of his friend and protector Anastasio Alfaro. These specimens mostly bear no collecting date (Schlechter, 1918, 1921).

The third group of Tonduz's plants upon which Schlechter based his descriptions of new orchid species were received at Berlin shortly after World War I and published in Schlechter's *Additamenta ad Orchideologiam Costaricensem* (1923). Here Schlechter described another 13 new taxa, several of which lack any information about locality. It is noteworthy that Schlechter did not give Adolphe Tonduz the recognition of an eponymous chapter, as he did with Alberto Manuel Brenes (1870–1948) (*Orchidaceae Brenesianae*; Schlechter,



1923) and the brothers Kurt and Alfred Brade (1867–1955 and 1881–1971, respectively) (*Orchidaceae Bradeanae*; Schlechter, 1923). Instead, Tonduz's new orchids were mostly included within the chapter dedicated to the great "patroness" of Costa Rican orchidology, Amparo López-Calleja de Zeledón. In the introduction to his *Orchidaceae Amparoanae*, Schlechter (1923) remembers when, in 1921, Tonduz sent him a first collection of Costa Rican orchids, explaining that they were the result of an initiative by doña Amparo, who had not only had Tonduz pressing specimens from her cultivated plants, but had also sent Karl Wercklé (1860–1924) out to the field to collect new materials for his studies (Pupulin, 2010b). Indeed, the relationship between Schlechter and Amparo López-Calleja had begun in 1919, when, after receiving a letter from Rudolf Schlechter asking for Costa Rican orchid material, doña Amparo reacted with enthusiasm and arranged to hire Tonduz and Wercklé for this purpose. The results were three shipments of herbarium specimens that were received by Schlechter between 1921 and 1923. Among these specimens, Schlechter found three new genera and 62 new species (Schlechter, 1923). Lankester in 1923 wrote with envy: "No wonder Schlechter had a rich CR collection; he had the whole of the orchids from the National Herbarium!" In the few cases when collecting numbers are recorded (i.e., *Isochilus amparoanus* Schltr., Tonduz 32; *Cynoches amparoanum* Schltr., Tonduz 49; *Sobralia amparoae* Schltr., Tonduz 51; *Epidendrum falcatum* var. *zeledoniae* Schltr., Tonduz 132), these should not be confused with actual "field numbers" as Tonduz apparently used—again—his low numbers for the materials pickled in the garden of Amparo López-Calleja. The new orchids described from collections by Tonduz in 1913 were mostly gathered among the hills surrounding the small town of San Ramón, in the northwestern Cordillera de Tilarán. Tonduz lived in San Ramón for a short time after the disastrous expedition to the River San Juan under the patronage of Guillermo Acosta Piepper (1878–1955), mayor of the village, to whom Schlechter (1923) would dedicate his genus *Acostaea* in the Orchidaceae. Acosta was a good friend to Tonduz and helped to rescue him during the tremendous binge that put to an end his last herborization in Costa Rica in 1913 (Jiménez, 1971). Even though the specimens collected in this period and cited by Schlechter in his protologues have no numbers, some of the isotypes that we studied for the present work associate Tonduz's name with herbaria unique numbers; they are mentioned accordingly in this paper.

Finally, there is a fourth, small group of species that were described in Europe from living specimens, sent by Tonduz during his first years of activity in Costa Rica (Kränzlin, 1895a, 1895b; Rendle, 1900; Cogniaux, 1902; Woolward, 1906; Schlechter, 1919). According to Jenny (2013, 2015), Tonduz had been invited in 1889 by M. William Barbey (1842–1914) to assume the curatorship of the Herbarium Boissier in Geneva. Jenny suggests that it was the same Barbey who helped Tonduz in obtaining his position with the Costa Rican government. The Swiss engineer, botanist, philanthropist and founder of the *Bulletin de l'Herbier Boissier*, W. Barbey, married in 1869 Caroline Boissier (née Butini Boissier, 1847–1918), a Swiss botanist, and daughter

of the famous botanist Pierre Edmond Boissier (1810–1885). Throughout an entire life of botanical explorations, Pierre Boissier had assembled a large collection of exotic plants on his land in Valleyres, where more than 3,500 species of plants were grown, and at Rivage, on the shores of Lake Geneva (another 1,500 plus species, as well as an important private herbarium) (Fig. 10). Some of the plants requiring a controlled environment were grown by his daughter, Caroline, in the greenhouse built on one of her father's properties at la Grande Perrière in Chambésy, near Geneva, where all the plants of the collections at Rivage were transferred after Boissier's death in 1885.



FIGURE 10. The building hosting the Herbarium Boissier in Geneva, circa 1890. From Autran, 1896.

Among the tropical epiphytes, Orchidaceae were well represented in Boissier's collection, and by 1885 a total of 772 species and 62 varieties of living orchids, belonging to 122 genera, had been recorded (Autran and Durand, 1896). Whatever the nature of the relationship was between Tonduz and Barbey, he must certainly have had some connection with the Barbey-Boissier family, as several of his fascicles about the botanical exploration of Costa Rica were originally published in the bulletin of the Boissier herbarium (Tonduz, 1895b, 1896, 1897a). It is not known how many living plants Tonduz sent to the collections of Madame Barbey, but according to one of the employees at the Herbarium Boissier, Gustave Beauverd (1867–1942), the shipments from Costa Rica were frequent, particularly of ferns, aroids, orchids, cacti, Piperaceae and bromeliads (Beauverd, 1922). At least six of the specimens under the care of the chief-gardener at La Perrière, M. Paul Simmler, served as the basis for the description of new orchid species or to discuss previously published names (Kränzlin, 1895a, 1895b; Rendle, 1900; Cogniaux, 1902; Woolward, 1906; Schlechter, 1919). The Swiss botanist and entomologist Eugène John Benjamin Autran (1855–1912) was the curator of the Boissier Herbarium at that time. He was responsible for the identification of the Barbey-Boissier living collections and in charge of sending botanical samples of orchids for study by the best specialists of the time, Schlechter and Kränzlin in Berlin-Dahlem, and Cogniaux in Brussels. He was also the editor of the *Bulletin de l'Herbier Boissier*, where most of the new orchid species that Tonduz sent from Costa Rica to Chambésy were described.



## NUMERATION SYSTEM OF TONDUZ' SPECIMENS

The numbers associated with specimens collected by Tonduz have traditionally been regarded as his own collecting numbers and treated as such in both floristic and monographic essays (Cogniaux, 1891; Schlechter, 1906, 1907, 1910, 1911; Britton and Rose, 1928). Strictly speaking, however, they are not collector's field numbers as contemporary botanists use them, but, rather, somewhat similar to the "accession numbers" used in botanical collections. Under Tonduz's curatorship, the herbarium of the IFGN apparently adopted a system of consecutive numeration of the *exsiccata* that was independent of the collector. As Adolphe Tonduz was by far the most active collector at the Institute, followed at a great distance by its director, H. Pittier, most of the numbers assigned to the specimens at the herbarium indeed correspond to Tonduz's collections. They must not, however, be interpreted as a system of consecutive, personal numbers by Tonduz. Once specimens are arranged in ascending order, Tonduz's numeration presents in fact several "gaps." While in some cases this might be the artificial effect of unicate specimens that have been lost or destroyed (and of which we have no trace), in several cases the missing numbers appear instead in their due order in the series of the Institute collections, but associated with the name of a different collector. So, for example, IFGN number 2176 is a specimen of *Prosthechea livida* (Lindl.) W.E. Higgins, collected by Tonduz in San José on March 10, 1890, while number 2177, the type of *Ornithidium costaricense* Schltr., is a collection made by Pittier at Rancho Flores, on the slopes of Barva volcano, in February of the same year. Collections made by Tonduz at Rancho Flores that same month, are recorded at the IFGN under numbers 2147 and 2149. Number 6793, the holotype of *Inga aestuariorum* Pittier (Fabaceae), is based on a collection made by Pittier himself in April 1892, while number 6795 is a specimen of *Senna reticulata* (Willd.) H.S. Irwin & Barneby (Fabaceae), collected by Tonduz in March 1892, and number 6797, is a collection of the same month made by Pittier, (*Piper pseudodilatatum* C.DC., Piperaceae). Number 6593 (*legit* Tonduz) is *Commelina rufipes* Seub. (Commelinaceae), and number 6600 (*legit* Pittier) is the type of *Vanilla pittieri* Schltr., but both the specimens came from the banks of the River Ceibo, near Buenos Aires in southern Costa Rica, where they were both collected in January 1892.

Considering the system of accession numbers used by the employees of the IFGN to identify the specimens, there is no rational reason to believe that the numeration did not start at number one. As we noted previously, the first IFGN number assigned to a specimen of Tonduz's that can with certainty be assigned to a specific date corresponds to a collection of June 20 1889, when the naturalist had just arrived in Costa Rica. This collection, however, bears the number 1088 which would lead to the conclusion that the previous numbers had already been assigned to specimens by other collectors, probably Pittier himself or one of his colleagues. Among the numbers assigned to Tonduz, there are numbers lower than 1088, i.e. 61, an *Olyra latifolia* L.

(Poaceae) from La Guácima, or 182, a specimen of *Pharus* (Poaceae) from Limón on the Atlantic coast, but they have no collecting date. "Accession" numbers from 354 to 693 are collections made between July 1891 and January 1894. Numbers 900–903 correspond to late collections of April–May 1913.

When the National Museum inherited the botanical collections of the IFGN after its dissolution in 1904, the sheet numeration previously in use at the Institute was maintained. It remains unmodified until today, as the old numbers of the IFGN have been incorporated into the barcodes associated with each specimen. So, the plants collected by Tonduz for the herbarium of the Institute bear their original numbers. These were adopted by the herbarium of the National Museum to identify the collection sheets with a number corresponding to that handwritten on the labels of the duplicates sent out from the IFGN, and later from the Museum, to other research centres around the world. As can be seen, these numbers are not Tonduz's own numbers, but they nonetheless unequivocally identify the specimens collected by Tonduz for the Institute. When, in 1904, the Museum took over the management of the IFGN herbarium, the staff continued assigning "accession numbers," or "herbarium numbers," to new collections by Tonduz, but these numbers were diluted among those assigned to the collections of other botanists and collectors working for the Museum, including Carl Wercklé, Alberto M. Brenes, and the brothers Alfred and Alexander Curt Brade, among others.

Because of the numeration system originally adopted by the IFGN, the numbers assigned to the collection sheets at the herbarium were not always arranged chronologically, and it is legitimate to assume that later collections could sometimes receive lower numbers if processed at an earlier stage. This could explain several apparent contradictions in the numeration of Tonduz's materials. So, for example, numbers 1530–1541 belong to collections of September–November 1892, but number 1690 is from 1889, and most of the collections of 1892 have numbers from 6524 onward. Numbers from 7355 through 7463 represent collections of the year 1898, but they are included within the numbers assigned to Tonduz's collections for 1893, which range from 7226 to 8472.

Students of Tonduz's material should be forewarned, as apparently his lowest numbers might have been used for different sets of specimens, i.e. the plants he originally collected in Europe; some of the early collections from Costa Rica (IFGN numbers); the specimens prepared from plants cultivated in the garden of Amparo Calleja de Zeledón; those collected in Guatemala during his last herborizations.

Furthermore, the actual name of the collector (preceded by the word *legit*) was apparently only of accessory importance at the IFGN according to the method of numeration in use at there. For the purpose of specimen accession and filing into the collections, a given number represented, for the curators of the IFGN, simply the result of a "collection act," and was completely unrelated to who collected the plant

or the plants. Any new accession number was assigned to a new specimen or to a group of specimens supposedly belonging to the same taxon. When it/they were extracted from Pittier's field press, they were "assigned" to him (i.e., *legit* Pittier); when coming from the press of Tonduz, they became associated with Tonduz's name (i.e., *leg.* Tonduz).

The method had its shortcomings. When Pittier and Tonduz collected together—and this happened often—they frequently collected the same plants at the same locality and at the same moment. According to the system used by the curators at the IFGN, all the specimens belonging to the same taxon and the product of the same collecting act received the same accession number. This is the reason why we have collections, like those of *Epidendrum cardiophorum* from Tsaki (Apr. 1895, no. 9519), or *E. henrici* from the trees around San José (no. 2176), which have the same accession number but were recorded on some labels as collected (*lecti*) by Pittier, and on others as collections by Tonduz. The "collecting act" could sometimes include up to three different collectors, as is shown in the case of the *Oncidium turialbae* type collection. The holotype, eventually destroyed in Berlin, was a plant collected by Paul Biolley "auf 'Crescentia'-Bäumen bei Turialba" (on *Crescentia* trees at Turialba), to which the Institute assigned the number 8423. This is the information that Schlechter (1910) quoted in the protologue, and the illustrator employed by Professor Ames in Berlin copied from the holotype on

his tracings. However, two other collectors took part to that collection. On the specimen that the IFGN sent to the specialists of the Smithsonian in Washington (US 57719), number 8423 is associated with a collection by A. Tonduz ("Sur les *Crescentia* à Turialba"), and on the specimen that US received for identification from the Herbarium du Jardin Botanique de l'État in Brussels (US 57718), the same number 8423 is a collection by H. Pittier.

For the purposes of the IFGN this was obviously unimportant, but it became a nomenclatural conundrum when authors of new taxa interpreted the "accession number" of the IFGN as a true "collector number" and quoted it as such in their protologues. How should we treat the duplicates of Pittier 9519 (as it was quoted in the protologue and is written on the labels at CR and US) which are conserved at BR and G but with labels assigning the collections to Tonduz? How to manage the collection of *Epidendrum henrici* made by Tonduz and conserved at CR, which has the same accession number as the simultaneous collection by Pittier, which was eventually used as the holotype and erroneously treated as a Pittier number? In such cases, and in view of the historical and nomenclatural importance of these specimens, we opted for correcting the original error as it appeared in the protologues, quoting [between square brackets] the numbers with the meaning that was originally assigned to them at the IFGN and at CR, and treating all the specimens with the same accession numbers as duplicates.

#### TYPIFICATION OF COSTA RICAN ORCHIDACEAE DESCRIBED FROM COLLECTIONS BY A. TONDUZ

We discuss here those Tonduz' collections that served as the bases for the description of 63 new orchid taxa. They are alphabetically arranged and accordingly numbered in the catalogue from 1 to 63, beginning with *Brassavola scaposa* and ending with *Tetragamestus gracilis*. Some of the concerned species, however, have quite complicated taxonomical histories, and in several cases the same specimens were used to typify new names when the original epithets could not be maintained in the new proposed generic combinations (es. *Camaridium adolphii*, based on *Ornithidium tonduzii*; *Camaridium tonduzii*, based on *C. costaricense*; *Epidendrum boissierianum*, based on *E. biflorum*; *E. palmense*, based on *E. magnibraceatum*). In these cases, for the convenience of the reader we included the replacing names in the alphabetic arrangement of the catalogue, but they were not numbered in order to not inflate the number of taxa originally described on Tonduz' collections. *Epidendrum tonduzii*, a *nomen nudum*, is also listed alphabetically for reasons of completeness, but it is accordingly not numbered as no actual Tonduz' specimen was ever proposed to typify the name.

1. *Brassavola scaposa* Schltr., *Orchis* 13: 77. 1919. TYPE: COSTA RICA. [San José]: Auf Bäumen der Berge und Hügel bei San Jose, A. Tonduz s.n. (holotype: B, destroyed; photograph of the holotype, designated here as the lectotype: AMES 40559, barcode<sup>6</sup>00056718). Fig. 11.

The plant collected by Tonduz, on which the type specimen was prepared, was cultivated at Chambésy near Geneva, where Caroline Boissier maintained a large collection of orchids and other exotic plants in her greenhouses at "La Perrière." The type specimen was sent to the Berlin Museum for study by the orchid specialists working at the center, where it was likely destroyed in the fire of 1943. The type sheet was photographed in 1934 by R. Mansfeld upon request by professor O. Ames for the archives of the Harvard University Herbaria. This photograph is ostensibly the only evidence of the original collection, and the only candidate for the typification of *Brassavola scaposa*, and for this reason we chose it as the lectotype.

The original collecting locality cited by Schlechter in the protologue ("On trees of the mountains and hills in San José") is unlike, as with the exception of the rare and very distinctive *Brassavola acaulis* Lindl. & Paxton, Costa Rican species of *Brassavola* are restricted in distribution to the warm lowlands up to 500 meters of elevation. The unusual elevation of Tonduz' collection data also surprised Schlechter, who in the protologue noted that *B. scaposa* is "of the few species in the genus that occur at a certain altitude above sea level" (Schlechter, 1919). He compared the new species with *B. acaulis* for the short and slender stems and the terete leaves, and with *B. nodosa* Lindl. for the charactersitic of the terminal inflorescence (basal in *B. acaulis*), surpassing the leaves, and the flowers.

<sup>6</sup>Several numbers may appear stamped on sheets from AMES. When we cite a "barcode," we refer to a number given to each specimen and shown on a small label, ca. 1 × 5 cm, with the heading "Harvard University Herbaria."

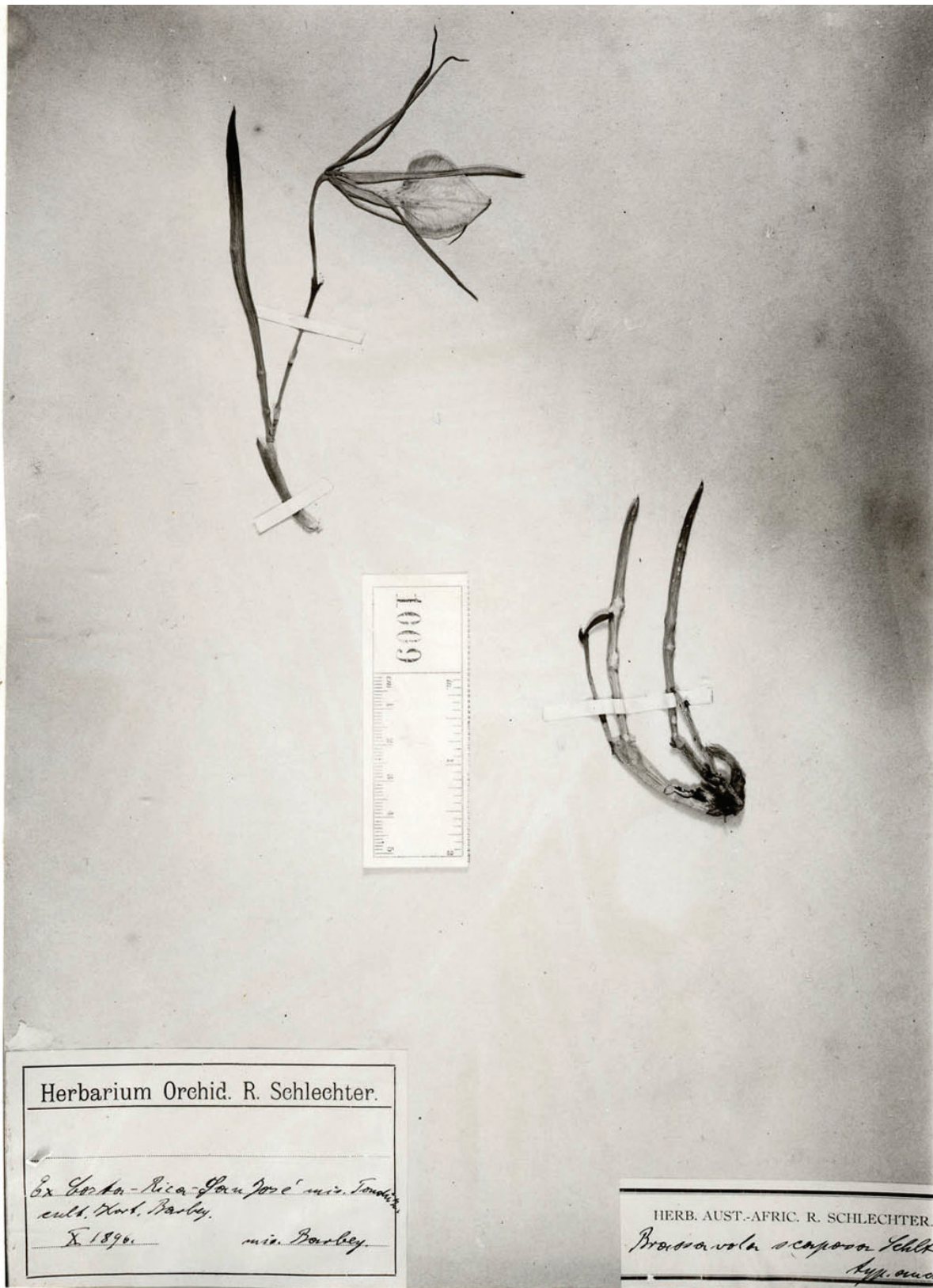


FIGURE 11. Lectotype of *Brassavola scaposa*. Courtesy of the Harvard University Herbaria, reproduced with permission of the President and Fellows of Harvard College.



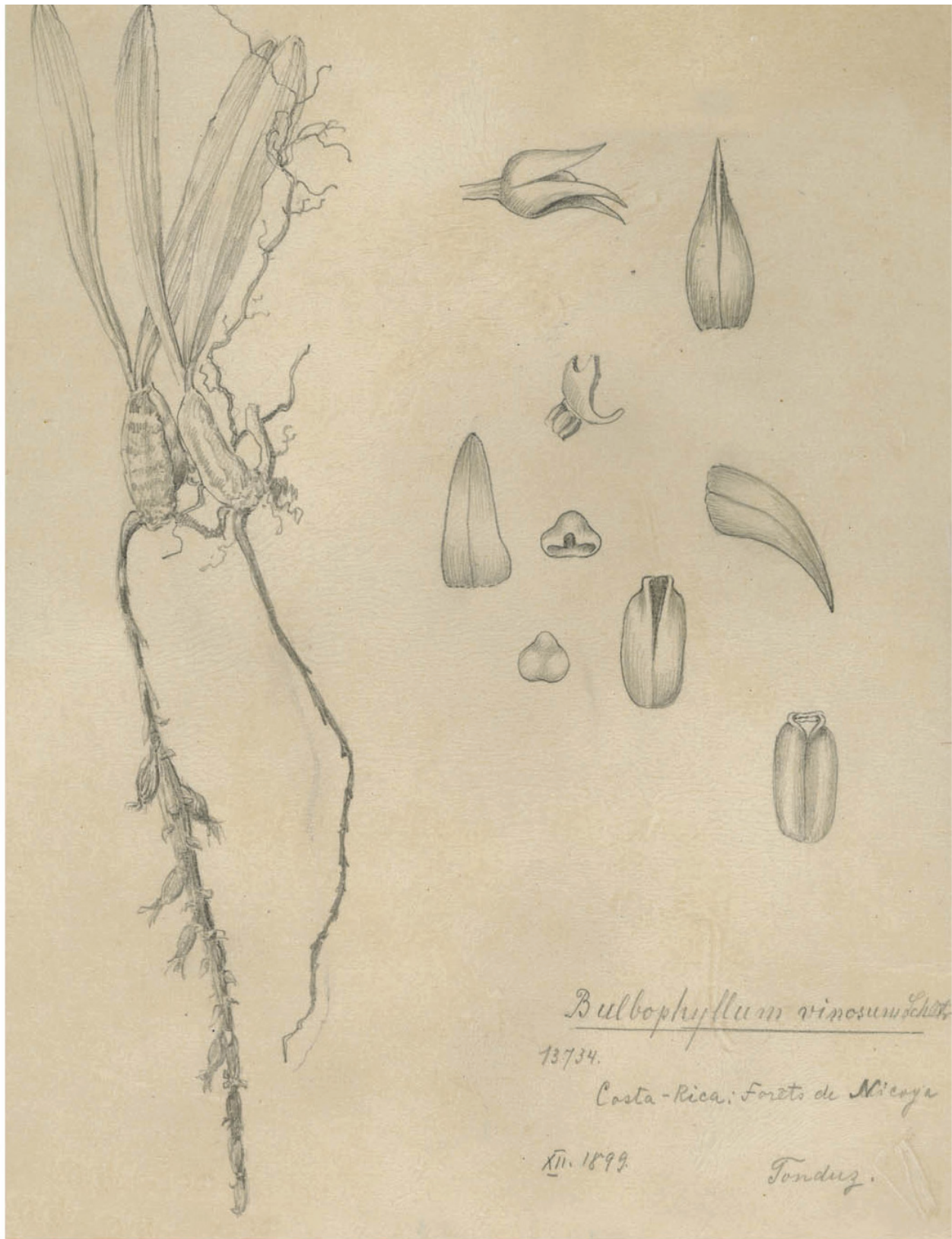


FIGURE 12. Lectotype of *Bulbophyllum vinosum*. Courtesy of the Harvard University Herbaria, reproduced with permission of the President and Fellows of Harvard College.

In Costa Rican populations of *B. nodosa sensu lato* from the Pacific lowlands, the inflorescence is usually distinctly shorter than the leaves, while it is subequal to longer than the leaves in populations from the Caribbean lowlands, which may perhaps be treated as a different taxon. Schlechter (1919) compared *B. scaposa* with a *Brassavola* specimen illustrated by Alphonse Gossens (1866–1944) in the *Dictionnaire iconographique des orchidées* (Cogniaux and Gossens, 1897) and treated as *B. grandiflora* Lindl., which was based on a plant collected at Puntarenas, on the Pacific coast of Costa Rica.

The photograph of the holotype at AMES (Fig. 11) clearly show a specimen that, albeit vegetatively small (leaves vary in length from 6.5 to 9.5 cm), has terete leaves and short inflorescences that barely reach half the length of the subtending leaf. The single flower is comparatively large with respect to the plant, but with sepals 5.5 cm long and a lip 4.5 cm long, it is smaller than flowers of other populations recorded from the Pacific coast (i.e., Pupulin, 1998: 970–971).

The name has been treated as a synonym of *Brassavola nodosa* (L.) Lindl. by Pupulin (2002) and Dressler (2003), and we agree with that interpretation.

2. *Bulbophyllum vinosum* Schltr., Beih. Bot. Centralbl., Abt. 36(2): 411–412. 1918. TYPE: COSTA RICA. [Guanacaste], Forêts de Nicoya, December 1899, A. Tonduz s.n. (*Herb. Inst. Fis.-Geogr. Nac. 13734*) (holotype: B, destroyed; lectotype, selected here: tracings of the original illustration of the holotype made under Schlechter's supervision, AMES 00027795/barcode 0027795; illustration of the flower from the holotype published by Mansfeld, 1931: no. 238). Fig. 12.

No actual type material of the species is known to be in existence. The tracings of Schlechter's drawings made in Berlin under the supervision of Schlechter, chosen here as the species' lectotype, clearly illustrate the habit and the floral details of this relatively common species. The name is a synonym of the widespread *Bulbophyllum pachyrachis* (A.Rich.) Griseb.

*Camaridium adolphi* Schltr., Repert. Spec. Nov. Regni Veg. Beih. 19: 58, 141. 1923. See replaced name: *Ornithidium tonduzii* Schltr.

3. *Camaridium costaricense* Schltr., Repert. Spec. Nov. Regni Veg. 3(42–43): 249. 1907. TYPE: COSTA RICA. Auf einem Baume eines Weideplatzes bei La Palma, ca, 1550 m, blühend im August 1898, A. Tonduz s.n. (*Herb. Instit. physico-geogr. nat. costaricensis 12429*) (holotype: B, destroyed; lectotype, selected here: US 815052/barcode 00393654; isolectotypes: CR 12429; K 000079320; US 577589/barcode 00094068; tracings of the original illustration of the holotype made under Schlechter's supervision: AMES 24146/barcode 00106440). Fig. 13A.

Synonym: *Camaridium tonduzii* Schltr., Repert. Spec. Nov. Regni Veg. 8(191–195): 571. 1910, *nom. illeg.*; *Maxillaria tonduzii* Ames & Correll, Bot. Mus. Leaflet 11(1): 17–18. 1943, replacing name.

The drawings made by John Atwood for his studies in Costa Rican *Maxillaria*, hydrating flowers from the isotypes at US, perfectly match the copy of Schlechter's sketches of the holotype, kept at AMES. While the isotype at CR has no flowers, and US 577789 only has a crushed flower in a pocket, both the isotypes at US (815052) and K are fertile. Even though the fertile plant at US probably represents just a couple of lateral branches of a main stem, we choose to lectotypify the species with this specimen because it was studied and illustrated by Atwood for his detailed monograph of *Maxillaria sensu lato* for the flora of Costa Rica (Atwood, 1999).

Overlooking his previous description of *C. costaricense* of 1907, Schlechter described the same species again three years later with the name *Camaridium tonduzii*, basing it on the same specimen collected by Tonduz under his number 12429 (Schlechter, 1910). Under the provisions of art. 52.1. of the International Code of Nomenclature for algae, fungi, and plants (Melbourne Code) (McNeill et al., 2012), the latter name is therefore illegitimate and to be rejected as nomenclaturally superfluous (the taxon to which it was applied including the type of a name that ought to have been adopted under the rules).

When *Maxillaria* Ruiz & Pav. is treated in its broadest sense, *sensu* Chase et al. (2015), *C. costaricense* must be treated as *M. tonduzii* Ames & Correll, a new name created to circumvent the previous use of the specific epithet *costaricense* in *Maxillaria*, already occupied by *M. costaricensis* Schltr. (1923). If a narrower circumscription of *Maxillaria* is adopted instead, as that proposed by Whitten et al. (2007) and Blanco et al. (2007), the correct name in *Camaridium* is *C. costaricense*.

4. *Camaridium dendrobioides* Schltr., Beih. Bot. Centralbl., Abt. 2 36(2): 415. 1918. TYPE: COSTA RICA. Forêts des collines de San Ramón, 1500–1600 m, May 1913, A. Tonduz s.n. (*herb. Mus. Nation. Costa Rica 17620*) (holotype: B, destroyed; lectotype, selected here, the isotype at US 94065/barcode 1080674; isolectotype: K 000463350; copy of Schlechter's original illustration of the type: AMES 24138/barcode 00106423; illustration of the flower from the holotype published by Mansfeld, 1931: no. 238). Fig. 13B. Synonyms: *Maxillaria dendrobioides* (Schltr.) L.O. Williams, Ann. Missouri Bot. Gard. 8(191–195): 571. 1910. *Adamanthus dendrobioides* (Schltr.) Szlach., Richardiana 7(1): 30. 2007[2006].

Both the isotypes at US and K bear the number 17619, assigned to the specimens by the staff of the Museo Nacional de Costa Rica, while in the protologue Schlechter cited number 17620. The latter number, however, belongs to a collection of *Epidendrum majale* (see above, under this species' entry). As the labels of both the sheets state that they were collected in the "Forêts des collines de San Ramón, 1500–1600 m, 12 May 1913," in accordance with the citation in the protologue, we prefer to treat the number citation in Schlechter (1923) as a *lapsus calami*, and consequently the specimens at US and K as isotypes. The isotype at US, selected here as the lectotype, is fertile



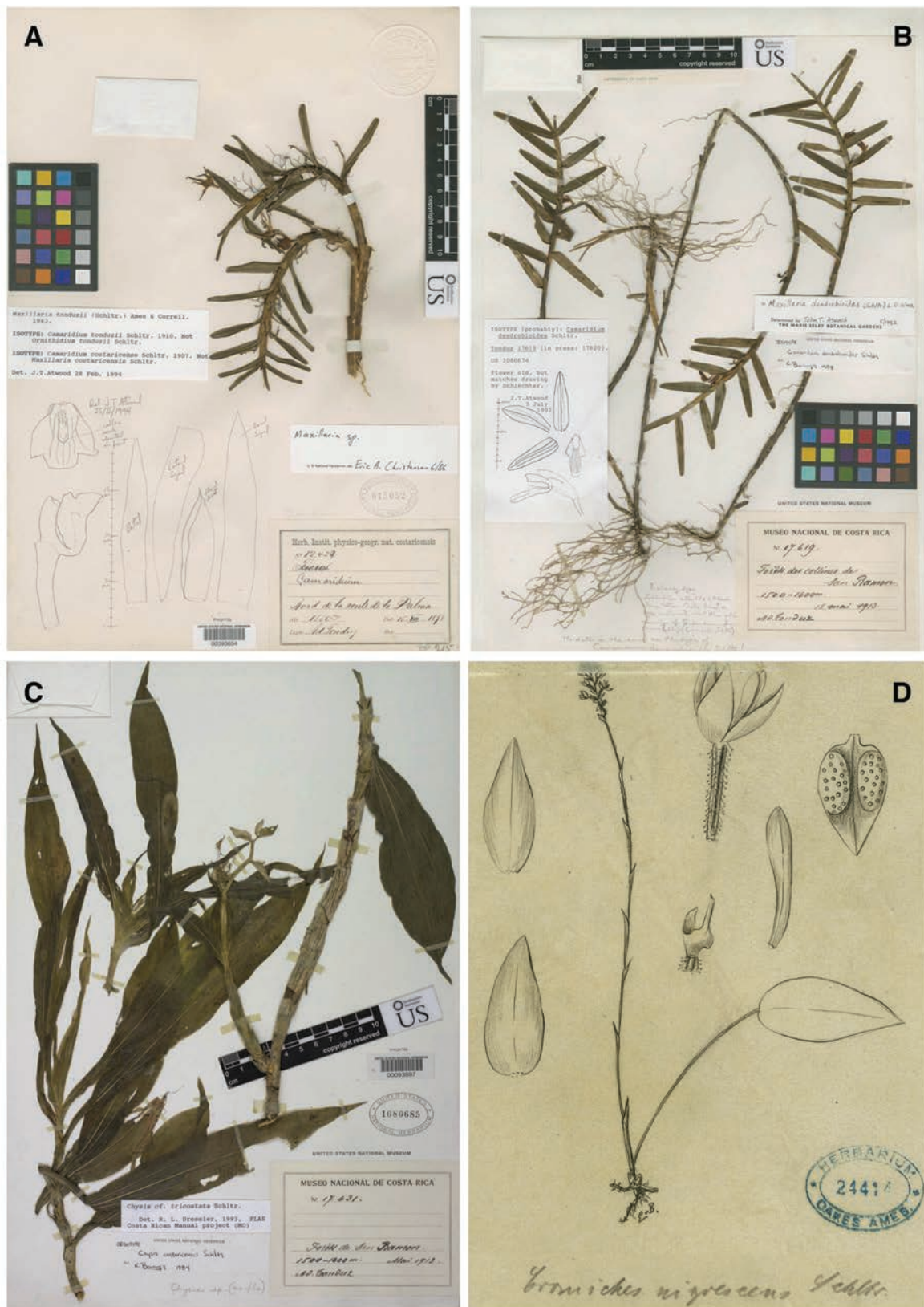


FIGURE 13. **A**, Lectotype of *Camaridium costaricense*; **B**, Lectotype of *Camaridium dendrobioides*; **C**, Lectotype of *Chysis costaricensis*; **D**, Lectotype of *Cranichis nigrescens*. A–C, courtesy of the United States National Herbarium, Smithsonian Institution; D, courtesy of the Harvard University Herbaria, reproduced with permission of the President and Fellows of Harvard College.



and in perfect condition. It was studied and annotated by C. Schweinfurth and by Atwood for his treatment of Costa Rican *Maxillaria* (1999), who hydrated and drew one of the flowers of the type specimen.

Even though in his treatment of *Maxillaria* for the *Flora Costaricensis*, Atwood (1999) cited the holotype of *C. dendrobioides* as conserved at CR, this probability is unlikely, as the original specimens studied by Schlechter were destroyed in Berlin. He was probably misled by Schlechter's citation of the herbarium of the Museo Nacional de Costa Rica in the species' protologue, but this is just the number that the Museum assigned to the collection of Tonduz to uniquely identify it before sending the specimen to Berlin. No specimens of *C. dendrobioides* are actually conserved at CR. Atwood (1999) treated *C. dendrobioides* (under *Maxillaria*) as a complex of species, probably including *C. simile* Schltr., *C. jimenezii* Schltr., and *Maxillaria valerioi* Ames & C. Schweinf.

The copy of Schlechter's original drawing conserved at AMES well illustrate the habit and flower of the species, with the distinctly three-lobed lip, provided with a ligulate midlobe, which characterize *C. dendrobioides* when considered as a distinct species from *C. simile* and *C. jimenezii*.

*Camaridium tonduzii* Schltr. Repert. Spec. Nov. Regni Veg. 8(191–195): 571. 1910. See discussion under *Camaridium costaricense*.

5. *Chysis costaricensis* Schltr., Repert. Sp. Nov. Regni Veg. Beih. 19: 297. 1923. TYPE: COSTA RICA. Forêts de San Ramón, alt. 1500–1600 m, Mai 1913, A. Tonduz s.n. (*Herb. Nat. Costaric. 17631*) (holotype: B, destroyed; isotype, selected here as the lectotype: US 1080685/barcode 00093897). Fig. 13C.

The specimen conserved at US is the only extant evidence of the original material described by Schlechter, and is therefore selected as the species' lectotype. It is, however, a sterile specimen, and the real identity of *C. costaricensis* could therefore remain quite a mystery. The chances to collect the species again in the forests of San Ramón are low, as plants of *Chysis* have been severely collected in the field due to their showy flowers, and several populations in the area of San Ramón are known to have become extinct through overcollection and the impact of coffee plantations.

In 1993, Dressler annotated the isotype specimen with the name *C. tricostata* Schltr., but this taxon of dubious Central American origin has thick pseudobulbs, while according to the protologue, the pseudobulbs of *C. costaricensis* are just about 1 cm in diameter, according with the plant mounted on the sheet at US. For this reason, both Pupulin (2002) and Dressler (2003) treated *C. costaricensis* as a synonym of the narrow, fusiform-stemmed *C. bruennowiana*, even though the latter is based on a Peruvian collection by J. Warczewicz. Dressler (2003) also suggested that the Pacific populations of the Costa Rican *C. bruennowiana*, characterized by pendulous, lax pseudobulbs, could be treated as a distinct taxon, in which case they would correspond to

*C. costaricensis*. It is clear that the identification of the Central American species of *Chysis* is in urgent need of a second taxonomic look (see Fowlie, 1971; Dressler, 2000).

6. *Cranichis nigrescens* Schltr., Repert. Spec. Nov. Regni Veg. 10(263–265): 482. 1912. TYPE: COSTA RICA. Ohne nähere Standortsangabe, A. Tonduz s.n. (holotype: B, destroyed; tracings of the original drawing of the holotype made under Schlechter's supervision, selected here as the lectotype: [AMES 24414/barcode 00098427] [Fig. 13D]; illustration of the flower from the holotype published by Mansfeld, 1931: no. 24).

We were unable to find any specimen belonging to the original collection by Tonduz, and we therefore selected the drawing at AMES as the species' lectotype. The drawing includes floral dissections and the plant habit, the latter of which was not published by Mansfeld (1931). The name is a synonym of *Cranichis diphylla* Sw., a species widespread in the Neotropics from Mexico to Peru and the Antilles, which can be recognized by the entire petals, the concave lip and the inconspicuous bracts of the stem.

7. *Cycnoches amparoanum* Schltr., Repert. Spec. Nov. Regni Veg. Beih. 19: 48. 1923. SYNTYPES: COSTA RICA. San José: Kultiviert im Garten der Mdme. Amparo de Zeledón von El Guayabe [Guayabo] bei Turrialba, im Jahre 1920, A. Tonduz 49 (B, destroyed); blühend in August–September 1921, C. Wercklé 86 (B, destroyed). Lectotype, selected by Pupulin (2010b); tracing of Schlechter's drawings of a syntype: AMES 31562/barcode 00098523.

No extant type material of the species is known to exist. The analytical drawings of the plant and the flower at AMES, based on one of the syntypes, bear no annotation of the collector's name and the plant cannot be assigned with certainty to Tonduz or Wercklé. However, Pupulin (2010b) noted that the description of the plant in the protologue was likely prepared from a cultivated specimen, and this suggests the Tonduz specimen, cultivated in one of the properties of Amparo López-Calleja near Turrialba. A photograph of the lectotype is provided in Pupulin 2010b (Fig. 14A).

8. *Cycnoches tonduzii* Schltr., Repert. Spec. Nov. Regni Veg. Beih. 19: 298. 1923. TYPE: COSTA RICA: San Ramón, im Mai 1913, A. Tonduz s.n. (holotype: B, destroyed; copy of the original drawing of the type, made by Mansfeld in 1934, selected here as the neotype: AMES 40544/barcode 00098544). Fig. 14B.

No actual original material studied by Schlechter remains, and the drawing made by Mansfeld, done nine years after Schlechter's death, is not eligible for lectotypification. However, as the drawing requested by professor Ames to understand the concept of *Cycnoches tonduzii* is the only remaining evidence related to the type material, we propose to neotypify the species with this drawing.

The taxonomy of the genus *Cycnoches* is in great need of clarification about species circumscriptions. Dressler (2003) considered *C. tonduzii* a synonym of *C. warszewiczii* Rchb.f., a species shared by Costa Rica and western



FIGURE 14. **A**, Lectotype of *Cynoches amparoum*; **B**, Neotype of *Cynoches tonduzii*; **C**, Lectotype of *Elleanthus tonduzii*; **D**, Lectotype of *Epidendrum abbreviatum*. A–B, D, courtesy of the Harvard University Herbaria, reproduced with permission of the President and Fellows of Harvard College; C, courtesy of the Museo Nacional de Costa Rica, Departamento de Historia Natural.

Panama, while D'Arcy (1987) treats it as a synonym of *C. ventricosum* Bateman, originally described from Guatemala. Female flowers of other *Cycnoches* species in Costa Rica have general flower morphology quite similar to that drawn by Schlechter in his sketch of the type of *C. tonduzii*, but staminate flowers also have a distinctly shorter column, while the gynostemium drawn by Schlechter belongs without doubts to a pistillate flower, which could only correspond in the concerned region to *C. warscewiczii*.

9. *Elleanthus tonduzii* Schltr., Repert. Spec. Nov. Regni Veg. 8(191–195): 567. 1910. TYPE: COSTA RICA. auf Bäumen bei La Palma, blühend im Jul 1895, A. Tonduz s.n. (*Herb. Instit. physic-geogr. nat. costaricensis* 9689) (holotype: B, destroyed; isotypes: AMES 20858/barcode 00090609; US 815039, BR 0000009895270; CR 9689, selected here as the lectotype [Fig. 14C]; tracing of the original drawing of the holotype made under Schlechter's supervision: AMES 24337/barcode 00099070; flower analysis published by Mansfeld, 1930: no. 18).

The isotype specimen at the herbarium of the Museo Nacional de Costa Rica is complete and fertile, and it is in excellent condition, so we selected it as the species' lectotype. The isotype at AMES, even if smaller than the other isotypes, only including the apical portion of a stem, is particularly useful as one of its flowers was drawn and dissected by Schweinfurth for his studies on Central American orchids. The sheet also includes an ink drawing of the original plant mounted on Schlechter's holotype. On another sheet at AMES, the tracings of Schlechter's original drawing include the dissection of the flower, later published by Mansfeld in his compilation of Schlechter's flower analyses of new orchids (Mansfeld, 1930).

*Elleanthus tonduzii* is endemic to Costa Rica and western Panama, and living plants may exceed three meters in length in their natural habitat. The bright red to orange-red flowers on strongly ramified stems provided with narrow leaves make this species unmistakable.

10. *Encyclia tonduziana* Schltr., Repert. Spec. Nov. Regni Veg. Beih. 19: 132. 1923. SYNTYPES: COSTA RICA. [Alajuela]. Cismo bei San Jeronimo de Grecia, um 2100 m, blühend im April 1910, A. Brade & C. Brade 1274 (syntype: B, destroyed; neotype, chosen by Pupulin and Bogarín (2012): tracing of Schlechter's sketch of the holotype, AMES 31577/barcode 00099108. COSTA RICA. [Alajuela]. Forêts de San Ramón, 1500–1600 m, May 1913, A. Tonduz s.n. [17649 Herb. Costaric.] (syntype: B, destroyed).

Schlechter (1923) dedicated this species to Adolphe Tonduz as he knew that the researcher of the Costa Rican flora had recently passed away. It is a synonym of *Encyclia mooreana* (Rolfe) Schltr., originally described from several plants of cultivated origin, and Schlechter (1923) also described it another time with the name *E. brenesii* on the basis of another Costa Rican collection by Alberto Brenes.

The reflexed, olive-green sepals and petals stained with purple, and the violet-purple lip, with the suborbicular midlobe folding downward laterally and the lateral lobes

that are basally narrow and wider at apex, easily distinguish this species. A photograph of the neotype is provided by Pupulin and Bogarín (2012: Fig. 4, 25).

11. *Epidendrum abbreviatum* Schltr., Repert. Spec. Nov. Regni Veg. 3(33): 107. 1906. TYPE: COSTA RICA. Ohne Nummer und nähere Standortsangabe, 10 May 1913, H. Pittier u A. Tonduz 17618 [correct: A Tonduz s.n. (*Mus. Nac. Costa Rica* 17618)] (holotype: B, destroyed; photo of the holotype, selected here as the lectotype: AMES 39204/barcode 00070025 [Fig. 14D]; illustrations of type: AMES 26028/barcode 70023, AMES-70024; flower analysis published by Mansfeld, 1930: no. 182).

Even though Schlechter (1923) cited the type of *E. abbreviatum* as a collection by Pittier and Tonduz, the number recorded in the protologues, 17618, unequivocally belongs to a collection by Tonduz alone. The photographs of the original sheets of the Botanical Museum of Berlin-Dahlem, conserved at AMES and chosen here as the species' lectotype, clearly show that Schlechter received two specimens of this species from Costa Rica. The first, sent from the Instituto Físico-Geográfico Nacional in the last years of the nineteenth century, is a collection without locality and *sine numero* by Pittier and Tonduz, while the second is a plant collected by Tonduz at San Ramón in 1913, which was sent to the German specialist from the Museo Nacional de Costa Rica under the Museum's number 17618. As the latter is the only number that Schlechter associated with the type in the protologue, it must be regarded as the holotype.

The name is the basionym of *Prosthechea abbreviata* (Schltr.) W.E.Higgins, a species easily recognized by the widely spaced, mostly diphyllous pseudobulbs, the inflorescence produced from a spathe and the almost flat lip.

12. *Epidendrum acrochordonium* Schltr., Beih. Bot. Centralbl., Abt. 2 36(2): 400–401. 1918. TYPE: COSTA RICA. A. Tonduz s.n. [holotype: B, destroyed; lectotype designated by E. Santiago and E. Hágsater (2006): tracing of Schlechter's drawings of the holotype, AMES 26926/barcode 00070028; illustration of the flower from the holotype published by Mansfeld, 1931: no. 184].

Synonym: *Epidendrum pumilum* Rolfe, Bull. Misc. Inform. Kew 1863(79): 171. 1893.

In the absence of any actual specimens or other type material of this species, Santiago and Hágsater (2006) selected the copy of the type drawing at AMES, made under the supervision of Schlechter himself, as the lectotype (Fig. 15).

The name is a synonym of *E. pumilum*, based on a plant imported from Costa Rica and grown by Messrs. F. Sander & Co., of St. Albans. The small plants with verrucose stems and ovate, pustulose leaves, and the pale yellow flowers with a white lip, marked with a single, dark purple fleck, are unmistakable characters of this species.

13. *Epidendrum adolphii* Schltr., Repert. Spec. Nov. Regni Veg. 3(33–34): 108. 1906. TYPE: COSTA RICA. In den



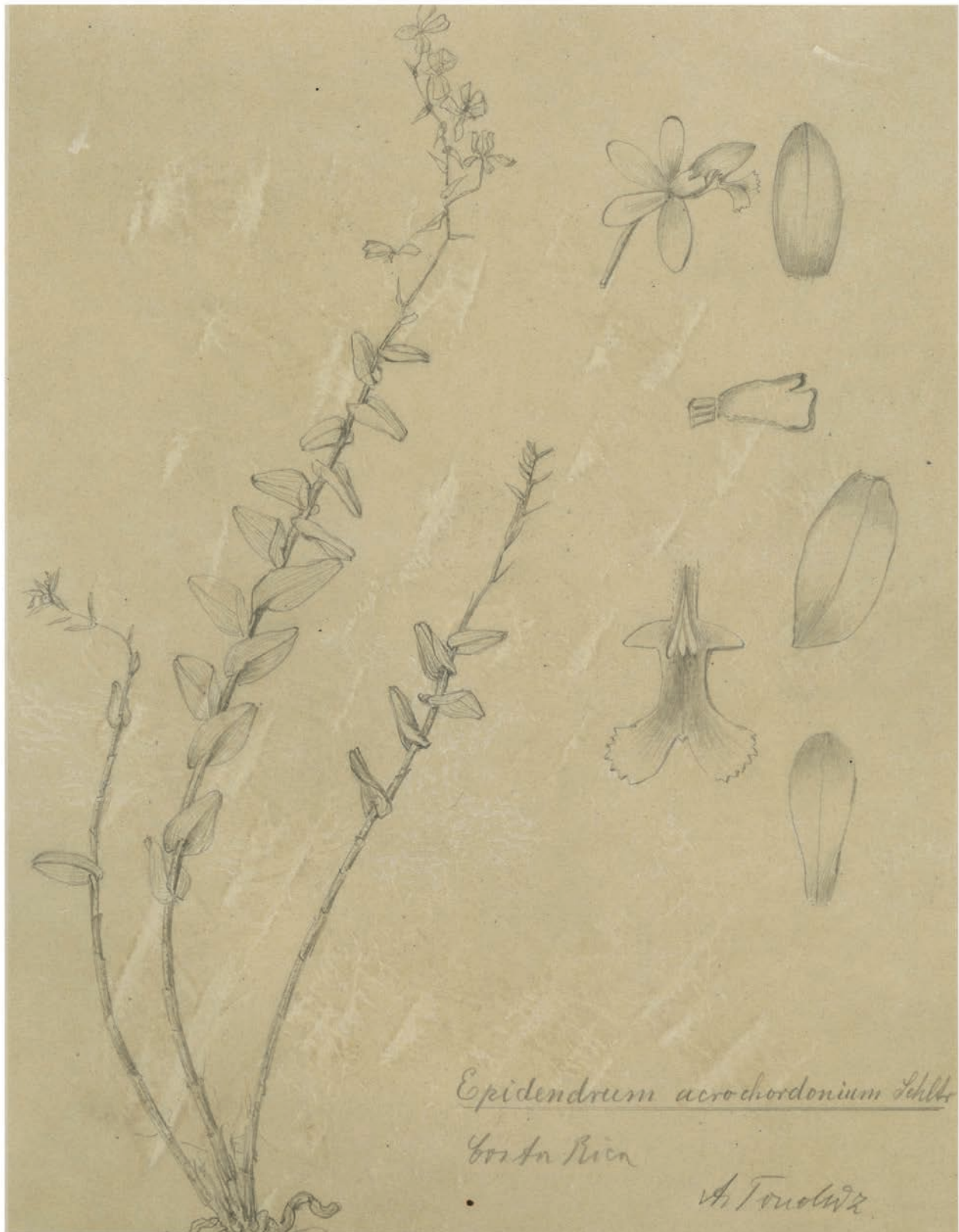


FIGURE 15. Lectotype of *Epidendrum acrochordonium*, selected by Santiago & Hágsater (2006). Courtesy of the Harvard University Herbaria, reproduced with permission of the President and Fellows of Harvard College.

Wäldern von Tablazo, ca. 1800 m, blühend im Apr. 1893, *A. Tonduz s.n.* (*Herb. Instit. Costaric. no. 7950*) (holotype: B, destroyed; isotype, selected here as the lectotype: BR 657366/barcode 00006573669 [Fig. 16A]; copy of Schlechter's drawings of the holotype, AMES barcode 00070042).

Homotypic synonym: *Oerstedella adolphi* (Schltr.) Brieger, *Die Orchideen* 9(33–36): 516. 1977.

Heterotypic synonyms: *Epidendrum endresii* Rchb.f., *Gard. Chron.*, n.s., 19: 432. 1883.

*Epidendrum tonduzii* C.H.Lank., *nom. nud.*

The tracing of Schlechter's drawing of the holotype, which were previously chosen as the species' lectotype (Santiago and Hágsater, 2007), clearly illustrate the verrucose sheaths of the stem, the 4-lobed lip, the dorsally glabrous sepals, and the clinandrium longer than the free portion of the column, which are characteristic of the species. The existence of an isotype in BR, which is complete, fertile and in good condition, makes that lectotypification superfluous and supersedes it.

The name is synonym of *Epidendrum endresii*, originally described on the basis of a number of plants collected in Costa Rica by A. R. Endrés and F. C. Lehmann, and material cultivated by F. Sander.

As previously discussed by Santiago and Hágsater (2007), the name *Epidendrum tonduzii* is nothing more than a simple *lapsus calami* by Charles H. Lankester (1879–1969) who, discussing some of his recent collections of *Epidendrum*, wrote the specific epithet of one of the species as “tonduzii” (surname) instead of “adolphii” (Tonduz' given name, as used by Schlechter), giving in some way the impression of proposing a new species (Lankester, 1924). As Lankester never prepared a type for a plant that he was not willing to describe, and being aware of the identity of this concept with that of *E. adolphi*, Santiago and Hágsater (2007: sub pl. 931) proposed to neotypify *E. tonduzii* with the tracings of Schlechter's original drawing of *E. adolphi*, which they also selected as the lectotype of the latter name (Santiago and Hágsater, 2007: sub pl. 931). This option, however, is expressly contrary to the provisions of art. 61.5 of the Code of Nomenclature (McNeill et al., 2012), which states, “Confusingly similar names based on the same type are treated as orthographical variants.” In Lankester's paper (1924), *Epidendrum tonduzii* was published without any description or diagnosis, and the name is not referred to any former one, and we therefore consider that it should be simply treated as a *nomen nudum*.

14. *Epidendrum barbeyanum* Kraenzl., *Bull. Herb. Boissier* 3(11): 607. 1895. TYPE: COSTA RICA. “Das exemplar, nach welchem ich diese neue Art aufstelle, erhielt ich durch Hrn. Eug. Autran aus der Sammlung der Mad. William Barley-Boissier zu Chambésy bei Genf; es stammt aus Costa Rica. Es wurde durch Herrn Ad. Tonduz, Leiter des Botanischen Instituts in San José gesandt,” *A. Tonduz s.n.* (holotype: B, destroyed; neotype, designated here: a specimen ostensibly prepared from the same plant used for the holotype: COSTA RICA. Bords du Virilla pres de San José. Serres de la Perrière, 10 October 1897, *A. Tonduz s.n.*

[G 00428338] [Fig. 16B]; F negative coll. 25440 [in part]; copies of the photograph: AMES 34975/barcode 00070103; SEL).

Homotypic synonym: *Neolehmannia barbeyana* (Kraenzl.) Garay & Dunst., *Venez. Orchid. Ill.* 6: 38. 1976.

Heterotypic synonym: *Epidendrum amparoanum* Schltr., *Repert. Spec. Nov. Regni Veg. Beih.* 19: 34. 1923. TYPE: COSTA RICA. [San José: Moravia,] San Jerónimo, c. 1350 [m], blühend im Mai 1921, C. Wercklé 10 (holotype: B, destroyed).

*Epidendrum barbeyanum* was described on the basis of a plant originally collected in Costa Rica by A. Tonduz and sent as a living specimen to the Barbey-Boissier conservatory in Chambésy, near Geneva. A portion of the plant was prepared for study by Eugène Autran (1855–1912), a known botanist and entomologist who was the curator and an active collector of the Boissier Herbarium, where he also edited the *Bulletin l'Herbier Boissier*. Among his activities, he was in charge of the taxonomic identification of the large collections of living plants maintained by Pierre Edmond Boissier, his daughter Carolina and his son-in-law William Barbey. The collection had, by 1885, reached the respectable figure of over 4200 species, 772 of which were orchids (Autran and Durand, 1896). After receiving the plant from Autran in Gross-Lichterfelde, near Berlin, Kränzlin described it in September of 1895, mentioning its origin as “Costa Rica,” without specifying a locality and a date referable to the collection (Kränzlin, 1895a). A specimen of the same species, today conserved at the herbarium of National Museum in Costa Rica under the original number 1339 of the IFGN, was collected by Tonduz along the “*haie d'un pâturage près San Juan*” (hedge of a pasture near San Juan [correctly San José]), on September 28, 1889. Considering the times necessary to ship the plant to Switzerland, having it cultivated and flowered, and a dried specimen sent out to a specialist for determination, it is not improbable that the material eventually studied by Kränzlin was part of the same collection as the specimen kept at CR.

Reviewing the taxonomy of *E. barbeyanum*, Sánchez Saldaña and Hágsater (2006) refer to the holotype as a specimen conserved at G, also citing photographs of the type filed in the collections of the Harvard University Herbaria (AMES) and the Marie Selby Botanical Gardens (SEL). The photograph of the specimen was documented by J. Francis Macbride (1892–1976) in the context of his project, funded by the Rockefeller Foundation and based at the Field Museum of Natural History, aimed at photographing European herbarium specimens of nomenclatural types (*F negative collection 25440*). Interestingly, Macbride's negative of *E. barbeyanum* is filed at F under the “Types of the Delessert Herbarium,” where it was probably never included, as the materials of this herbarium were presented to the City of Geneva by Delessert's nieces, the baronesses of Hottinger and Bartholdi, as early as 1869 (Staples and Jacquemoud, 2005), while the herbarium Barbey-Boissier was donated to the Botanical Institute of the University of Geneva only in 1918, and its specimens were gradually incorporated in the Botanical Conservatory of the City from 1943 until 1975 (Jacquemoud, 2011).





FIGURE 16. **A**, Lectotype of *Epidendrum adolphii*; **B**, Neotype of *Epidendrum barbeyanum*; **C**, Holotype of *Epidendrum biflorum*; **D**, MacBride's photography of the sheet with specimens of *Epidendrum barbeyanum*, taken at the herbarium of the University of Geneva, ca. 1936–1937. A, courtesy of the Herbarium, Botanic Garden Meise; B–C, courtesy of the Herbarium, Conservatoire et Jardin botaniques de la Ville de Genève; D, courtesy of the Field Museum, Chicago.



The photograph by James Francis Macbride (Fig. 16D), which was taken in late 1936 or early 1937 (Field Museum of Natural History, 1937), when the sheet was still conserved at the University of Geneva, unequivocally shows several specimens mounted on a single sheet, the earlier of which prepared on October 1895, posterior to the date of the original description. A second label on the same sheet provides information about the original collecting locality (“*Bords du Virilla près San José. Costa Rica. Tonduz*”) but it is dated October 1897, and this confirms that the stems with flowers mounted on the sheet were prepared at two different times, albeit from the same living specimen. Evidently, Autran was conscious of the value of the original plant on which Kränzlin based its description of *E. barbeyanum*, and prepared several specimens from what we could today consider the “clonotype,” even though this category has no meaning in botanical nomenclature.

At the herbarium of the Conservatoire et Jardin botaniques de la Ville de Genève, where they are kept today, the specimens are mounted on two sheets, the first one (G00420236) including the parts flowered in October 1895, and the second one (G00428338, Fig. 16B) the gatherings of October 1897. According to the provision of Art. 9.3 of the Code of nomenclature (McNeill et al., 2012), neither the actual specimens nor their photograph are eligible for lectotypification, as for nomenclatural purposes the definition of “original material” is limited to those specimens and illustrations that were unpublished and published either prior to or together with the protologue. The additional fact that the sheet photographed by Macbride is not annotated in Kränzlin’s handwriting, supports our view that these specimens were never seen by the author of the species.

As Tonduz’ specimen at CR is sterile, we choose to neotypify the species with the specimen prepared in Switzerland in October 1897 (Fig. 16B), as it was ostensibly prepared, though at a different date, from the same specimen cultivated in the greenhouses de La Perrière and sent to Kränzlin for determination, on which he described *E. barbeyanum*. The selected neotype is more complete than the specimen prepared on October 1895, as it includes a flattened, ancipitous stem covered by broadly loose leaf-sheaths, narrower at the base and broadening toward the apex, the elliptic leaves and large flowers with a broad, trilobed lip and a reduced clinandrium, which are typical of the species.

*Epidendrum barbeyanum* was also described by Schlechter as *Epidendrum amparoanum*, based on a collection by Karl Wercklé from the heights of San Jerónimo, not far from San José. As discussed by Pupulin (2010b), no specimens or any other material associated with Schlechter’s protologue exist, and the species is awaiting neotypification.

15. *Epidendrum biflorum* Cogn., Bull. Herb. Boissier, sér. 2, 2(4): 337–338, f. 1–3. 1902. TYPE: COSTA RICA. Dans les serres de la Pierrière (Chambézy), sur la fin de Décembre 1901, A. Tonduz & W. Barbey s.n. (holotype: G 00305449 [Fig. 16C]).

Synonym: *Epidendrum boissierianum* Schltr., replacing name.

Alfred Cogniaux described *E. biflorum* on the basis of a plant originally sent by Tonduz from Costa Rica and cultivated in the greenhouse of Madame Barbey at Chambézy, where it flowered for the first time at the end of 1901. Cogniaux’ description was published the following year in the bulletin of the Boissier herbarium (Cogniaux, 1902). At the time of its publication, the name was however predated by *Epidendrum biflorum* Ruiz and Pav. (1798), based on a collection from Tarma, in central Peru. In 1918, Schlechter created for it the substitute name *Epidendrum boissierianum*.

The holotype at G includes the apices of two stems, each with a single flower, plus a copy of the original illustration drawing prepared by Cogniaux and published in the bulletin of the Boissier Herbarium.

The name is a synonym of *Epidendrum sculptum* Rchb. f. (1854), a broadly distributed species ranging from Mexico to Ecuador and the Guyanas, originally based on a collection by C. F. Lehmann from Chagres in Panama. The specimen presented in the lectotype illustration, based on a cultivated plant, is erect, but in its natural habitats *E. sculptum* typically grows as a pendent epiphyte.

*Epidendrum boissierianum* Schltr., Beih. Bot. Centralbl., Abt. 2, 36(2): 459. 1918. See replaced name: *Epidendrum biflorum* Cogn.

16. *Epidendrum cardiophorum* Schltr., Repert. Spec. Nov. Regni Veg. Beih. 9(208–210): 214. 1911. TYPE: COSTA RICA. in dem Wäldern von Tsaki, Talamanca, ca. 200 m, blühend im April 1895, H. Pittier [s.n., (*Herb. instit. physico-geogr. nat. costaricensis*)] 9519 (holotype: B, destroyed; isotype, designated here as the lectotype: CR 9519 [Fig. 17A]; isolectotypes: BR 00000657435; G 00168668; US 815035/00316361; tracings of the original drawing of the holotype, made under Schlechter’s supervision: AMES 00070175).

As we discussed in the introductory chapter on the numeration of Tonduz’ specimens, the quote of Pittier 9519 in the protologue (and, consequently, on the copy of Schlechter’s drawing of the type) represents a misunderstanding of the numeration system used at the IFGN. Even though the duplicates at BR and US bear the name of Tonduz as the collector, they belong to the same type collection and have to be considered as isotypes. The isotype at CR, which we selected as the species lectotype, is complete, fertile, and in excellent condition.

The rhizomatous habit with scandent rhizome and stems produced far apart from each other, the ancipitous, short inflorescence and the small flowers with the part of the perianth less than 1 cm long distinguish this species, broadly distributed from Mexico to the northern portion of the Andes.

17. *Epidendrum chondranthum* Kraenzl., Vierteljahrsschr. Naturf. Ges. Zürich 74: 136–137. 1929. TYPE: COSTA RICA. Forêts des collines de Tremedal près San Ramón

in 1500–1600 m., May 1913, *A. Tonduz s.n.* (*Museo Nacional de Costa Rica 17622*) (holotype: Z. 6823/barcode 000016397, and Z 6823/barcode 000016398 [Fig. 17C]; isotypes: AMES 22101/barcode 00070199; BM 000026897; G 00168665; P 651-123-60/barcode 00438711; US 1080677/barcode 00075623).

The type of *Epidendrum chondranthum* is one the last Costa Rican orchid collected in the field by Tonduz, under the number 17622 of the Museo Nacional de Costa Rica. Even though the labels on the holotype and the isotypes only indicate the month of May 1913 as the collecting date, the type of *Epidendrum majale*, collected in the same locality and with a few numbers lower, was gathered on May 13, 1913.

The holotype at the Zürich herbarium is mounted on two sheets, which received two different barcode assignments, but the original accession number of the herbarium (no. 6823) is the same for the two sheets, which is permissible under the provisions of the Code of nomenclature (Art. 8.3. “A specimen may be mounted as more than one preparation, as long as the parts are clearly labeled as being part of that same specimen”) (McNeill et al., 2012). Both the sheets are annotated by Kränzlin, with the indication “Typus” in his handwriting (Fig. 17C).

The name is a synonym of *Epidendrum exasperatum* Rchb.f., a common epiphyte of the montane forests of Costa Rica, originally based on a plant collected in Costa Rica by H. Wendland in 1857. The species is recognized by its 4-lobed lip and the non-verrucose leaf sheaths (which are quite atypical in the *Oerstedella* group of *Epidendrum*), and the inflorescences produced both apically and laterally.

18. *Epidendrum falcatum* var. *zeledoniae* Schltr., Repert. Spec. Nov. Regni Veg. Beih. 19: 37. 1923. TYPE: COSTA RICA. Auf Magnolia im Garten de Mdme. Amparo de Zeledon; blühend in Januar 1921, *A. Tonduz 132* (holotype: B, destroyed; lectotype designated by Hågsater and Salazar (1990): drawing of type, AMES 39210/barcode 00070339).

Schlechter (1923: 37) distinguished var. *zeledoniae* from the typical form of *E. falcatum* by the slender habit, the longer, narrower and thinner leaves, and the smaller flowers, commenting about the similarity of this taxon with *E. parkinsonianum* Hook. The drawing of the type conserved at AMES (Fig. 17B) well illustrates the habit and flower of the species, which is today treated as a synonym *E. parkinsonianum* Hook., characterized by the pendent habit with slender stems, which are apically provided with a single, succulent leaf, and the large flower with a deeply trilobed lip.

19. *Epidendrum henrici* Schltr., Repert. Spec. Nov. Regni Veg. 3(33–34): 108. 1906. SYNTYPES: COSTA RICA: auf Bäumen bei San José, blühend im März und Juli, *H. Pittier [H. PITTIER and TH. DURAND/Plantae costaricensis exsiccatae] 2176* (holotype: B, destroyed; isosytype, selected here as the lectotype: US 814930/barcode 00093808 [Fig. 18A]; isolectotypes: AMES 24001/barcode 00070412 [including the drawing of a flower and photographs of the specimens at P and US]; BR 988691/

barcode 0000009886919; CR 2176 [“Sur les arbres des haies autour de San José,” *A. Tonduz s.n.*, *Museo Nacional de Costa Rica 2176*]; P 00410693; tracings of the original drawing of the syntype, made under Schlechter’s supervision: AMES 24000/barcode 00070413; illustration of the flower from the holotype published by Mansfeld, 1931: no. 197). COSTA RICA: *A. Tonduz 8204* (B, destroyed; isosyntypes: BR 657195/barcode 0000006571955; BR 657418/barcode 0000006574185).

Both the illustration of the flower from one of the syntypes published by Mansfeld (1931), and the tracings of the same syntype made for Professor Ames under Schlechter’s supervision, are based on *Pittier 2176*, and for this reason we consider it advisable to lectotypify the species with this collection instead of the extant specimens gathered by Tonduz. Among the extant isosyntypes, the specimen at US (Fig. 18A) is complete and fertile, and it was studied and annotated by Ames, Hubbard and Schweinfurth for their monograph on the genus *Epidendrum* (Ames et al., 1936).

Even though in the protologue Schlechter (1906) cited the type as a collection by Pittier number 2176, this number was in fact an herbarium accession number assigned to this collection by the Institute/Museum, which were temporarily merged at that time. Whilst the lectotype sheet, as well as the isolectotypes at BR and P, bear an original label of “H. PITTIER and TH. DURAND/Plantae costaricensis exsiccatae,” where number 2176 is associated with a collection by Pittier, the original label of the sheet at CR belongs to Costa Rican National Museum, where the same number 2176 was associated with a collection of the same species, and made at the same date, by Tonduz.

*Epidendrum henrici* is here considered a synonym of the common and widespread *Prosthechea livida* (Lindl.) W.E.Higgins, based on a Colombian type, distinguished by the trilobed lip with three rows of verrucose and deeply retuse keels, and obtuse lateral lobes.

20. *Epidendrum magnibracteatum* Ames, Schedul. Orch. 1: 16–17. 1922. *nom. illeg. hom.* TYPE: COSTA RICA. Forests of La Palma, Aug 1895, *A. Tonduz s.n.* (*Herb. Instit. physico-geogr. nat. costaricensis 9688*) (holotype: US 815038/barcode 00093789 [Fig. 18B]; isotypes: CR 9688 [sterile], Z 000016403; drawing of type: AMES barcode 00070563).

Synonym: *Epidendrum palmense* Ames., replacing name.

When describing the species, Ames (1922) used the epithet *magnibracteatum*, omitting the fact that Kränzlin had used it before for another *Epidendrum* from Colombia (Kränzlin, 1920). Shortly after, he noticed the error and in the second volume of its *Schedulae Orchidianae* for 1923 he proposed for the species the new name *Epidendrum palmense* (Ames, 1923). The specimen at AMES was mistakenly labeled with a collection date “VII.1885,” a date that precedes by four years the arrival of Tonduz in Costa Rica.

*Epidendrum palmense* belongs to a taxonomically difficult group of species characterized by the strongly

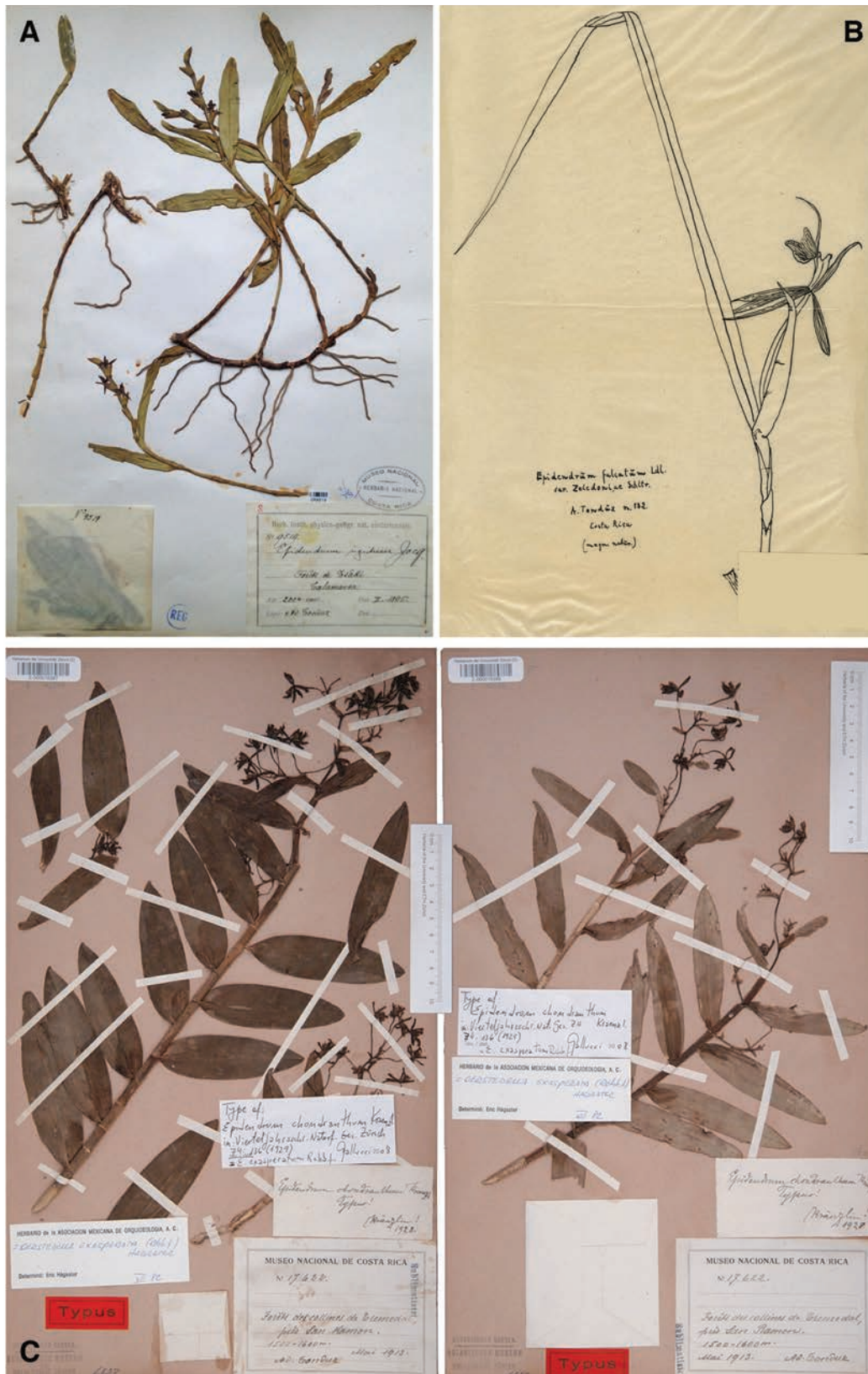


FIGURE 17. **A**, Lectotype of *Epidendrum cardiophorum*; **B**, Lectotype of *Epidendrum falcatum* var. *zeledoniae*, selected by Hágsater & Salazar (1990); **C**, Holotype of *Epidendrum chondranthum* (two sheets). **A**, courtesy of the Museo Nacional de Costa Rica, Departamento de Historia Natural; **B**, courtesy of the Harvard University Herbaria, reproduced with permission of the President and Fellows of Harvard College; **C**, courtesy of the Zürcher Herbarien, University of Zurich.



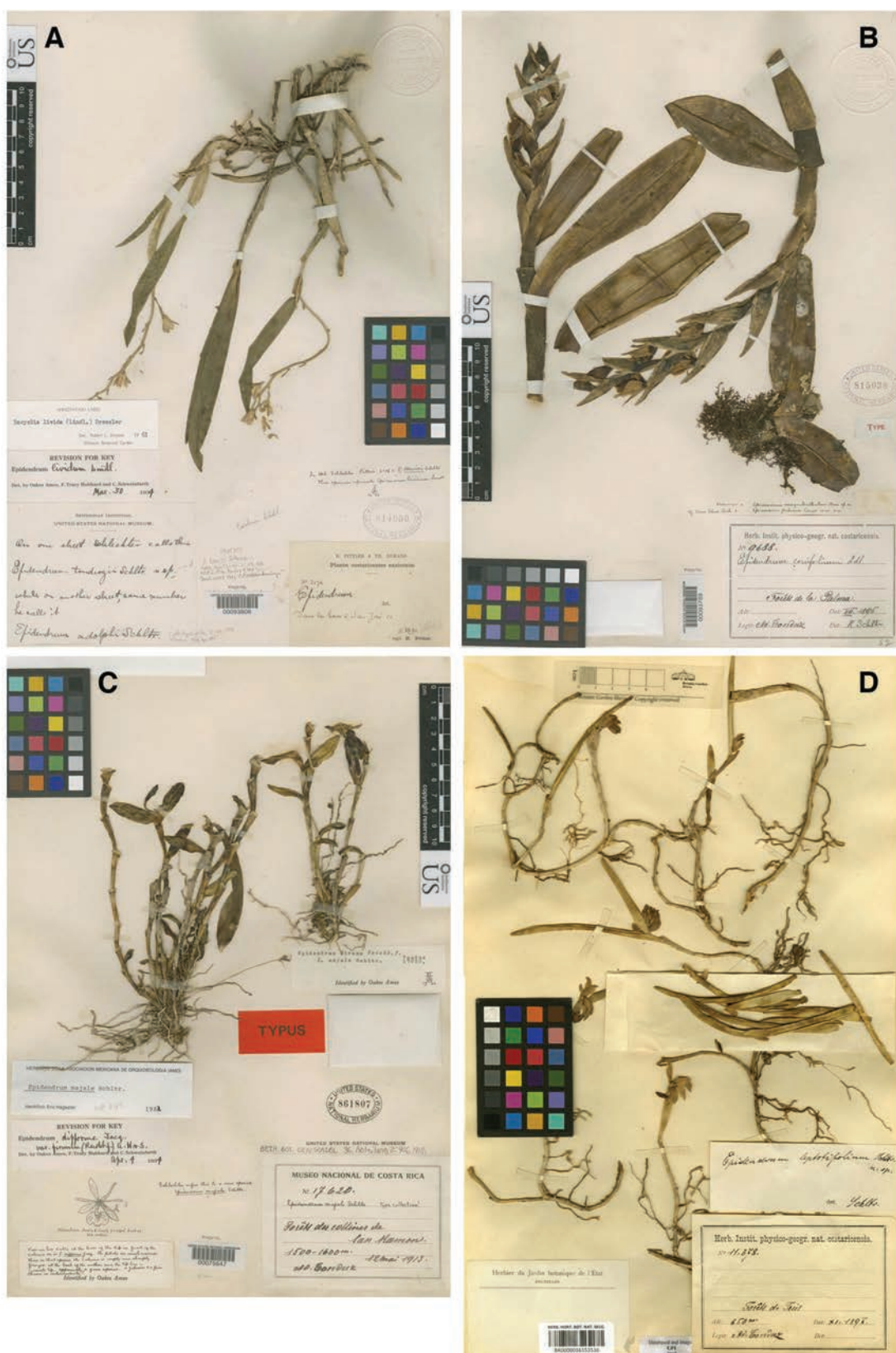


FIGURE 18. **A**, Lectotype of *Epidendrum henrici*; **B**, Holotype of *Epidendrum magnibracteatum*; **C**, Lectotype of *Epidendrum majale*; **D**, Lectotype of *Epidendrum octomerioides*. A–C, courtesy of the United States National Herbarium, Smithsonian Institution; D, courtesy of the National Botanic Garden of Belgium Herbarium.

flattened stems, prominent flower bracts, and very fleshy, green to purple-flushed flowers. Among the taxa of this group, *E. palmense* may be distinguished by the long, acuminate floral bracts, the petals connate to the upper margin of the lateral sepals, and the rheniform lip.

21. *Epidendrum majale* Schltr., Beih. Bot. Centralbl., Abt. 2 36(2): 406. 1918. TYPE: COSTA RICA. Forêts des collines de San Ramón, 1500–1600 m, 12 May 1913, A. Tonduz s.n. (*Museo Nacional de Costa Rica 17620*) (holotype: B, destroyed; lectotype, designated by Sánchez and Hągsater (2007): US 861807/barcode 00075647; isolectotypes: AMES 21993/barcode 00070570, BM 000026899, G 00168862, K 000583761, LE 00001442, P 653-123-60/barcode 00477943, P 654 123-60/barcode 00477948, Z 000016404; tracing of the type, made under supervision of R. Schlechter: AMES 26886/barcode 00070571; drawing of type: AMO; illustration of the flower from the holotype published by Mansfeld, 1931: no. 209).

Collected on the way back from the expedition of Maurice de Périgny to the northern plains draining toward the Río San Juan, at the border between Costa Rica and Nicaragua, the type of *E. majale* belongs to the last group of Costa Rican orchids collected in the field by Tonduz. The lectotype at US (Fig. 18C) illustrates well the characteristics of the species, with rather small habit compared to other species of the *Epidendrum difforme* complex, the apical, subsessile and non-spathaceous inflorescence, the filiform petals and the entire lip.

*Epidendrum majale* is a synonym of *Epidendrum firnum* Rchb.f., a common species in Central America from Nicaragua to Panama, originally described on the basis of a plant collected in Costa Rica by H. Wendland in 1857.

22. *Epidendrum octomerioides* Schltr., Repert. Spec. Nov. Regni Veg. 3: 248. 1907. TYPE: COSTA RICA: In Wäldern bei Teus (Taus), c. 650 m ü. d. M., blühend im November 1897, A. Tonduz s.n. (*Herb. Institut. physico-geogr. nat. costaricensis 11378*) (holotype: B, destroyed; isotype, selected here as the lectotype: BR barcode 0000016153516 [Fig. 18D]; tracings of the original illustration of the holotype made under Schlechter's supervision: AMES barcode 00070636; illustration of the flower from the holotype published by Mansfeld, 1931: no. 211).

The isotype at BR that we selected as the species' lectotype, is complete and fertile, and it well illustrates the repent habit with the new, cylindrical stem coming from the middle of the last stem, the roots coming from the basal nodes, and the small, apical flowers produced on a very short inflorescence. The sheet of the isotype is annotated in Schlechter's handwriting, with the intended name "*Epidendrum leptotifolium*," evidently in allusion to the shape of the leaves reminding those of the orchid genus *Leptotes*.

Two copies of Schlechter's original drawing of the type of *E. octomerioides* were made: one published by Mansfeld (1931), and another one requested by Oakes Ames and made under Schlechter's direct supervision, now saved at

the Harvard University Herbaria. Both illustrations include a floral analysis, but the latter also presents the unmistakable plant habit that is very characteristic of *E. octomerioides*. *Epidendrum octomerioides* is widely distributed in both the Caribbean and the Pacific watershed of the Costa Rican cordilleras, from low to mid elevations.

23. *Epidendrum pachycarpum* Schltr., Repert. Spec. Nov. Regni Veg. 3(33–34): 109. 1906. TYPE: COSTA RICA: in den Wäldern von Nicoya, blühend im Mai 1900, A. Tonduz [*Museo Nacional de Costa Rica 13976*] (holotype: B, destroyed; isotype, selected here as the lectotype: US 577920/barcode 00025106 [Fig. 19A]; isolectotype: US 577921/barcode 00025107; traces of the original drawings of the holotype, made under Schlechter's supervision: AMES 25248/barcode 00070654; illustration of the flower from the holotype published by Mansfeld, 1931: no. 212).

The specimens at US are sterile, and only a few broken fragments of the flowers are conserved into the pocket of the sheet that we selected as the species' lectotype. The characteristics of the perianth were recorded by Schlechter in his drawing of the holotype, a copy of which was prepared in Berlin for Professor O. Ames and is now conserved at the Harvard University Herbaria.

Originally collected in the strongly seasonal regions of the Nicoya peninsula, this widespread species is the only large-flowered *Prosthechea* forming natural populations in the dry, semi-deciduous forests of northern Pacific Costa Rica. The ovoid pseudobulbs, the partially ringent flowers, and the subacute lip with plain margins, which are well illustrated in the copy of Schlechter's drawing of the holotype (AMES), easily distinguish the species from its closest relatives (Pupulin and Karremans, 2007).

The name is a synonym of *Prosthechea chacaoensis* (Rchb.f.) W.E.Higgins.

*Epidendrum palmense* Ames., Schedul. Orchid. 2: 33. 1923. See replaced name: *Epidendrum magnibracteatum* Ames.

24. *Epidendrum polychlamys* Schltr., Repert. Spec. Nov. Regni Veg. 3(33–34): 109. 1906. TYPE: COSTA RICA: auf den Bäumen der Weideplätze von La Palma, blühend am 24 Aug 1898, A. Tonduz s.n. (*Herb. Institut. costaric. 12492*) (holotype: B, destroyed; isotype, selected here as the lectotype: K 000463408 [Fig. 19B]; isolectotypes: AMES 22675/barcode 00070721, US 579474/barcode 00093833; illustration of the flower from the holotype published by Mansfeld, 1931: no. 215).

The isotype specimen at US, of which that at AMES is a fragment, bears a label with the number 12492 of the "Herb. H. Pittier, Costa Rica" which is not cited in the protologue, while the isotype at K has a label with the correct number of the IFGN, as quoted by Schlechter in the original description. It is obvious that all three specimens are part of the same Tonduz' collection of August 24, 1898 from La Palma, but we choose to lectotypify the species with the specimen at Kew as it better corresponds to the citation of the type by Schlechter.





FIGURE 19. **A**, Lectotype of *Epidendrum pachycarpum*; **B**, Lectotype of *Epidendrum polychlamys*; **C**, Holotype of *Epidendrum sancti-ramoni*; **D**, Analytical drawing of *Epidendrum trachythecae*, traced by Mansfeld (from Mansfeld 1931). A, courtesy of the United States National Herbarium, Smithsonian Institution; B, courtesy of the Board of Trustees, Royal Botanical Gardens, Kew; C, courtesy of the Zürcher Herbarien, University of Zurich.



Endemic to Costa Rica and Panama, *E. polychlamys* is recognized by the rhizomatous plants with narrow stems provided with two to three apical leaves, the very short inflorescence with broadly ovate bracts, and the broadly oblong, apiculate lip, which can be observed in the specimen that we selected as the lectotype.

25. *Epidendrum sancti-ramoni* Kraenzl., Vierteljahrsschr. Naturf. Ges. Zürich 74: 137–138. 1929. TYPE: COSTA RICA. Collines de Tremedal près San Ramón, 1500–1600 m., 10 May 1913, A. Tonduz [s.n. (Museo Nacional de Costa Rica 17617)] (holotype: Z 000016394; isotypes: AMES 22654/barcode 00070839; AMES 22205/barcode 00070840; P 00484726; Z 000016395; US 1080672/00023322; LE 00006552).

Barringer (1991) lectotypified *E. sancti-ramoni* with a specimen kept at the Oakes Ames Herbarium at the Harvard University Herbaria (specimen number 22654), in the belief that the actual holotype was destroyed in Berlin together with most of Kränzlin's types. However, Kränzlin studied the type specimen of this species in the herbarium of the University of Zürich, where it is still conserved and annotated as "Typus" in Kränzlin's handwriting (Fig. 19C). Kränzlin published the new species he studied in Zürich in the *Vierteljahrsschrift der Naturforschenden Gesellschaft in Zürich*, the quarterly journal of the Zurich Natural History Society (Kränzlin, 1929), together with another *Epidendrum* species whose type is kept in the same herbarium, *E. chondrantum* (see above). As Tonduz' specimen in Zurich is ostensibly that on which Kränzlin based his description, it has to be considered the holotype, and the lectotypification proposed by Barringer is here superseded. In the collections of Zurich herbarium another Tonduz' specimen of the same species is conserved (Z 000016395), but this was not annotated by Kränzlin.

*Epidendrum sancti-ramoni* belongs to the *Epidanthus* group of *Epidendrum* (Barringer, 1991), characterized by the small plants with narrow leaves less than 3 mm broad and small flowers produced on a comparatively long inflorescence without a basal spathe. Within this group, *E. sancti-ramoni* is distinguished by the acicular leaves and the three-lobed, very small lip, not exceeding 2 mm in length.

*Epidendrum tonduzii* C.H.Lank., Orchid Rev. 32(372): 163. 1924. See under *Epidendrum adolphii* Schltr.

26. *Epidendrum trachythece* Schltr., Repert. Spec. Nov. Regni Veg. 3(42–43): 249. 1907. TYPE: COSTA RICA. in den Wäldern von Tablazo, ca. 1800 m, blühend im April 1883, A. Tonduz 7941 (holotype: B, destroyed; neotype designated by Sánchez and Hágsater (2008): COSTA RICA. [San José; Carraigres,] Tablazo, 1900 m, 30 XI 1960, C. Horich s.n., MO; illustration of the flower from the holotype published by Mansfeld, 1931: no. 230).

Schlechter (1907) described *E. trachythece* on the basis of a plant collected by Tonduz in the mountains that divide San José from the plains of the old capital city, Cartago. As no dried material referable to this collection has been

conserved, Sánchez and Hágsater (2008) neotypified the species with a modern collection from the type locality. We think, however, that the illustration published by Mansfeld (1931) (Fig. 19D), being an exact tracing of Schlechter's original analysis of a flower from the holotype, would have been a firmer choice for neotypification.

Broadly distributed in Central America from Mexico to Panama, *E. trachythece* is a small epiphyte having many-branched, diphyllous stems and few-flowered, terminal inflorescences; the small, greenish-white flowers have a characteristic transversely elliptic-subrhreniform lip, provided with a bi-partite, obtuse callus at the base.

27. *Goodyera ovatilabia* Schltr., Repert. Spec. Nov. Regni Veg. Beih. 19: 274. 1923. TYPE: COSTA RICA. Auf dem Turrialba, im August, A. Tonduz s.n. (holotype: B, destroyed; lectotype, selected here: tracings of Schlechter's original drawing of the holotype, AMES 31635/barcode 00099598). Fig. 20.

The drawing of the type specimen, showing the long inflorescence typical of the genus and the dissected perianth, is chosen here as the lectotype, as no other type material of *Goodyera ovatilabia* was found. Originally collected in the surroundings of the county of Turrialba, *Goodyera ovatilabia* is one of the few species of *Goodyera* known to occur in Costa Rica, and most probably the only one to be found growing in the oak tree forests as high as 3,000 m on the Caribbean slopes. The species is also known from western Panama.

As mentioned by Dressler (2003), *G. ovatilabia* resembles the Mesoamerican *G. striata* Rchb.f. by the similar minute pale flowers with a deeply concave lip. Nevertheless, the plants of *G. ovatilabia* are much smaller (3–5 cm vs. up to 35 cm long) and distinguished by the acute entire lip.

28. *Goodyera turrialbae* Schltr., Repert. Spec. Nov. Regni Veg. Beih. 19: 275. 1923. TYPE: COSTA RICA: Volcan de Turrialba, 2000 m, im August, A. Tonduz s.n. (holotype: B, destroyed; lectotype, selected here: tracings of the original drawing of the holotype, AMES 31633/barcode 00099603). Fig. 21.

No other type material of the species than the holotype destroyed in Berlin is known to exist. The tracings of the original drawings by Schlechter illustrate the habit well with an inflorescence and the details of the perianth, and they are therefore chosen here as the lectotype. *Goodyera turrialbae* was originally collected in the Turrialba volcano and is known only from Costa Rica.

The species is similar to *G. micrantha* but is distinguished from it for the bigger flowers; the broadly cuneate leaves, not rounded at the base and the glabrous ovary.

29. *Habenaria costaricensis* Schltr., Repert. Spec. Nov. Regni Veg. 17(481/485): 138. 1921. TYPE: COSTA RICA. Bords gazonnés de la voie ferrée entre San José et San Juan, 1100 m, Sept 1913, A. Tonduz 17652 (holotype: B, destroyed; lectotype, designated by Christenson [1996]: US 93266/barcode 1080689; tracings of the original drawing of



FIGURE 20. Lectotype of *Goodyera ovatilabia*. Courtesy of the Harvard University Herbaria, reproduced with permission of the President and Fellows of Harvard College.



FIGURE 21. Lectotype of *Goodyera turrialbae*. Courtesy of the Harvard University Herbaria, reproduced with permission of the President and Fellows of Harvard College.



the holotype, made under Schlechter's supervision: AMES 00024305/barcode 0099764; illustration of the flower from the holotype published by Mansfeld, 1931: no. 2).

Christenson (1996) selected the specimen at US over the one supposedly kept at CR because the former was studied, illustrated and annotated by Oakes Ames for his monographic study of *Habenaria* (Ames, 1920, 1943). Nevertheless, we were unable to find any reference to a collection by Tonduz in the Herbarium of the Museo Nacional de Costa Rica and the associate databases. The lectotype (Fig. 22A) is complete and fertile, and well exemplifies the plant with a foliaceous stem, flower provided with a relatively short, upwarding spur, which are characteristic of the species.

*Habenaria costaricensis* is endemic to the Pacific watershed of the main Costa Rican cordilleras.

30. *Habenaria endresiana* Schltr., Repert. Spec. Nov. Regni Veg. Beih. 19: 272. 1923. TYPE: COSTA RICA. Ohne nähere Standortsangabe, A. Tonduz s.n. (holotype: B, destroyed; lectotype, selected here: tracings of the drawings of the holotype, AMES 31631/barcode 00099838 [Fig. 22B]).

No actual specimens of the original collection have been found. The copy of Schlechter's original drawings of the holotype are selected as the lectotype as they well illustrate the plant with slender, foliaceous stem and narrow, erect leaves, bearing a few flowers with deeply trilobed labellum, provided on the rear with a long spur.

The species is usually treated as a synonym of *Habenaria trifida* Kunth, widespread throughout the entire Neotropical region, from Mexico to Brazil and Argentina.

31. *Habenaria gymnadenioides* Schltr., Repert. Spec. Nov. Regni Veg. Beih. 19: 271. 1923. TYPE: COSTA RICA. ohne nähere Standortsangabe, A. Tonduz s.n. (holotype: B, destroyed; tracings of the drawings of the holotype, selected here as the lectotype: AMES 31632/barcode 00099863 [Fig. 22C]).

In the absence of any specimens referable to the type collection, we selected here as the species' lectotype the tracings of Schlechter's original drawings of the holotype. The relatively small plants (to 25 cm tall), with the upper part of the stem bearing a few leaves, the densely many-flowered inflorescence, and the deeply tri-lobed labellum, with the lateral lobes subequal to the midlobe, which Schlechter (1923) considered characteristic of the species, are well illustrated in the lectotype drawings.

The species has been treated by Dressler (1999, 2003) and Pupulin (2002) as a synonym of *Habenaria wercklei* Schltr., a species ranging from Honduras to Costa Rica.

32. *Isochilus amparoanus* Schltr., Repert. Spec. Nov. Regni Veg. Beih. 19: 27. 1923. SYNTYPES: COSTA RICA. San José, im Garten de Mdme. Amparo de Zeledon, 1920, A. Tonduz 32 (B, destroyed). COSTA RICA. 1921, C. Wercklé 83 (B, destroyed). Lectotype, selected by Pupulin [2010b: fig. 13D]: tracings of Schlechter's drawings of a syntype, AMES 31625/barcode 00100365).

Synonym: *Isochilus major* var. *amparoanus* (Schltr.) Correll, Bot. Mus. Leaflet 10(1): 11–12. 1941.

In the protologue, Schlechter (1923) cited Tonduz 32 and Wercklé 83, without expressly indicating the type. No original material of these collections is known to exist, and the copies of Schlechter's drawings of the type kept at AMES have no indication about the collector. However, as these drawings were ostensibly prepared from one of the syntypes and are annotated as "type," they were selected as the species' lectotype (Pupulin, 2010b). The name is probably a synonym of *Isochilus chiriquensis* Schltr.

33. *Lepanthes fimbriata* Ames, Sched. Orch. 3: 11–12. 1923. TYPE: COSTA RICA. Alto de Ochomogo, alt 1550 m, Dec. 1896, A. Tonduz s.n. (*Herb. Instit. physico-geogr. nat. costaricensis* 10387) (holotype: US 815046; isotypes, AMES 22851/barcode 00064918 [including a drawing of type], CR 10387).

On the holotype sheet at US, which bears the original label of the IFGN herbarium, are mounted three specimens, only one of which still has a single bud (Fig. 22D). The isotype at AMES (Fig. 23A) is sterile, but nonetheless it has an original drawing by Ames showing the long-ciliate-pubescent petals and labellum, and the long, bilobed appendix of the lip, which distinguish the species.

34. *Masdevallia tonduzii* Woolward, Bull. Herb. Boissier, sér. 2, 6(1): 82. 1906. TYPE: COSTA RICA ["Hab. Costa Rica"]. 1894. In hortum Chambesiensis (Helvetia), quotannis floret, A. Tonduz s.n. (holotype: BM000084394 (?); isotype: G 005915-000346/barcode 00168757 [Fig. 23C]).

The plant that served as the type for *Masdevallia tonduzii* was collected in 1894, during the herborizations carried out along the basin of the Reventazón river, on the Caribbean watershed of the Cordillera de Talamanca, which Tonduz explored down to the outpost of the Angostura, where the path reached its end point in the impenetrable vegetation of the Atlantic rainforest (Tonduz, 1896). *Masdevallia tonduzii* can be still observed as a rare epiphyte endemic to this region, down to the warm, Caribbean forest of western Panama. It was not until 1900 when a specimen prepared at La Perrière from the plant received from Costa Rica was sent to Florence Woolward (1854–1936) for her studies on *Masdevallia*. The last part of Woolward's *magnum opus* on the genus had been published just a few years before (Woolward, 1896), and no illustration of the species was included with the original description of *M. tonduzii* (Woolward, 1906). As noted by Mrs. Woolward, *M. tonduzii* flowered "every year" in the Barbey-Boissier greenhouse at Chambésy (Woolward, 1906), and according to Jenny (2015) the type plant remained in cultivation in Switzerland at least until 1910.

Beginning in 1890, F. Woolward spent some ten years on visits to Newbattle Abbey, in Scotland, painting orchid flowers from the extensive collection of Schomberg Kerr, Marquess of Lothian. Here the illustrator depicted more



FIGURE 22. **A**, Lectotype of *Habenaria costaricensis*; **B**, Lectotype of *Habenaria endresiana*; **C**, Lectotype of *Habenaria gymnadenioides*; **D**, Holotype of *Lepanthes fimbriata*. A, D, courtesy of the United States National Herbarium, Smithsonian Institution; B, C, courtesy of the Harvard University Herbaria, reproduced with permission of the President and Fellows of Harvard College.







than 350 orchids, of which 85 were species of *Masdevallia*. These latter were published in parts between 1891 and 1896 as “*The Genus Masdevallia*.” The pressed flowers from Newbattle Abbey are preserved at the Natural History Museum in London, where Woolward worked on completion of the project for Schomburgk. Interestingly, in the herbarium collections of the Natural History Museum (BM) is conserved a specimen of *M. tonduzii*, gathered on November 11, 1905, just a year before the publication of the new species in the bulletin of the Boissier herbarium. The specimen at BM (000084394; Fig. 23D) is recorded as a collection *sine numero* by J. O’Brien (1842–1930), a renown orchid specialists of the time and secretary of the Orchid Committee of the Royal Horticultural Society (Natural History Museum, 2014). As it is doubtful that living plants of the rare *M. tonduzii* were in cultivation in England at that time, it might well be that the specimen deposited by O’Brien was indeed the true plant studied by F. Woolward upon the request by G. Beauverd.

The type specimen at G consists of just a leaf and an inflorescence with a flower. It has no handwritten annotations by Miss Woolward, so it could hardly be considered the exact specimen on which the author prepared her description, and it is quite improbable that Woolward would have sent back to Geneva her specimen from London, where she worked, or from Belton, in Lincolnshire, where she lived. According to the original label affixed to the sheet, however, G. Beauverd prepared it at the same time (December 7, 1900) of the specimen sent to Miss Woolward for determination, and it can therefore considered as an isotype (and eventually selected for species lectotypification if the BM specimen was not suitable for this purpose).

The thick, oblong-lanceolate leaves, the erect, single-flowered inflorescence, and the pubescent, white flower with a lemon-yellow gorge and bright yellow tails, all characters noted in the protologue, made this species unmistakable among Costa Rican *Masdevallia*.

35. *Maxillaria microphyton* Schltr., Repert. Spec. Nov. Regni Veg. 8(182/184): 457. 1910. TYPE: COSTA RICA. In Wäldern von La Palma, c. 1700–2000 m, blühend im Jul 1895, A. Tonduz [s.n., *Herb. Instit. physico-geogr. nat. costaricensis*] 9670 (holotype: B, destroyed; isotype, selected here as the lectotype: US 577269/barcode 00094043). Fig. 23B.

Homotypic synonyms: *Camaridium microphyton* (Schltr.) M.A. Blanco, Lankesteriana, 7(3): 520. 2007. *Chaseopsis microphyton* (Schltr.) Szlach. and Sitko, Biodivers. Res. Conservation 25: 25. 2012. *Ornithidium parvulum* Schltr., Repert. Spec. Nov. Regni Veg. 9(214/216): 292. 1911, *nom. illeg. superfl.*

Heterotypic synonyms: *Ornithidium pallidiflavum* Schltr., Repert. Spec. Nov. Regni Veg. Beih. 19: 143, 242. 1923. *Maxillaria pallidiflava* (Schltr.) Senghas, Orchideen (ed. 3) 1/B(28): 1751. 1993. TYPE: COSTA RICA. Arbres des paturages à San Pedro de San Ramón, 1075 m, Sept. 1921, A.M. Brenes 135 (holotype: B, destroyed; lectotype, designated by Barringer [1986]: CR 26021).

The isotype at US, selected here to lectotypify the species, includes a fertile plant and the sketch of a rehydrated flower, made by J. T. Atwood during the preparation of his treatment of Costa Rican *Maxillaria* for the *Flora Costaricensis* (Atwood, 1999).

The species, endemic to Costa Rica, is easily distinguished from its relatives by the non-reflexed lip, provided with lateral lobes that exceed in length the extension of the central callus. The description of *Ornithidium parvulum* made by Schlechter (1923) is based on the same type collection of *Maxillaria microphyton*, which made it a superfluous, illegitimate name.

36. *Maxillaria pachyacron* Schltr., Repert. Spec. Nov. Regni Veg. 9(205–207): 165. 1911. TYPE: COSTA RICA. in den Wäldern von La Palma, 1700–2000 m, blühend im Juli 1895, A. Tonduz 9681 (holotype: B, destroyed; tracings of Schlechter’s drawings of the type, designated here as the lectotype: AMES 24781/barcode 00101468, in part [Fig. 24A]; epitype, designated by Atwood (1999): COSTA RICA. La Palma, S. Ingram & K. Ferrell 770 [SEL]).

The collections of the Smithsonian host a specimen of *Maxillaria* (577273/barcode 00094047) that bear a label of Tonduz 9681, but Atwood showed that the mounted plant is not in agreement with the original protologue, having a rhizomatous habit and much smaller flowers, with a very different lip (Atwood, 1999).

As typified by Atwood, *M. pachyacron* is distinguished by the presence of foliaceous sheaths subtending the pseudobulbs, the green (non-spotted) leaves, the floral bract shorter than the ovary, the long column foot, and the long sepals up to 5 cm in length.

37. *Maxillaria piestopus* Schltr., Repert. Spec. Nov. Regni Veg. Beih. 19: 302–303. 1923. TYPE: COSTA RICA. Alajuela: San Ramón, May 1913, A. Tonduz s.n. (holotype: B, destroyed; neotype designated by Atwood (1999): COSTA RICA. Cartago: Orosi, C.H. Lankester 1213, AMES 34211/barcode 00045361; photo of holotype, including a floral analysis: AMES 40549/barcode 00045360).

John T. Atwood typified *M. piestopus* in his treatment of *Maxillaria* for *Flora Costaricensis* (Atwood, 1999). In absence of actual material of this taxon, Atwood chose to neotypify with a collection by Lankester kept at AMES (Fig. 24C). According to the label of the Ames herbarium, the plant was collected at Orosi, but probably it was just cultivated there. On the sheet of the neotype there is another label in Lankester’s handwriting that apparently quotes the name of Brenes, which led us to suppose that the specimen was originally collected in one of the typical Brenesian localities around San Ramón, the type locality for the species. Even though Atwood did not cite it, at the AMES herbarium is also conserved a photograph of the holotype taken in Berlin, which clearly shows the habit of the plant with a single flower, and also includes the original sketch of the flower and its dissection prepared by Schlechter (Fig. 24B).

*Maxillaria piestopus* belongs to a group of species with pseudobulbs subtended by non-foliaceous sheaths, and



FIGURE 24. **A**, Lectotype of *Maxillaria pachyacron*; **B**, Photo of the holotype of *Maxillaria piestopus*; **C**, Neotype of *Maxillaria piestopus*. All by courtesy of the Harvard University Herbaria, reproduced with permission of the President and Fellows of Harvard College.

is distinguished by the oblanceolate leaf, the large floral bracts, the triquetrous ovary, and the oblanceolate petals. Atwood (2003) considers *M. piestopus* as a little known and possibly extinct species.

38. *Microstylis adolphi* Schltr., Beih. Bot. Centralbl., Abt. 2 36(2): 380–381. 1918. TYPE: COSTA RICA. Alto de la Cruz, A. *Tonduz s.n.* (holotype: B destroyed; illustration of type, made under Schlechter's supervision, and selected here as the lectotype: AMES 24378/barcode 00101595 [Fig. 25A]; illustration of the flower from the holotype published by Mansfeld, 1931: no. 53).

No actual material referable to the type of *M. adolphi* is known to exist. We chose to typify the species with the drawing conserved at AMES over the floral analysis published by Mansfeld (1931), as it includes also the plant habit, which is characteristic of the species.

The species, known exclusively by the type and from a rather cryptic locality, is distinguished by the pseudobulbous stems, apically two-leaved, and the truncate to slightly retuse apex of the lip.

The name is the basionym of *Malaxis adolphi* (Schltr.) Ames (Orchidaceae 7: 158. 1922).

39. *Microstylis microtoides* Schltr., Beih. Bot. Centralbl., Abt. 2 36(2): 381–382. 1918. TYPE: COSTA RICA, A. *Tonduz s.n.* (holotype: B, destroyed; lectotype, selected here: tracings of the original drawing of the holotype, made under Schlechter's supervision, AMES 24381/barcode 00101714; illustration of type, AMES; illustration of the flower from the holotype: Mansfeld 1931: no. 58 [Fig. 25B]).

*Microstylis microtoides* is known exclusively from the tracings of Schlechter's original drawing of the flower from the type, published by Mansfeld in 1931, that we selected to neotypify the species.

According to the floral analysis, *M. microtoides* is similar to the widespread *M. carnosa* (Kunth) C.Schweinf., which presents a clearly three-lobed, concave lip, provided with rounded, thickened lateral lobes. The inflorescence of the latter species is commonly described as spicate, even though the flowers are born on short pedicels. Schlechter described the inflorescence of *M. microtoides* as an elongate raceme, but characterized it as densely many-flowered, and gave the length of the pedicel plus ovary as 1.7 mm. It is unfortunate that the drawing published by Mansfeld does not show the vegetative habit of *M. microtoides* to interpret Schlechter's observation, but a dense inflorescence with short-pedicelled flowers must be difficult to distinguish from "spicate" inflorescence of *M. carnosa*, and we agree with Schweinfurth (1941) in considering the two taxa conspecific. The lack of any specific locality quoted in the protologue makes the chances to search for other specimens of this elusive taxon quite feeble. Schlechter compared it with *M. gracilis* (= *Malaxis cogniauxiana* [Schltr.] Pabst), but the latter species, endemic to Brazil, has bifoliate stems and subcapitate inflorescence.

40. *Microstylis pandurata* Schltr., Repert. Spec. Nov. Regni Veg. 3(31–32): 77. 1906. TYPE: COSTA RICA.

in den Wäldern bei La Palma, ca. 1450 m, blühend am 31 Aug 1898, A. *Tonduz 12508* (holotype: B, destroyed; isotype selected here as the lectotype, a flower conserved in glycerine: AMES barcode 00083007; tracings of the original drawings of the type, made under Schlechter's supervision: AMES 24148/barcode 00101732; illustration of the flower from the holotype published by Mansfeld, 1931: no. 60).

The flower conserved in glycerine at AMES is the only known actual specimen belonging to the original collections, and for this reason we designated it as the species' lectotype. *Microstylis pandurata* is unmistakable for the subquadrate lip of the flower, broader at apex than at the base. The copy of Schlechter's original drawing of the type also illustrates the characteristic, monophyllous habit of the species (Fig. 25C).

The name is the basionym of *Malaxis pandurata* (Schltr.) Ames (Proc. Biol. Soc. Wash. 35: 84. 1922).

41. *Microstylis tonduzii* Schltr., Repert. Spec. Nov. Regni Veg. 3(33–34): 106. 1906. TYPE: COSTA RICA. in den Wäldern des Barba, blühend am 6 Feb 1890, A. *Tonduz 1946* (holotype: B, destroyed; illustration of type, selected here as the lectotype: AMES 24159/barcode 00101764 [Fig. 25D]; illustration of the flower from the holotype published by Mansfeld, 1931: no. 63).

No material referable to the type of *M. tonduzii* has been located. A tracing of Schlechter's floral analysis was published by Mansfeld (1931), but the drawing conserved at AMES also includes the plant habit, and therefore we chose it to lectotypify the species.

The leaf petioles embracing the base of the inflorescence distinguish this species among the rhizomatous *Malaxis* in Costa Rica, where it is endemic. The name is the basionym of *Malaxis tonduzii* (Schltr.) Ames (Proc. Biol. Soc. Wash. 35: 85. 1922).

42. *Oncidium tonduzii* Schltr., Repert. Spec. Nov. Regni Veg. 9(196–198): 31. 1910. TYPE: COSTA RICA. in den Wäldern von Santo Domingo de Golfo Dulce, blühend im März 1896, A. *Tonduz [s.n. (Herb. Instit. physico-geogr. nat. costaricensis)] 9891* (holotype: B, destroyed; lectotype, designated by Christenson (1996): US 577283/barcode 00094118 [Fig. 26A]; isolectotypes: US 795707/barcode 00025928, US 00795708/barcode 00025926, US 00815040/barcode 00025927, US 00815041/barcode 00025925, AMES 5386/barcode 00064915, CR; tracings of Schlechter's original drawing of the type, AMES 31601/barcode 00102562 and AMES 24203/barcode 00102563; illustration of the flower from the holotype published by Mansfeld, 1931: no. 297).

The large plants with paniculate inflorescences bearing short, few flowered branches, and the relatively small flowers with subquadrate wings of the column distinguish the species.

The name is a synonym of *Oncidium polycladium* Rchb.f. ex Lindl., endemic to the Pacific regions of central and southern Costa Rica and western Panama.

43. *Oncidium turialbae* Schltr., Repert. Spec. Nov. Regni Veg. 9(196–198): 32. 1910. TYPE: COSTA RICA. Auf



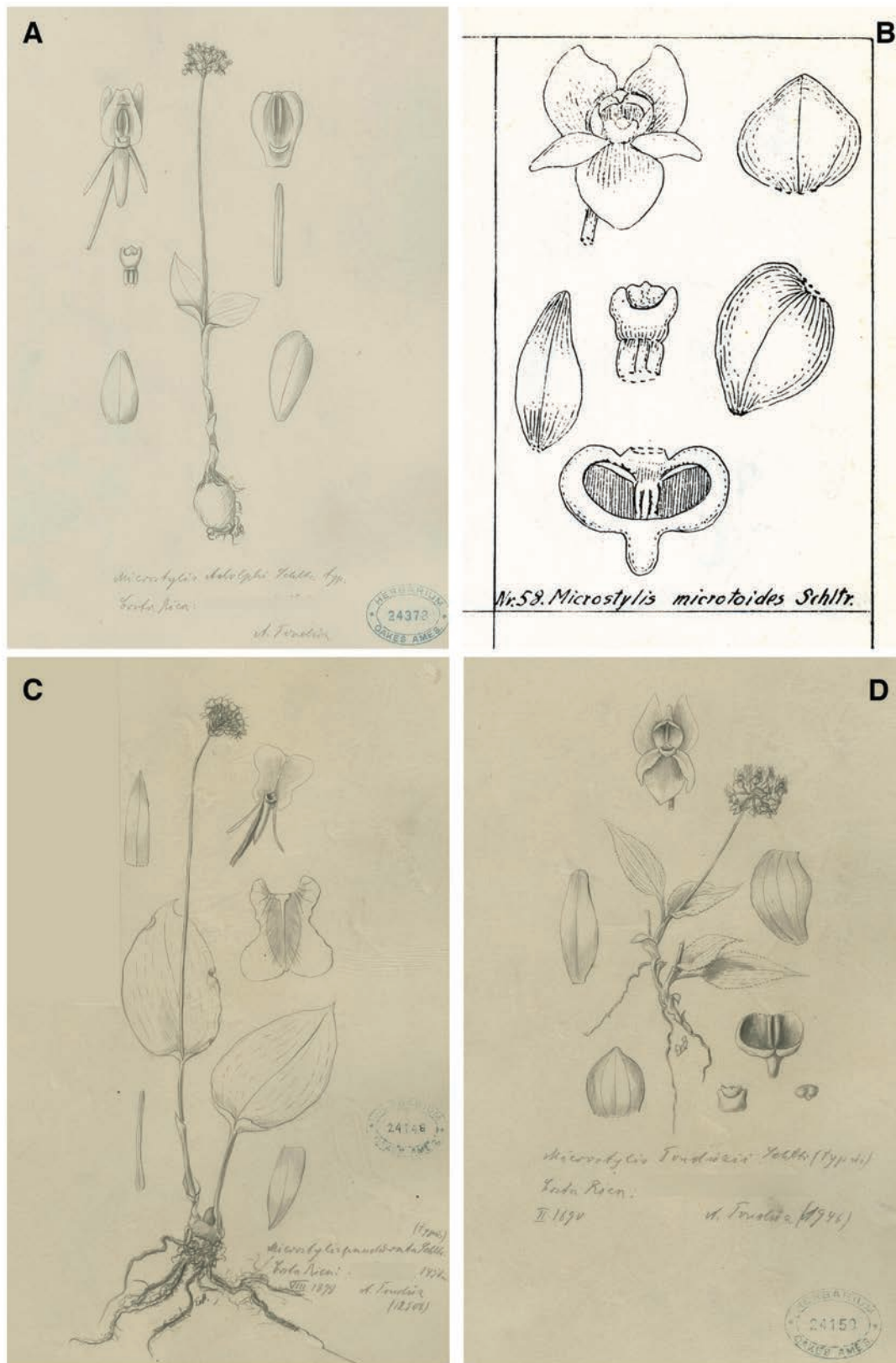


FIGURE 25. **A**, Lectotype of *Microstylis adolphii*; **B**, Neotype of *Microstylis microtooides*; **C**, Tracings of the original drawing of type of *Microstylis pandurata*; **D**, Lectotype of *Microstylis tonduzii*. All by courtesy of the Harvard University Herbaria, reproduced with permission of the President and Fellows of Harvard College.

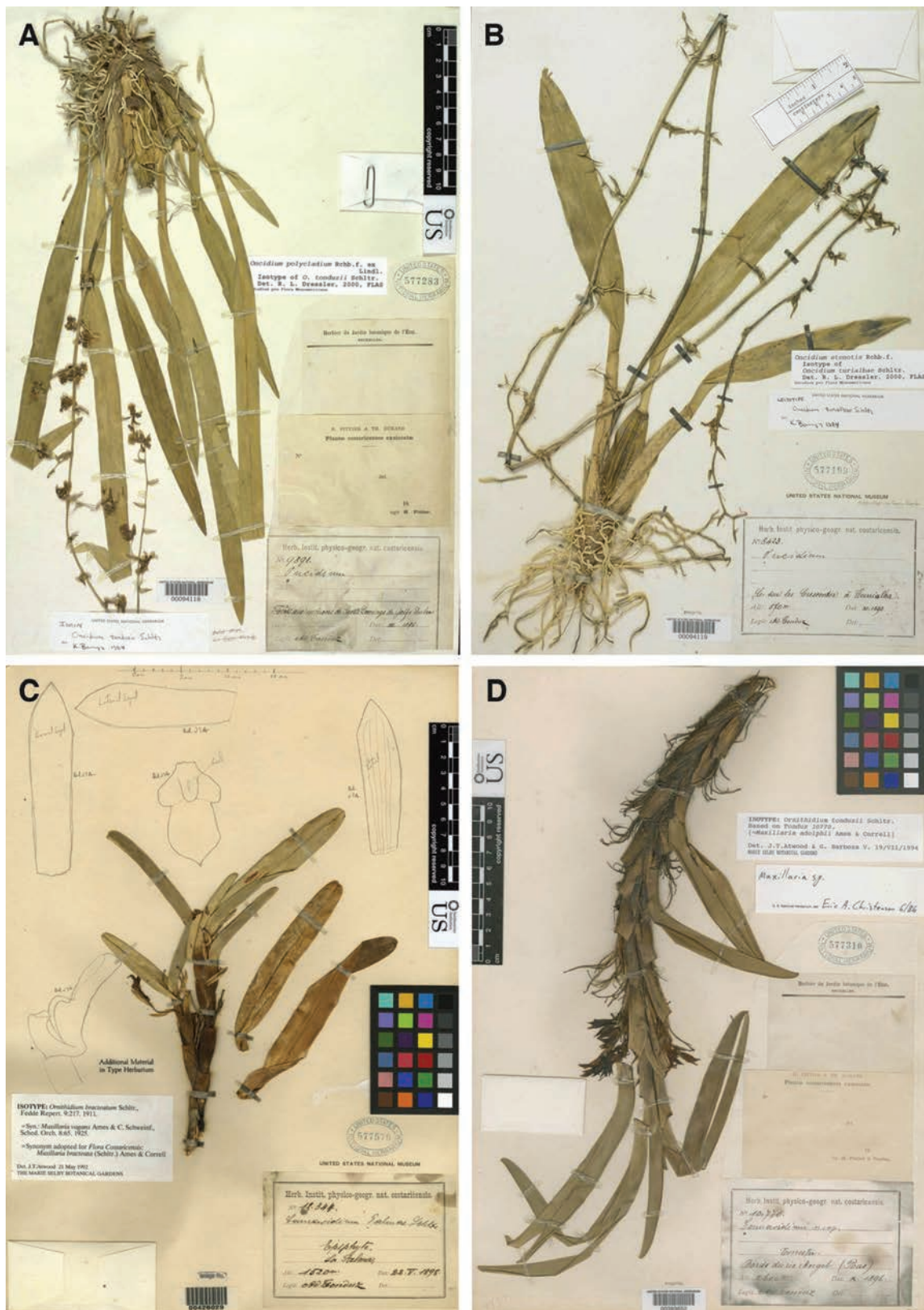


FIGURE 26. **A**, Lectotype of *Oncidium tonduzii* selected by Christenson (1996); **B**, Lectotype of *Oncidium turialbae* selected by Christenson (1996); **C**, Lectotype of *Ornithidium bracteatum* selected by Atwood (1994); **D**, Lectotype of *Ornithidium tonduzii* selected by Atwood (1999). All by courtesy of the United States National Herbarium, Smithsonian Institution.



“Crescentia”-Bäumen bei Turialba, 570 m, blühend im Nov 1893, *P. Biolley 8423* (holotype: B, destroyed; lectotype, designated by Christenson (1996): US 577199/barcode 00094119 [*legit* A. Tonduz]); isolectotype: US 577198/barcode 00025930 [*legit* H. Pittier]; tracings of Schlechter’s drawing of the holotype: AMES 24204/barcode 102572 [*legit* P. Biolley]); illustration of the flower from the holotype published by Mansfeld, 1931: no. 298).

The lectotype selected by Christenson (1996) is complete, and it still has a few remaining flowers in the mid portion of the inflorescence (Fig. 26B). It is not in perfect agreement with the protologue (Schlechter, 1910), which quotes the collector as P. Biolley, but according to our understanding of the IFGN system of specimens’ accession (see the introductory chapter on the numeration of Tonduz’ specimens), both “Herb. Instit. physic-geogr. nat. costaricensis/N°. 8423/Legit A Tonduz,” and “N° 8423/legit H. Pittier,” have to be considered as isotypes, even though the names of Tonduz and Pittier are not quoted as such in the original description.

The analyses of the flowers mounted on the specimen “N° 8423/legit H. Pittier” (US), drawn by J. T. Atwood in preparation of the *Oncidium* treatment for *Flora Costaricensis* (Atwood and Mora-Retana, 1999), perfectly correspond with the floral analyses prepared by Schlechter and traced for Professor Ames (AMES), as well as those published by Mansfeld (1931).

Mora-Retana (1999) treated *O. turialbae* as a synonym of *O. stenotis* Rchb.f., a broadly distributed species from Honduras to Ecuador and Peru, common in the Atlantic lowland forests of Costa Rica.

44. *Ornithidium bracteatum* Schltr., Repert. Spec. Nov. Regni Veg. 9(208–210): 217–218. 1911. TYPE: COSTA RICA. bei La Palma, ca. 1520 m, blühend am 22 Mai 1898, *A. Tonduz [s.n. (Herb. Instit. physic-geogr. nac. Costaricensis)] 12344* (holotype: B, destroyed; isotype, designated by Atwood (1994) as the lectotype: US 577579/barcode 00428029; isolectotype: US 815051/barcode 00386000; tracings of Schlechter’s original drawings of the holotype: AMES 24136/barcode 00102671; illustration of the flower from the holotype published by Mansfeld, 1931: no. 277).

The isotype selected by Atwood (1994) as the species’ lectotype is an apical portion of an adult plant, and it is fertile. The lectotype sheet also bears Atwood’s analysis of a rehydrated flower from the isotype (Fig. 26C) for his studies on Costa Rican *Maxillaria*. The other isotype at US, which include several fertile cane-like stems, has a label bearing an intended name by Schlechter, and never published, “*Camaridium palmae*,” named from the type locality.

The species, endemic to Costa Rica and Panama, is easily distinguished from other taxa of the *Camaridium* group by the foliaceous bracts subtending the pseudobulbs, the short column (<6 mm long), and the terete ovary.

When *Maxillaria* is considered in its broad sense, the species has to be treated as *M. bracteata* (Schltr.) Ames & Correll (Bot. Mus. Leaf. 11(1): 14–15. 1943). When

a narrower circumscription of *Maxillaria* is favored, *Ornithidium bracteatum* correctly belongs to the genus *Camaridium* Lindl. (see Blanco et al., 2007) and should be treated as *C. bracteatum* (Schltr.) Schltr. (Repert. Spec. Nov. Regni Veg. Beih.19: 57. 1923).

45. *Ornithidium tonduzii* Schltr., Repert. Spec. Nov. Regni Veg. 3(42–43): 250–251. 1907. TYPE: COSTA RICA. an den Ufern des Río Angel (Poás), ca. 2600 m, blühend im Oktober 1896, *A. Tonduz [s.n. (Herb. Instit. physic-geogr. nat. costraicensis)] 10770* (lectotype designated by Atwood [1999]: US 938677; isolectotype, US 577310; tracings of Schlechter’s drawing of the holotype: AMES 24216/barcode 0045385; photos of the holotype in Schlechter’s herbarium: AMES 24216/barcode 0045385).

Synonym: *Camaridium adolphi* Schltr., Repert. Spec. Nov. Regni Veg. 19: 58, 141. 1923; *Maxillaria adolphi* (Schltr.) Ames & Correll, Bot. Mus. Leaf. 11(1): 18–19. 1943; *Adamanthus tonduzii* (Schltr.) Szlach. & Sitko, Biodivers. Res. Conservation 25: 22. 2012.

When accepting a narrower circumscription of *Maxillaria* and the closely related genera, as proposed by Whitten et al. (2007) and Blanco et al. (2007), the species described by Schlechter belongs to *Camaridium*, a genus of some 80 taxa characterized by floral bracts longer than the pedicel and ovary, which overlap with the base of the dorsal sepal, and sepals and petals without fiber bundles. Schlechter (1923) first recognized the affinities of his *O. tonduzii* with *Camaridium*, and created the new name *Camaridium adolphi* to accommodate it, as the specific epithet *tonduzii* was already occupied in *Camaridium* by *C. tonduzii* Schltr. (Schlechter, 1910), an illegitimate name based on the same type as *C. costaricense* Schltr. (1907). *Adamanthus tonduzii* (Schltr.) Szlach. & Sitko and *Maxillaria adolphi* (Schltr.) Ames & Correll are both based on *Tonduz 10770*, and they must not to be confused with *M. tonduzii* Ames & Correll, which is a replacing name for *Camaridium costaricense* Schltr. instead.

Atwood (1999) designated the specimen at US (Fig. 26D), which is complete and fertile, as the species’ lectotype. Interestingly, it bears both the IFGN label that ascribes the collection to Tonduz, and another label indicating that the collections was made by “H. Pittier & Tonduz.” At the Herbarium of the Museo Nacional de Costa Rica is kept another specimen of this species collected by Tonduz on the Pacific slopes of the Barva volcano in February 1890 (*Tonduz s.n.*, CR 2083).

46. *Ornithocephalus tonduzii* Schltr., Beih. Bot. Centralbl., Abt. 2 36(2): 420. 1918. TYPE: COSTA RICA. *A. Tonduz s.n.* (holotype: B, destroyed; isotype, selected here as the lectotype: US 938677; isolectotype: US 577310; tracings of Schlechter’s original drawings of the holotype: AMES 24167/barcode 00102717 (Fig. 27A); illustration of the flower from the holotype published by Mansfeld, 1931: no. 306).



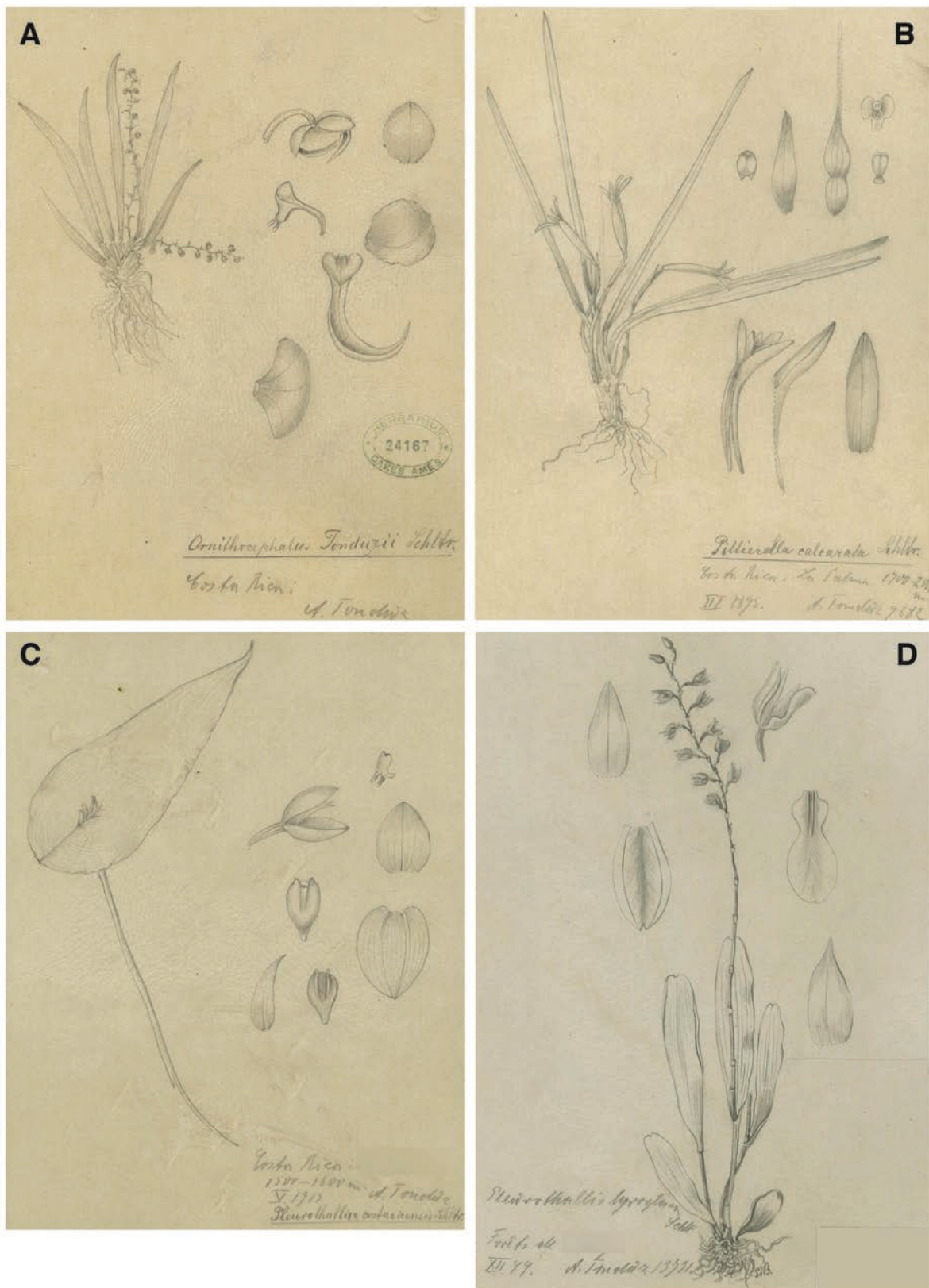


FIGURE 27. **A**, Tracings of the original drawing of the holotype of *Ornithocephalus tonduzii*; **B**, Lectotype of *Pittierella calcarata*; **C**, Lectotype of *Pleurothallis costaricensis*; **D**, Lectotype of *Pleurothallis lyroglossa* designated by Luer (2000). All by courtesy of the Harvard University Herbaria, reproduced with permission of the President and Fellows of Harvard College.

Charles Schweinfurth (manuscript note at AMES, 1934) considered *O. tonduzii* closely allied to *O. elephas* Rchb.f., but in the latter species (according to Reichenbach's drawing of the type), the lobes of the basal callus are erect, instead of spreading as in *O. tonduzii*. It is probably near, if not conspecific with, *Ornithocephalus inflexus* Lindl., with which it shares a broadly cordate callus at the base of the lip, but with a proportionately longer blade, that is distinctly upcurved-hooked apically. Several authors, however, treat *O. inflexus* (based on a Mexican collection by Hartweg) as a synonym of *O. gladius* Hook., whose type is a collection by H. Crueger from Trinidad. Toscano de Brito and Dressler (2000) considered *O. tonduzii* a good species, endemic to Costa Rica and Panama, and distinct from their *O. numenius*, only known from Nicaragua and Honduras; they offer, however, no information on how to distinguish these closely related taxa.

47. *Pittierella calcarata* Schltr., Repert. Spec. Nov. Regni Veg. 3(31–32): 81. 1906. TYPE: COSTA RICA. in den Wäldern von La Palma, 1700–2000 m, blühend im März 1895, A. Tonduz 9682 (holotype: B, destroyed; lectotype, designated here: tracings of Schlechter's original drawings of the holotype, AMES 24793/barcode 00103194). Fig. 27B.

The tracings of the holotype made in Berlin, which we choose to lectotypify the species, well illustrate the unequal apical leaf lobes, the inflorescences of few internodes with tubular bracts that characterize the species.

Schlechter (1906) described *P. calcarata* as the type species of his genus *Pittierella*, which he considered a "singular," ebulbose plant to be compared with *Phreatia* Lindl., an unrelated orchid group native of Southeast Asia. A few years later, in describing *Cryptocentrum minus*, Schlechter (1912) intended publishing a new combination in *Cryptocentrum* Benth. & Hook. for his *Pittierella*, but he involuntarily referred to it as *Pittierella costaricensis*, a name never published (*nomen nudum*), and therefore also his *combinatio nova*, *Cryptocentrum costaricense*, has to be treated as a *nomen nudum* without botanical standing.

The name is the basionym of *Cryptocentrum calcaratum* (Schltr.) Schltr. (Repert. Spec. Nov. Regni Veg. 12(322–324): 214. 1913) or the alternative *Maxillaria calcarata* (Schltr.) Molinari (Richardiana 15: 296. 2015), when the genus *Cryptocentrum* is considered as part of a broad *Maxillaria*.

48. *Pleurothallis costaricensis* Schltr., Beih. Bot. Centralbl. 36(2): 395–396. 1918. *nom. illeg. hom.* TYPE: COSTA RICA. Forêts de San Ramón, 1500–1600 m, May 1913, A. Tonduz (CR-17647) (holotype: B, destroyed; lectotype, designated here: tracings of the original drawing of the holotype, made under Schlechter's supervision, AMES 23674/barcode 00074180 [Fig. 27C]).

Synonym: *Pleurothallis schlechteriana* Ames, Schedul. Orch. 2: 24. 1923. *nom. nov.* (earlier name: *Pleurothallis costaricensis* Rolfe, Bull. Misc. Inform. Kew 1917(2): 80. 1917).

The name *Pleurothallis costaricensis*, which Schlechter chose to describe one of the collections made by Tonduz at San Ramón in 1913, had been used the year before by Robert A. Rolfe (in the Bulletin of Miscellaneous Information Kew, 1917[2], 80) in describing another collection made by Lankester in Costa Rica and it was, therefore, illegitimate at the time of its publication. Renaming the species as *P. schlechteriana* in honor to its author, Ames (1923) suggested a close relationship of *P. costaricensis* Schltr. with *P. cardiothallis* Rchb.f. (the type, a cultivated specimen without known origin), an interpretation followed, among others, by Stevens and collaborators (2001), Pupulin (2002), and CONABIO (2009).

*Pleurothallis schlechteriana* surely belongs to the *P. cardiothallis* group, characterized by large plants with deeply cordate, soft leaves and delicate, bilabiate, large flowers with a distinct temporal activity, which in Costa Rica includes *P. oncoglossa* Luer and another four, probably undescribed taxa. The species of this group, however, are characterized by a subrectangular to triangular lip, variously thickened at the apex, and with the base provided with a small glenion, which is quite distinct from the ovate-oblong lip, provided with two adaxial, short keels, which Schlechter (1918) mentioned in the protologue and that are well illustrate in the lectotype drawing (Fig. 59).

49. *Pleurothallis lyroglossa* Schltr., Repert. Spec. Nov. Regni Veg. 8(191–195): 566. 1910. TYPE: COSTA RICA. [Guanacaste]: in den Wäldern von Nicoya, blühend im Dez 1899, A. Tonduz [s.n. (Museo Nacional de Costa Rica)] 13731 (holotype: B, destroyed; lectotype, designated by Luer (Monogr. Syst. Bot. Missouri Bot. Gard. 79: 80. 2000): tracings of the original drawing of the holotype made under Schlechter's supervision, AMES 23649/barcode 00074425; illustration of the flower from the holotype published by Mansfeld, 1931: no. 128).

The original drawing of the holotype (Fig. 27D), selected as lectotype by Luer (2000), well illustrates the sessile, oblong leaves; the glabrous, connate sepals and the lobed lip with the apex broadly rounded, which distinguish the species.

The name is a synonym of *Stelis quadrifida* (La Llave & Lex.) R. Solano & Soto Arenas, which was originally described as *Dendrobium quadrifidum* La Llave & Lex. from a plant collected by J. J. M. Lexarza in Valladolid (present day Morelia), Mexico. The species has a wide distribution from Mexico to Colombia, Venezuela, and the Greater Antilles (Luer, 2003).

50. *Pleurothallis microtatantha* Schltr., Repert. Spec. Nov. Regni Veg. 3(44–45): 276. 1907. TYPE: COSTA RICA. In den Wäldern von Rancho Flores, ca. 2040 m, blühend am 22 Feb 1890, A. Tonduz 2156 (holotype: B, destroyed; isotype, designated here as the lectotype: US 577083/barcode 00093661 [Fig. 28A]; tracings of the original drawings of the holotype made under Schlechter's supervision, designated here as the epitype: AMES 23651/barcode 00074439 [Fig. 28B]; drawing of the flower from the holotype published by Mansfeld, 1931: no. 129).

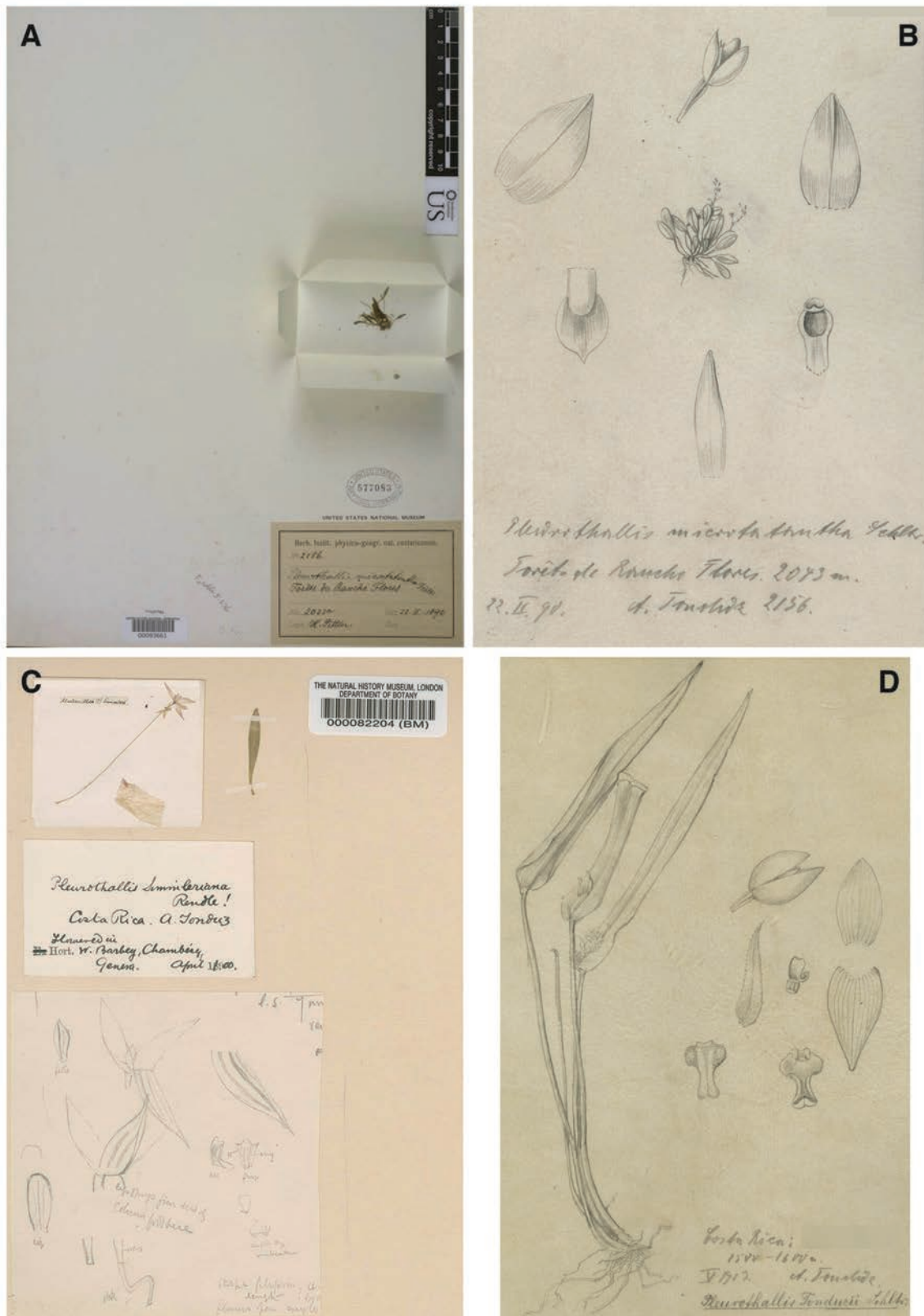


FIGURE 28. **A**, Lectotype of *Pleurothallis microtatantha*; **B**, Tracings of the original drawing of the holotype of *Pleurothallis microtatantha*; **C**, Holotype of *Pleurothallis simmleriana*; **D**, Lectotype of *Pleurothallis tonduzii*. A, courtesy of the United States National Herbarium, Smithsonian Institution; B–D, courtesy of the Harvard University Herbaria, reproduced with permission of the President and Fellows of Harvard College; C, courtesy of the Herbarium of the British Museum of Natural History.



The only known specimen referable to the original collection, kept at US, which we chose as the species lectotype, is sterile. The copy of Schlechter's original drawings of the holotype illustrates—albeit not perfectly—the floral details and we proposed it as an epitype to help understand Schlechter's concept. The illustration shows its characteristic very small habit with small flowers, successive inflorescence exceeding the leaf size, and the lip provided with a distinct basal callus, unique in the genus.

The species, which Schlechter indicated as “one of the smallest *Pleurothallis* I have ever seen” (Schlechter, 1907), belongs to the genus *Platystele*, which indeed includes some of the smallest orchid species in the world; even within the Lilliputian genus *Platystele*, *P. microtatantha* has very small flowers (Fernández et al., 2014). The name is the basionym of *Platystele microtatantha* (Schltr.) Garay (Bot. Mus. Leaflet 21: 251. 1967).

51. *Pleurothallis simmleriana* Rendle, J. Bot. 38(451): 274–275. 1900. TYPE: COSTA RICA. Flowered by M.W. Barbey at Chambésy, near Geneva, A. Tonduz s.n. (holotype: BM000082204 [Fig. 28C]; tracings of the original drawing of the holotype: AMES 23676/ barcode 00104089).

Homotypic synonyms: *Specklinia simmleriana* (Rendle) Luer, Monogr. Syst. Bot. Missouri Bot. Gard. 95: 263. 2004. *Sarcinula simmleriana* (Rendle) Luer, Monogr. Syst. Bot. Missouri Bot. Gard. 105: 218. 2006.

*Pleurothallis simmleriana* was described on the basis of a plant originally collected in Costa Rica by A. Tonduz and sent as a living specimen to the Barbey-Boissier conservatory in Chambésy. Being a mecca for plant taxonomists and enthusiasts, especially European, the greenhouses at Chambésy served as an invaluable source for rarities and novelties. During a trip that included Geneva around April of 1900, Alfred Barton Rendle (1865–1938), an avid English botanist, made a mandatory visit to William Barbey and his collections, where his attention was brought to two small, delicate Costa Rican species that were flowering at that moment. Rendle, who worked for the Department of Botany of the British Museum (where he would occupy the chair of Keeper of Botany from 1906 to 1930), took dried specimens back to London, where he classified them as new to science. He published both species in the “Journal of Botany, British and Foreign,” as *Pleurothallis simmleriana* and *Physosiphon minor*, in July of the same year. The first was dedicated by request (most probably of Mr. Barbey) to Paul Simmler, chief gardener of the Bossier Collections, whose ability to cultivate tropical plants in that Swiss environment were more than appreciated.

The specimen saved at BM consists of a single leaf and a flowered inflorescence, with a sketch of the dissected perianth. The original label in Rendle's handwriting clearly indicates that the specimen was collected in Costa Rica by Tonduz, and therefore should be considered as the holotype. The drawing of the type at AMES was undoubtedly traced on the BM's material.

The species belongs to the group of *Specklinia brighamii/condylata* (sensu Bogarín et al., 2014), mainly characterized by the caespitose plants less than 10 cm tall, the elongated

peduncles with a succession of overlapping floral bracts, and a “fascicle” of pedicels forming an extremely congested raceme. The flowers are mostly speckled, maculate or stained, with entire, smooth sepals and petals, the petals widen towards the middle and an oblong to spatulate lip. Within this taxonomically difficult group, the separation among species is largely based on subtle floral characters and/or the sum of a set of differences in both vegetative and floral morphology. *Specklinia simmleriana* has been traditionally treated as a widespread species, ranging from Guatemala to Colombia, and several authors also include the Costa Rican *Pleurothallis periodica* Ames in its synonymy (Stevens et al., 2001; Luer, 2002, 2003; Pupulin, 2002; among others). In this interpretation, *S. simmleriana* includes plants with an oblong lip, provided with two distinct, triangular, obtuse projections along the proximal margins, but the drawing of the type at BM simply shows an elliptic lip with no lateral projections, which in Costa Rica are restricted to the Caribbean slopes of the Central and Talamanca mountain ranges. As Tonduz provided no locality data for his collection of the type specimen of *Pleurothallis simmleriana*, the true identity of this species has to be carefully assessed to correctly interpret its taxonomic status.

52. *Pleurothallis tonduzii* Schltr., Beih. Bot. Centralbl., Abt. 2 36(2): 397. 1918. TYPE: COSTA RICA. Forêts de San Ramón, 1500–1600 m, May 1913, A. Tonduz s.n. (*herb. Nac. Costa Rica 17646*) (holotype: B, destroyed; lectotype, designated here: tracings of the original drawing of the holotype, made under Schlechter's supervision, AMES 23680/barcode 00074808 [Fig. 28D]; illustration of the flower from the holotype published by Mansfeld, 1931: no. 144).

Synonyms: *Acronia tonduzii* (Schltr.) Luer, Monogr. Syst. Bot. Missouri Bot. Gard. 103: 199, f. 200. 2005. *Zosterophyllanthos tonduzii* (Schltr.) Szlach. & Kulak, Richardiana 6(4): 193. 2006.

No actual material of the original collection by Tonduz has been located, and for this reason we designate as the species' lectotype the tracings made in Berlin of the original drawings of the holotype prepared by Schlechter, made under his supervision. The tracings clearly show the characteristic, tall habit of the plant with narrow, erect leaves, slightly cordate at the base. The sketches of the flower illustrate the denticulate petals and the lip with strongly revolute margins, appearing pandurate in outline, that Schlechter mentioned in the protologue.

Endemic to Costa Rica and western Panama, *P. tonduzii* is a widespread but uncommon epiphyte of the premontane and montane forests on both watersheds of the continental divide.

53. *Restrepia tonduzii* Schltr., Repert. Spec. Nov. Regni Veg. Beih. 19: 291. 1923. TYPE: COSTA RICA. La Palma, im Jahre 1912, A. Tonduz s.n. (holotype: B, destroyed; lectotype, designated by Luer (Monogr. Syst. Bot. Missouri Bot. Gard. 59: 106. 1996): tracings of Schlechter's original drawings of the holotype, AMES 24512/barcode 00103799). Fig. 29A.

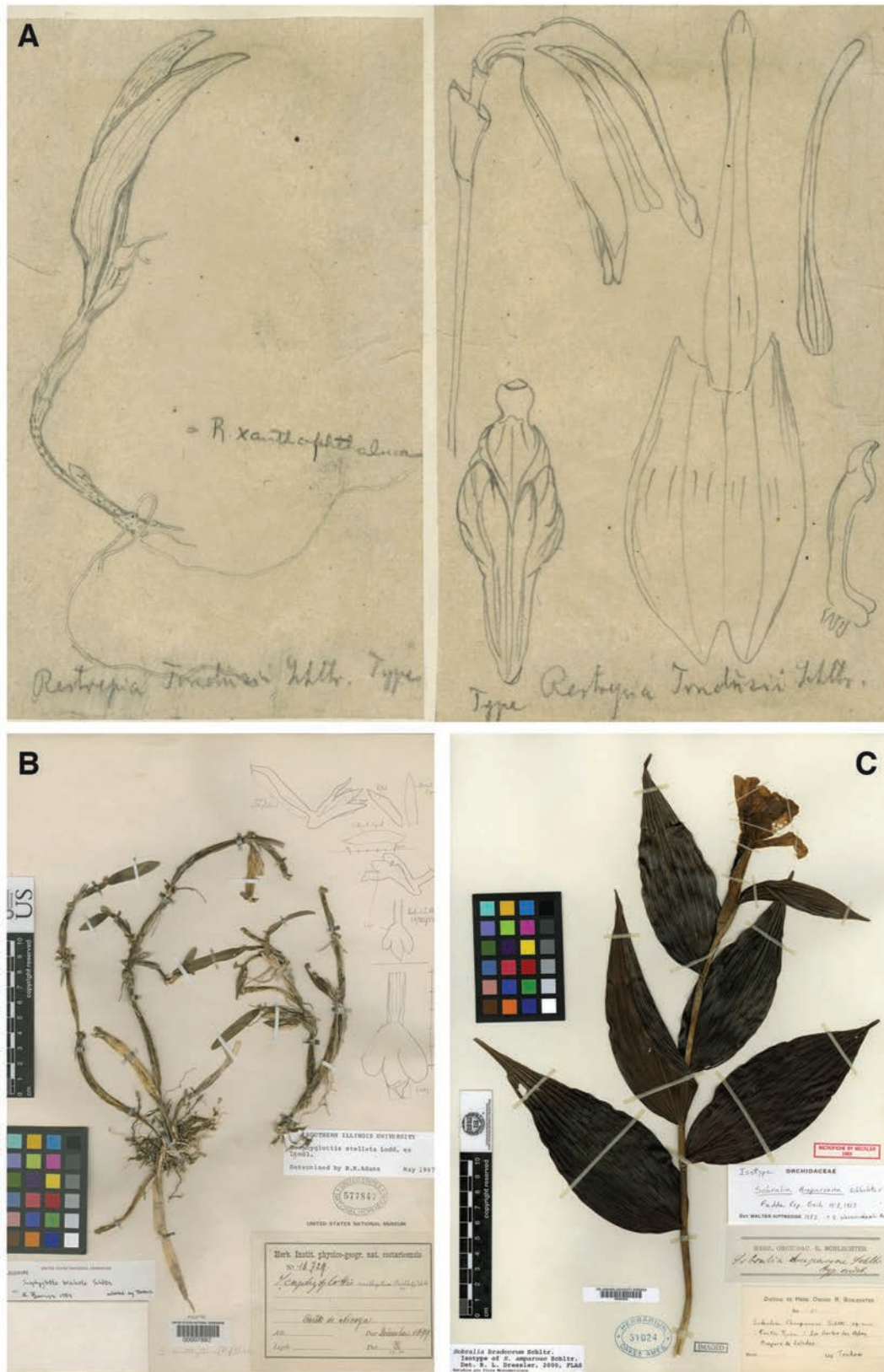


FIGURE 29. **A**, Lectotype of *Restrepia tonduzii* designated by Luer (1996); **B**, Lectotype of *Scaphyglottis brachiata*; **C**, Lectotype of *Sobralia amparaoe*. **A**, **C**, courtesy of the Harvard University Herbaria, reproduced with permission of the President and Fellows of Harvard College; **B**, courtesy of the United States National Herbarium, Smithsonian Institution.

The drawings of the type at AMES, selected by Luer (1996) as the species' lectotype, clearly show the habit of the plant with the characteristic position of the flower, growing near the base of the dorsal side of the leaf. They also show the details of the dissected parts of the flower.

Most authors treat *R. tonduzii* as a synonym of *Restrepia muscifera* (Lindl.) Rchb.f. ex Lindl. (Jørgensen et al., 1999; Luer and Escobar Restrepo, 1996; Hågsater and Salazar, 1990; Pupulin, 2002; CONABIO, 2009; among others), a species widely distributed from Mexico to Colombia, originally described from a plant collected in Guatemala by G. Skinner.

54. *Scaphyglottis brachiata* Schltr., Repert. Spec. Nov. Regni Veg. 9: 432. 1911. TYPE: COSTA RICA. [Guanacaste]. In den Wäldern von Nicoya, blühend in Dezember 1899, A. Tonduz [s.n. (*Herb. Instit. physico-geogr. nat. costaricensis*) 13729 (holotype: B, destroyed; isotype, designated here as the lectotype: US 577847 [Fig. 29B]; tracings of the original drawings of the holotype, made under Schlechter's supervision: AMES 24598/barcode 00104153; illustration of the flower from the holotype published by Mansfeld, 1931: no. 169).

The isotype at US, designated as the species' lectotype, is complete and fertile, and it also bears floral analysis prepared by J. T. Atwood for his studies on Costa Rican orchids. The notably thickened pseudobulbs and the flowers with the column provided with stigmatic, long dentiform wings, easily distinguish the species.

The name is a synonym of *S. stellata* Lodd. Ex Lindl., based on a Guyanese specimen from Demerara, a broadly distributed species ranging from Costa Rica southward to Bolivia, the Guyanas and Brazil.

55. *Sobralia amparoae* Schltr., Repert. Sp. Nov. Regni Veg. Beih. 19: 8. 1923. TYPE: COSTA RICA. Im Garten der Mdme. Amparo de Zeledon, A. Tonduz 51. (holotype: B, destroyed; isotype, designated here as the lectotype: AMES 31024/barcode 00090628 [Fig. 29C]).

*Sobralia amparoae* is one of the species that Schlechter described from dried materials prepared by Tonduz in the garden of Mme. Amparo López-Calleja in San José. The original collecting locality of the specimen, if known at the time of its preparation, was not recorded. The isotype at AMES is the only known evidence of the original collection: it is made by the foliaceous apex of a stem and a flower on a short, conic inflorescence. The flower, however, was gummed on the sheet and is very brittle, so its rehydration would probably be impossible. Unfortunately, no drawing of the type specimen is conserved.

*Sobralia amparoana* is probably a good species. Robert Dressler and the senior author are working at an attempt to reconstruct the identity of this elusive species, trying to match its salient characters, as Schlechter stated them in the protologue, with those of living *Sobralia* specimens with known provenance. When this patient work has concluded, perhaps it could be possible to designate an epitype based on a modern collection with geographic identity. *Sobralia amparoae* is apparently characterized by the tall plants (up

to two meters high) with glabrous stems and large flowers pale rose in color, with a yellow blotch in the throat of the lip, a quite unusual combination of features among Costa Rican species of *Sobralia*.

56. *Spiranthes tonduzii* Schltr., Repert. Spec. Nov. Regni Veg. 9(196–198): 26. 1910. TYPE: COSTA RICA: in den Wäldern von Boruca, blühend im Dez 1891, A. Tonduz s.n. [*Herb. Instit. physico-geogr. nat. costaricensis*] 4645 (holotype: B, destroyed; isotype: US 579418/barcode 00093367 [not seen]; tracings of the original drawings of the holotype, made under Schlechter's supervision: AMES 23177/barcode 00104551 [Fig. 30A]; drawings of the isotype made by O. Ames: AMES 24482/barcode 00104553).

Homotypic synonyms: *Stenorrhynchos tonduzii* (Schltr.) Schltr., Beih. Bot. Centralbl. 37(2): 448. 1920. *Mesadenella tonduzii* (Schltr.) Pabst & Garay, Arch. Jard. Bot. Rio de Janeiro 12: 209. 1953.

The specimen recorded in the type database of the Herbarium at the Smithsonian Institution is the only known isotype, and therefore it would be the best candidate for lectotypification. We do not formally designate it here as such because we were unable to see it or to obtain a digital reproduction of the specimen.

The Ames herbarium at Harvard own a copy of the original drawing of the holotype, made in Berlin under the supervision of Schlechter (Fig. 30A), as well as a drawing of the isotype specimen kept at the Smithsonian. On the latter sheet, Ames himself drew a flower and its dissection during a visit to US.

The name is treated as the basionym of *Mesadenella tonduzii* by Stevens and co-workers (2001), Pupulin (2002), and Dressler (2003), an uncommon species distributed from Mexico to Costa Rica, also doubtfully recorded from Brazil (Forzza et al., 2014).

The only known species of the genus *Mesadenella* in Costa Rica, *M. tonduzii* is recognized by the broadly elliptic, non-articulate leaves forming a basal rosette and the long, lax inflorescence of resupinate flowers, with a distinct mentum produced by the connate base of the lateral sepals.

57. *Stelis aemula* Schltr., Beih. Bot. Centralbl., Abt. 2 36(2): 385. 1918. TYPE: COSTA RICA. Forêts de San Ramón, 1500–1600 m, A. Tonduz s.n. (*Museo Nacional de Costa Rica 17632b*) (holotype: B, destroyed; isotype, designated here as the lectotype: US 1080686/barcode 00093535; epitype, designated here, tracings of the original drawings of the holotype, made under Schlechter's supervision: AMES 23691/barcodes 00090504 [Fig. 30B]).

The isotype at US is the only known extant material of the original collection and is therefore designated as the lectotype. The specimen, however, is sterile, and for this reason we also propose as an epitype the sheet at AMES that includes tracings of Schlechter's analyses, and a sketch with comments by O. Ames.

The epitype sheet, with tracings of Schlechter's original analyses, also includes a sketch made by Oakes Ames of a flower from the isotype at US, but the studied specimen had the lip missing and the petals much damaged. From





FIGURE 30. **A**, Tracings of the original drawing of holotype of *Spiranthes tonduzii*; **B**, Epitype of *Stelis aemula*; **C**, Tracings of the original drawing of holotype of *Stelis connixta*; **D**, Tracings of the original drawing of holotype of *Stelis connixta*. All by courtesy of the Harvard University Herbaria, reproduced with permission of the President and Fellows of Harvard College.

his observations of the type materials Ames (manuscript notes, 1927) considered that *S. aemula* and *S. sarcodantha* (see below) are difficult to set apart, and probably conspecific. Indeed, the Museo Nacional de Costa Rica sent the specimens of the plants that served Schlechter for describing both new species as a sole collection by Tonduz, filed under the Museum number 17632. Schlechter interpreted one of the specimens as *S. sarcodantha*, and added a “b” to the other one to distinguish it as the type of *S. aemula*. He distinguished *S. sarcodantha* from *S. aemula* by the thinner leaves, the more slender inflorescence and the more membranous flowers. However, from the tracings of the original drawings of both species, the floral details are “inconsiderably” different, as stated by Ames in his note on the epitype sheet.

The ramicaul shorter than the leaf, the subcongested inflorescence, the sepals only partially fused, the three-veined dorsal sepal, and the lip without an apical apicule, distinguish the species among Costa Rican relatives.

58. *Stelis conmixta* Schltr., Beih. Bot. Centralbl., Abt. 2 36(2): 387–388. 1918. TYPE: COSTA RICA. Forêts de San Ramón, 1500–1600 m, A. Tonduz s.n. (*Museo Nacional de Costa Rica 17632a*) (holotype: B, destroyed; isotype, selected here as the lectotype: AMES 23707/barcode 00084129 [the flower preserved in glycerine]; tracings of the original drawings of the holotype, made under Schlechter’s supervision: AMES 23707/barcode 00104691 [Fig. 30C]; illustration of the flower from the holotype published by Mansfeld, 1931: no. 85).

*Stelis conmixta* is the second taxon that Schlechter described on the basis of a collection made by Tonduz at San Ramón, which the staff at the Museo Nacional considered a unique collection, filed under the Museum number 17632. Schlechter interpreted one of the specimens as *S. sarcodantha*, added a letter “a” to one of the others to distinguish it as the type of *S. conmixta*, and marked with “b” the plant that he treated as the type of his *S. aemula*. Schlechter (1918) compared it with *S. sarcodantha*, from which he mainly distinguished it by the thinner stems and leaves and the more delicate, almost twice larger flowers, provided with a rhombic lip. The drawing selected as the lectotype well illustrates these characters. The sheet of the lectotype also has a photograph of the holotype, taken in Berlin prior to its destruction.

The relatively large plant with narrow leaves and congested inflorescences that barely surpass the leaf, and the large flowers with the lateral sepals connate almost to the mid-length and the dorsal sepal five-veined distinguish *S. conmixta*, known only from Costa Rica.

59. *Stelis effusa* Schltr., Repert. Spec. Nov. Regni Veg. 3(42–43): 247. 1906. TYPE: COSTA RICA. epiphytisch auf Bäumen bei Turrialba, ca. 570 m, blühend im Nov 1893, A. Tonduz [s.n. (*Herb. Instit. physico-geogr. nat. costaricensis*) 8279] (holotype: B, destroyed; isotypes: AMES 23717/barcode 00084176, designated here as the lectotype; AMES 21921/barcode 00104739; CR 8279; US

577191; Z 00066959; photograph of the holotype taken in Berlin: AMES 21921/barcode 00104739; tracings of the original drawings of the holotype, made under Schlechter’s supervision: AMES 23717/barcode 00104740 [Fig. 30D]).

The isotypes at AMES (×2), US, and Z are fertile, while the isotype at CR is sterile. AMES 23717/barcode 00084176 is chosen as the lectotype as the sheet on which it is mounted also bears the tracings of Schlechter’s analyses, which are crucial for the understanding of the taxonomic concept.

The lax, zig-zag inflorescence much larger than the leaf, the circular, apiculate sepals and the lip provided with a cavity extending to the apex, distinguish the species, which is endemic to Costa Rica.

60. *Stelis longicuspis* Schltr., Repert. Spec. Nov. Regni Veg. 9(196–198): 28. 1910. TYPE: COSTA RICA. in den Wäldern von La Palma, ca. 1459 m, blühend im Nov 1898, A. Tonduz [s.n. (*Herb. Instit. physico-geogr. nat. costaricensis*) 12650] (holotype: B, destroyed; lectotype, designated here: tracings of the original drawings of the holotype, made under Schlechter’s supervision, AMES 55250/barcode 00104825 [Fig. 31A]; photograph of the holotype taken in Berlin: AMES 55250/barcode 00104825).

The lectotype drawing well illustrates the lax inflorescence, the acuminate petals, and the long-acuminate lip characterizing the species. The sheet also includes a photograph of the holotype taken in Berlin, where the original floral analysis by Schlechter was affixed.

Luer (2009) treated the name as a synonym of *Stelis pardipes* Rehb. f., based on plant collected by H. Wendland in Costa Rica at Desengaño, approximately at the same type locality of *S. longicuspis*. This interpretation was originally suggested by Schlechter himself, who annotated the tracings of his drawings of the type with this synonymy (Fig. 31A).

61. *Stelis sarcodantha* Schltr., Beih. Bot. Centralbl., Abt. 2 36(2): 392–393. 1918. TYPE: COSTA RICA. Forêts de San Ramón, 1500–1600 m, A. Tonduz s.n. (*Museo Nacional de Costa Rica 17632*) (holotype: B, destroyed; isotypes: AMES 24935/barcode 00104976 [the fragments of the flower stored in glycerine], designated here as the lectotype, with sketches by O. Ames of a flower from the type and photographs of the holotype at Berlin [barcode 00084411] and the isotype at US [barcode 00084412] [Fig. 31B]; US 1080686; tracings of the original drawings of the holotype, made under Schlechter’s supervision, AMES 24934/barcode 00104975; analytical drawings by O. Ames of a flower from the type: AMES 33368/barcode 00104977; illustration of the flower from the holotype published by Mansfeld, 1931: no. 106).

The isotype sheet at US, which has four specimens mounted, is sterile, and for this reason we selected to lectotypify the species with the sheet at AMES, which has a flower conserved in glycerine, and analytical drawings made from the type.

The plants with narrowly elliptic leaves surpassing in length the ramicaul, the sepals obtuse, and the ovoid lip with a small callus on the back distinguish the species. D’Arcy

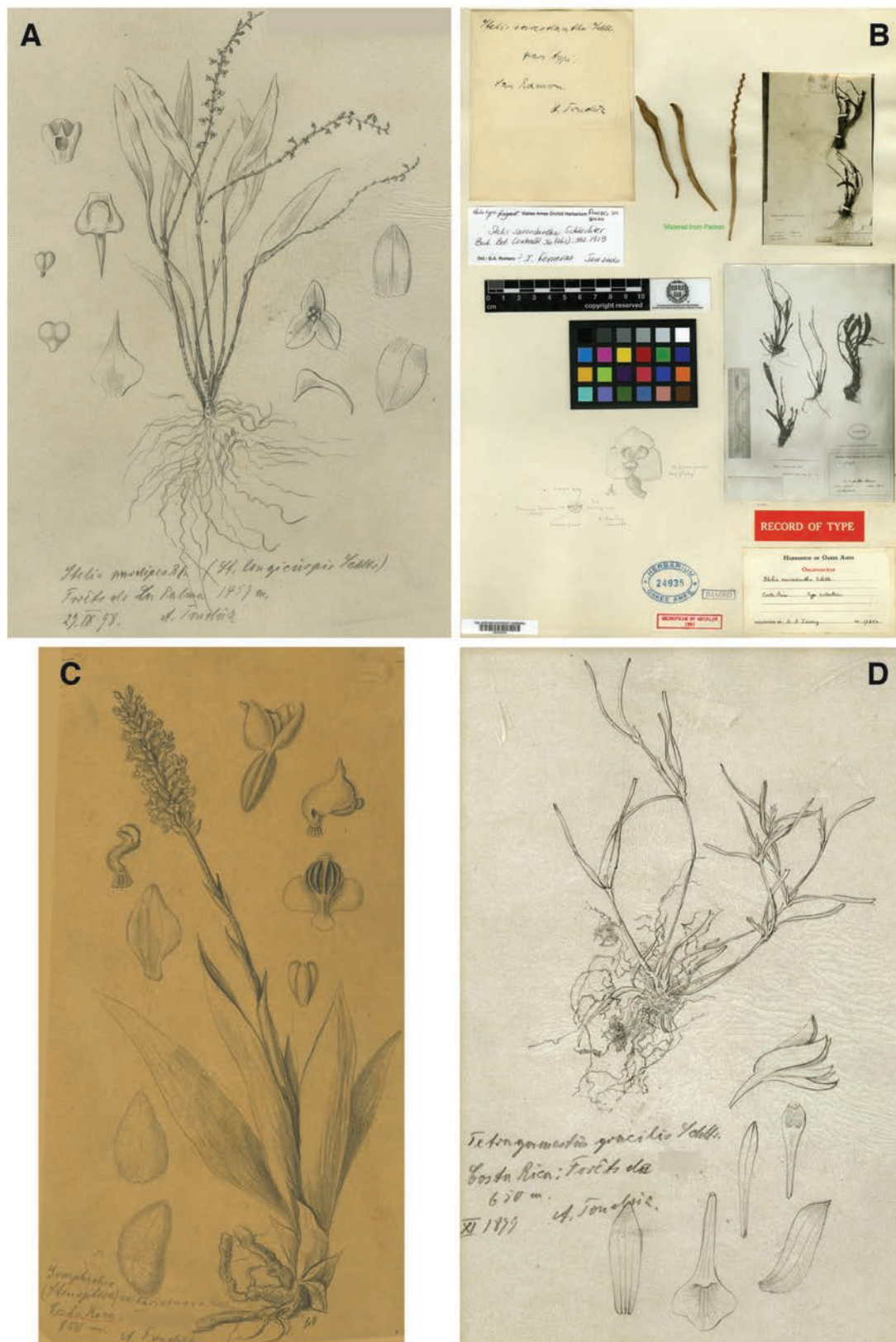


FIGURE 31. **A**, Lectotype of *Stelis longicuspis*; **B**, Lectotype of *Stelis sarcodantha*; **C**, Lectotype of *Stenoptera costaricensis*; **D**, Lectotype of *Tetragamestus gracilis*. All by courtesy of the Harvard University Herbaria, reproduced with permission of the President and Fellows of Harvard College.



(1987) and Stevens and co-workers (2001) treat the name as a synonym of *Stelis aemula* Schltr., a broadly distributed species ranging from Mexico to Costa Rica, described from a simultaneous collection by Tonduz that originally bore the same accession number at the Museo Nacional de Costa Rica (see above).

62. *Stenoptera costaricensis* Schltr., Beih. Bot. Centralbl. 36(2): 375. 1918. TYPE: COSTA RICA. Turrialba. A Tonduz s.n. (holotype: B, destroyed; lectotype, designated here: tracings of the original drawings of the holotype, made under Schlechter's supervision, AMES 24338/barcode 00105055 [Fig. 31C]; illustration of the flower from the holotype published by Mansfeld, 1931: no. 22).

No material of the original collection is known to be in existence, and we are lectotypifying the species with the tracings of the original analytical drawings of the holotype, made in Berlin for the herbarium of Professor O. Ames at Harvard University. *Stenoptera costaricensis* may be recognized by the bracts of the inflorescence shorter than the subtending flowers, the thickened lip with the side lobes erect, flanking the column, and the S-shaped column, which are well illustrated in the lectotype drawings.

The name is the basionym of *Gomphichis costaricensis* (Schltr.) Ames, F.T.Hubb. & C.Schweinf. (Bot. Mus. Leaflet 3: 37. 1934), and the species has been treated under this name in Pupulin (2002) and Salazar (2005, with photograph).

*Rodriguezia inconspicua* Kraenzl., Bull. Herb. Boissier 3(12): 630–631. 1895, replacing name for *Trichocentrum candidum* Lindl.

Synonym: *Hybochilus inconspicuus* (Kraenzl.) Schltr., Repert. Spec. Nov. Regni Veg. 16(468/473): 430. 1920. *Leochilus inconspicuus* (Kraenzl.) M.W.Chase & N.H.Williams, Lindleyana 21(3): 21. 2008.

As Kränzlin received from E. Autran a specimen of a small-flowered Oncidiinae species collected by Tonduz in Costa Rica and grown in the greenhouse of Mme. Barbey at Chambésy, he erroneously believed that it corresponded to the species described almost sixty years before by John Lindley as *Trichocentrum candidum*. The similarity between the two species, if any, is however, superficial at most and

Dressler (2003) considered it a synonym of *Gomphichis adnata* (Ridl.) Schltr. (based on *Stenoptera adnata* Ridl.), but the type of this species was originally collected at Roraima, in Venezuelan Guayana.

63. *Tetragamestus gracilis* Schltr., Beih. Bot. Centralbl. 36(2): 400. 1918. TYPE: COSTA RICA: [Cartago: Turrialba]. Forêts de Tuis, 650 m, Nov. 1897, A. Tonduz [s.n., Herb. Inst. Phys. Geogr. Costar.] 11588 (holotype: B, destroyed; lectotype, selected here: tracings of the original drawings of the holotype, made under Schlechter's supervision, AMES 24591/barcode 00105243 [Fig. 31D]; illustration of the flower from the holotype published by Mansfeld, 1931: no. 168).

In the absence of any actual material referable to the type collection, we have chosen to lectotypify *T. gracilis* with the tracings made in Berlin of the original drawing of the holotype. The drawings well illustrate the habit of the species, with the new pseudobulbs produced at the top of the oldest ones, forming chains, and the 3-lobed, almost rhombic lip, which characterize the taxon.

The name is the basionym of *Scaphyglottis gracilis* (Schltr.) Schltr. (Repert. Spec. Nov. Regni Veg. Beih. 19: 28. 1923), which most authors (see, for example, D'Arcy, 1987; Brako and Zarucchi, 1993; Stevens et al., 2001; Pupulin, 2002; Dressler, 2003; Jørgensen et al., 2014; among others) treat as a synonym of *S. prolifera* Cogn.

#### EXCLUDED NAMES

the two taxa have no relationship. Even though subsequent authors treated the substitute name *R. inconspicua* as that of a new species (i.e., Schlechter, 1920; Chase, 1986; Chase et al., 2008), considering it typified by *Tonduz s.n.*, the name was explicitly proposed as an avowed substitute for *T. candidum*, due to Kränzlin's erroneously belief that the epithet "candida" was already occupied in *Rodriguezia*. As a substitute name is typified by the type of the name that it replaces, *R. inconspicua* is typified by the type of *T. candidum*, a true species of *Trichocentrum* based on a Guatemalan collection by G. Skinner, and is therefore a synonym of the latter species. Tonduz' collection, of which duplicates exist at CR, HBG, and G, has therefore no nomenclatural standing.

#### LITERATURE CITED

- AMES, O. 1920. *Illustrations and studies of the family Orchidaceae. The genus Habenaria in North America*. Vol. 4. Ames Botanical Laboratory, Massachusetts.
- . 1922. *Orchidaceae quaedam Americanae*. Sched. Orchid. 1: 1–24.
- . 1923. *Orchidaceae quaedam Americanae II*. Sched. Orchid. 2: 1–38.
- . 1943. *Studies in Habenaria and Dichaea*. Bot. Mus. Leaflet. Harv. Univ. 11(3): 57–80.
- AMES, O., F. T. HUBBARD, AND C. SCHWEINFURTH. 1936. *The genus Epidendrum in the United States and Middle America*. Botanical Museum, Cambridge, Massachusetts.
- ATWOOD, J. T. 1994. Two new species of Costa Rican *Maxillaria* (Orchidaceae), and a clarification of *Maxillaria bracteata*. Lindleyana. 9: 239–242.
- . 1999. *Maxillaria* Ruiz & Pavón. Pages 32–84 in J. T. ATWOOD, AND D. E. MORA-RETANA, EDs. *Family #39 Orchidaceae: Tribe Maxillarieae: subtribes Maxillariinae and Oncidiinae*. Chicago Natural History Museum, Chicago.
- . 2003. *Maxillaria*. Pages 291–332 in B. E. HAMMEL, M. H. GRAYUM, C. HERRERA, AND N. ZAMORA, EDs. *Manual de Plantas de Costa Rica. Vol. III*. Missouri Botanical Garden Press, St. Louis.
- AND D. E. MORA-RETANA. 1999. *Family #39 Orchidaceae: Tribe Maxillarieae: subtribes Maxillariinae and Oncidiinae*. Chicago Natural History Museum, Chicago.

- AUTRAN, E. J. B. AND T. DURAND. 1896. *Hortus Boissierianus: énumération des plantes cultivées en 1885 à Valleyres (Vaud) et à la Perrière (Chambésy près Genève)*. Imprimerie Georges Bridel & Co, Lausanne.
- BARRINGER, K. A. 1986. *Typification of Schlechter's Costa Rican Orchidaceae. I, Types collected by A. Brenes*. Chicago Natural History Museum, Chicago.
- . 1991. A revision of *Epidendrum* subgenus *Epidanthus* (Orchidaceae). *Brittonia*. 43(4): 240–252.
- BEAUVERD, G. 1922. M. Adolphe Tonduz. *Bull. Soc. Bot. Genève*, ser. 2. 14: 12–13.
- BIOLLEY, P. 1887. *Elementos de historia natural*. Imprenta Nacional, San José.
- . 1898. *Elementos de gramática griega aplicados al estudio de la lengua castellana*. Typ. Chamerot et Renouard, Paris.
- BLANCO, M. A., S. KOEHLER, N. H. WILLIAMS, I. OJEDA, K. M. NEUBIG, AND L. ENDARA. 2007. Generic realignments in Maxillariinae. (Orchidaceae). *Lankesteriana*. 7: 515–537.
- BOGARÍN, D., Z. SERRACÍN, AND Z. SAMUDIO. 2014. Illustrations and studies in Neotropical Orchidaceae. The *Specklinia condylata* group (Pleurothallidinae) in Costa Rica and Panama. *Lankesteriana*. 13(3): 185–206.
- BRAKO, L. AND J. L. ZARUCCI. 1993. *Catalogue of the Flowering Plants and Gymnosperms of Peru*. Missouri Botanical Garden Press, St. Louis.
- BRITTON, N. L. AND J. N. ROSE. 1928. *North American Flora. Vol. 23, Part I. (Rosales). Mimosaceae*. The New York Botanical Garden, New York.
- BUTZIN, F. 1978. In Berlin existing types of Schlechter's orchid species. *Willdenowia*. 8(2): 401–407.
- . 1980. Typenstudien im Berliner Orchideen-Herbar: Arten von Kränzlin und Mansfeld. *Willdenowia*. 10: 147–149.
- CHASE, M. W. 1986. A monograph of *Leochilus* (Orchidaceae). *Syst. Bot. Monogr.* 14: 1–97.
- , K. M. CAMERON, J. V. FREUDENSTEIN, A. M. PRIDGEON, G. SALAZAR, C. VAN DEN BERG, AND A. SCHUITEMAN. 2015. An updated classification of Orchidaceae. *Bot. J. Linn. Soc.* 177(2): 151–174.
- , N. H. WILLIAMS, K. M. NEUBIG, AND W. M. WHITTEN. 2008. Taxonomic transfers in Oncidiinae to accord with *Genera Orchidacearum*, Volume 5. *Lindleyana*. 77: 20–31.
- CHRISTENSON, E. A. 1996. Notes on Neotropical Orchidaceae II. *Lindleyana*. 11(1): 12–26.
- COGNIAUX, A. 1891. Melastomataceae in: A. de Candolle, and C. de Candolle, eds., *Monographiae Phanerogamarum*, Vol. 7. G. Masson, Paris.
- . 1902. Une orchidée nouvelle de Costa-Rica. *Bull. Herb. Boissier*, sér. 2. 2(4): 337–338.
- COGNIAUX, A. AND A. GOSSENS. 1897. *Dictionnaire Iconographique des Orchidées. Genre Brassavola, pl. 1*. Imp. F. Havermans, Bruxelles.
- COMISIÓN NACIONAL PARA EL CONOCIMIENTO Y USO DE LA BIODIVERSIDAD (CONABIO). 2009. *Capital Natural México. Catálogo taxonómico de especies de México I*. CONABIO, México City.
- D'ARCY, W. G. 1987. *Flora of Panama. Checklist and Index. Part 1: The introduction and checklist*. Missouri Botanical Garden Press, St. Louis.
- DRESSLER, R. L. 1999. Mesoamerican orchid novelties 4, *Habenaria*. *Ibugana*. 7(1–3): 93–101.
- . 2000. Mesoamerican orchid novelties 3. *Novon*. 10: 193–200.
- . 2003. Orchidaceae. Pages 1–595 in B. E. HAMMEL, M. H. GRAYUM, C. HERRERA, AND N. ZAMORA, EDS. *Manual de Plantas de Costa Rica. Vol. III*. Missouri Botanical Garden Press, St. Louis.
- DURAND, T. AND H. PITTIER. 1891. *Primitiae florum costaricensis. Vol. I*. Jardin botanique de l'État, Bruxelles.
- . 1896. *Primitiae florum costaricensis. Vol. 2, t. IX*. Instituto Físico-Geográfico Nacional, San José.
- EAKIN, M. C. 1999. The origins of modern science in Costa Rica: the Instituto Físico-Geográfico Nacional, 1887–1904. *Latin Amer. Res. Rev.* 34(1): 123–150.
- FERNÁNDEZ, M., D. BOGARÍN, A. P. KARREMANS, AND D. JIMÉNEZ. 2014. New species and records of Orchidaceae from Costa Rica III. *Lankesteriana*. 13(3): 259–282.
- FIELD MUSEUM OF NATURAL HISTORY. 1937. *Annual Report of the Director to the Board of Trustees for the Year 1936*. Chicago Natural History Museum, Chicago.
- FOWLIE, J. A. 1971. Three distinctive species of *Chysis* from Central America. *Orchid Digest*. 35: 85–87.
- FORZZA, R. C., A. COSTA, J. A. SIQUEIRA FILHO, G. MARTINELLI, R. F. MONTEIRO, F. SANTOS-SILVA, D. P. SARAIVA, AND B. PAIXÃO-SOUZA. 2014. Lista de Espécies da Flora do Brasil. Jardim Botânico do Rio de Janeiro, Rio de Janeiro; <http://floradobrasil.jbrj.gov.br/jabot/floradobrasil/FB66> (accessed June 2015).
- GRAYUM, M. H., B. E. HAMMEL, S. TROYO, AND N. ZAMORA. 2004. La exploración botánica y la florística en Costa Rica. Page 147 in B. E. HAMMEL, M. H. GRAYUM, C. HERRERA, AND N. ZAMORA, EDS. *Manual de Plantas de Costa Rica. Volumen I. Introducción*. Missouri Botanical Garden Press, St. Louis.
- HÄGSATER, E. AND G. A. SALAZAR. 1990. *Orchids of Mexico, pt. 1. Icones Orchidacearum I*. Instituto Chino A. C., México City.
- HÄSLER, B. AND W. BAUMANN. 2000. *Henri Pittier 1857–1950*. Friedrich Reinhardt Verlag, Basel, Switzerland.
- HIEPKO, P. 1987. The collections of the Botanical Museum Berlin-Dahlem (B) and their history. *Englera*. 7: 219–252.
- JACQUEMOUD, F. 2011. On the Edmond Boissier herbarium and the creation of a Herbarium of the *Flora Orientalis* (G-BOIS): conservation, use and actuality of a scientific and cultural heritage of outstanding value. *Arch. Sci.* 64(1–2): 57–76.
- JENNY, R. 2013. What is in an orchid name: a tribute to the early naturalists in Costa Rica. *Lankesteriana*. 13(3): 291–317.
- . 2015. ...*Of men and orchids... Part I*. Imprenta Mariscal, Quito.
- JIMÉNEZ, O. 1971. Tonduzia. *Revista de Agricultura* (San José). 43(5–6–7–8): 55–67.
- JØRGENSEN, P. M., M. H. NEE, AND S. G. BECK. 2014. *Catálogo de las plantas vasculares de Bolivia*. Missouri Botanical Garden Press, St. Louis.
- KRÄNZLIN, F. W. L. 1895a. Eine neue *Epidendrum*-Art. *Bull. Herb. Boissier*. 3(11): 607–608.
- . 1895b. Eine neue *Rodriguezia*-Art. *Bull. Herb. Boissier*. 3(12): 630–631 (t.18).
- . 1920. Orchidaceae Kalbreyerianae I. *Notizbl. Bot. Gart. Berlin-Dahlem*. 7(69): 412–451.
- . 1929. Orchidaceae quedam novae. *Vierteljahrsschr. Naturf. Ges. Zürich* 74: 134–138.
- LANKESTER, C. H. 1924. *Epidendrum pumilum* and *E. tonduzii*. *Orchid Rev.* 32: 267.
- LUER, C. A. 1996. *Icones Pleurothallidarum XIII: Systematics of Restrepia (Orchidaceae)*. Missouri Botanical Garden Press, St. Louis.
- . 2000. *Icones Pleurothallidarum XX: Systematics of Jostia, Andinia, Barbosella, Barbrodia, and Pleurothallis and Subgenera Antilla, Effusia, and Restrepioidia*. Missouri Botanical Garden Press, St. Louis.
- . 2002. A systematic method of classification of the Pleurothallidinae versus a strictly phylogenetic method. *Selbyana*. 23(1): 57–110.

- . 2003. Orchidaceae subtribu Pleurothallidinae. In B. E. HAMMEL, M. H. GRAYUM, C. HERRERA, AND N. ZAMORA, EDs. *Manual de Plantas de Costa Rica. Vol. III*. Missouri Botanical Garden Press, St. Louis.
- . 2009. *Stelis of Ecuador, Part 4*. Missouri Botanical Garden Press, St. Louis.
- LUER, C. A. AND R. ESCOBAR RESTREPO. 1996. *Icones Pleurothallidarum—XIII. Systematics of Restrepia (Orchidaceae)*. Missouri Botanical Garden Press, St. Louis.
- MANSFELD, R. 1929. Figuren-Atlas zu den Orchideenfloren der südamerikanischen Kordillierenstaaten von R. Schlechter. *Repert. Spec. Nov. Regni Veg. Beih.* 57: 1–142.
- . 1930. Blütenanalysen neuer Orchideen von R. Schlechter. I. Südamerikanische Orchideen. *Repert. Spec. Nov. Regni Veg. Beih.* 58: Tab. 1–60.
- . 1931. Blütenanalysen neuer Orchideen von R. Schlechter. II. Mittelamerikanische Orchideen. *Repert. Spec. Nov. Regni Veg. Beih.* 59: Tab. 1–81.
- . 1932. Blütenanalysen neuer Orchideen von R. Schlechter. III. Afrikanische und madagassische. *Repert. Spec. Nov. Regni Veg. Beih.* 68: Tab. 49–104.
- . 1934. Blütenanalysen neuer Orchideen von R. Schlechter. IV. Indische und malesische Orchideen. *Repert. Spec. Nov. Regni Veg. Beih.* 74: Tab. 49–104.
- MCCOOK, S. G. 2002. *States of Nature. Science, agriculture, and environment in the Spanish Caribbean, 1760–1940*. University of Texas Press, Austin.
- 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, AND J. H. WIERSEMA. 2012. *International Code of Nomenclature for algae, fungi, and plants (Melbourne Code): adopted by the Eighteenth International Botanical Congress Melbourne, Australia, July 2011*. Koeltz Scientific Books, Oberreifenberg.
- MORA-RETANA, D. E. 1999. *Oncidium* Sw. Pages 135–150 in J. T. ATWOOD, AND D. E. MORA-RETANA. *Family #39 Orchidaceae: Tribe Maxillarieae: subtribes Maxillariinae and Oncidiinae*. Chicago Natural History Museum, Chicago.
- NATURAL HISTORY MUSEUM. 2014. Dataset: Collection specimens. Natural History Museum, London; <http://data.nhm.ac.uk/specimen/3cb9f9ad-e8be-4350-8d05-9337c6204965> (accessed August 9, 2015).
- OSSENBACH, C. 2009. Orchids and orchidology in Central America: 500 years of history. *Lankesteriana*. 9(1–2): 1–242.
- PITTIER, H. 1898–1900. *Primitiae florum costaricensis*. Vol. 2. Instituto Físico-Geográfico Nacional, San José.
- . 1901. *Primitiae florum costaricensis*. Vol. 3(1). Instituto Físico-Geográfico Nacional, San José.
- . 1904. *Primitiae florum costaricensis*. Vol. 3(2). *Bull. Herb. Boissier*. 4: 936–972.
- . 1905. *Primitiae florum costaricensis*. Vol. 3(2). *Bull. Herb. Boissier*. 5: 1–260.
- . 1908. *Ensayo sobre las plantas usuales de Costa Rica*. H. L. and J. B. McQueen, Washington.
- PLIMPTON, G., AND P. AMES PLIMPTON. 1979. *Oakes Ames. Jottings of a Harvard Botanist*. Harvard University Press, Cambridge, Massachusetts.
- PUPULIN, F. 1998. Orchid flora of Manuel Antonio National Park, Quepos, Costa Rica. *Revista Biol. Trop.* 46(4): 961–1031.
- . 2002. Catálogo revisado y anotado de las Orchidaceae de Costa Rica. *Lankesteriana*. 4: 1–88.
- . 2010a. *Flora Costaricensis. Family #39 Orchidaceae: Tribe Cymbidieae: Subtribu Zygopetalinae*. Chicago Natural History Museum, Chicago.
- . 2010b. Orchidaceae Werckleanae: typification of Costa Rican orchid species described from collections by K. Wercklé. *Bot. J. Linn. Soc.* 163(2): 111–184.
- PUPULIN, F., AND D. BOGARÍN. 2012. A taxonomic revision of *Encyclia* (Orchidaceae: Laeliinae) in Costa Rica. *Bot. J. Linn. Soc.* 168: 395–448.
- PUPULIN, F. AND A. KARREMANS. 2007. *Prostechea ionophlebia* and *P. chacaoensis*: two different species, but which is which? *Lindleyana in Orchids*. 76(3): 202–208.
- PUPULIN, F., C. OSSENBACH, R. JENNY, AND E. VITEK. 2011. Typi Orchidacearum ab Augusto R. Endresio in Costa Rica lecti. *Ann. Naturhist. Mus. Wien, B.* 112: 265–313.
- . 2012. Additamenta ad Typos Endresianos Orchidacearum Costaricae. *Ann. Naturhist. Mus. Wien, B.* 113: 133–138.
- . 2013. Species Endresianae. Pages 305–343 in C. OSSENBACH, F. PUPULIN, AND R. JENNY, EDs. *Orchids in the life and work of Auguste R. Endrés. Vol. 1. The Texts*. Naturhistorisches Museum in Wien, Vienna.
- RENDEL, A. B. 1900. New orchids from Costa Rica. *J. Bot.* 38(451): 274–275.
- SALAZAR, G. A. 2005. *Gomphichis* Lindl. Pages 330–331 in F. PUPULIN, ED. *Vanishing Beauty. Native Costa Rican orchids. Vol. 1. Acianthera-Kegelella*. Editorial de la Universidad de Costa Rica, San José.
- SÁNCHEZ SALDAÑA, L., AND E. HÁGSATER. 2006. *Epidendrum barbeyanum* Kraenzl. Plate 811 in E. HÁGSATER, AND L. SÁNCHEZ SALDAÑA, EDs. *Icones Orchidacearum, Species new and old in Epidendrum. The genus Epidendrum, part 5*. Instituto Chinoín A. C., México City.
- . AND ———. 2007. *Epidendrum firmum* Rchb.f., Plate 937 in E. HÁGSATER, AND L. SÁNCHEZ SALDAÑA, EDs. *Icones Orchidacearum, Species new and old in Epidendrum. The genus Epidendrum, part 6*. Instituto Chinoín, A. C., México City.
- . 2008. *Epidendrum trachythece* Schltr., Plate 1188 in E. HÁGSATER, AND L. SÁNCHEZ SALDAÑA, EDs. *Icones Orchidacearum, Species new and old in Epidendrum. The genus Epidendrum, part 7*. Instituto Chinoín, A. C., México City.
- SANTIAGO, E., AND E. HÁGSATER. 2006. *Epidendrum pumilum* Rolfe. Plate 880 in E. HÁGSATER, AND L. SÁNCHEZ SALDAÑA, EDs. *Icones Orchidacearum, Species new and old in Epidendrum. The genus Epidendrum, part 5*. Instituto Chinoín, A. C., México City.
- . 2007. *Epidendrum endresii* Rchb.f. Plate 931 in E. HÁGSATER, AND L. SÁNCHEZ SALDAÑA, EDs. *Icones Orchidacearum, Species new and old in Epidendrum. The genus Epidendrum, part 6*. Instituto Chinoín, A. C., México City.
- SAX, K. 1950. Oakes Ames, 1874–1950. *J. Arnold Arbor.* 31: 335–337.
- SCHLECHTER, R. 1906. Orchidaceae novae et criticae, Decas VII. *Repert. Spec. Nov. Regni Veg.* 3: 106.
- . 1907. Orchidaceae novae et criticae, Decas VIII. *Repert. Spec. Nov. Regni Veg.* 3: 246–251.
- . 1910. Orchidaceae novae et criticae, Decas XIV–XV. *Repert. Spec. Nov. Regni Veg.* 8: 561.
- . 1911. Orchidaceae novae et criticae, Decas XVIII. *Repert. Spec. Nov. Regni Veg.* 9: 161.
- . 1912. Orchidaceae novae et criticae, Decas XXXIV. *Repert. Spec. Nov. Regni Veg.* 10: 480–486.
- . 1918. Kritische Aufzählung der bisher aus Zentralamerika bekanntgewordenen Orchideen; D. Beschreibungen neuer Arten. *Beih. Bot. Centralbl.* 36: 371–421.
- . 1919. Die Gattung *Brassavola* R.Br. *Orchis*. 13: 71–79.
- . 1920. Studium zur Klärung der Gattung *Rodriguezia* Ruiz et Pav. *Repert. Spec. Nov. Regni Veg.* 16: 425–430.



- . 1921. Orchidaceae novae et criticae, Decas LXIX. Repert. Spec. Nov. Regni Veg. 17, 138–144.
- . 1923. Orchidaceae novae et rariores collectorum variorum in Costa Rica collectae. Repert. Spec. Nov. Regni Veg. Beih. 19: 270–307.
- SCHWEINFURTH, C. 1941. Nomenclatorial notes among South American orchids. Bot. Mus. Leaflet. 10: 32–38.
- STAPLES, G. W. AND F. JACQUEMOUD. 2005. Typification and nomenclature of the Convolvulaceae in N. L. Burman's Flora Indica, with an introduction to the Burman collection at Geneva. *Candollea*. 60(2): 445–467.
- STEVENS, W. D., C. ULLOA ULLOA, A. POOL, AND O. M. MONTIEL. 2001. *Flora de Nicaragua*. Missouri Botanical Garden Press, St. Louis.
- TALADOIRE, E. 1995. Maurice de Périgny, archéologue ou explorateur? *J. Soc. Am.* 81: 243–252.
- TONDUZ, A. 1893. *Expediciones botánicas efectuadas en la parte meridional de Costa Rica por los años 1891–1892*. Tipografía Nacional, San José.
- . 1895a. Exploraciones botánicas en Talamanca. *Anales Inst. Fis.-Geogr. Nac. Costa Rica*. 8: 1–21.
- . 1895b. Herborisations au Costa Rica. *Bull. Herb. Boissier*. 3: 1–465.
- . 1896. Herborisations au Costa Rica. *Bull. Herb. Boissier*. 4: 163–177.
- . 1897a. Herborisations au Costa Rica. *Bull. Herb. Boissier*. 5: 15–30.
- . 1897b. *La fumagina del cafeto*. Instituto Físico-Geográfico Nacional, San José.
- TOSCANO DE BRITO, A. L. V. AND R. L. DRESSLER. 2000. New combinations in *Ornithocephalus* (Ornithocephalinae: Orchidaceae) and description of a new species from Mesoamerica. *Lindleyana*. 15(4): 252–255.
- 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.
- WOOLWARD, F. H. 1896. *The genus Masdevallia. Issued by the Marquess of Lothian, K.T., chiefly from plants in his collection of orchids at Newbattle Abbey. With additional notes by F.C. Lehmann (German Consul in the Republic of Colombia)*. R.H. Porter, London.
- . 1906. *Masdevallia tonduzii* Spec. nov. *Bull. Herb. Boissier*. 6: 82.

## APPENDIX

## PLANTS DEDICATED TO ADOLPHE TONDUZ

## Acanthaceae

- Aphelandra tonduzii* Leonard  
*Chamaeranthemum tonduzii* Lindau  
*Justicia tonduzii* Lindau  
*Mendoncia tonduzii* Turrill  
*Ruellia tonduzii* Lindau

## Annonaceae

- Guatteria tonduzii* Diels

## Apocynaceae

- Tonduzia* Pittier (genus)  
*Tonduzia longifolia* (A. DC.) Markgr.  
*Tonduzia macrantha* Woodson  
*Tonduzia macrophylla* Kuhlmann  
*Tonduzia parvifolia* Pittier  
*Tonduzia pittieri* Donn.Sm.  
*Tonduzia stenophylla* Pittier

## Araceae

- Anthurium tonduzii* Engl.  
*Dieffenbachia tonduzii* Croat & Grayum  
*Urospatha tonduzii* Engl.

## Aristolochiaceae

- Aristolochia tonduzii* Schmidt

## Aspidiaceae

- Aspidium tonduzii* H.Christ  
*Dryopteris tonduzii* C.Christ

## Asteraceae

- Eupatorium tonduzii* Klatt  
*Liabum tonduzii* B.L.Rob.  
*Mikania tonduzii* B.L.Rob.  
*Senecio tonduzii* Greenm.  
*Sinclairia tonduzii* Rydb.  
*Verbesina tonduzii* Greenm.

## Begoniaceae

- Begonia tonduzii* C.DC. ex Durand & Pittier

## Bignoniaceae

- Anemopaegma tonduzianum* Kranz. l.  
*Petastoma tonduzianum* Kraenzl.

## Bromeliaceae

- Aechmea tonduzii* Mez & Pittier  
*Tillandsia tonduziana* Mez  
*Vriesea tonduziana* L.B.Sm.

## Cactaceae

- Cereus tonduzii* A.Weber  
*Rhipsalis tonduzii* F.A.C.Weber  
*Werckleocereus tonduzii* Britton & Rose

## Capparaceae

- Capparis tonduzii* Briq.  
*Cleome tonduzii* Briq.

## Celastraceae

- Gyminda tonduzii* Loes.

## Cucurbitaceae

- Anguria tonduzii* Cogn.  
*Cyclanthera tonduzii* Cogn. ex Th.Dur.et Pitt.  
*Gurania tonduziana* Donn.Sm.  
*Weinmannia tonduzii* Engl.

## Cunoniaceae

- Weinmannia tonduzii* Engl. & Prantl

## Cyperaceae

- Cyperus tonduzianus* Boeck.  
*Scleria tonduzi* Boeck.

## Euphorbiaceae

- Croton tonduzii* Pax

## Fabaceae

- Anneslia tonduzii* Britton & Rose  
*Cassia tonduzii* Standl.  
*Chamaecrista tonduzii* Britton & Rose  
*Cojoba tonduzii* Britton & Rose  
*Inga tonduzii* Donn.Sm.

## Fagaceae

- Quercus tonduzii* Seem.

## Guttiferae

- Rheedia tonduziana* Engl.

## Lamiaceae

- Salvia tonduzii* Briq.

## Lauraceae

- Ocotea tonduzii* Standl.  
*Phoebe tonduzii* Mex

## Lomariopsidaceae

- Elaphoglossum tonduzii* H.Christ

## Malpighiaceae

- Stigmaphyllon tonduzii* C.E.Anderson

## Marcgraviaceae

- Marcgravia tonduzii* Gilg

## Melastomataceae

- Acinodendron tonduzii* Kuntze  
*Clidemia tonduzii* Gleason  
*Miconia tonduzii* Cogn.

## Meliaceae

- Cedrela tonduzii* C.DC.  
*Guarea tonduzii* C.DC.  
*Trichilia tonduzii* C.DC.

## Menispermaceae

- Hyperbaena tonduzii* Diels

## Monimiaceae

- Siparuna tonduziana* Perkins

## Moraceae

- Ficus tonduzii* Standl.

## Myrtaceae

- Calyptranthes tonduzii* Donn.Sm.

## Orchidaceae

- Camaridium tonduzii* Schltr.  
*Cycnoches tonduzii* Schltr.  
*Elleanthus tonduzii* Schltr.  
*Encyclia tonduziana* Schltr.  
*Lepanthes tonduziana* Schltr.  
*Masdevallia tonduzii* Woolward  
*Microstylis tonduzii* Schltr.  
*Oncidium tonduzii* Schltr.  
*Ornithocephalus tonduzii* Schltr.  
*Pleurothallis tonduzii* Schltr.  
*Spiranthes tonduzii* Schltr.  
*Stelis tonduziana* Schltr.

## Piperaceae

- Peperomia tonduzii* C.DC.  
*Piper tonduzii* C.DC. ex Pittier

## Poaceae

- Chusquea tonduzii* Hack.  
*Paspalum tonduzii* Mez  
*Trisetum tonduzii* Hitchc.

## Pteridophyta

- Acrostichum tonduzii* Christ  
*Aspidium tonduzii* Christ

## Rosaceae

- Lachemilla tonduzii* Dammer

## Rubiaceae

- Cephaelis tonduzii* K.Krause  
*Gonzalagunia tonduzii* K.Krause  
*Hoffmannia tonduzii* Standl.

## Sabiaceae

- Meliosma tonduzii* Donn.Sm.

## Smilacaceae

- Smilax tonduzii* Apt

## Verbenaceae

- Avicennia tonduzii* Moldenke

## Viscaceae

- Phoradendron tonduzii* Trel.

A NOTE ON THREE “NEW” SPECIES OF *XYLOBIUM*  
(ORCHIDACEAE, MAXILLARIINAE) FROM  
RUIZ AND PAVÓN’S PERUVIAN COLLECTIONS

FRANCO PUPULIN<sup>1</sup>

**Abstract.** The recent transfer to the genus *Xylobium* of three orchid species originally described by Ruiz and Pavón as members of *Maxillaria* is challenged on the basis of the extant evidence found in the herbarium and the archives of the Royal Botanic Garden, Madrid, where the first set of materials intended for the *Flora Peruviana et Chilensis* is deposited. The study of the taxonomic literature does not support the claims about a common usage of the three names, *Maxillaria alata*, *M. bicolor*, and *M. cuneiformis*, as being referable to *Xylobium*.

**Keywords:** *Flora Peruviana et Chilensis*, *Maxillaria*, Orchidaceae, Pavón Jiménez José Antonio, Ruiz López Hipólito, *Xylobium*

In a recently published paper, Carpio Lau and coauthors (2016) formally transferred to the genus *Xylobium* Lindl. three orchid species originally described in the late eighteenth century by Hipólito Ruiz and José Pavón as members of their broadly defined concept of *Maxillaria* (Ruiz and Pavón, 1794, 1798). The nomenclatural recombinations are apparently based on the opinions of previous authors (i.e., Schweinfurth, 1960; Brako and Zarucchi, 1993; Roque and León, 2007; Schuiteman and Chase, 2015), as well as on alleged morphological features, both vegetative and floral, of the three transferred species of *Maxillaria*.

Actually, the consideration of *Maxillaria alata* Ruiz & Pav., *M. bicolor* Ruiz & Pav., and *M. cuneiformis* Ruiz & Pav., as belonging to *Xylobium*, which the authors claim is consistent with the taxonomic literature is instead, quite circumstantial at best.

In his treatment of the Peruvian orchid flora, Schweinfurth (1960: 676, 682, 690) offered no rationale for the taxonomic treatment of these three taxa, nor did subsequent authors who, in their quotes of one or another of the concerned species of *Maxillaria*, followed Schweinfurth both explicitly (i.e., Roque and León, 2007: 824–825) and implicitly (i.e., Schuiteman and Chase, 2015). In particular, in their catalogue of Peruvian plants, Brako and Zarucchi (1993) considered *M. alata* as co-specific with *Cyrtidiorchis alata* (Lindl.) Rauschert (based on *Camaridium alatum* Lindl., the type: “In montibus Loxa,” Hartweg s.n.), while both *M. bicolor* and *M. cuneiformis* are treated as true members of *Maxillaria*, even though they recorded a personal communication by G. Carnevali, who believed that *M. bicolor* belongs to *Xylobium* (the same belief is expressed about *M. triphylla*, which truly belongs instead to *Cyrtorchilium*; see Pupulin, 2012a). *Maxillaria cuneiformis* was not discussed either in the paper by Roque and León (2007) or by Schuiteman and Chase (2015), and the latter authors did not treat *M. bicolor* either. Apart from the literature cited by Carpio Lau and coauthors (2016) to support their view, the most

recent checklist of Peruvian Orchidaceae (Zelenko and Bermúdez, 2009) omits *M. alata*, and treats both *M. bicolor* and *M. cuneiformis* as good species of *Maxillaria*.

The orchid generic concepts originally proposed by Ruiz and Pavón (1794) in their preliminary introduction to the flora of Peru and Chile are quite broadly defined, and the boundaries between genera are sometimes weak enough to overlap. This explains why species that belong to the same genus according to the current classification were described by Ruiz and Pavón (1798) into different genera. So, for example, of the four species of *Cyrtorchilium* Kunth described by Ruiz and Pavón, three were proposed as members of their *Maxillaria*, and the last one as a species of *Bletia* Ruiz & Pav. (Dalström, 2001; Pupulin, 2012a). Accordingly, of the 16 species of *Maxillaria* originally described in the *Systema vegetabilium florum Peruviana et Chilensis* (Ruiz and Pavón, 1798, title hereafter shortened in text as the *Systema*), only five belong to the modern concept of *Maxillaria* sensu lato, and only three if the genera *Maxillariella* M.A. Blanco & Carnevali and *Ornithidium* Salisb. ex R.Br., are recognized as distinct from *Maxillaria*. Of the remaining eleven species, one belongs to *Cyrtopodium* R.Br., three to *Cyrtorchilium* Kunth, one to *Ida* A. Ryan & Oakeley (*Sudamerlycaste* Archila), one to *Oncidium* Sw., and two to *Xylobium*. Until Carpio Lau and collaborators (2016), the last three species have been treated as *incertae sedis*. When *Maxillariella*, *Ornithidium*, and *Sauvetrea* Szlach., are treated as congeneric with *Maxillaria*, three additional species of this genus must be added to the list, originally described by Ruiz and Pavón as *Fernandezia punctata* Ruiz & Pav., *F. haematodes* Ruiz & Pav., and *Bletia uniflora* Ruiz & Pav., respectively (Blanco et al., 2007; Pupulin, 2012a, 2012b).

The correct interpretation of the orchid names originally proposed by Ruiz and Pavón in their account on the orchid flora of the Viceroyalty of Peru, as well as a positive identification of the concerned species, has been

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traditionally hampered by the often extremely synthetic nature of the protologues published in the *Systema* (Ruiz and Pavón, 1798) and the fragmentary character of the main set of their herbarium specimens, conserved in Madrid (MA). The discussion and taxonomic interpretation of the unpublished orchid paintings produced during the Spanish botanical expedition to South America (Pupulin, 2012a, 2012a b, 2014) allowed, in several cases, to correctly place Ruiz and Pavón's names in the systematic context of the South American orchid flora, sometimes correcting previous erroneous identifications based on the interpretation of the protologues alone. Nevertheless, not all the species described by the Spanish botanists were illustrated at the time of the expedition, and a few illustrations that Ruiz cited in his manuscripts were eventually lost or dispersed after the incorporation of the South American materials to the Oficina Botánica in Madrid in the early nineteenth century (Steele, 1964; Miller, 1970; Rodríguez Nozal, 1994; García Guillén and Muñoz Paz, 2003; Pupulin, 2012a).

Apart from the main herbarium of the botanical expedition led by Ruiz, and the impressive body of original illustrations prepared during the journey of the botanists in the Viceroyalty, the Royal Botanic Garden of Madrid (RBGM) also hosts a monumental corpus of manuscripts of the expedition, mostly in the characteristic handwriting by Ruiz, but also with descriptions and notes by the two "agregados" (attachés) to the expedition, Juan José Tafalla and Juan Agustín Manzanilla (Pupulin 2012a), who continued the American collections after the return to Spain of the "first" and "second" botanists. For most of the species, the archives at the RBGM conserve both the original manuscripts prepared in South America and a fair copy, presumably prepared in Madrid, which often synthesize the original field writings to match the limited space allowed for the texts to be sent to the press (Fig. 1). In turn, for reasons of space and cost, the text of the protologues published in the *Systema* is often further reduced with respect to the descriptions' fair copies.

Arranging the manuscripts in anticipation of the publication of the *Systema*, and the subsequent planned volume VIII of the *Flora Peruviana et Chilensis* (including the *Gynandria monandria* and *Gynandria diandria*, or the Orchidaceae, which was never published), Ruiz unequivocally associated the manuscripts with the botanical illustrations, assigning them the same consecutive numbers (nos. 156–215 refer to the orchids). He also annotated on the fair copy of the manuscripts when no associated illustrations existed ("s.ic.," "s.icone," *sine icone*, without figure) and, less frequently, when no herbarium material had been prepared ("*sin esqueleto*," without dried specimen). Ruiz clearly annotated on the fair copy manuscript of *Maxillaria cuneiformis* (no. 166) that neither illustration nor *exsiccatum* were conserved of this taxon ("*s.ic. y sin esqueleto*"). In this case, our understanding of Ruiz and Pavón's concept has to completely rely on the published protologue (Ruiz and Pavón, 1798: 223) and the original manuscript, which fortunately includes further details about the floral shape and color. As in both the manuscript

descriptions of *Maxillaria alata* (no. 167) and *M. bicolor* (no. 168) Ruiz indicated that no illustrations of these species were prepared, **but made no reference to the lack of *exsiccata***, this strongly suggests that actual type specimens were originally incorporated into the herbarium of the *Flora Peruviana et Chilensis*.

In the herbarium of Ruiz and Pavón, which also contains the specimens sent from Peru and Ecuador by the *agregados* of the expedition (see meaning of *agregados* above), are conserved 14 sheets originally annotated by the Spanish botanists as species of "*Maxillaria*." Of these, only one (the type of *M. platypetala*) is a true *Maxillaria* in the modern sense, while four others belong to *Cyrtorchilum*, three to *Ida* and three to *Xylobium*, and one each to *Cyrtopodium*, *Epidendrum*, and *Oncidium*. There are, however, another 13 sheets variously labeled in Ruiz's and Manzanilla's handwriting as "*Fernandezia*," "*Orchys*" [*sic*], and "*Ophrys*," which do correspond to *Maxillaria* *sensu lato* according to the current classification. No specimen at MA, other than the type materials of *Maxillaria undulata* (MA 810873) and *M. variegata* (MA 801871, 810872) could be assigned to *Xylobium*. Among the specimens truly belonging to *Maxillaria*, none agree with the type localities cited in the *Systema*, with the exception of the type specimen of *Maxillaria prolifera* (annotated as «*Ophrys*»), originally collected at Huassahuassi. Nevertheless, ample possibilities exist that the type material of *M. alata* and *M. cuneiformis* could be searched for within the many herbaria where the specimens collected in Peru during the Botanical Expedition were dispersed during the nineteenth century (see, in particular, Rodríguez Nozal, 1994).

On the basis of the actual evidence, it is legitimate to challenge the transfer of the three "obscure" species of *Maxillaria* to *Xylobium*. When Ruiz and Pavón described those species that indisputably belong to *Xylobium*, i.e., *Maxillaria undulata* and *M. variegata* (Ruiz and Pavón, 1798), they clearly noted in the manuscripts and/or protologues that the leaves are many-veined or plicate ("*quinque septem nervia striata*," "*quinquenervia plicata*"), a feature that is typical of the genus. Also, in both species, Ruiz noted in his unpublished manuscripts, that the mid-lobe of the lip is tuberculate-glandulose ("*rugoso granulosum*") in *M. undulata*; "*ad apicem puntatoglandulosum*" in *M. variegata* [manuscripts at MA, AJB04-M-0004-0003-017 and AJB04-M-0004-0003-019, respectively]). In *M. cuneiformis*, the leaves are expressly described as "*ensiformia canaliculata, [...] nitida*," or conduplicate and glossy, and the manuscript description characterizes the lip as "*integrum*," entire, two features that are incompatible with *Xylobium*, whose species invariably present plicate leaves and, with a few exceptions, distinctly three-lobed labella. The pseudobulbs of *M. bicolor* are described as ancipitous, a character unknown in any *Xylobium* species, and the pedicels are "*subdichotomi*," i.e., arranged in two opposite rows in the same plane, while in *Xylobium* the flowers are spirally arranged on the rachis (Whitten, 2009). The available material relative to *M. alata* is, if possible, still more curt, and the manuscript description conserved in





Madrid has little to add to the published protologue (Ruiz and Pavón, 1798: 223). The specific epithet is derived from the winged characteristic of the fruits, but a trigonous ovary is at most rare in *Xylobium*.

There are no rational reasons to “resolve” the taxonomy of the less obvious species of *Maxillaria* originally described by Ruiz and Pavón transferring them arbitrarily to another genus. If a “consistent” use in literature of these names exists, it is including them in *Maxillaria*, albeit with uncertainty. On its side, the available evidence, which does not include the access to the type specimens of two of the concerned taxa—probably hosted in herbaria other than Madrid—suggests that at least two of the species, *M. bicolor* and *M. cuneiformis*, certainly do not belong to *Xylobium* according to their characteristic morphological features, as described by Ruiz and Pavón. The typical inflorescence arrangement of the third transferred taxon, *M. alata*, strongly suggests that it is not a species of *Xylobium* either.

The pure nomenclatural exercise of transferring “names” from one genus to another without gaining any additional information about the real nature of the concerned organism simply transforms a scientific uncertainty into a false obviousness and plainness. Artificially inflating the taxonomy of *Xylobium* with the addition of three “phantom” species from Peru not only risks obscuring the phylogeographic history of the genus and altering the information about the diversity of the Peruvian flora, but also precludes serious attempts at interpreting and understanding the original concepts of Ruiz and Pavón. There are still several herbaria remaining in Europe and the United States to search for the original material brought back from Peru by the Spanish Botanical Expedition and, most importantly, there are places in the Peruvian province of Tarma still awaiting new botanical exploration aimed at rediscovering the plants originally collected during the long journey of the Expedition to the Viceroyalty of Peru.

#### LITERATURE CITED

- BLANCO, M., G. CARNEVALI, W. M. WHITTEN, R. SINGER, S. KOEHLER, N. WILLIAMS, I. OJEDA, K. NEUBIG AND L. ENDARA. 2007. Generic realignments in Maxillariinae (Orchidaceae). *Lankesteriana* 7(3): 515–538.
- BRAKO, L. AND J. L. ZARUCCHI. 1993. Catalogue of the flowering plants and gymnosperms of Peru. *Monogr. Syst. Bot. Missouri Bot. Gard.* 45.
- CARPIO LAU, J. N., E. A. MOLINARI-NOVOA AND M. MENDOZA TINCOPA. 2016. *Notulae nomenclaturales* II. A comment on three *Maxillaria* species of Ruiz and Pavón (Orchidaceae). *Weberbauerella* 1(9): 1–3.
- DALSTROM, S. 2001. A Synopsis of the genus *Cyrtochilum* (Orchidaceae; Oncidiinae): taxonomic reevaluation and new combinations. *Lindleyana* 16(2): 56–80.
- GARCÍA GUILLÉN, E. AND O. MUÑOZ PAZ. 2003. Historia administrativa y organización de los fondos de la Expedición al Virreinato del Perú (1777–1831). Pages 171–220 in F. MUÑOZ GARMENDÍA, ED. *La botánica al servicio de la Corona. La expedición de Ruiz, Pavón y Dombey al Virreinato del Perú (1777–1831)*. Lunweg/CSIC. Barcelona.
- MILLER, H.S. 1970. The herbarium of Aylmer Bourke Lambert: notes on its acquisition, dispersal, and present whereabouts. *Taxon* 19: 489–553.
- PUPULIN, F. 2012a. The Orchidaceae of Ruiz & Pavón’s “Flora peruviana et Chilensis.” A taxonomic study. I. *Anales del Real Jardín Botánico de Madrid* 69(1): 21–79.
- . 2012b. The Orchidaceae of Ruiz & Pavón’s “Flora peruviana et Chilensis.” A taxonomic study. II. *Anales del Real Jardín Botánico de Madrid* 69(2): 143–186.
- . 2014. What those old drawings have to tell us. *Orchids* (Bull. Amer. Orch. Soc.) 83(7): 422–433.
- RODRÍGUEZ NOZAL, R. 1994. Las colecciones americanas generadas por las Expediciones Botánicas de de la España ilustrada: un análisis de su dispersión. *Lulooa* 17: 403–436.
- ROQUE J. AND B. LEÓN. 2007. Orchidaceae endémicas del Perú. *Rev. Peruana Biol.* 13(2): 759s–878s.
- RUIZ, H. AND PAVÓN J. 1794. *Flora peruviana et chilensis prodromus*. Typis Gabrielis de Sancha. Madrid.
- . 1798. *Systema vegetabilium Florae Peruviana et Chilensis, characteres prodromi genericos differentiales, specierum omnium differentias, durationem, loca natalia, tempus florendi, nomina vernacula, vires et usus nonnullis illustrationibus interspersis complectens*. Typis Gabrielis de Sancha. Madrid.
- SCHUITEMAN, A. AND M. CHASE. 2015. A reappraisal of *Maxillaria* (Orchidaceae). *Phytotaxa* 225(1): 1–78.
- SCHWEINFURTH, C. 1960. Orchidaceae, Orchids of Peru. *Fieldiana, Botany* 30(3): 533–785.
- STEELE, A. R. 1964. *Flowers for the King: The expedition of Ruiz and Pavón and the Flora of Peru*. Duke University Press, Durham, North Carolina, U.S.A.
- WHITTEN, W. M. 2009. *Xylobium*. Pages 208–211 in A. M. PRIDGON, P. CRIBB, M. W. CHASE AND F. N. RASMUSSEN, EDS. *Genera Orchidacearum. Volume 5. Epidendroideae (Part II)*. Oxford University Press, Oxford.
- ZELENSKO, H AND P. BERMÚDEZ. 2009. Species of Peru. Pages 394–405 in H. ZELENSKO, AND P. BERMÚDEZ, EDS. *Orchid species of Peru*. ZAI Publications. Quito.



## A NOTE ON *MASDEVALLIA ZAHLBRUCKNERI* AND *M. UTRICULATA* (ORCHIDACEAE)

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**Abstract.** *Masdevallia utriculata* and *M. zahlbruckneri* are characterized and illustrated based on living plants from Costa Rica. The species are compared with each other on the basis of their general similar morphology. Their taxonomic status is reviewed.

**Keywords:** *Masdevallia utriculata*, *M. zahlbruckneri*, new record, taxonomy, *Zahleria*

Heinrich Gustav Reichenbach was the first to propose subdivisions of the genus *Masdevallia* Ruiz & Pav.; he published 14 sections in total (Reichenbach f., 1873, 1874a, 1874b, 1875, 1876a, 1876b, 1877, 1878a, 1878b; Woolward, 1896; Luer, 1986), including *Masdevallia* sect. *Amandae* Rchb.f. (Reichenbach f., 1874b). Luer (1986) raised *Amanda* to the rank of subgenus and included five sections within it: *Masdevallia* sections *Amandae*, *Fissae* Rchb.f., *Nidificae* Luer, *Ophioglossae* Luer and *Pygmaeae* Luer. Luer would later elevate these sections to the rank of subgenus (Luer, 2000).

When establishing subgenus *Pygmaeae* Luer, the author united subgenus *Masdevallia* sections *Amaluzae* and *Aphanes* with subgenus *Amanda* section *Pygmaeae* (Luer, 1986). He also clarified that, although the species in subgenus *Pygmaeae* were probably not closely related, he brought them together because of their tufted small habit. In turn, subgen. *Pygmaeae* was divided into four sections: *Amaluzae* Luer, *Aphanes* Luer, *Pygmaeae* Luer, and *Zahlbrucknerae* Luer. Luer (2000) characterized *Masdevallia* sect. *Zahlbrucknerae* as a group of small to medium size herbs with caespitose habit, with a successively flowered raceme borne by an ascending, horizontal to descending, terete peduncle, provided with smooth or slightly costate ovaries and sepals contracted into slender tails. The lips are more or less oblong with a pair of longitudinal calli. The most distinguishing feature of this section is the morphology of the callous petals, which present a distinct, retrorse process at the base, and one or two retrorse teeth above the unguiculate base. In the most recent reclassification of *Masdevallia*, Luer (2006) created the novel generic concept, *Zahleria*, typified by *Z. zahlbruckneri* (Kraenzl.) Luer. *Zahleria* additionally includes, *Masdevallia naranjapatae* (Luer) Luer and *M. vieirana* (Luer & R.Escobar).

Meanwhile, in a very different corner of *Masdevallia*, Reichenbach f. proposed *Masdevallia* sect. *Coriaceae*

Rchb.f. (Reichenbach f., 1874), which in turn Veitch and Sons (1889) reduced to subsection. Luer (1986) retained *Masdevallia* sect. *Coriaceae* and split into subsections *Coriaceae* (Rchb.f.) H.J.Veitch and *Durae* Luer. In 2000, Luer elevated subsection *Durae* to the sectional rank, and in 2006 he reduced sect. *Durae* to the synonymy of his new genus *Regalia* (Luer, 2000, 2006). According to Luer, *Regalia* is a small Andean genus composed of ten species, characterized by large plants with stout ramicauls, thickly coriaceous leaves, and racemes of large, rigid, fleshy, long-lasting, long-caudate flowers produced in slow succession. The petals are thickly cartilaginous, paddle-shaped and truncate, and the lip is oblong and thick, with a pair of concavities at the base (Luer, 2006). *Regalia utriculata* (Luer) Luer (= *Masdevallia utriculata*) is one of its smallest members and lacks the otherwise characteristic long tails of the lateral sepals.

*Masdevallia utriculata* and *M. zahlbruckneri* share several morphological traits with other species of *Masdevallia* that have not been placed in the same section, subgenus or even genus (Luer, 2006). We here present material of both the species from Costa Rica and discuss their taxonomic status.

*Masdevallia zahlbruckneri* Kraenzl., Repert. Spec. Nov. Regni Veg. 17: 413. 1921. TYPE: COSTA RICA. Ohne genauem Standort (Endrés) [Endrés 463, collected and illustrated in 1870] (holotype: W 0019499).

Epiphytic, caespitose, small, *herbs*. *Roots* slender. *Ramicauls* slender, erect, 1.0–1.5 cm long, enclosed by 2–3 close, tubular sheaths. *Leaf* erect to suberect, coriaceous, 4.6–8.1 cm long including a petiole, the blade narrowly obovate, obtuse, 1.9–2.0 cm wide, gradually narrowed below into the sub-petiolate base. *Inflorescence* a loose, successively few-flowered raceme borne by a descending to horizontal peduncle 2.7–7.0 cm long, produced from low on the ramicaul, with a bract below the middle. *Floral bracts*

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tubular, 2–5 mm long. *Pedice* 4–10 mm long. *Ovary* curved, 2–4 mm long. *Sepals* glabrous externally, the *dorsal sepal* yellow, often flecked with red or purple, microscopically cellular growths, obovate, 17–22 mm long, 4–6 mm wide including the tails in the natural position, connate to the lateral sepals for 3–5 mm to form a cylindrical tube, the free portion broadly triangular, the obtuse apex contracted into an erect, slender (occasionally thickened distally), yellow tail 12–17 mm long; the *lateral sepals* red-purple, diffusely spotted with darker purple, the spots sometimes raised, with tufts of red hairs, cellular-pubescent to shortly pubescent within, connate 7–12 mm into an ovate, bifid lamina 17–23 mm long, 8–10 mm wide, the acute apices contracted into slender, yellow tails 7–9 mm long; *petals* white, dark red-purple on the labellar half, elliptical-oblong, 4–6 mm long, 2–3 mm wide, the apex obtuse, apiculate or retuse, the labellar half callous, ending in one retrorse teeth above the unguiculate base; *lip* white, diffusely dotted with purple, the dots sometimes raised, oblong-ligulate, 4–7 mm long, 1.7–2.0 mm wide, very slightly narrowed near the middle, the apex subacute, rounded to subtruncate, the disc lightly channeled between a low, longitudinal pair of calli, the base subtruncate, hinged below. *Column* yellow-white to green, the margin purple, semiterete, 4–5.5 mm long, the foot stout with a short, incurved extension.

**Distribution:** from Costa Rica to Ecuador.

**Eponymy:** The name honors Alexander Zahlbruckner (Fig. 1) an Austrian botanist who specialized in the study of lichens. He studied at the University of Vienna, and was the grandson of the well-known Austrian botanist Johann Baptist Zahlbruckner (Pisút, 2002). Alexander supplied Fritz Kraenzlin with many specimens from Reichenbach's herbarium.

**Phenology:** Apparently flowering all year round.

**Additional specimens examined:** COSTA RICA. Alajuela: San Carlos, Venecia, without further data collection. It flourished in culture in the Lankester Botanical Garden, *C. Blanco s.n.* (JBL-spirit); Parque Nacional Rincón de la Vieja, rd. to Colonia Grande by Quebrada Rancho Grande, 700 m, 7 July 1978, *C. Todzia 351* (CR); San Ramón, September 1990, *L. Acosta s.n.* (USJ); San Carlos, Venecia, flourished in culture at Lankester Botanical Garden on 20 March 2002 *C. Blanco s.n.* (CR); San Carlos, Reserva Forestal Juan Castro Blanco, November 1992, flourished in culture at Lankester Botanical Garden on April 1993, *Dora E. Mora s.n.* (USJ) Guanacaste: Tilarán, Tierras Morenas, desviación a la izquierda después del Río Cabuyo, camino al Proyecto Geotérmico Tenorio y Cerro Jilguero, ca. 4.5 km norte de Tierras Morenas, ladera sureste del Volcán Tenorio, 10°36'11.6"N, 85°00'05.3"W, 900–1000 m, bosque



FIGURE 1. Portraits of Alexander Zahlbruckner, taken from Pisut (2002).

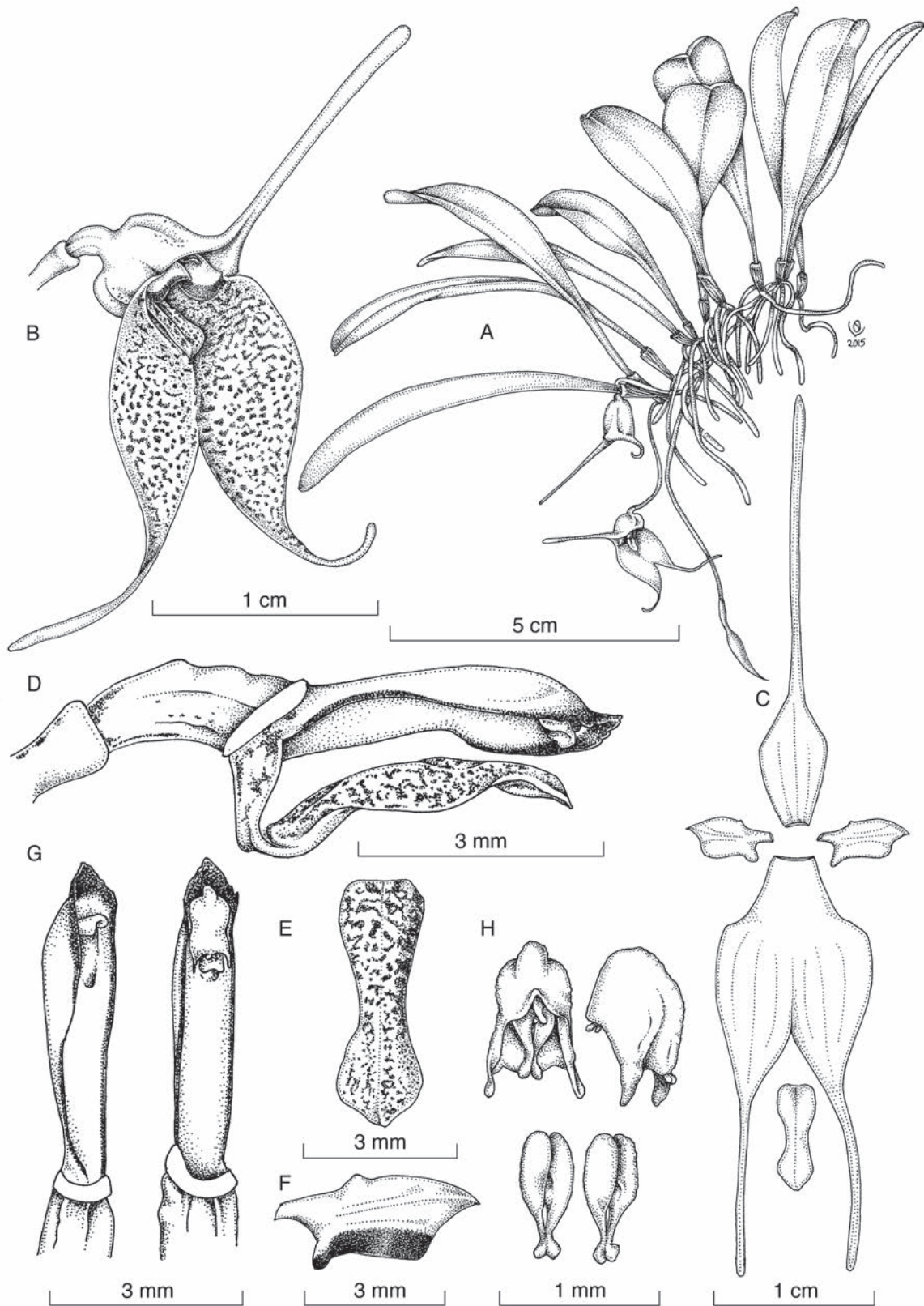


FIGURE 2. *Masdevallia zahlbruckneri*. A, Habit; B, Flower; C, Perianth, flattened; D, Column and lip, side view; E, Lip; F, Petal, ventral view; G, Column, ventral and side views; H, Anther cap and pollinarium. Drawn from Karremans 5873 by L. Oses.



pluvial premontano, epífitas a orillas del camino y en bordes de potreros, 2 February 2006, *D. Bogarín, R.L. Dressler, R. Gomez and A. Rojas 2410* (JBL-spirit); Tilarán, Tierras Morenas, desviación a la izquierda después del Río Cabuyo, entrada al Proyecto Geotérmico Tenorio y Cerro Jilguero, ca. 7 km al noreste de Tierras Morenas, ladera sureste del Volcán Tenorio, 10°36'55.7"N, 85°00'43.1"W, 900–1100 m, bosque pluvial premontano, epífitas a orillas del camino y bosque secundario, 2 February 2006, *D. Bogarín, R. L. Dressler, R. Gómez, and A. Rojas 2413* (JBL-spirit); San José: Pérez Zeledón, San Andrés de Dota, epiphytic plant growth, 10 September 1990, *Victor Gin Lun s.n.* (USJ); Pérez Zeledón, San Ramón Norte, trail to the summit of Cerro Pelón, 1400–1640 m, 3 May 2000, *F. Pupulin, et al. 2405* (USJ); Pérez Zeledón, Paramo, 1420m, 9°29'01"N, 83°45'18"W, Paramo, bosque muy húmedo premontano, sobre la calle principal entre San Ramón Norte y Santa Eduvigis, epífitas al lado de la calle pocos km antes del pueblo, 6 April 2013, *A.P. Karremans, R. Lok, R. Ferreira and V. Ferreira 5873* (JBL-spirit) Fig. 2; Pérez Zeledón, Paramo, Los Ángeles, sobre el camino a San Gerardo de Dota, montañas al norte del río División, en línea con el centro de Los Ángeles, 1700 m, 9°29'55"N, 83°47'46"W, bosque pluvial premontano, a orillas del camino dentro del bosque, 29 May 2014, *A.P. Karremans and G. Meza, L. Oses 6246* (JBL-digital collection); same date and locality *A.P. Karremans, G. Meza and L. Oses 6247* (JBL-digital collection).

*Masdevallia utriculata* Luer. *Phytologia* 44(3): 169, 1979. TYPE: PANAMA. Chiriquí [Boquete]: epiphytic in cloud forest on Cerro Pate Macho, alt. 2200 m, 27 February 1979, *R. L. Dressler and J. Kuhn s.n.* (holotype, SEL; illustration *Luer 4073*).

Epiphytic, caespitose, *herbs*, small to medium in size. *Roots* coarse. *Ramicauls* slender, erect, 1.0–1.5 cm long, enclosed by 2–3 thin, close, tubular sheaths. *Leaf* erect, coriaceous, 6–10 cm long including an indistinct petiole 1.0–1.5 cm long, narrowly oblong-obovate, 1.2–1.5 cm wide, subacute to obtuse at the apex, narrowed below into the subpetiolate base. *Inflorescence* a congested, few-flowered raceme of successive flowers from low on the ramicaul, borne by a stout, suberect to horizontal peduncle, 1.5–2.0 cm long, with a bract near the middle. *Floral bract* tubular, 4–5 mm long. *Pedicel* 4–15 mm long. *Ovary* subverrucose with undulate ribs, 2–5 mm long. *Sepals* fleshy, rigid, the *dorsal sepal* yellow-green, with a few purple verrucosities within, obovate, 12–20 mm long, 4–6 mm wide, connate to the lateral sepals for 5 mm into a cylindrical tube, the apex subacute, contracted into an erect, thick, subclavate, laterally compressed, yellow-green tail ca. 6–11 mm long; the *lateral sepals* yellowish, studded with multiple red excrescences within, connate 15 mm to form an obovate, coarsely verrucose, bifid lamina 15–20 mm long, 9–13 mm wide expanded, with the apices subacute; *petals* yellow, spotted with purple on the labellar half, oblong, 5.0–5.5 mm long, 2 mm wide, the apex truncate-retuse, with a longitudinal callus along both borders, the upper overhanging the apex, the callus of the labellar margin distinct, ending between the basal and middle thirds; *lip* dull yellow, diffusely dotted

with purple, thick, obovate, minutely verrucose, 5.0–6.5 mm long, 2–3 mm wide, the apex broadly rounded, verrucose, the disc shallowly sulcate between a longitudinal pair of oblique calli obtusely angled above the middle, the base bilobed-cordate, each lobe deeply saccate, hinged beneath. *Column* yellow, marked with purple, semiterete, 5 mm long, the foot equally long, spotted with purple, with an incurved 3 mm extension.

**Distribution:** Known from Western Panama and from Coto Brus and Talamanca in Costa Rica at elevations between 2100–2400 m.

**Etymology:** From the Latin *utriculatus*, “with small bladders,” referring to the base of the lip.

**Phenology:** Apparently flowering all year round.

**Additional specimens examined:** COSTA RICA. Limón: Talamanca, Bratsi, Parque Internacional La Amistad, Valle del Silencio, sendero desde el Jardín (turbera) hacia los Cerros Tararias, cruzando el afluente del Río Terbi (Río de las Plantas), base del cerro conocido como “Ventanas,” 9°08'08.39"N, 82°57'32.58"W, 2400 m, bosque pluvial montano, 19 September 2014, *A. Karremans, M. Díaz, M. Fernández, C. Godínez, J. Godínez, L. Oses, J. Ramírez and D. Villalobos 6365* (JBL-spirit). Puntarenas: Coto Brus, Sabalito, Zona Protectora Las Tablas, 15 km al noreste de Lucha, Sitio Tablas, Finca Sandí-Hartmann “El Capricho,” camino a El Surá, 8°57'0.63"N, 82°44'59.72"W, 2017 m, bosque pluvial montano bajo, 10 December 2013, *D. Bogarín, A. Karremans, M. Fernández and L. Sandoval 10691* (JBL-spirit); Coto Brus, Sabalito, Zona Protectora Las Tablas, 15 km al noreste de Lucha, Sitio Tablas, en potreros de la Finca Sandí-Hartmann “El Capricho,” 8°58'01.98"N, 82°44'57.42"W, 2162 m, epífitas en árboles aislados en bosque pluvial montano bajo, 11 December 2013, *A. Karremans, D. Bogarín, M. Fernández and L. Sandoval 6169* (JB-spirit); Coto Brus, Sabalito, Zona Protectora Las Tablas, 13 km al noreste de Lucha, Sitio Coto Brus, entre Río Surá y Quebrada Sutú, Finca de Miguel Sandí, 8°56'46.1"N, 82°44'30.9"W, 1778 m, bosque pluvial montano bajo, epífitas en potreros arbolados, 20 April 2012, *A.P. Karremans and J. Geml 5387* (JBL-spirit); Same date and locality *A.P. Karremans and J. Geml 5417* (JBL-spirit); Coto Brus, Sabalito, Zona Protectora Las Tablas, 13 km al noreste de Lucha, Sitio Coto Brus, Finca de Miguel Sandí, 8°56'46.1"N, 82°44'30.9"W, 1778 m, “*ad ager Sandiorum ‘El Capricho,’ supra arbores praecipue quercinis in collibus montibusque et ad margines pascuibus inter flumen Sutú,*” bosque muy húmedo premontano, 6 October 2010, *D. Bogarín, R.L. Dressler, M. Fernández and F. Pupulin 8088* (JBL-spirit); Same date and locality *M. Fernández, R.L. Dressler, D. Bogarín, F. Pupulin 430* (JBL-spirit); Same date and locality *M. Fernández, R.L. Dressler, D. Bogarín, F. Pupulin 431* (JBL-spirit); Coto Brus, Sabalito, Zona Protectora Las Tablas, 15 km al noreste de Lucha, Sitio Tablas, Finca Sandí-Hartmann “El Capricho,” camino a El Surá, 8°57'0.63"N 82°44'59.72"W, 2017 m, bosque pluvial montano bajo, 10 December 2013, *D. Bogarín, A. Karremans, M. Fernández and L. Sandoval 10652* (JBL-spirit) Fig. 3; Same date and locality, *D. Bogarín A. Karremans, M. Fernández and L. Sandoval 10647* (JBL-spirit); Same date and locality *A. Karremans, D. Bogarín, M. Fernández and L. Sandoval 6106* (JBL-spirit).

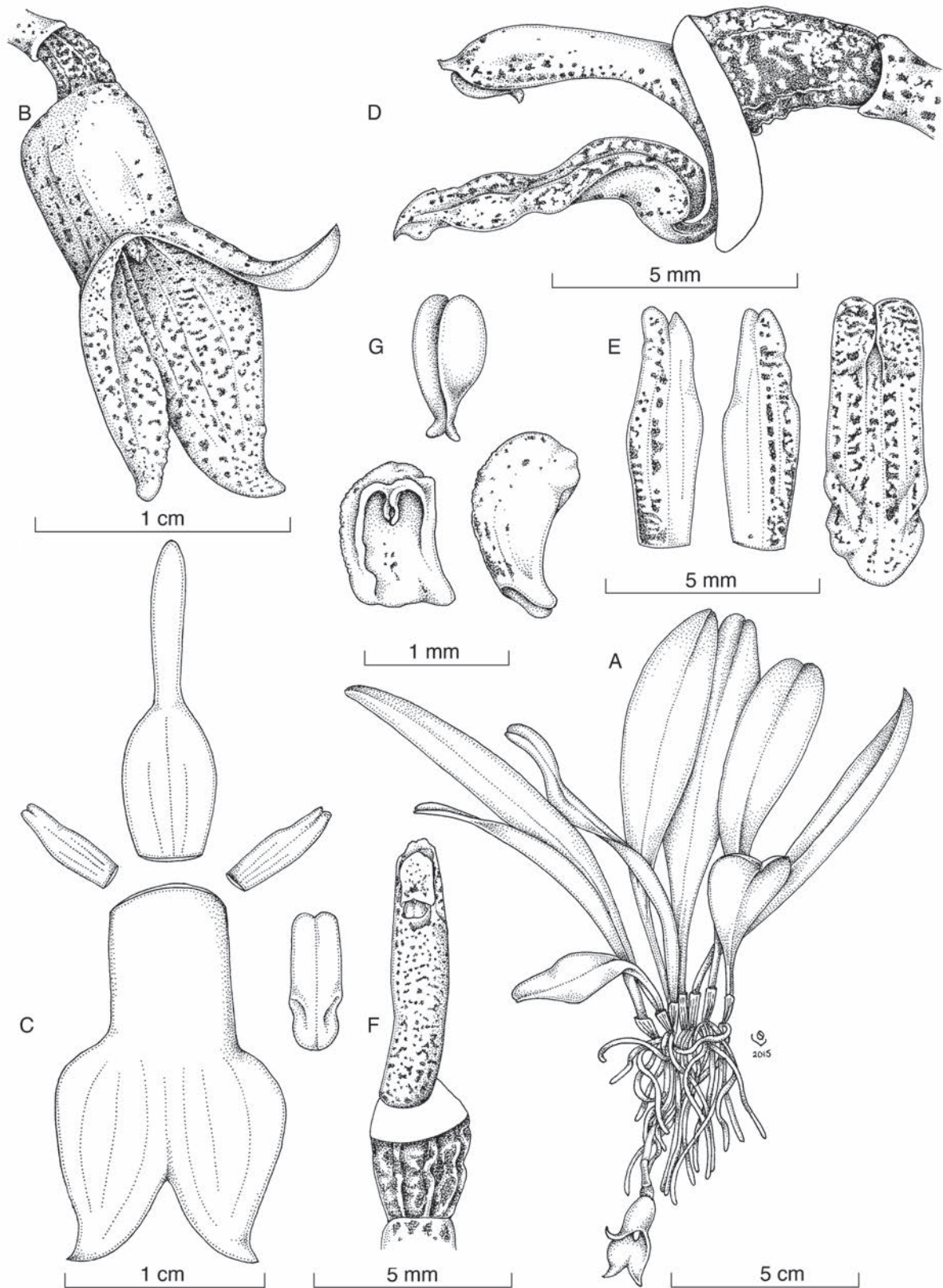


FIGURE 3. *Masdevallia utriculata*. **A**, Habit; **B**, Flower; **C**, Perianth, flattened; **D**, Column and lip, side view; **E**, Petals and lip, ventral view; **F**, Column, ventral view; **G**, Pollinarium and anther cap. Drawn from *D. Bogarín 10652* by L. Oses.

## DISCUSSION

*Masdevallia zahlbruckneri* and *M. utriculata* share features including the relatively small caespitose habit (7–10 cm long tall), a short, horizontal peduncle (horizontal to descending in *M. zahlbruckneri*); a short, successively flowered raceme, the longitudinally convex ovary (slightly steeper in *M. zahlbruckneri*) and a superficial resemblance in the color pattern of the sepals and lip. *Masdevallia crescenticola* F.Lehm. & Kraenzl., *M. descendens* Luer & Andreetta, *M. leontoglossa* Rchb.f., *M. lintrricula* Königer, *M. loui* Luer & Dalström, *M. mascarata* Luer and Vasquez, *M. pyxis* Luer, are also morphologically similar to *M. zahlbruckneri* and *M. utriculata*, sharing a pendulous inflorescence (with exception of *M. mascarata* and *M. pyxis*), the yellow dorsal sepal, and the lateral sepal and lip marked with purple spots.

We can, nevertheless, also find several differences between *M. zahlbruckneri* and *M. utriculata*. In all the examined specimens, there is consistent variation in the length of the tails of each sepal, the tail of the dorsal sepal being up to 12 mm longer, and the one on the lateral sepals up to 7–9 mm longer in *M. zahlbruckneri* versus *M. utriculata*, respectively. The dorsal sepal in *M. utriculata* is prominently thickened apically, whilst the tail of *M. zahlbruckneri* is slender to only slightly thickened. The most important dissimilarity, found in the petals, led Luer (2006) to place the two species in different sections and even different genera. In *M. zahlbruckneri* the laminar half of the lip is callous, ending in an obtuse angle, or into one or two retrorse teeth above the unguiculate base; this characteristic is absent in *M. utriculata*, whose petals are oblong with a callous lower margin. The color pattern of the petals also differs between the two species; they are white and dark red-purple on the labellar half in *M. zahlbruckneri*, whereas in *M. utriculata* the petals are yellow, spotted with purple on the labellar half. The lip is oblong without marginal folds, the disc shallowly sulcate between a longitudinal pair of oblique calli obtusely angled above the middle and the disc lightly channeled between a low, longitudinal pair of calli, the base subtruncate, hinged below in *M. zahlbruckneri*. The yellow-white to green column of *M. zahlbruckneri* has a continuous purple margin, while the column of *M. utriculata* is marked with purple spots along the margins. The pollinaria also differ, although they are hardly noticeable (Fig. 4–6). The two species also have a different pattern of distribution and altitudinal range (Fig. 7–8). According to the known collecting itineraries of Endrés, it can be suspected that the type of *M. zahlbruckneri* came from the area around San Ramón, in the Tilarán mountain range Pupulin et al., 2014).

The process at the base of the petals has been one of the most important criteria to recognize species segregated from *Masdevallia* in different genera (Luer, 2006). Luer's *Acinopetala* differs from *Zahleria* in the petals, which have small process above or along the margin between the middle and basal third in *Acinopetala*, while in *Zahleria* they are provided with a longitudinal callus on the lower

half ending in a retrorse process (Luer, 2006). However, this particular feature is not always evident, and can sometimes vary within a single taxon. *Masdevallia schizopetala*, which has also been placed in *Masdevallia* sect. *Zahlbrucknerae*, was later transferred to the genus *Acinopetala* instead, on the basis of the distinct petals' callus. *Masdevallia humilis* Luer was originally described as a toothless relative of *M. zahlbruckneri*, but was later synonymized. This indicates that this feature does not represent a key character for the recognition of a natural group as species (Fig. 9).

High morphological variation was found in the flowers of *M. zahlbruckneri*, especially in the shape of petals and the length of the dorsal and lateral sepal tails, as was suggested by Luer (2000) where Luer even found that some populations of the species have a clavate dorsal sepal in Central America. *Masdevallia utriculata* is characterized by a broadly cylindrical sepaline tube with the widely expanded, red-verrucose lateral sepals tailless. The tail of the dorsal sepal is clavate. The studied specimens present a slight variation in the arrangement of the tails and the purple dots density of the sepals (Fig. 6).

Due to the overall similarity between the two species, both in terms of vegetative habit and floral shape, we were initially surprised to find out that they had not been associated with each other based on their general morphology, but were assigned instead to different genera, *Regalia* for *M. utriculata* and *Zahleria* for *M. zahlbruckneri* (Luer 2006). Our unpublished DNA analyses of the group confirm, however, that they are not closely related at all. In the sense of *Masdevallia* systematics, it is clear that there is still much to answer and understanding how each species relates to others is one of the most essential questions to resolve.

Flower morphology, most commonly used for the classification of species, has been amply proven to be convergent in many groups of Pleurothallidinae, frequently responding to pollinator adaptations rather than genetic history (Pridgeon et al., 2001; Karremans et al., 2013, 2015). Plant habit, although also under selective pressure due to ecological niche preferences, is however under less influence of the pollinators, and can be more constant amongst close relatives in the Pleurothallidinae. Phylogenetic inferences based on DNA data give us an unbiased view of the relationships amongst species and can be a guide to understand which morphological characteristics have actually converged and which are phylogenetically informative. It is clear now that some of the features used to group species of *Masdevallia* do not convey phylogenetic information and should therefore be revised. It is difficult to place species of *Masdevallia* in subgenera and sections with absolute confidence, and it is not surprising that the genera proposed as segregates of *Masdevallia* are not monophyletic (Abele, 2005, 2007; Pridgeon et al., 2005). We believe a phylogenetic analysis of the entire genus in its broad sense coupled with a morphological characterization of the resulting groups of species is very necessary.



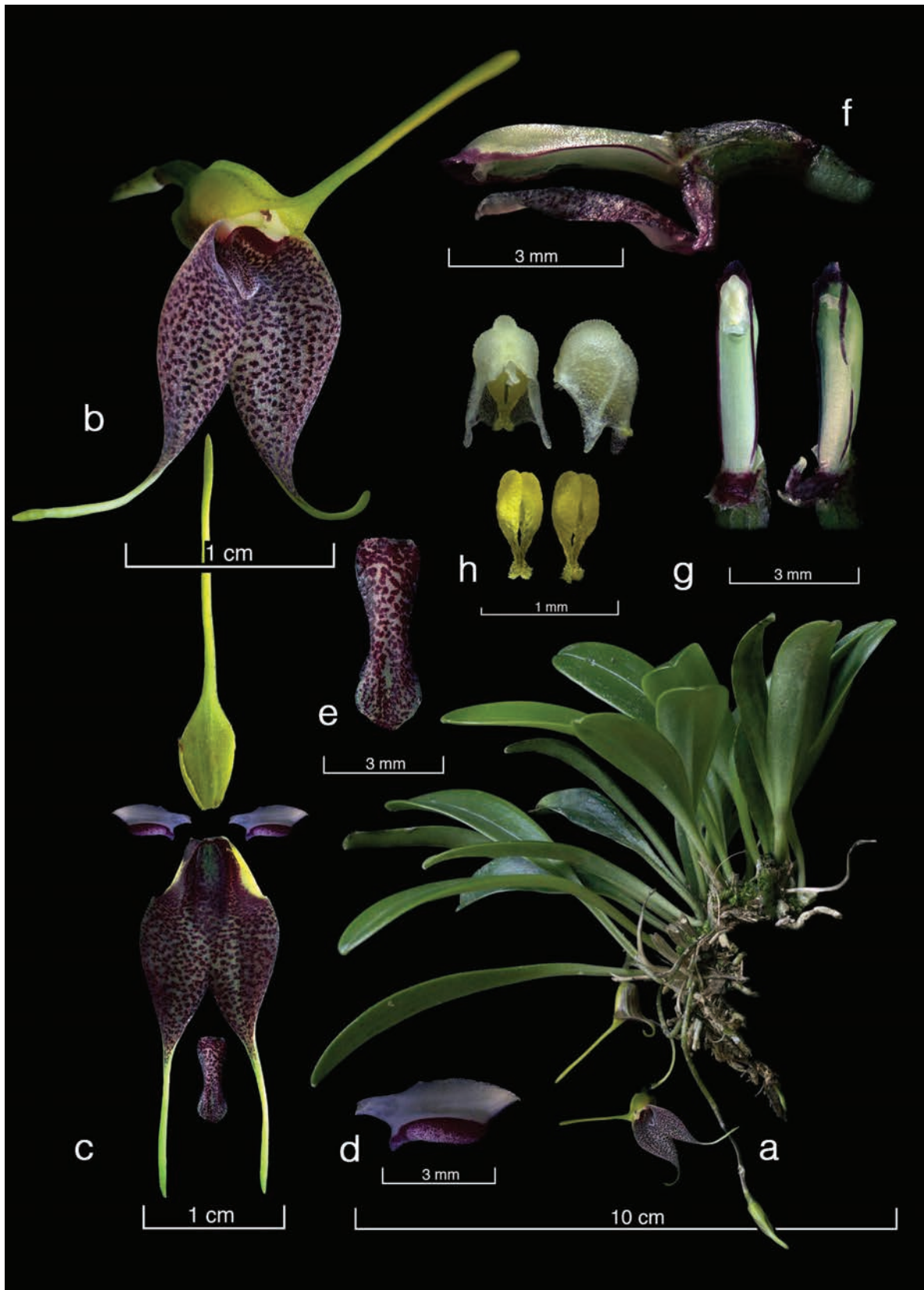


FIGURE 4. Lankester composite dissection plate (LCDP) of *Masdevallia zahlbruckneri*. **A**, Habit; **B**, Flower; **C**, Dissected perianth; **D**, Petal adaxial view; **E**, Lip, adaxial view; **F**, Column and lip, lateral view; **G**, Column, adaxial and three quarters view; **H**, Pollinarium and anther cap. All images from A. P. Karremans 5873, photographs by A. Karremans and L. Oses.

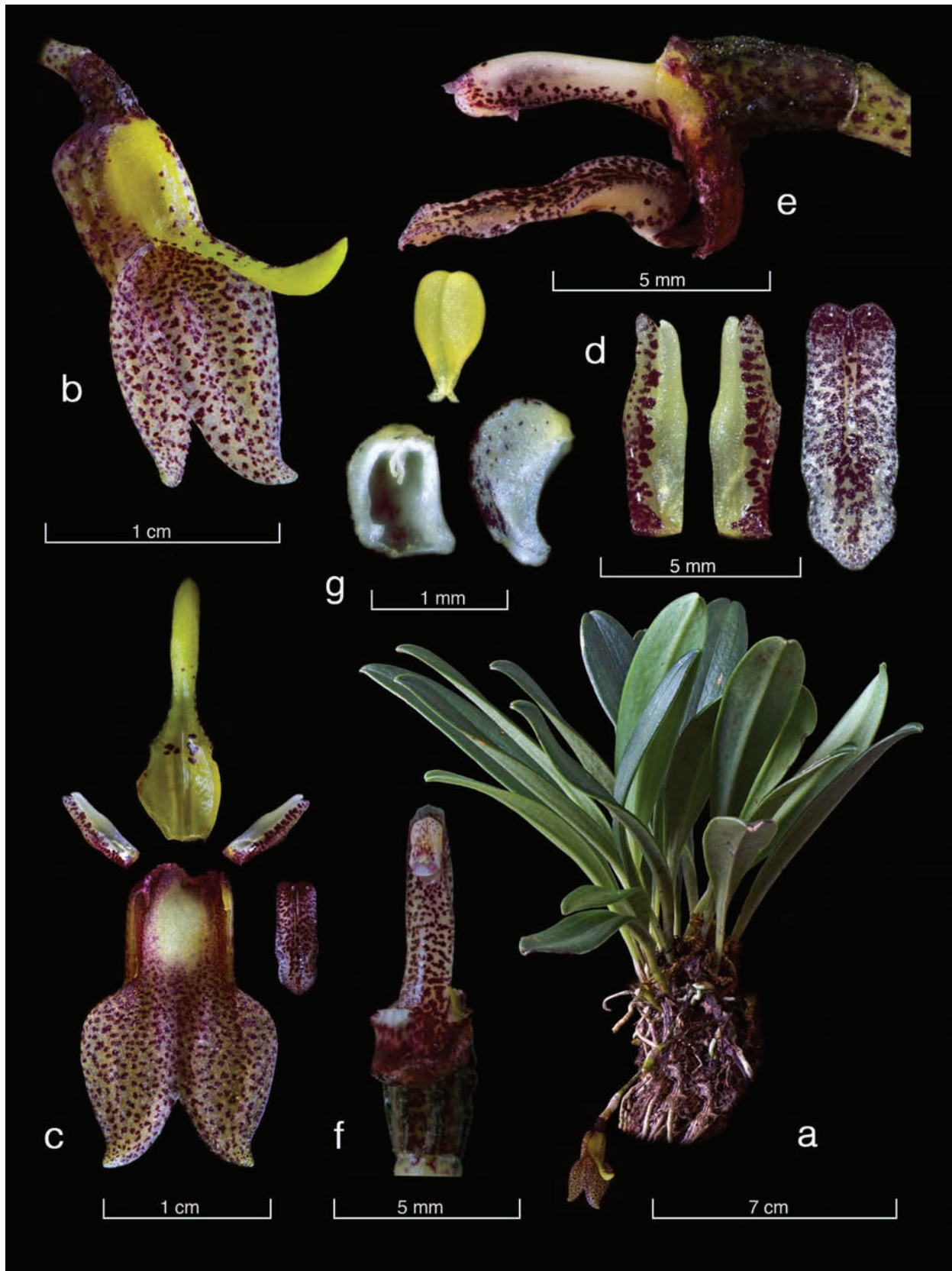


FIGURE 5. LDCP of *Masdevallia utriculata*. A, Habit; B, Flower; C, Dissected perianth; D, Petals and lip, adaxial view; E, Column and lip, lateral view; F, Column, adaxial view; G, Pollinarium and anther cap. All images from *D. Bogarín 10652*, photographs by D. Bogarín.



FIGURE 6. Intra-specific variation of floral morphology in different specimens of: **A**, *Masdevallia zahlbruckneri*: **a**, AK5873; **b**, AK6247; **c**, AK6246. **B**, *M. utriculata*: **d**, AK6106; **e**, DB10647; **f**, AK6169; **g**, AK6100; and **h**, DB10652. Photographs by L. Oses (A) and A. Karremans (B) (AK = A. Karremans; DB = D. Bogarín).



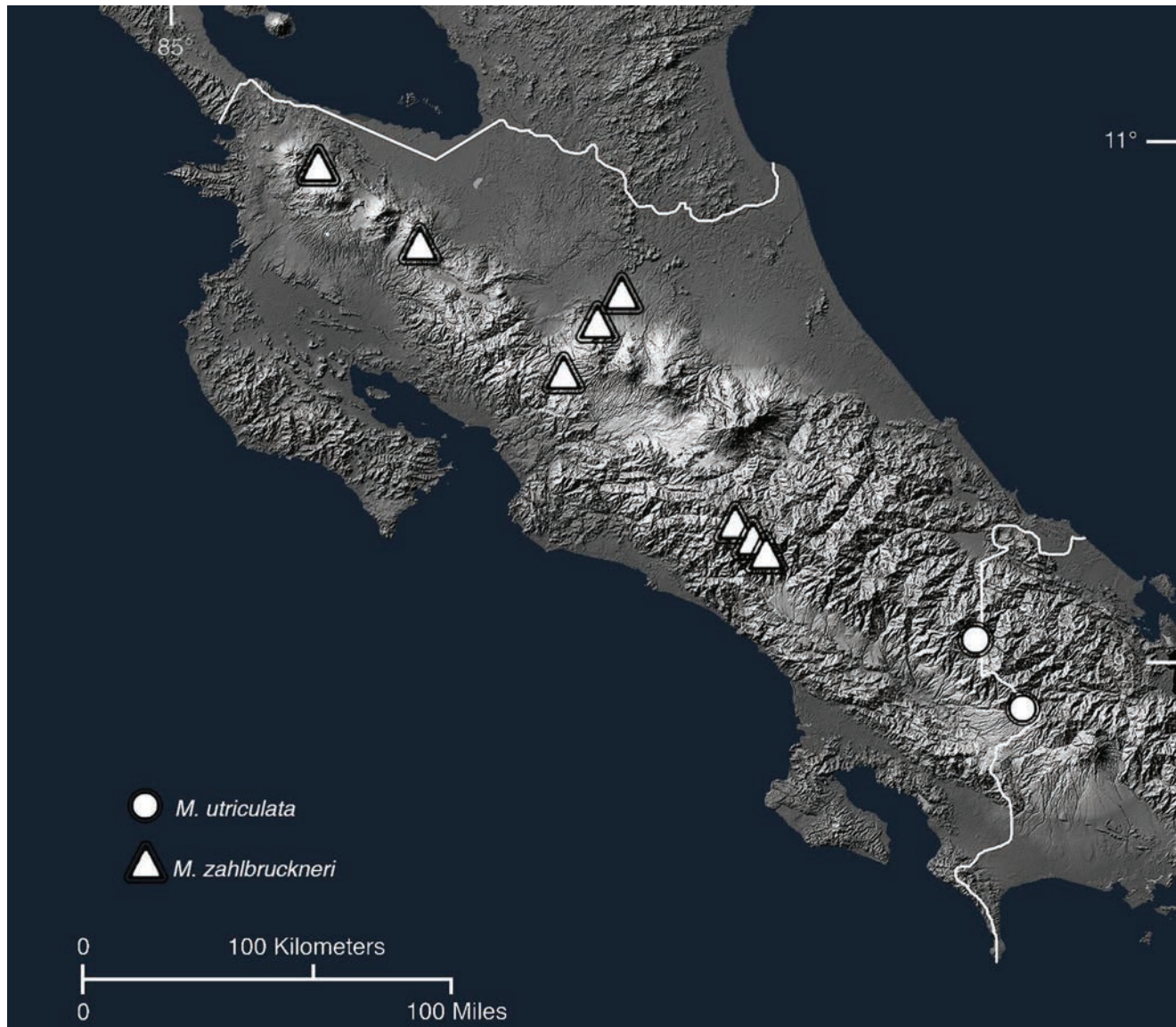


FIGURE 7. Distribution map of *Masdevallia zahlbruckneri* and *M. utriculata* in Costa Rica.

#### LITERATURE CITED

- ABELE, A. D. 2007. Phylogeny of the genus *Masdevallia* Ruiz & Pav. (Orchidaceae) based on morphological and molecular data. Disertación PhD. Hamburg University.
- , B. RUDOLPH, J. THIEDE, AND J. G. ROHWER. 2005. Phylogeny of the genus *Masdevallia* Ruiz & Pav. based on morphological and molecular data. Congrès mondial et exposition d'orchidées—18th World Orchid Conference. Dijon, France. 111–116.
- LUER, C. A. 1980. *Orchidaceae Masdevallia humilis*. Phytologia 46: 350.
- . 1986. Icones Pleurothallidarum II: Systematics of *Masdevallia*. Monogr. Syst. Bot. Missouri Bot. Gard.: 1–62.
- . 2000a. Icones Pleurothallidarum XIX. Systematics of *Masdevallia* Part One. Missouri Bot. Gard. 77: 1–264.
- . 2000b. Icones Pleurothallidarum. XXI. Systematics of *Masdevallia*, Part Two. Monogr. Syst. Bot. Missouri Bot. Gard. 82: 265–518.
- . 2006. Icones Pleurothallidarum XXVIII. Reconsideration of *Masdevallia*, and the systematics of *Specklinia* and vegetatively similar genera (Orchidaceae). Monogr. Syst. Bot. Missouri Bot. Gard. 105: 21–244.
- KARREMANS, A. P. AND M. MUÑOZ. 2011. *Pleurothallis silvae-pacis*, a new species. Orch. Rev. 121: 155–159.
- , F. T. BAKKER, F. PUPULIN, R. SOLANO-GÓMEZ, AND M. J. M. SMULDERS. 2013. Phylogenetics of *Stelis* and closely related genera (Orchidaceae: Pleurothallidinae). Plant Syst. Evol. 29(1): 69–86.
- , D. BOGARÍN, AND B. GRAVENDEEL. 2015. *Specklinia lugduno-batavae* (Pleurothallidinae: Orchidaceae), a new species in the *S. digitalis* group. Blumea 59: 180–184.
- PISÚT, I. 2002. Alexander Zahlbruckner (1860–1938): The Author of Two Historical Milestones in Lichenology. The Bryologist 105: 243–245.

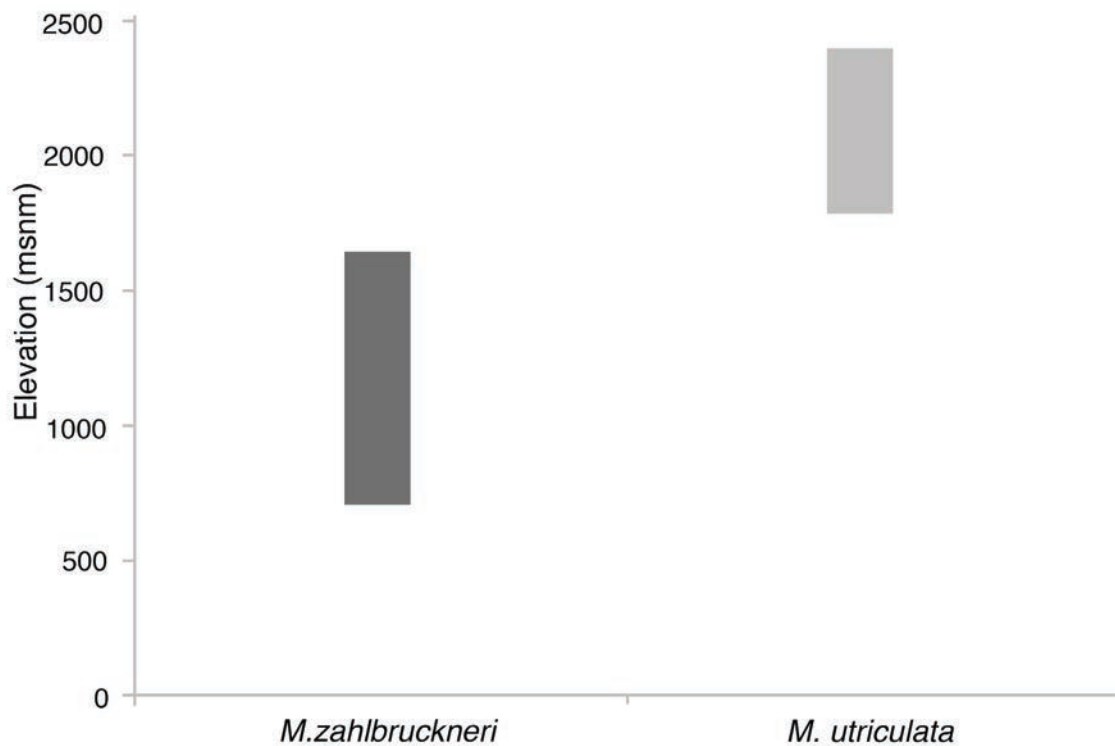


FIGURE 8. Altitudinal range distribution of *Masdevallia zahlbruckneri* and *M. utriculata* in Costa Rica.

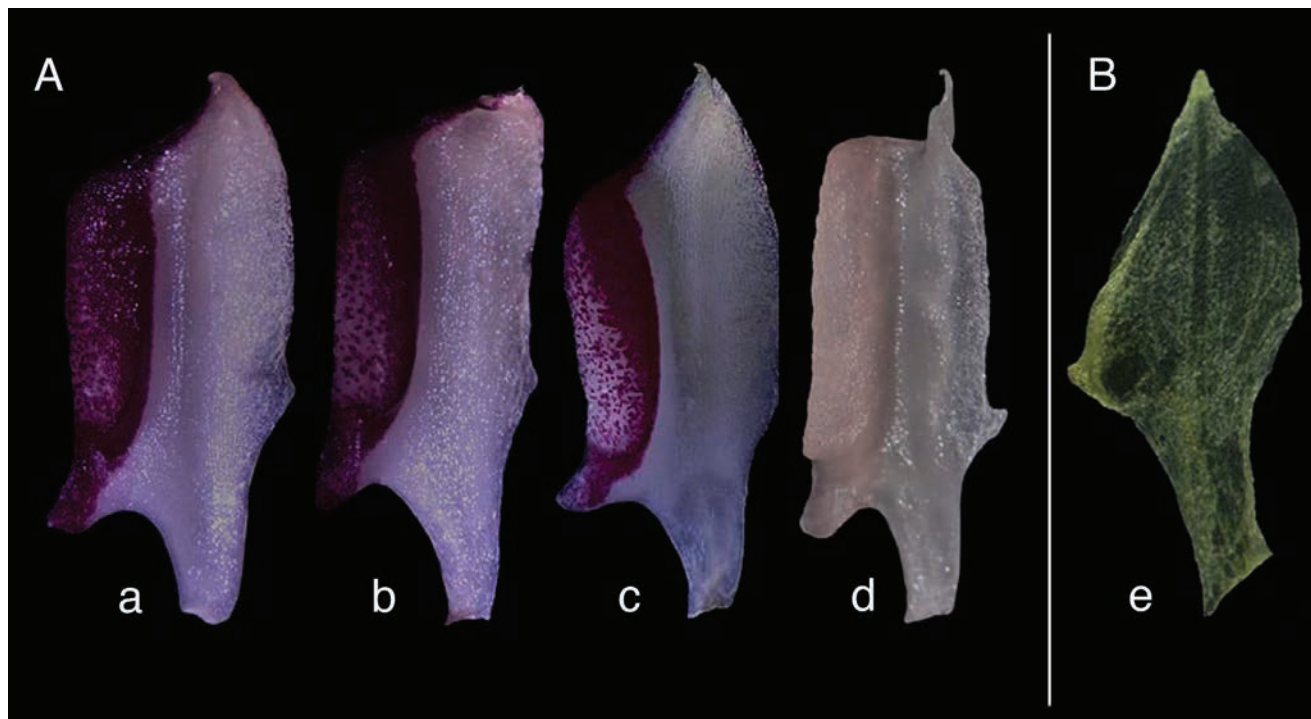


FIGURE 9. Adaxial view of the petal of different specimens. **A**, *Masdevallia zahlbruckneri*: **a**, AK6246; **b**, AK6246; **c**, AK5873; **d**, DB2413 (JBL-Spirit). **B**, *M. schizopetala*: **e**, DB10475. Photographs by L. Oses (AK = A. Karremans; DB = D. Bogarín).

- PUPULIN, F., C. OSSENBACH, AND R. JENNY. 2014. Mr. Auguste R. Endrés: Not so mysterious, after all. *Orchids* (West Palm Beach) 83(10): 604–617.
- PRIDGEON, A. M., AND M. W. CHASE. 2001. A phylogenetic reclassification of *Pleurothallidinae* (Orchidaceae). *Lindleyana* 16: 71–235.
- , R. SOLANO, AND M. W. CHASE. 2001. Phylogenetic relationships in *Pleurothallidinae* (Orchidaceae): Combined evidence from nuclear and plastid DNA sequences. *Amer. J. of Bot.* 88 (12): 2286–2308.
- , P. CRIBB, M. W. CHASE, AND F. N. RASMUSSEN. 2005. *Genera Orchidacearum* Volume 4: Epidendroideae. Oxford University Press, Oxford.
- REICHENBACH, *f.*, H. G. 1873. New Garden Plants. The Gardeners' Chronicle and Agricultural Gazette 37: 1238.
- . 1874a. New Garden Plants. *Gard. Chron.*, 1: 240–372.
- . 1874b. New Garden Plants. *Gard. Chron.*, 2: 290.
- . 1875. New Garden Plants. *Gard. Chron.*, 2: 388.
- . 1876a. New Garden Plants. *Gard. Chron.*, 5: 8.
- . 1876b. New Garden Plants. *Gard. Chron.*, 6 (138): 226.
- . 1877. Orchideae Roezlianae novae. *Linnaea* 41: 10–11.
- . 1878a. Orchideae F. C. Lehmannianae ecuadorenses. *Otia Bot. Hamburg.* 1: 14–16.
- . 1878b. New Garden Plants. *Gard. Chron.*, 1: 72.
- VEITCH AND SONS. 1889. Manual of Orchidaceous plants, Vol. 1, Epidendreae, Part 5: 14–76.
- WOOLWARD, F. H. 1896. *The genus Masdevallia*. R.H. Porter, London.

## APPENDIX

## INDEX TO NUMBERED COLLECTIONS

- Blanco s.n.* [JBL D2280] (1); *s.n.* [CR](4).
- Todzia 351* (2).
- Acosta s.n.* (3).
- Mora s.n.* (5).
- Bogarín & al.* 2410 (6); 2413 (7); 10691(14); 8088 (18); 10652 (20); 10647 (21).
- Lun s.n.* (8).
- Pupulin & al.* 2405 (9).
- Karremans & Lok* 5873 (10).
- Karremans & Geml* 5387 (16); 5417 (17).
- Karremans & al.* 6246 (11); 6247 (12); 6365 (13); 6169 (15); 6106 (22).
- Fernández & al.* 430 (19); 431 (19).



## TERNSTROEMIA WASHIKIATII (PENTAPHYLACACEAE): A NEW TREE SPECIES FROM EASTERN ECUADOR

XAVIER CORNEJO<sup>1,2</sup> AND CARMEN ULLOA ULLOA<sup>3</sup>

**Abstract.** *Ternstroemia washikiatii* a new species of Pentaphylacaceae from the Amazonian forests of Eastern Ecuador, is here described and illustrated. It is distinguished from the remaining species in the genus by the large leaves (21–33 × 8.5–11 cm), and the very distinctive large fruits (4.5–5.5 × 6.5–7.7 cm) with six to nine seeds. *Ternstroemia washikiatii* is assessed as Near Threatened.

**Resumen.** Se describe e ilustra *Ternstroemia washikiatii*, una nueva especie de Pentaphylacaceae de los bosques amazónicos del oriente de Ecuador. Esta nueva especie se distingue de las restantes en este género por las hojas grandes (21–33 × 8.5–11 cm) y los frutos grandes (4.5–5.5 × 6.5–7.7 cm) con seis a nueve semillas, que son muy distintivos. A esta nueva especie se asigna el estatus de Casi Amenazada.

**Keywords:** Amazonia, Pentaphylacaceae, *Ternstroemia washikiatii*, Ecuador, endemic

*Ternstroemia* Mutis ex L. f. (Pentaphylacaceae) is widely distributed in tropical and subtropical America, Africa, Southeast and East Asia (Weitzman et al., 2004; Berry and Weitzman, 2005; Mabberley, 2008; Santamaría Aguilar et al., 2015). The genus comprises ca. 100 species, ca. 60 of those occurring in the Neotropics (Every, 2009), including the type, *Ternstroemia meridionalis* Mutis ex L. f., collected in northwestern South America. Four species were reported for Ecuador (Jørgensen and León-Yáñez, 1999, as Theaceae) but none in the Amazon region. During field work in Eastern Ecuador the senior author collected a tree with large fruits that does not match any of the current species described in the genus. After consulting collections in AAU, GB, GUAY, MO, NY, and S (herbarium acronyms according to Thiers, 2016), as well as images of type collections on JStor (plants.jstor.org) we concluded that these collections belong to an undescribed species that we formally present herein.

***Ternstroemia washikiatii*** Cornejo & C.Ulloa, *sp. nov.*  
TYPE: ECUADOR. Pastaza: 18 km E from Puyo, finca Ursula, secondary wet forest, 1°30'28"S 77°50'16"W, 650 m, 3 July 2016 (fr), *Xavier Cornejo & Naten Washikiat* 8808 (Holotype: GUAY; Isotypes: MO, NY, QCA). Fig. 1.

Species nova affinis *Ternstroemia macrocarpa* Triana & Planch. et *T. krukkoifiana* Kobuski, a qua foliis et fructus grandioribus, semina 6–9 (vs. 16–18 *T. macrocarpa*, 1–2 *T. krukkoifiana*) differt.

*Tree* to 14 m tall and 30 cm or more dbh; glabrous throughout. *Branches* stout, lenticellate, glabrous. *Stipules* absent. *Leaves* spirally arranged, clustered at end of terminal branches; *blades* coriaceous, shortly oblanceolate or narrowly-obovate to narrowly-elliptic, 21–33 × 8.5–11 cm, cuneate at base, barely obtuse and acuminate at apex, the acumen 1.5–2.7 cm long, margins minutely denticulate to serrulate in seedlings, turning entire with age, mature leaves

with revolute margins mainly at base, dark green (in vivo) and dark brown (dry), midvein sulcate above, pale green (in vivo) and light brown with abundant glandular darker dots and a prominent midvein beneath (dry); main lateral veins ca. 14 to 17 on each side, weakly brochodromous, intersecondaries present, glabrous on both sides; *petioles* 1.5–3 × 0.3–0.4 cm, flattened-depressed and longitudinally channeled adaxially, glabrous. *Inflorescences* and flowers not seen. *Fruits* terminal amphisarca, globose-depressed, 4.5–5.5 × 5.5–7.7 cm, mucronulate at apex, opaque orange, abundantly lenticellate and glabrous at maturity; crowned by a persistent calyx, the calyx lobes 5(–6), imbricate in 2 whorls, the external whorl of lobes cartilaginous, ovate to deltoid, 1.0–1.4 × 0.8–1.2 cm, the margins glandular denticulate, the apex apiculate, glabrous without. *Pedicels* in fruit, 1.2–1.7 × 0.7–0.9 cm, straight to weakly curved, 1-ribbed laterally, abundantly lenticellate. *Mesocarp* 0.8–2 cm thick. *Locules* 2; placentation basal, the seeds attached from the apex of a central column. *Seeds* 6 to 9, obovate to somewhat oblong, 2–3 × 1.3–2 cm (in vivo), 2–2.5 × 1.3–1.7 cm (dry), testa orange, covered by a soft, purple-red sarcotesta.

**Eponymy:** The epithet of this taxonomic novelty honors Ramiro Washikiat, the indigenous Achuar co-collector, for his invaluable help gathering samples of this tree when first discovered.

**Paratype:** ECUADOR. Pastaza: 18 km E from Puyo, finca Ursula, secondary wet forest, 1°30'28"S, 77°50'16"W, 650 m, 10 January 2016 (fr), *X. Cornejo, R. Washikiat & A. Kay 8770* (GUAY).

**Habitat and distribution:** *Ternstroemia washikiatii* is known only from a single tree in the type locality. The habitat is a secondary Amazonian forest located at finca Ursula, a private property located 18 km E from Puyo, Pastaza province, in Eastern Ecuador.

Thanks are due to Ursula Gelchsheimer for the kind invitation to explore the finca Ursula, the type locality. We also thank the curators of AAU, GB, GUAY, MO, NY, and S for permitting us to study their holdings, and Peter Stevens for discussion on the identity of this plant, and the comments of two anonymous reviewers.

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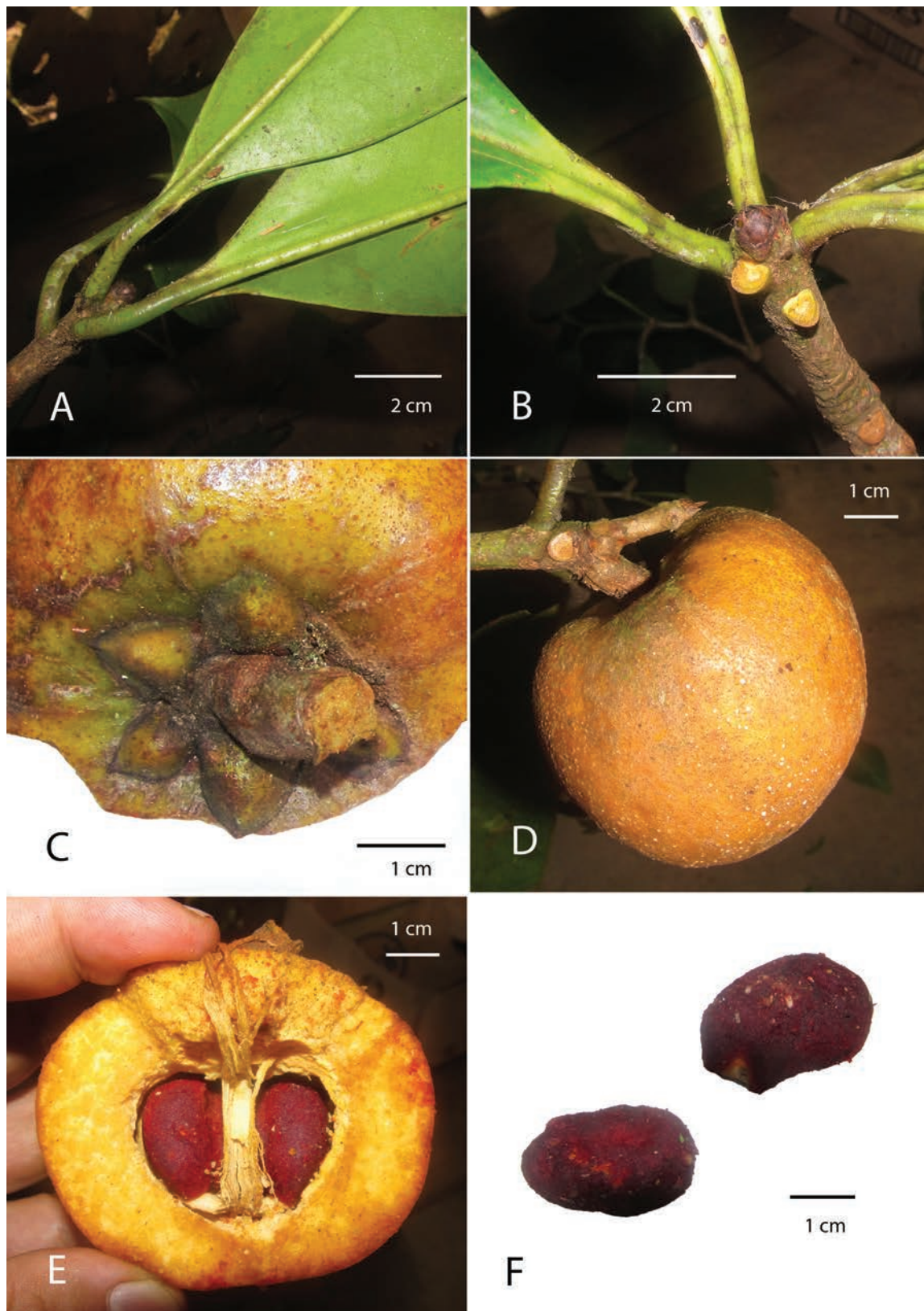


FIGURE 1. *Ternstroemia washikiatii* Cornejo & C.Ulloa. **A**, terminal leafy branch bearing petioles and cuneate leaf bases, abaxial view; **B**, terminal leafy branch bearing channelled petioles and fresh petiolar scars, adaxial view; **C**, fruit with pedicel and persistent calyx, basal view; **D**, mature fruit attached to a terminal branch, lateral view; **E**, Longitudinal section of a mature fruit; **F**, detached seeds. Photographs by X. Cornejo based on the Holotype.

**Seed germination:** Seeds outside of the fruit have been observed to germinate after six to seven months without removal of the sarcotesta. After falling, the fruits remain hard and last for several months on the forest floor until they decompose. A cut of fully closed fruit revealed that the seeds have the ability to germinate before the exocarp and mesocarp decay, and without help of dispersers. Those young seedlings carefully removed from closed fruits could potentially be cultivated. These observations suggest that the fruits could be harvested from the forest and stored in a moist, shady environment for several months in order to manage the species for reforestation, forest restoration, or ex situ conservation programs.

**Conservation status:** At present, the native vegetation of the area where *Ternstroemia washikiatii* occurs is mostly conserved. However, deforestation and forest fragmentation is expected in the near future due to road construction and

mainly due to the advance of the agricultural frontier and land use or forest conversion to cattle farms. Therefore, the preliminary status of Near Threatened (NT) (IUCN, 2012), is assigned to this species.

Because of the large size of the fruits, compared to other Neotropical species, *Ternstroemia washikiatii* may resemble the Colombian *T. macrocarpa* Triana & Planch. or the Brazilian *T. krukoffiana* Kobuski; however, *T. washikiatii* differs from both species by the distinctively larger fruits and longer leaf blades, different number of seeds, and different pattern of distribution and elevation. It is most likely that these are the largest fruits in the genus in the Neotropics, being much wider than those of *T. krukoffiana*. Although we did not find flowers, having monitored the phenology of the tree for a year, other species in the genus have been described and compared with fruiting characters (Kobuski, 1942). Table 1 presents the differences among these species.

TABLE 1. Comparison of *Ternstroemia washikiatii* Cornejo & C.Ulloa with similar large fruited species.

	<i>T. WASHIKIATII</i>	<i>T. MACROCARPA</i>	<i>T. KRUKOFFIANA</i>
Calyx lobes (fruit)	10–14 × 8–12 mm	20 × 11–14 mm	8–10 × 7–8 mm
Leaves	21–33 cm × 8.5–11 cm	8–16 × 5–8 cm	12–20 × 4–5 cm
Fruit length × diam.	4.5–5.5 × 5.5–7.7 cm	2–2.5 × 2 cm	4–5 × 3.5–4 cm
Number of seeds	6–9	16–18	1–2
Elevation	650 m	2500–3000 m	160 m
Distribution	Pastaza, Ecuador	Andes, Colombia	Amazonas, Brazil

#### LITERATURE CITED

- BERRY, P. E. AND A. L. WEITZMAN. 2005. Ternstroemiaceae. Pages 300–308 in J. A. STEYERMARK, P. E. BERRY, K. YATSKIEVYCH AND B. K. HOLST, EDS. Flora of the Venezuelan Guayana 9. Missouri Botanical Garden Press, St. Louis.
- EVERY, J. L. R. 2009. Pentaphylacaceae. In W. MILLIKEN, B. KLITGÅRD, AND A. BARACAT [2009 onwards], Neotropikey-Interactive key and information resources for flowering plants of the Neotropics. Available from: [www.kew.org/neotropikey](http://www.kew.org/neotropikey) (accessed May 21, 2016).
- IUCN. 2012. IUCN Red List Categories and Criteria Version 4. IUCN Gland, Switzerland, and Cambridge, United Kingdom.
- JØRGENSEN, P. M. AND S. LEÓN-YÁNEZ, EDS. 1999. *Catalogue of the Vascular Plants of Ecuador*. Monogr. Syst. Bot. Missouri Bot. Gard. 75: 1–1181.
- KOBUSKI, C. E. 1942. Studies in the Theaceae, XII. Notes on the South American species of *Ternstroemia*. J. Arnold Arboretum 23: 298–343.
- MABBERLEY, D. J. 2008. *Mabberley's Plant-book: A Portable Dictionary of Plants, their Classifications, and Uses*, Third edition. Cambridge University Press, Cambridge.
- SANTAMARÍA AGUILAR, D., Q. JIMÉNEZ-MADRIGAL AND A. K. MONRO. 2015. A new species of *Ternstroemia* (Pentaphylacaceae) from La Amistad Binational Park and World Heritage Property, Costa Rica and Panama. *Phytotaxa* 217: 87–91.
- THIERS, B. 2016. *Index Herbariorum: A global directory of public herbaria and associated staff*. New York Botanical Garden's Virtual Herbarium. Available from: <http://sweetgum.nybg.org/ih/>.
- WEITZMAN, A. L., S. DRESSLER AND P. F. STEVENS. 2004. Ternstroemiaceae. Pages 450–460 in K. KUBITZKI, ED. *The Families and Genera of Vascular Plants. Flowering Plants. Dicotyledons*. Vol. 6. Springer-Verlag, Berlin. doi: 10.1007/978-3-662-07257-8\_47



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