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NOTES ON THE CORRECT IDENTITY OF *CERATOSTYLIS SIAMENSIS* (EPIDENDROIDEAE: PODOCHILEAE) FROM INDIA

Shuvadip Sarkar[1], D. K. Agrawala[2,5], D. Maity[3,5] & M. Khanal[4]

[1]Central National Herbarium, Botanical Survey of India, Howrah–711103, West Bengal, India.

[2]Botanical Survey of India, CGO Complex, 3rd MSO building, Salt Lake, Kolkata–700064, West Bengal, India.

[3]Taxonomy and Biosystematics Laboratory, Department of Botany, University of Calcutta, 35, Ballygunge Circular Road, Kolkata–7000019, West Bengal, India.

[4]Taxonomy and Biodiversity Laboratory, Department of Botany, Sikkim University, 6th mile, Samdur, Gangtok–737102, Sikkim, India.

[5]Authors for correspondence: drdkbsi@gmail.com, debmaity@yahoo.com

Abstract. While conducting taxonomic studies on the tribe Podochileae (Orchidaceae) for the Flora of India, two species, *Ceratostylis siamensis* and *Ceratostylis himalaica* have been examined using types, protologues, fresh specimens, and authentic herbarium collections. *Ceratostylis siamensis* was previously reported and documented in Arunachal Pradesh, India. However, we determined upon closer examination that this record was based on erroneous identification. The correct identity of this species is *C. himalaica*. Consequently, *Ceratostylis siamensis* is excluded from the flora of India.

Keywords / Palabras Clave: Arunachal Pradesh, *Ceratostylis himalaica*, identificación errónea, misidentification, orchids, orquídeas, taxonomía, taxonomy

Introduction. The genus *Ceratostylis* Blume (Orchidaceae: Epidendroideae: Podochileae) comprises approximately 147 species distributed from India and China through Southeast Asia, New Guinea and the southwest Pacific islands (Chase *et al.* 2015, Pridgeon *et al.* 2005). Three species are found in India (Singh *et al.* 2019).

The genus is exclusively characterized by solitary, terete or dorsiventrally flattened leaf, midlobe of labellum swollen and bulbous. During a taxonomic revision of *Ceratostylis* in India under the National Mission on Himalayan studies, *Ceratostylis siamensis* Rolfe ex Downie and *Ceratostylis himalaica* Hook.f. have been studied with types, protologues, fresh specimens and authentic herbarium collections. Whether true *C. siamensis* distributed in China, Laos, Thailand, Tibet, Vietnam, has been found distinct by virtue of its short, erect, unbranched stems (1.5–5.0 cm long) with closely placed pseudobulbs forming a tuft; leaves obliquely emarginate with obtuse lobes, lateral sepals are 3-veined and the labellum is distinctly 3-lobed.

Gogoi and Riniya (2020) recorded *Ceratostylis siamensis* from the Ziro Valley, Lower Subansiri district of Arunachal Pradesh. This marked a new distributional record for India. Through meticulous examination of voucher specimens of *C. siamensis* deposited at the Herbarium of the Orchid Research Centre Tippi (not listed in "Index Herbariorum," henceforth abbreviated as OHT) and the Herbarium of the Orchid Society of Eastern Himalaya (TOSEHIM), Regional Orchid Germplasm Conservation and Propagation (Assam Circle), as well as living specimens conserved in the conservatory of the CCF office at Hapoli in the Lower Subansiri district and with consultation of relevant literature (Chen *et al.* 2009, Chowdhery 1998, Hooker 1890, 1894, King & Pantling 1898, Pal 2013, Pearce & Cribb 2002, Pradhan 1979, Rao 2010, Seidenfaden 1986, Singh *et al.* 2019), it was identified as *C. himalaica* Hook.f. Therefore, *C. siamensis* has been excluded from Indian flora. A comprehensive description of *C. himalaica* and its relationship with *C. siamensis* has been discussed. Information on phenology, habitat, distribution & specimens are included to facilitate a better understanding for *C. himalaica*.

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Ceratostylis himalaica Hook.f., *Fl. Brit. India* 5: 826. 1890; *Ritaia himalaica* (Hook.f.) King & Pantl., *Ann. Roy. Bot. Gard. (Calcutta)* 8: 157, t.214. 1898; *Ceratostylis siamensis* auct. non Rolfe ex Downie. 1925: Gogoi & Riniya, *Richardiana*: 134, f. 1–2. 2020.
Eria ramosissima Wall. ex Hook.f., *Fl. Brit. India* 5: 826. 1890.

TYPE: Bhutan, *Griffith 5214* (P!) [P00403825] **Lectotype** (inadvertent designation by Seidenfaden, 1986: 117 by reference to "P! Type"); *Griffith 5214* (syn. K-LINDL!) [K000810605]; *Griffith 1187* (syn. K-LINDL!) [K000810604]; East Nepal, 10th Dec., *Hooker 359* (syn. K-LINDL!) [K000810606]; *Hooker 359* (syn. K-LINDL!) [K000810603]; India, Khasia Hills, *Gibson s.n.* (syn. CAL).

Epiphytic, prostrate *plants*, 7–19 cm long. *Stems* 4–15 cm long, pendulous, dichotomously branched, branched stem is formed by the union of rhizome segments from the base of each pseudobulbs; the elongation of the stem continues with age by adding the fresh shoots every season, enveloped thoroughly by 0.5–1.5 cm long sheaths; sheaths many imbricate, scale-like, ovate-lanceolate, subacute with strongly veined, each branches bearing a single leaf. *Leaves* 5.4–6.6 × 0.5–0.7 cm, linear-oblong, fleshy, apex unequally bilobed, smaller lobe acute and larger lobe acute or rounded, base tapering towards 0.6–1 cm long petiole. *Inflorescence* 0.8–1.5 cm long, arising from base of the leaf, 1–2-flowered, subcapitate; peduncle 4–5 mm long, enveloped with two sheaths. *Floral bracts* 3.5–4.0 × 0.8–1.2 mm long, lanceolate, acute to acuminate, cymbiform, glabrous. *Flowers* 5.2–8.0 × 3.5–5.0 mm, externally pubescent, greenish-yellow, petals purplish-brown, lip yellowish with auricular obscure side lobes with purple margins, apical part with yellow thick cushion-like portion on the back side. *Pedicel and ovary* 1.7–3.2 mm long, densely pubescent. *Sepals* sub-equal, pubescent externally; dorsal sepal 2.8–3 × 1.3–2.0 mm, lanceolate, subacute, concave, 3-veined, often purple coloured; lateral sepals similar, 2.4–2.7 × 3–3.5 mm, broadly ovate, acuminate, 3–5 veined, often purple coloured, basal portion falcate, connate at the base to form a mentum. *Petals* 2.6–2.8 × 0.7–0.9 mm, linear, spreading, acute, glabrous, 3-nerved. *Labellum* 2.1–2.8 × 0.9–1.2 mm, obscurely 3-lobed, fleshy, cymbiform, basal portion saccate, margin entire, apical portion consist of cushion-like callus on the abaxial side, side lobes are auricular, disc hairy. *Column* 0.8–1.0 mm long, erect, base with 1.05 mm long foot attached to the base of the labellum. *Clinandrium* 0.8 mm wide. *Stigma* broad. *Anther* 0.4–0.5 × 0.7–0.8 mm, 4-celled, ovate, terminal. *Pollinia* 8, unequal, ca. 0.5 –0.7 × 0.1–0.2 mm, clavate, connected to an oblong small viscidium by granular stipe. *Capsules* 5–6 × 3–4 mm, ellipsoid. (Fig. 1).

Phenology: Plants flower from May to June; fruits were recorded in July.

Habitat: Epiphytic, found on moss-covered tree trunks and rock boulders at elevations of 1000–2000 m. Host plant: observed growing on the trunks and branches of *Quercus griffithii* Hook.f. & Thomson ex Miq. (Fagaceae).

Global distribution: India, Bhutan, China, Laos, Malaysia, Myanmar, Nepal, Vietnam.

Distributin in India: Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim, West Bengal.

Specimens examined: **Arunachal Pradesh**: Jengging, 06 Nov 1990, *Hegde 26034* (Orchid Herbarium Tipi, not in "Index Herbariorum" and hence-forth abbreviated as OHT); Sangti, 1676 m, 05 Sep 1983, *Hegde 9662* (OHT); West Kameng, Sessa, 02 Oct 1980, *A. N. Rao 77239* (ASSAM); 09 Jun 1980, *Hegde 4017* (APFH); 09 Jul 1983, *A. N. Rao 9172* (OHT); 23 Jun 1982, *Hegde 2649* (OHT); 14 Jun 1980, *Hegde 2649* (OHT); Sessa Top, 27 Jul 1996, *A. N. Rao 29025* (OHT); Subansiri, Hapoli Behind D.C's Office, 10 May 1966, *A. R. K Sastry 44873* (ASSAM, ARUN); Sayata to Paji, 20 Nov 1964, *A. R. K Sastry 40794* (ASSAM); Ziro to Begi, 04 Jun 1961, *G. V. Subba Rao 24746* (ASSAM); Begi, 26 Apr 1980, *G. D. Pal 78255* (ARUN); Kameng F.D, Dirang Dzong, 1829 m, 16 May 1957, *R. S. Rao 7538* (ASSAM); Sissini camp, 1219 m, 25 Mar 1957, *G. Panigrahi 5995* (ASSAM); Sisni, 10 Jun 1984, *Hegde 15862* (OHT); *Hegde 15863* (OHT); *Hegde 15864* (OHT); *Hegde 15865* (OHT); Baha Hill Kalaktang, 10 May 1958, *G. Panigrahi 15320* (ASSAM); Siang F.D, Geling to Kepangla, 823 m-1524 m, 10 Nov 1958, *R.S. Rao 17548* (ASSAM); Sirang-Geizing, 640 m-1372 m, 20 Nov 1958, *R.S. Rao 17923* (ASSAM); West Siang, Nyodo-Sibe near Basar, 28 Nov 2010, *M. Bhaumik 25537* (ARUN); Lohit, Forest Around Camp C5, 27 Dec 1969, *B. Krishna 48757* (ASSAM); Dibang

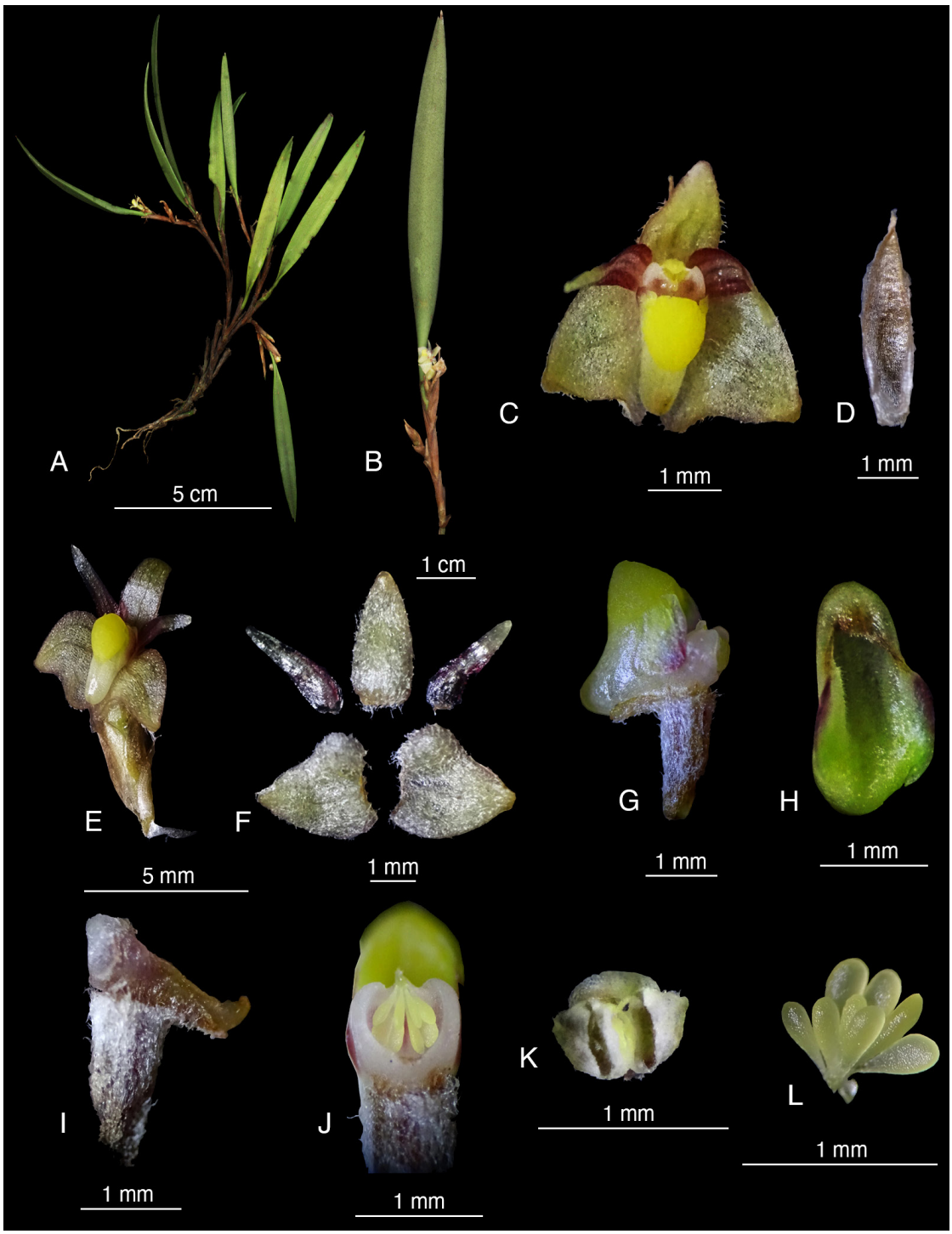

Figure 1. *Ceratostylis himalaica*. **A**. Habit. **B**. Leaf with inflorescence. **C**. Flowers (top view). **D**. Bracts. **E**. Flower. **F**. Dissected floral parts (Dorsal sepal, lateral sepals and petals). **G**. labellum with column. **H**. Labellum. **I**. Column with foot. **J**. Clinandrium with pollinia. **K**. Anther cap. **L**. Pollinia. Dissection and photo plate by Shuvadip Sarkar.

FIGURE 2. Type specimen of *Ceratostylis siamensis* from Kew [Barcode no: K000597122]. ©Board of Trustees of the Royal Botanic Gardens, Kew.

Valley, Mehao lake, 1500 m, 17 Apr 1999, *M. Bhaumik 2428* (CAL); Mipi, 1500 m, 05 Sep 2000, *M. Bhaumik & M.K. Pathak 3549* (CAL); 01 Apr 1984, *K. Haridasan 652* (APFH); Deli valley, *Kingdon Ward 8100* (K); Ziro valley, Tale wildlife Sanctuary, 03.13.2020 (in fl.), *Gogoi 00806* (OHT; TOSEHIM); Lower Subansiri, Kardo forest, Hapoli, 778 m, 23 Sep 2021, *S. Sarkar 94996* (Cultivated at CNH- Pargola). **Manipur:** *Chowlu s.n.* (Centre for Orchid gene conservation of Eastern Himalayan region, not in "Index Herbariorum" and hence-forth abbreviated as COGCEHR); Senapati Hills, 1435 m, 26 Mar 2003, *S. Phukan 60281* (ASSAM). **Meghalaya:** Khasia Hills, Cherapunji, 1219 m, Jun 1897, *CG Foundlock s.n.* (CAL, P); 05 Apr 1972, *P.C. Pant 50833* (ASSAM). **Mizoram**: Lushai Hills, *Parry 563* (K); *Koelz 32747* (K); Blue Mountain, Lushai Hills, 7000 ft, 21 Apr 1953, *Thakur Rup Chand 7005* (MICH). **Nagaland:** Reserve forest, Puliebadze, 1623 m, 20 Nov 1973, *T.M. Hynniewta 56278* (ASSAM); Tseminyu, *Hynniewta 80727* (ASSAM). **Sikkim:** *Pantling 149* (BM, K, W); *J.D. Hooker s.n.* (P); 1220 m, *J.D. Hooker s.n.* (CAL, P); 1524 m, Jun 1899, *Pantling 149* (CAL, GH); 1891, *Pantling 149* (CAL, P); Tendong, *Pantling 149* (K); Teesta Valley, *Pradhan 1* (C); *Trudel 598* (C); Rongli-Rorathang, 15 Sep 2018, *D.K.A 40511* (Cultivated at BSHC). **West Bengal**: Sinchu La, 1767 m, 02 Mar 1934, *K. Biswas 1950* (CAL).

NOTES: *Ceratostylis himalaica* differs from *C. siamensis* in several key characteristics: it possesses a prostrate, elongated stem (10–15 cm long), which branches and originates from the union of rhizome segments at

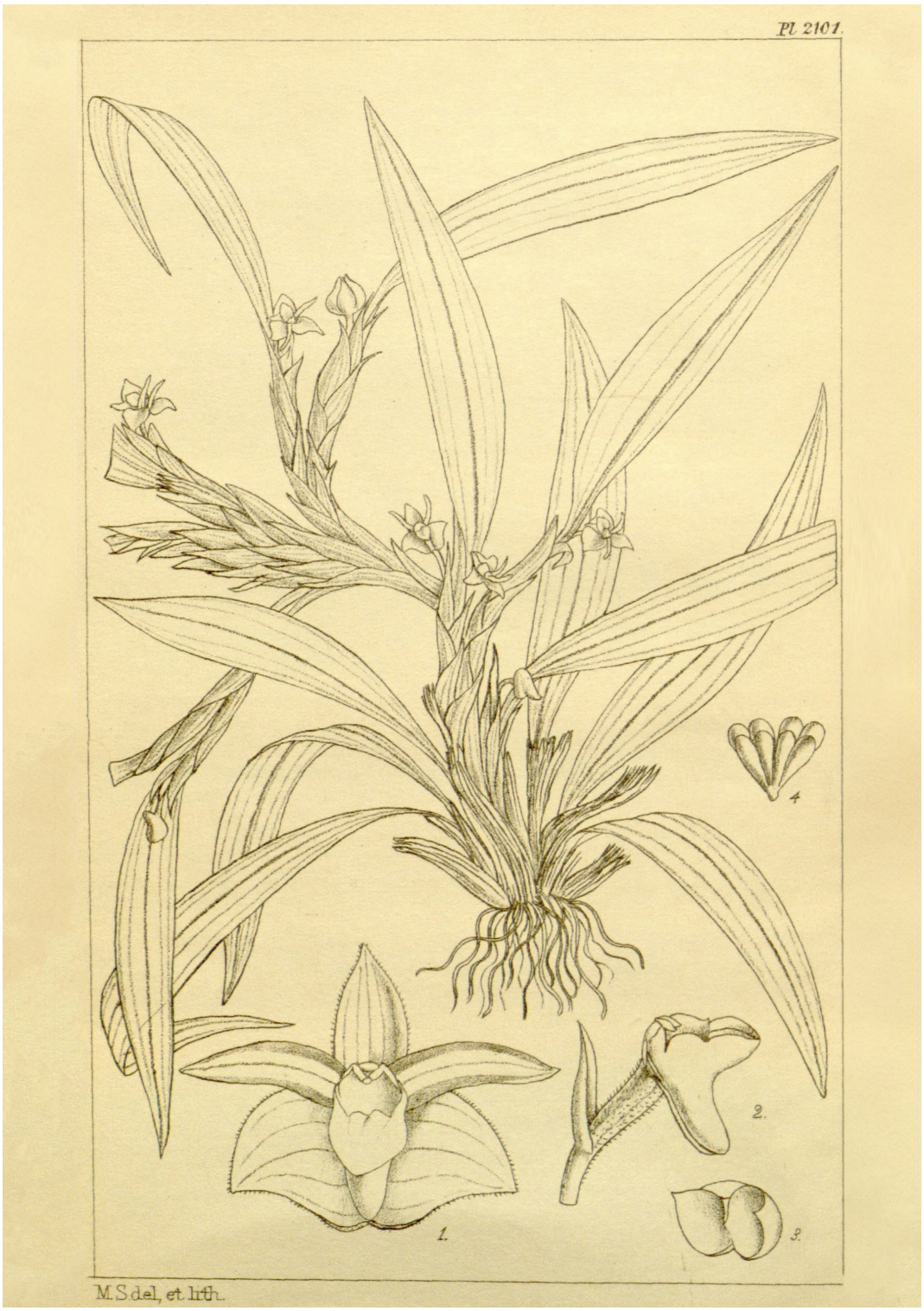

Figure 3. Illustration of *Ceratostylis himalaica*. Reproduced from Icones Plantarum (Pl. 2101).

the base of each pseudobulb. This elongation of the stem continues over time as fresh shoots are added each season. The leaves are obliquely emarginate at the apex with acute lobes, the lateral sepals are 5-veined and the labellum is obscurely 3-lobed or unlobed. In contrast, *C. siamensis* features short, erect, unbranched stems (1.5–5.0 cm long) with closely placed pseudobulbs forming a tuft. Its leaves are also obliquely emarginate but with obtuse lobes, the lateral sepals are 3-veined and the labellum is distinctly 3-lobed.

The specimens reported by Gogoi and Riniya (2020) exhibit the characteristics of *C. himalaica*. While describing *C. himalaica*, Hooker (1890) erroneously mentioned the lateral sepals as 3-veined, whereas his original illustration [Icon. Pl. t.2101] (Hook.f. 1894) depicts lateral sepals with 5 veins. This discrepancy is supported by fresh collections from Sikkim and Arunachal Pradesh and observations by Seidenfaden (1986), who noted specimens from Sikkim with 5 red stripes on the sepals. In contrast, *C. siamensis* is described as having lateral sepals with 3 purple veins. Dissected floral parts in Gogoi and Riniya (2020) also reveal 5-veined lateral sepals (Fig. 1D,F), indicating their identity as *C. himalaica*.

Based on the stem structure, leaf, petal and labellum characteristics, the specimens reported by Gogoi and Riniya (2020) as *C. siamensis* have been redetermined as *C. himalaica*, leading to the exclusion of the former from the Flora of India.

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Author contributions. **SS**: Conceptualization (equal); Investigation (equal); Writing – original draft preparation (equal); Writing – reviewing and editing (equal); **DKA**: Supervision (equal); Writing – reviewing and editing (equal); Investigation (equal); **DM**: Supervision (equal); Writing – reviewing and editing (equal); Investigation (equal); **MKl**: Data curation (equal); Investigation (equal).

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Conflict of interest. The authors have no conflict of interest to declare.

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LEPANTHES CHALALENSIS (PLEUROTHALLIDINAE), A NEW SPECIES ENDEMIC TO THE SANTANDER DEPARTMENT IN COLOMBIA

EDICSON PARRA-SÁNCHEZ[1,8], EUGENIO RESTREPO[2,3,4], YADIR BARRERA[5], JUAN CAMILO ORDÓÑEZ-BLANCO[6] & DAVID P. EDWARDS[1,7]

[1]Ecology and Evolutionary Biology, School of Biosciences, University of Sheffield, S10 2TN, U.K.

[2]Programa de Biología, Facultad de Ciencias Exactas y Naturales, Universidad de Caldas, Calle 65 #26-10, Manizales, Colombia.

[3]Grupo de Investigación Schultes, Fundación Ecotonos, Carrera 72 #13ª-56, Cali, Colombia.

[4]Grupo Científico Calaway Dodson: Investigación y Conservación de Orquídeas del Ecuador, Quito, 170510, Pichincha, Ecuador.

[5]Colegio rural el Santuario, Virolin, Santander, Colombia.

[6]Jefe de Horticultura, Jardín Botánico de Cali-FZC, Cr2 Oe 14-02, Cali, Colombia.

[7]Department of Plant Sciences, University of Cambridge, Cambridge, CB2 3EA, U.K.

[8]Author for correspondence: edicsonparras@gmail.com

ABSTRACT. We propose *Lepanthes chalalensis* as a newly identified species confined to the north-east Andes of Colombia. We randomly placed 341 sampling plots across the Eastern Cordillera, including transformed and natural habitats. Here, we provide a detailed description, illustrating images, ecological discussions, a taxonomic key for the new entity, and a conservation status analysis. The species is highly geographically restricted (in 2 out of 341 sampling plots) and has a low population size (26 adult individuals). While *L. chalalensis* shows a resemblance to *L. velosa* from Ecuador, it can be distinguished by the wide lower lobe of the petals, which is long ciliated, the lip laminae, which are reduced and bear stiff cilia, and the appendix length, which appear to be twice as long as the lip blades. The species should be considered a conservation concern due to its high rarity.

RESUMEN. Proponemos *Lepanthes chalalensis* como una nueva especie confinada al noreste de los Andes de Colombia. La nueva especie fue hallada en un muestreo de 341 parcelas aleatoriamente posicionadas a lo largo de la Cordillera Oriental, incluyendo hábitats transformados y naturales. Se proporcionan la descripción detallada, imágenes ilustrativas, discusiones ecológicas y un análisis del estado de conservación. La especie está altamente restringida geográficamente (en 2 de las 341 parcelas de muestreo) y tiene un tamaño de población bajo (26 individuos adultos). Aunque *L. chalalensis* muestra una similitud con *L. velosa* de Ecuador, puede distinguirse por el lóbulo inferior de los pétalos, que es ancho y presenta una cilios largos, las láminas del labelo, que están reducidas y presentan cilios rígidos, y la longitud del apéndice, que parece ser el doble de la longitud de las láminas del labelo. La especie debe considerarse una preocupación de conservación debido a su alta rareza.

KEYWORDS / PALABRAS CLAVE: Cordillera Oriental, Eastern Cordillera, endémico, endemics, muestreo estandarizado, Neotrópico, Neotropics, standardised sampling

Introduction. The environmental crisis caused by anthropogenic activities is driving species to extinction at rates never seen before (Ceballos *et al.* 2015). Threats such as habitat loss, fragmentation, and climate change are the main drivers of this negative trend across biological groups (Travis 2003). However, these drivers do not impact all species in the same way. For instance, 77.3% of new plant species to science are considered rare species and more likely to face extinction than wide-spread species (Brown *et al.* 2023). Rare species are those spe-

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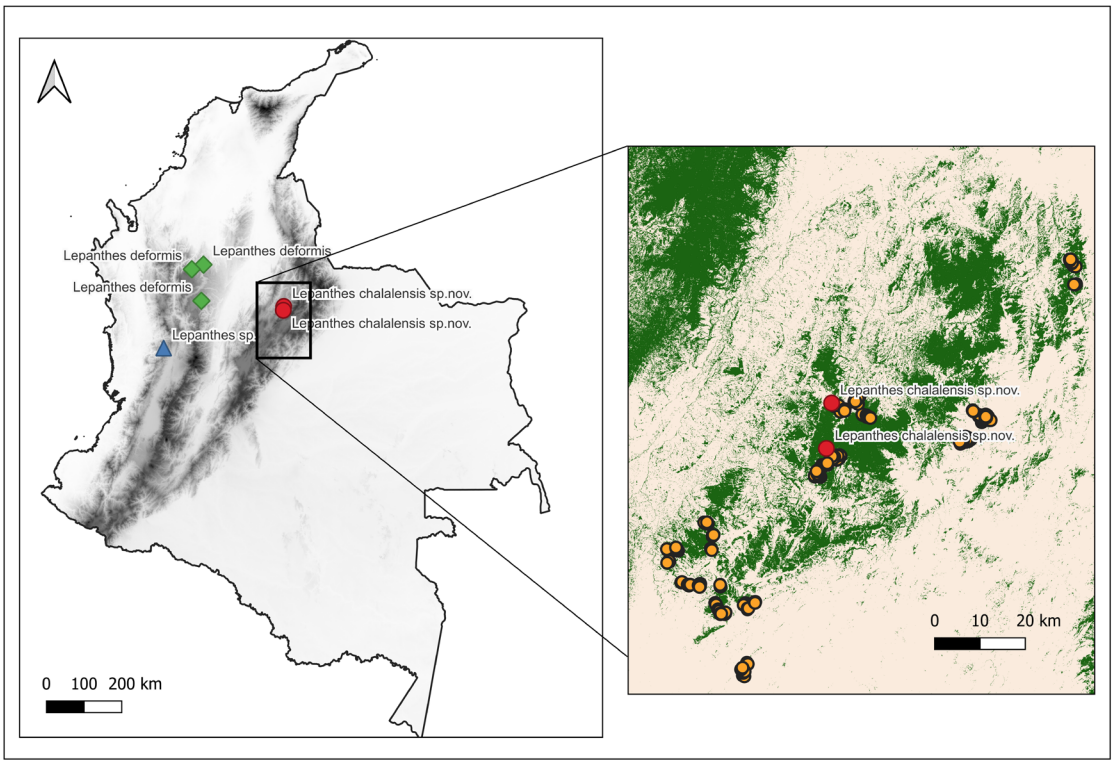

FIGURE 1. Distribution of related species of *Lepanthes chalalensis* E.Restrepo & E.Parra, and study area in the Eastern Cordillera of the Colombian Andes. Left panel shows the distribution of *Lepanthes chalalensis* (red dots), *L. deformis* Luer & Hirtz (green dots), and *Lepanthes sp. as* aff. *deformis* (blue triangle; Pérez-Escobar O., *pers. comm.*). Right panel displays study area within Colombia (black box), and elevation (digital elevation model from Tadono *et al.* 2014). The map shows the forest cover (green) and the absence of forest cover (grey; Vancutsem *et al.* 2021), and sampling plots (orange dots). Map composed by E.Parra-Sánchez using QGis 3.241.

cies with a restricted geographical range, low population size, and high habitat specialization (Rabinowitz 1981). Among plant families, Orchidaceae Juss. (Magnoliopsida) hold high levels of rarity, with an estimated 40% of species threatened (Zizka *et al.* 2021) and the highest proportion of endangered species among all plant families by trading (Hinsley *et al.* 2018). New orchid species are discovered every year in small populations and small ranges where natural habitats are highly transformed (Haddad *et al.* 2015, Parra-Sánchez 2023b, 2023c).

Lepanthes Sw. (Pleurothallidinae) is a neotropical genus of the Orchidaceae with 1196 species (Karremans *et al.* 2023). The genus is characterized by ramicauls covered with infundibuliform sheaths, often referred to as "lepanthiform sheaths," each bearing a single leaf that supports a slender, elongated inflorescence carrying one or multiple flowers. These flowers typically feature transversely lobed petals, and, in most cases, a specialized structure known as an appendix on the lip, facilitating pollination through pseudocopulation (Blanco & Barboza 2005, Luer 1996). Although the genus has many geographically restricted species (Crain & Tremblay 2014), there are some widespread species (e.g. *Lepanthes mucronata* Lindl., Moreno *et al.* 2020). Crain & Tremblay (2014) found that 70% of their *Lepanthes* records occurred in less than three localities (793 out of 1126 species). Drivers of rarity in *Lepanthes* include rapid diversification processes with short divergence time (5–10 Mya; Bogarín *et al.* 2018, Pérez-Escobar *et al.* 2017), dispersal limitation (Acevedo *et al.* 2020, Kindlmann *et al.* 2014, Tremblay 1997), highly specific pollination relationships (Blanco & Barboza 2005), and habitat specificity (Luer & Thoerle 2012). These idiosyncratic features might explain why 73% of the 564 *Lepanthes* species globally assessed are threatened with extinction (BGCI 2023).

We discovered a new species of *Lepanthes* belonging to the section *Lepanthes*, and morphologically similar to *Lepanthes deformis* Luer & Hirtz (1987) and *Lepanthes velosa* Luer & Hirtz (Karremans *et al*. 2021). These species are all characterized by a column twisted about 45 degrees and bending to one side. The discovery was made in the community of Virolin, Santander, in the eastern cordillera of the Colombian Andes. For the new species, we provide a description, diagnostic images, a discussion with the related affinities, and a discussion of its conservation status.

Materials and methods

Study area.— We sampled natural and transformed habitats in a randomised design in the Departments of Cundinamarca, Boyacá, Meta, and Santander in Colombia. Following Parra-Sánchez *et al.* (2023a), sampling points covered natural habitats and pastures across a 2252 m elevational range (1163–3415 m; Tadono *et al*. 2014) and a 2937 mm precipitation range (879–3817 mm per year).

Sampling design.— Sampling plots comprised Andean and Altoandino forests (Etter *et al.* 2021) with an average cloud cover of 82% (Wilson & Jetz 2016). In total, we sampled 206 natural habitat plots (148 forest, 48 paramo, and 10 paramo forest), and 135 transformed habitat plots (90 Andean transformed and 45 paramo transformed, Vancutsem *et al.* 2021; Fig. 1). We sampled all understorey orchid individuals at each plot of 10 × 30 m from the ground floor up to 2 m. Identification of species or morphospecies was conducted following specialized literature and consultancy with local experts at the Herbarium VALLE.

Descriptions and illustrating material.— We found a species morphologically similar to *Lepanthes velosa* and *L. deformis* that we propose as a new species to science. The flowers of the new entity were dissected, and characters were measured to prepare the description and protologue. Vegetative structures and reproductive structures were measured from living and spirit material. The botanical terminology used for the description followed Stearn (1992) and Luer & Thoerle (2012). We revised the original descriptions of the sister species and the most recent monographs of the genus, for Colombia (Luer & Thorle 2012), Ecuador (Luer 1996), and Venezuela (Romero-González & Carnevali 2000). Nine herbaria were consulted (AMES, CAUP, COL, CUVC, HUA, JAUM, JBB, VALLE, and MO).

Finally, illustrations and taxonomic revisions for each of the *Lepanthes* species to which the new entity was compared. Illustration done with Procreate® version 5.3.7. Figures and analyses were prepared using specialized software for composite plate, Adobe Photoshop® 2019, and maps on QGis 3.16 (QGIS 2021).

Taxonomic treatment

Lepanthes chalalensis E.Restrepo & E.Parra, ***sp. nov.*** (Fig. 2–4).

TYPE: Colombia. Santander: Municipio de Virolín, Hacienda la Argentina, 2880 m a.s.l., February 2019, *E. Parra-Sánchez 2401* (holotype: VALLE).

Diagnosis: *Lepanthes chalalensis* resembles the Ecuadorian *Lepanthes velosa* but can be easily distinguished by several characteristics. The lower lobe of the petals in *L. chalalensis* is much wider, measuring 0.93 mm, oblong, with a rounded apex and long cilia. Furthermore, the combination of the dimensions of the body, sinus and appendix in *L. chalalensis* is longer, about 1.62 mm, nearly twice as long as the lip blades when placed in their natural position, including the veil, whereas in *L. velosa*, the combined dimension of thebody, sinus and appendix is about 1.2 mm long, nearly as long as the lip, approximately.

Plant, epiphytic, caespitose up to 8.5 cm tall; *roots* slender. *Ramicauls* slender, horizontal to pendant, 5.00–5.54 cm long, enclosed by 6–7 blackish, tightly fitting, scabrous lepanthiform sheaths. *Leaves* erect, coriaceous, ovate-elliptical, 4.02–4.56 × 2.29–3.32 cm, the base broadly cuneate, contracted into a petiole 4.81 mm long, the apex shortly acuminate, emarginate with the mid vein extending beneath and ending in a short mucro. *Inflorescence* a very dense, distichous, successively flowered raceme up to 1.41–2.28 cm long, borne at the abaxial side of the leaf by a filiform peduncle 1.61–2.32 cm long; *floral bracts* slender, *ca*. 1 mm long, sparsely spiculate; *pedicel* 4.67–5.84 mm long; *ovary* terete, glabrous,

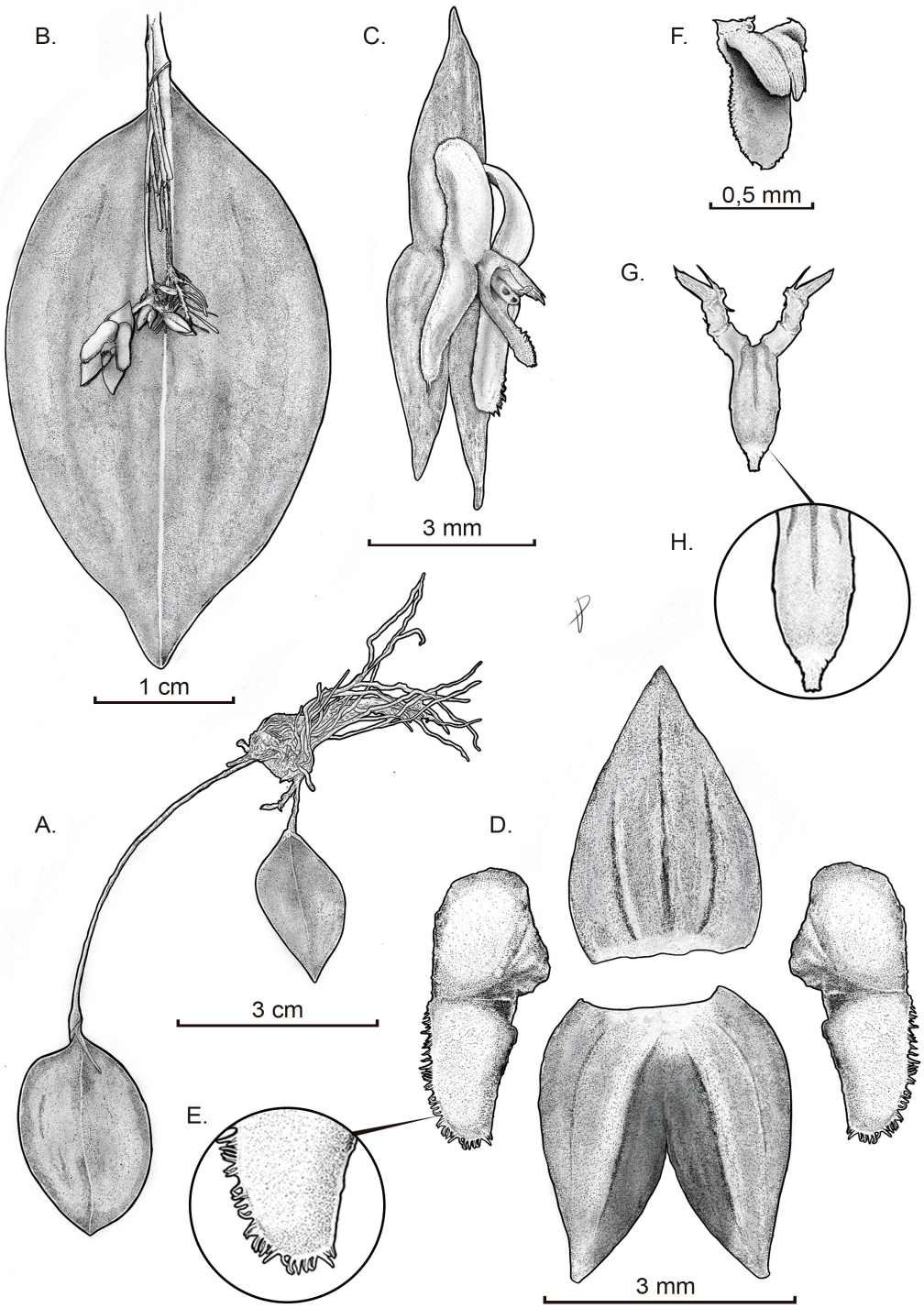

Figure 2. Drawing of *Lepanthes chalalensis*. **A**. Habit. **B**. Abaxial view of the leaf with flower. **C**. Flower. **D**. Dissected perianth. **E**. Zoom of the petal's lobe. **F**. Lip in natural position ¾ view. **G**. Lip in natural position without column front view and lip expanded. **H**. Zoom on the lip's apex. Drawn by Daniel Amaya-Jiménez from the plant that served as type.

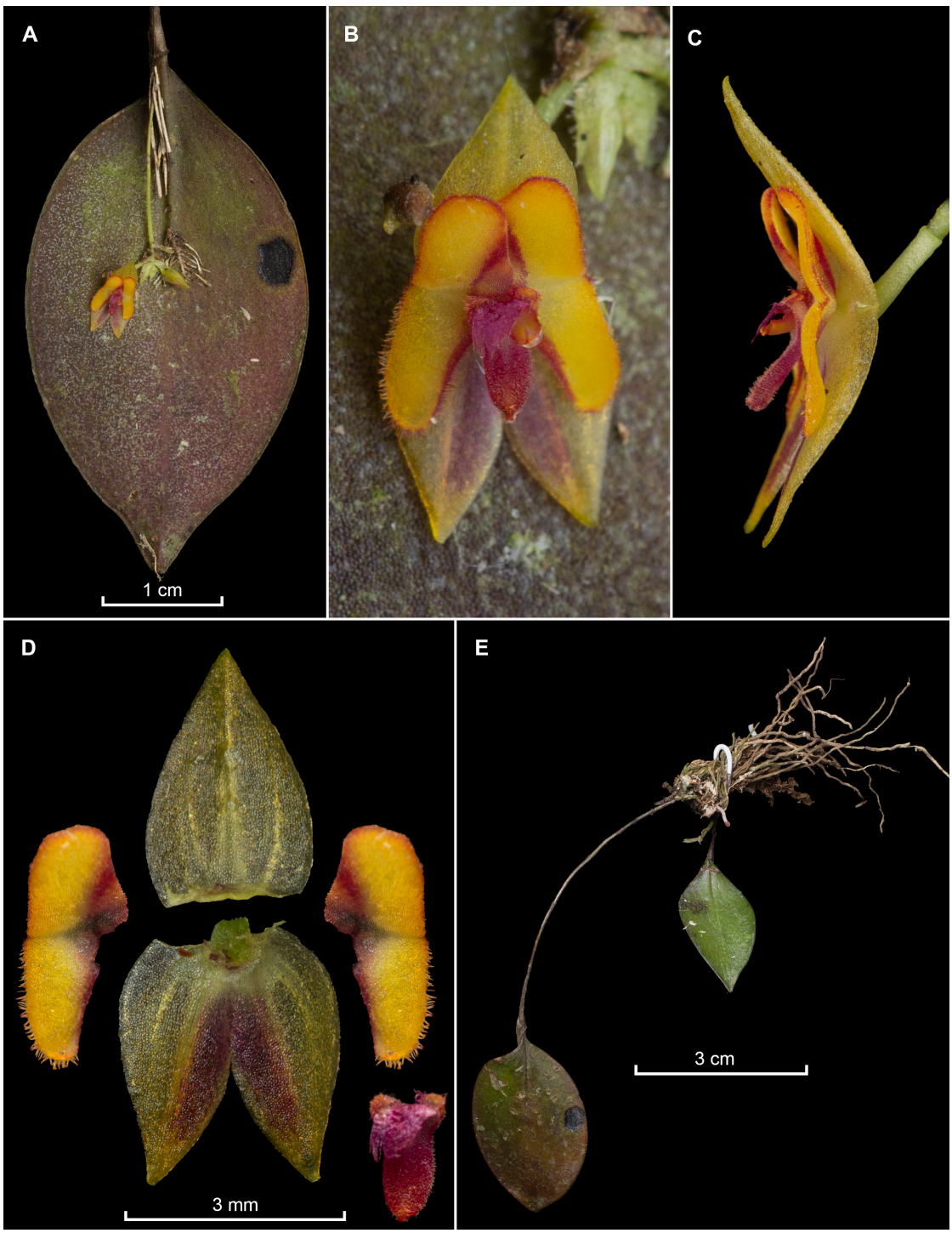

Figure 3. Illustrating images of *Lepanthes chalalensis* E.Restrepo & E.Parra, *in vivo*. **A**. Leaf plus flower in abaxial view. **B**. Flower, frontal view. **C**. Flower, lateral view. **D**. Dissected perianth. **E**. Plant habit. Photographed and prepared by Eugenio Restrepo from the plant that served as type (*Parra-Sanchez 2401*, VALLE).

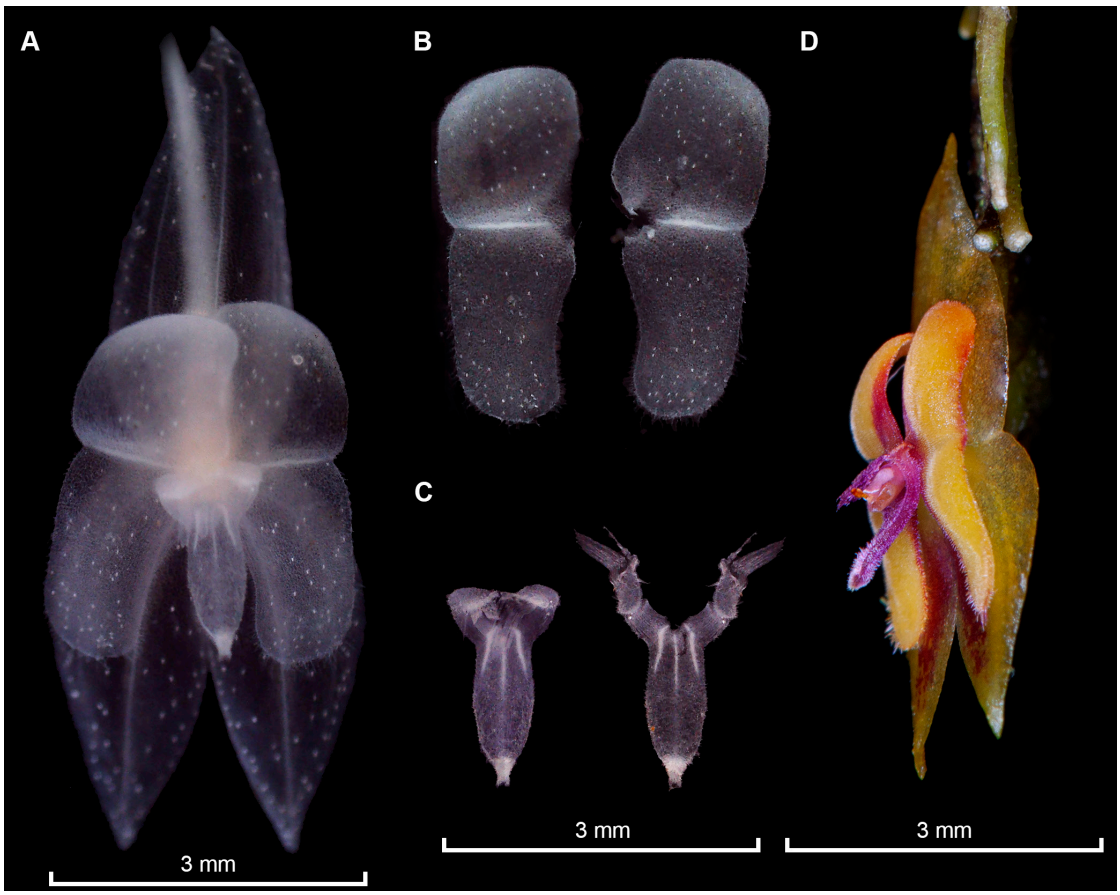

FIGURE 4. Flower dissection in spirit of *Lepanthes chalalensis* E.Restrepo & E.Parra. **A**. Entire flower preserved in spirit showing the "silver-like crystals" present in sepals, petals, column, and lip. **B**. Frontal view of the petals fully extended, note that the long cilia that can be seen *in-vivo* are not striking in the image. **C**. Frontal view of the lip, at the left the laminae not extended and extended at the right depicting the long sinus, and laminae extended. **D**. Flower in semilateral view showing the relation between the appendix and the lip length. Photographs by Melisa Alegría-Valencia (A–C) and Holguer **López (D).** Prepared by Eugenio Restrepo from the plant that served as type, except D (*Parra-Sanchez 2401*, VALLE).

keeled, 1.91–2.5 mm long; anatomically, all *flower* parts contain silver-like crystals, *sepals* hyaline, light yellow, glabrous, carinate externally, *dorsal sepal* ovate, acute, 3.47–4.90 × 2.66–2.80 mm, 3-veined, connate to the lateral sepals for *ca*. 1.22 mm; *lateral sepals* connate into a bifid lamina, , each being ovate-oblong, the apex attenuate, 2-veined, 3.78–4.44 × 1.22–2.12 mm connate for 1.73–2.00 mm; *petals* yellow suffused with red at the margins, transversely bilobed, microscopically pubescent, 1.33–1.54 × 3.31–3.58 mm wide, 1-veined, the upper lobe oblong with rounded end, *ca*. 1.54 wide, the lower lobe identical to the upper one, long ciliate, *ca*. 1.33 mm wide; *lip* red, bilaminate, covering two thirds of the column, the blades subrectangular, thickly verrucose, 0.45 × 0.27 each, cellular-papillose at the base, the anterior margins with a row of long, stiff cilia, connated beyond the base into a membranous, veil-like lamina; the body broad, the connectives narrowly oblong, born at either side of the lip; the body and sinus occupied by an oblong, minute appendix, the combined dimensions of the last 1.62 mm long, shallowly 3-veined, pubescent, with an ovoid, minutely pubescent bifid gland at the tip; *column* terete, 1.04–1.20 mm long, bent to one side, the *anther cap* deciduous, *pollinia* not seen *fruit* not seen.

Figure 5. Species comparison. **A**. *Lepanthes chalalensis* E.Restrepo & E.Parra. **B**. *Lepanthes velosa* Luer & Hirtz. **C**. *Lepanthes deformis* Luer & Hirtz. Photographs by Robinson Galindo-Tarazona (A), David Haelterman (B), and Andreas Kay (C). Prepared by Eugenio Restrepo.

Etymology: In reference to "Chalala" the territory of the "Guane" indigenous tribe settled in the territory currently known as Charalá in Santander, Colombia. The translation of "Chalala" from the Guane dialect is subject to dispute among anthropologists and historians. However, historical records trace back the name to the Indigenous Cacique Chalala, the leader of the tribe. The specific epithet of the species was selected by the community where the species was found.

Taxonomic discussion: *Lepanthes chalalensis* belongs to the section *Lepanthes* subsection *Lepanthes*. The new species exhibits an unusual development of the lip structures, similar to that seen in *L. deformis* and *L. velosa*. In these species, the lip blades are united into a thin, irregularly veined veil that overlys the column, which is twisted about 45 degrees and bent to the left (Luer & Thoerle 2012; Fig. 4B–C, Fig. 5). *Lepanthes chalalensis* can be distinguished for a series of floral morphological differences from similar species and elevations that species dwell in. The new species grows at ~2800 m, while *L. deformis* and *L velosa* are found relatively in the lowlands, at 750–1100 m. The closer species to *L. chalalensis* is *L. velosa*, which can be distinguished by a set of morphological differences in the lower lobe of the petals, which is much wider, oblong, with rounded apex, long ciliated *ca*. > 1 mm long (*vs.* narrowly triangular, short ciliate; *ca*. < 1 mm long). The key differences in the lip structures between *L. chalalensis* and *L. velosa* are the somewhat subrectangular and strongly reduced, more or less equal in *L. chalalensis*, with the anterior margins forming a row of long stiff cilia, and a much longer, oblong, 3-veined sinus (*vs.* also reduced, somewhat bigger blades, presenting a membranous, longitudinally microscopically veil-like lamina, and a smaller, shallowly channelled (unveined) appendix; Fig. 5). Furthermore, the relationship between the length in natural position of the sinus and the appendix, which *L. chalalensis* appears to be twice as long as the lip blades (*vs.* as long as the lip, *ca*. 1.2 mm long).

The other morphologically similar species is *Lepanthes deformis*, which has been found in the western cordillera of Colombia (*vs*. eastern cordillera of the new taxon). The new entity can be easily distinguished from *L. deformis* by the lateral sepals, which are nearly as wide as the dorsal sepal (*vs.* twice as wide as the dor-

sal sepal; both *ca*. 4 mm wide), the petals, which have subequal lobes, the lower oblong and long ciliated (*vs.* unequal, the lower much narrower, short ciliated (<1mm long). Finally, the appendix of the new species is longer, *ca*. 1.42 mm long, about twice the length of the lip blades (*vs.* appendix minute, not protruding, the lip laminae about 1.2 cm long). Likewise, the blade length in *L. deformis* is larger compared to *Lepanthes chalalensis*, and the sinus is somewhat reduced, ovoid, with a minute and ciliated appendix at the apical part, placing morphologically distant the grade of similarity of this species in the scheme (Fig. 5). *Lepanthes chalalensis* has "silver-like" crystals, that we speculate could be calcium oxalate (Chase & Peacor 1987). This feature is shared by at least one more species with 45 degrees twisted column not threated here (Pérez-Escobar *pers. comm*.). The actual role of these crystals is uncertain, but these crystals have been proposed to act as pseudonectar clusters for attracting pollinators (Chase & Peacor 1987), or crystal deposits (Luer 1990).

Habitat and ecology: The species is exclusively known from its type locality (Fig. 1). Our sampling indicates that it is infrequently encountered at 2200 m in elevation, where it grows epiphytically on lianas and fallen trees. Flowering has been observed throughout the year.

Conservation status: According to the IUCN criteria, this species might qualify for the Data Deficient (DD) category (IUCN 2020). However, our data suggests that it warrants conservation concern. We conducted random sampling across a 270 km south-to-north gradient and a 2640 meters elevational gradient (1120–3760 m; Fig. 1). In 341 plots (10 m × 30 m), we found only 26 adult individuals growing epiphytically in the understory in only two plots (tree density = 0.21 – 0.26 trees per m^2). Specifically, nine plots were within the same forest, and 24 plots were within a 10 km radius (Fig. 1). Our records indicate that the species appears to be geographically rare, with a small population size and specialized habitat requirements.

Population dynamics studies reveal occurrences of low fruit sets (Blanco & Barboza 2005, Tremblay *et al.* 1998), and evidence suggests that small plants experience the highest mortality in their natural habitat (Acevedo *et al.* 2020). Additionally, the sister species *Lepanthes deformis* is traded in the orchid market (https://ecuagenera.net/products/lepanthes-deformis), potentially making it highly vulnerable to illegal collection. Limited studies on the conservation impacts of wild collection of epiphytic orchids suggest a low tolerance to harvesting (Fernández *et al.* 2003, Tremblay *et al.* 1998). The detrimental effects of unsustainable collection have been observed in other species, leading to reduced inflorescence development (*Laelia autumnalis* (Lex.) Lindl.; Emeterio-Lara *et al.* 2021), or even pushing them perilously close to extinction (*Paphiopedilum canhii* Aver. & O.Gruss; Averyanov *et al.* 2014). Although the full extent of the impact of illegal collection or other threats on *Lepanthes* populations is not fully understood, we recommend considering this species as a conservation concern as a precautionary measure until a comprehensive risk assessment is conducted (Brown *et al.* 2023).

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Author contributions. **EPS**: Writing – review & editing, Visualization, Validation, Software, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. Fieldwork, ran the community workshops. **ER**: Taxonomic treatment, Writing – review & editing, Visualization and designing of Figures. **YB**, fieldwork and community leader. **JCOB**: Writing – review & editing. **DPE**: Conceptualization, Writing – review & editing, Supervision, Resources, Funding acquisition.

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NEW SPECIES AND RECORDS OF ORCHIDACEAE FROM COSTA RICA. IV.

Noelia Belfort-Oconitrillo[1,2,8], Grettel Salguero[1], Lizbeth Oses[1], Karen Gil-Amaya[1], Gustavo Rojas-Alvarado[1], Isler F. Chinchilla[1], Melissa Díaz-Morales[1,3], Franco Pupulin[1,4,5], Diego Bogarín[1,6,7] & Adam P. Karremans[1]

[1]Lankester Botanical Garden, University of Costa Rica, P.O. Box 302-7050 Cartago, Costa Rica.

[2]Orchid Conservation Project, Bosque de Paz Biological Reserve, Bajos del Toro, Alajuela, Costa Rica.

[3]Department of Evolutionary Neuroethology, Max Planck Institute for Chemical Ecology, Jena, Germany.

[4]Harvard University Herbaria, Cambridge, MA, U.S.A.

[5]The Marie Selby Botanical Gardens, Sarasota, FL, U.S.A.

[6]Herbario UCH, Universidad Autónoma de Chiriquí, David, Panamá.

[7]Evolutionary Ecology Group, Naturalis Biodiversity Center, Leiden, The Netherlands.

[8]Author for correspondence: noelia.belfort@ucr.ac.cr

Abstract. The fourth release of the series "New Species and Records of Orchidaceae from Costa Rica" documents and illustrates 17 taxa of the Costa Rican orchid flora. The new species records belong to the subtribes Pleurothallidinae (9 spp.), Maxillariinae (3 spp.), and Oncidiinae (2 spp.), including the description of two new species in *Pleurothallis* and *Telipogon*. Two new forms are described for *Isochilus latibracteatus* (Ponerinae) and *Masdevallia striatella* (Pleurothallidinae), and their differences from the typical forms are discussed. Additionally, the first record of a naturalized population of *Phalaenopsis stuartiana* (Aeridinae) in Costa Rica is discussed. Detailed descriptions, based on selected Costa Rican material, are included for all taxa, along with illustrations or Lankester Composite Digital Plates (LCDP). Information on their etymology, distribution, habitat, phenology, and distinguishing features compared to morphologically similar species is also provided. Finally, following the publication of the most recent Costa Rican orchid catalogue, we have identified some omissions and other new species described, which are discussed here. The orchid flora of Costa Rica now includes 1695 species and nine forms.

Resumen. La cuarta entrega de la serie "Nuevas especies y registros de Orchidaceae de Costa Rica" documenta e ilustra 17 taxones para la flora de orquídeas costarricenses. Los nuevos registros de especies pertenecen a las subtribus Pleurothallidinae (9 spp.), Maxillariinae (3 spp.) y Oncidiinae (2 spp.), incluyendo la descripción de dos especies nuevas en *Pleurothallis* y *Telipogon*. Se describen dos nuevas formas para *Isochilus latibracteatus* (Ponerinae) y *Masdevallia striatella* (Pleurothallidinae), y se discuten sus diferencias con las formas típicas. Además, se discute el primer registro de una población naturalizada de *Phalaenopsis stuartiana* (Aeridinae) en Costa Rica. Se incluyen descripciones detalladas, basadas en material costarricense seleccionado, para todas las especies, junto con ilustraciones o láminas digitales compuestas Lankester (LCDP). También se proporciona información sobre su etimología, distribución, hábitat, fenología y características distintivas comparadas con especies morfológicamente similares. Finalmente, tras la publicación del más reciente catálogo de orquídeas de Costa Rica, hemos identificado algunas omisiones y otras nuevas especies descritas que se comentan aquí. La flora de orquídeas de Costa Rica incluye ahora 1695 especies y nueve formas.

Keywords / Palabras clave: Aeridinae, Costa Rican orchids, *Flora Costaricensis*, Maxillariinae, Oncidiinae, orquídeas de Costa Rica, Pleurothallidinae

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Introduction. In 2003, Robert L. Dressler presented the most comprehensive treatment of Orchidaceae available to date for Costa Rica (Dressler 2003). Subsequently, the series "New Species and Records of Orchidaceae from Costa Rica" was initiated to formally document newly discovered species and report those previously unknown in the country. Three contributions to this series were published between 2008 and 2014 (Bogarín *et al.* 2008, Fernández *et al.* 2014, Karremans *et al.* 2012). Since the latest publication, 114 orchid species from Costa Rica have been described as new to science, averaging approximately 11 new species per year. These belong to multiple diverse genera, such as *Anathallis* Barb.Rodr. (Karremans & Vieira-Uribe 2020), *Andreettaea* Luer (= *Muscarella* Luer) (Fernández *et al.* 2021), *Brachionidium* Lindl. (Bogarín *et al.* 2015, Bogarín & Karremans 2016), *Campylocentrum* Benth. (Bogarín 2015), *Cischweinfia* Dressler & N.H.Williams (Pupulin *et al.* 2020a), *Crossoglossa* Dressler & Dodson (Ormerod 2014), *Daiotyla* Dressler (Pupulin 2019), *Dichaea* Lindl. (Pupulin 2019, Pupulin & Karremans 2020), *Echinosepala* Pridgeon & M.W.Chase (Pupulin *et al.* 2017c, 2020b, 2022), *Epidendrum* L. (Díaz-Morales & Karremans 2016, Karremans 2021), *Eurystyles* Wawra (Bogarín 2020), *Lepanthes* Sw. (Bogarín *et al.* 2018a, 2019, 2020, Bogarín & Kisel 2014, Chinchilla *et al.* 2020, Larsen 2014, Pupulin 2020, 2021, Pupulin & Bogarín 2014a,b), *Lockhartia* Hook. (Blanco 2014), *Malaxis* Sol. ex Sw. (Chinchilla *et al.* 2022, 2023), *Masdevallia* Ruiz & Pav. (= *Reichantha* Luer) (Bogarín *et al*. 2017, Smith *et al.* 2015, Pupulin 2020), *Maxillariella* M.A.Blanco & Carnevali (Bogarín *et al.* 2018b), *Mormodes* Lindl. (Blanco *et al.* 2016), *Myoxanthus* Poepp. & Endl. (Rojas-Alvarado & Karremans 2017), *Oncidium* Sw. (Pupulin 2020), *Pelexia* Poit. ex Lindl. (Bogarín & Pupulin 2021), *Platystele* Schltr. (Karremans & Bogarín 2017), *Pleurothallis* R.Br. (Karremans & Jiménez 2018, 2023, Pupulin 2020, Pupulin *et al.* 2017a,b, 2021), *Polycycnis* Rchb.f. (Gerlach & Pupulin 2020), *Prescottia* Lindl. (Pupulin 2020), *Prosthechea* Knowles & Westc. (Bogarín & Karermans 2015), *Pterichis* Lindl. (Kolanowska 2014), *Sarcoglottis* C.Presl (Bogarín & Pupulin 2021), *Scaphosepalum* Pfitzer (Karremans & Pupulin 2022), *Sobralia* Ruiz & Pav. (Dressler & Pupulin 2014, 2015, Dressler *et al.* 2014, 2016, Pupulin & Díaz-Morales 2022), *Specklinia* Lindl. (Bogarín *et al.* 2014, Karremans & Vieira-Uribe 2020, Karremans *et al.* 2015a,b, 2020), *Stelis* Sw. (Bogarín & Pupulin 2019, Karremans & Díaz-Morales 2017, Karremans & Rojas-Alvarado 2022, Rojas-Alvarado 2023), *Telipogon* Kunth (Bogarín *et al.* 2024, Pupulin & Bogarín 2022), *Vanilla* Mill. (Karremans & Lehmann 2018), and *Zootrophion* Luer (Pupulin & Rojas-Alvarado 2022). Also, new nothospecies have been proposed in *Cochlezella* J.M.H.Shaw, *Pleurothallis*, and *Phragmipedium* Rolfe (Pupulin 2015, Pupulin & Díaz-Morales 2018, Pupulin *et al.* 2021).

The most updated comprehensive catalogue of the Costa Rican orchid flora (Pupulin *et al.* 2023) accounts for 1684 species, four subspecies, 14 natural hybrids, and seven forms across 201 genera and two nothogenera. Here, we present detailed descriptions, illustrations, or Lankester Composite Digital Plates (LCDP) for 12 new records previously listed in Pupulin *et al.* (2023) and two new species to science in the Oncidiinae and Pleurothallidinae. Additionally, we formally describe and illustrate two new forms for *Isochilus latibracteatus* A.Rich. & Galeotti (Ponerinae) and *Masdevallia striatella* Rchb.f. (Pleurothallidinae). Furthermore, we discuss the first record of a population of *Phalaenopsis stuartiana* Rchb.f. (subtribe Aeridinae) naturalized in Costa Rica. Along with the generic monographs and taxonomic treatments for groups of closely related orchids in larger genera, this series represents our ongoing effort to contribute to *Flora Costaricensis*, with the aim of providing a comprehensive treatment of Costa Rican orchids (Atwood & Mora de Retana 1999, Bogarín *et al.* 2014, Pupulin 2010, Pupulin & Bogarín 2010, 2014a,b, Pupulin *et al.* 2020b, 2021, Rojas-Alvarado & Karremans 2020).

Materials and methods. Plants collected in Costa Rica between March 2002 and October 2023, were labeled and cultivated at the Lankester Botanical Garden (JBL), where their study and documentation were carried out. Field notes for each collection included geographical, phenological, and taxonomic data. At blooming, each plant was documented with high-resolution photography, including its dissected parts and the plant habit with relative scales. Photographs were mostly taken with Nikon cameras (D7100, D810) mounted on Manfrotto tripods, fitted with macro lenses (Micro Nikkor 60mm f/2.8, Micro Nikkor 105mm AF/ED f/2.8, Sigma DG Macro HSM 105mm f/2.8). Floral details were captured with a Micro-Nikkor 60mm f.2.8 and Zeiss Luminar 63mm, 40mm, 25mm, and 15 mm,

mounted on a Nikon PB6 bellows, or with a Leica Z16 APO Zoom microscope fitted with a Leica Planapo 1x Z-series lens. Images were post-edited for optimization using Adobe® Photoshop. Lankester Composite Digital Plates (LCDP) and other comparative plates of flowers were also prepared. Flowers and floral details were drawn using dissecting stereo microscopes Leica MZ9.5 and M80, fitted with Leica Planapo lenses and drawing tubes. Line drawings were mostly done using Rotring Rapidograph technical drawing pens with line widths of 0.1 or 0.2 mm on Fabriano, acid-free, smooth paper of 240g/m^2. For some illustrations, the line drawing was prepared using an Apple® iPad and Procreate®, the electronic drawing successively printed on Fabriano paper with a HP Color Laser Jet Pro M452nw, and the printed drawing hand-dotted with a Rotring Rapidograph technical drawing pen.

Inflorescence terminology follows the proposal by Rojas-Alvarado *et al.* (2021). For all the descriptions, measurements were mostly taken under a dissecting stereoscope or with the aid of the electronic scale bars inserted in the high-definition images of the floral details. We specified the specimens on which each description is based. The vouchers were prepared by fixing entire or dissected flowers in FAA solution to be deposited at the JBL spirit collection. Additional Costa Rican material studied includes the revision of specimens deposited in other herbaria such as CR and USJ (acronyms cited follow Thiers 2023). Specific coordinates of cited specimens were omitted to prevent illegal poaching but can be provided upon request for scientific purposes.

Taxonomic treatment

Anathallis Barb.Rodr.

Anathallis funerea (Barb.Rodr.) Luer, Monogr. Syst. Bot. Missouri Bot. Gard. 115: 258. 2009. Basionym: *Lepanthes funerea* Barb.Rodr., Vellosia, ed. 2, 1: 118. 1891. Homotypic synonyms: *Pleurothallis funerea* (Barb.Rodr.) Cogn. in C.F.P.von Martius & auct. suc. (eds.), Fl. Bras. 3(4): 567. 1896. *Specklinia funerea* (Barb.Rodr.) Luer, Monogr. Syst. Bot. Missouri Bot. Gard. 95: 260. 2004. *Panmorphia funerea* (Barb. Rodr.) Luer, Monogr. Syst. Bot. Missouri Bot. Gard. 105: 156. 2006.

TYPE: [Brazil. Amazonas] Hab. os ramos delgados das arvores das mattas do Rio Yauapery, Floresce em Março [(holotype, lost; lectotype designated by Barros & Barberena, *Rodriguésia* 61(1): 128. 2010: fig. D, tab. 200, vol. 3 (J. Barbosa Rodrigues, Iconographie des Orchidées du Brésil, reproduced in Springer (1996, p.258)].

Heterotypic synonyms: *Pleurothallis breviscapa* C.Schweinf., Bot. Mus. Leafl. 3: 79. 1935. *Anathallis breviscapa* (C.Schweinf.) Pridgeon & M.W.Chase, Lindleyana 16(4): 248. 2001. *Specklinia breviscapa* (C.Schweinf.) Luer, Monogr. Syst. Bot. Missouri Bot. Gard. 95: 259. 2004. TYPE: British Guyana. June 1897, *E.F. im Thurn 181* (holotype, K!).

Pleurothallis praemorsa Luer, Selbyana 2: 388. 1978. *Specklinia praemorsa* (Luer) Luer, Monogr. Syst. Bot. Missouri Bot. Gard. 95: 263. 2004. TYPE: Ecuador: Pastaza: epiphytic in rain forest about 20 km east of Puyo, alt. *ca.* 600 m, 3 Aug. 1977, *C. Luer 1813, J. Luer & J. Brenner* (holotype, SEL!).

Description: Based on *D. Bogarín 10298.*

Epiphytic *herb*, caespitose, small, to 5 cm tall. *Roots* flexuous, glabrous. *Ramicauls* erect, cylindrical, 0.6–2.0 cm long, 1 mm in diameter, with two internodes, the basal one shorter, covered by papery sheaths. *Sheaths* tubular, truncate to obtuse, ribbed, the basal one imbricate, the apical one shorter than the internode. *Leaves* elliptic to obovate, erect, 3.0–4.5 × 0.7–0.8 cm, base cuneate into a short petiole, apex acute, apiculate forming a minute tridentate apex. *Inflorescence* terminal at the apex of the ramicaul, with 1–4 successive multi-flowered coflorescences of 1.5–3.2 cm long, each one producing up to 4 successive brownish to greenish flowers. *Pseudopeduncle* 1–2 cm long, minutely pubescent, with a 3 mm long papery, acute, tubular bract at the base. *Floral bracts* 1.5–2.0 mm long, acute, minutely pubescent. *Ovary* subclavate, 0.75–1.0 mm long, minutely glandular, articled to a *pedicel* 2–5 mm long, minutely glandular. *Dorsal sepal* elliptic to ovate, acute, 12 × 4 mm, yellowish. *Lateral sepals* elliptic to ovate, acute, 11.0–12.0 × 3.0–3.5 mm. *Petals* yellowish with minute irregular brownish margins,

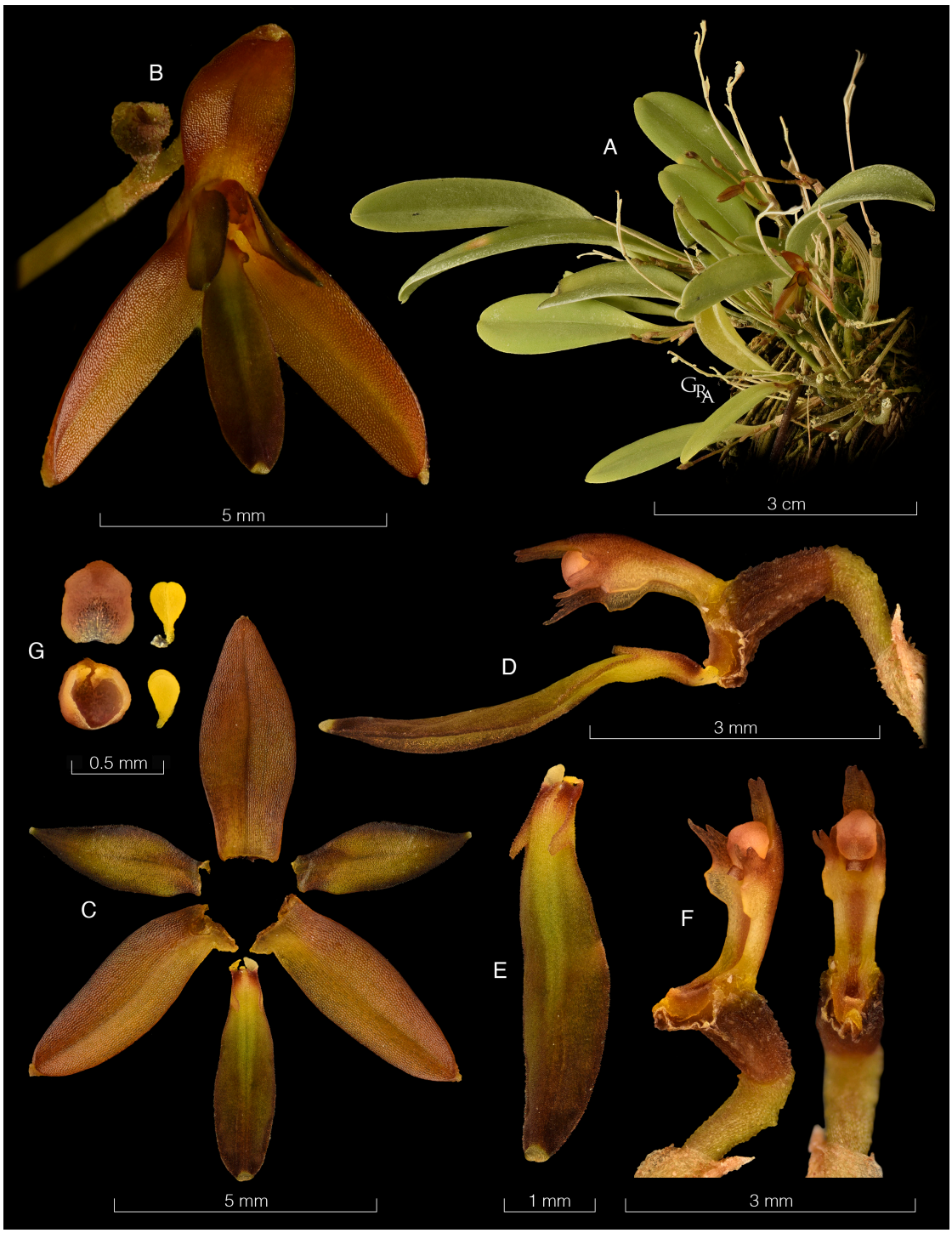

FIGURE 1. *Anathallis funerea* (Barb.Rodr.) Luer. **A**. Habit. **B**. Flower, ¾ view. **C**. Perianth dissected. **D**. Column with lip, lateral view. **E**. Lip, ¾ view. **F**. Column, ¾ and ventral views. **G**. Anther cap and pollinarium. LCDP prepared by G. Rojas-Alvarado based on *D.Bogarín 10298*.

acute, elliptic, 6.5–7.0 × 2.5 mm. *Lip* narrowly obovate, 4 × 1 mm, greenish, brownish to the margins, with a pair of auricles at the base, with short rounded and erected lateral lobes near the base, the middle lobe elliptic, with a truncate to emarginated apex. *Column* yellowish, 2 mm long, with a long-hooded apex, formed by two laterals and one dorsal long acute tooth; stigma ventral. *Anther cap* ventral, yellowish, 0.7 mm wide; pollinarium composed of two *pollinia*, 0.3 mm wide, with a pair of caudicles. *Fruit* not seen.

Etymology: Presumably from the Latin *fūnereus* "funeral" in reference to the dark color of the flowers.

Distribution: Costa Rica, Panama, Guyana, Guyana Francesa, Venezuela, Ecuador, Peru, Bolivia, and Brazil.

Habitat in Costa Rica: Epiphytic in secondary wet forest on the Caribbean slope of the Cordillera Volcánica Central at about 750 m in elevation.

Phenology: Flowering in October and November under cultivation.

Costa Rican material studied: **Limón**: Pococí, Guápiles, Bellavista, *ca.* 3.8 km al sur de la Escuela La Guaria de Bellavista, 746 m, orillas de un afluente del Río Blanquito, bosque muy húmedo tropical, epífitas en bosque secundario, 8 jun. 2013, *D. Bogarín 10298* (JBL-A0740 spirit!, Fig. 1).

Anathallis funerea is distinguished by the caespitose habit with minutely pubescent inflorescences as long as the leaf, producing single-successive brownish to greenish flowers, and the lip with a truncate apex. *Anathallis angulosa* (Luer & Hirtz) Luer is superficially similar, however it is distinguished from *A. funerea* by its glabrous inflorescence (*vs*. minutely pubescent), the acuminate petals (*vs*. acute), and the ciliate margins of the lip (*vs*. not ciliate?). The lip and the particular truncate apex of the lip in *A. funerea* are reminiscent of *A. peroupavae* (Hoehne & Brade) E.Barros, but, the latter is distinguished by the glabrous inflorescences and the pubescent petals (*vs*. minutely pubescent inflorescence and glabrous petals).

Dracula Luer

Dracula maduroi Luer, Monogr. Syst. Bot. Missouri Bot. Gard. 95: 234. 2004.

TYPE: Panama. Bocas del Toro: Velorio area, alt. 1100–1500 m, 10 Aug. 2003, *A. Maduro & E. Olmos 410* (holotype: MO), C. Luer illustr. 20534.

Description: Based on *N. Belfort-Oconitrillo 380 & K. Gil-Amaya*, *D. Bogarín 4405 et al.*, and *K. Gil-Amaya 246*.

Epiphytic *herb*, densely caespitose, up to 15 cm tall. *Roots* slender, *ca.* 1.2 mm in diameter. *Ramicauls* stout, erect, 1.30–3.20 cm long, enclosed by 2–3 tubular sheaths. *Leaves* erect to suberect, thinly coriaceous, carinate, narrowly linear-obovate, acute, 10.3–15.6 cm × 1.3–1.5 cm, gradually narrowed below into the conduplicate base. *Inflorescence* with successive multi-flowered coflorescences, each of them distantly and successively few-flowered. *Pseudopeduncle* slender, slightly descending, 10–17 cm long; *floral bract* tubular, acuminate, green, 7–10 mm long; *ovary* verrucose, round in cross section, brown, 5–6 mm long, articled to a *pedicel* 11–15 mm long. *Flower* pendant, caudate, expanded, densely pubescent adaxially, sepals white with purple tails turning dull yellow towards the apex, slightly spotted purple brown near the base, suffused with purple-pink towards the basal portion of the tails, petals light yellow, turning bright yellow towards the verrucose apical portion, lip white, column white turning cream-yellow towards the apical portion. *Dorsal sepal* broadly ovate, shallowly concave from the middle to the basal portion below the column, 8.8 × 9.3 mm without the tail, connate to the lateral sepals for 4 mm to form an expanded flower, the apex obtuse, contracted into a slender, filamentous tail, 3.71–4.37 cm long. *Lateral sepals* 11.7–12.3 mm long without the tail, connate to *ca.* 11 mm to form a broad and bipartite synsepal 14.7 mm wide, shallowly concave near the base below the lip, the apices obtuse, contracted into slender tails 3–4 cm long. *Petals* cartilaginous, oblong, 3 mm long, l.5 mm wide, the apex obtuse, papillose, indistinctly bivalvate, the margin obtuse, denticulate, the outer lamina rounded, denticulate. *Lip* subpandurate, truncate, 4.7 × 2.2 mm, the hypochile oblong, 2.8–3.3 × 2.2 mm, hinged to the column-foot by a thin

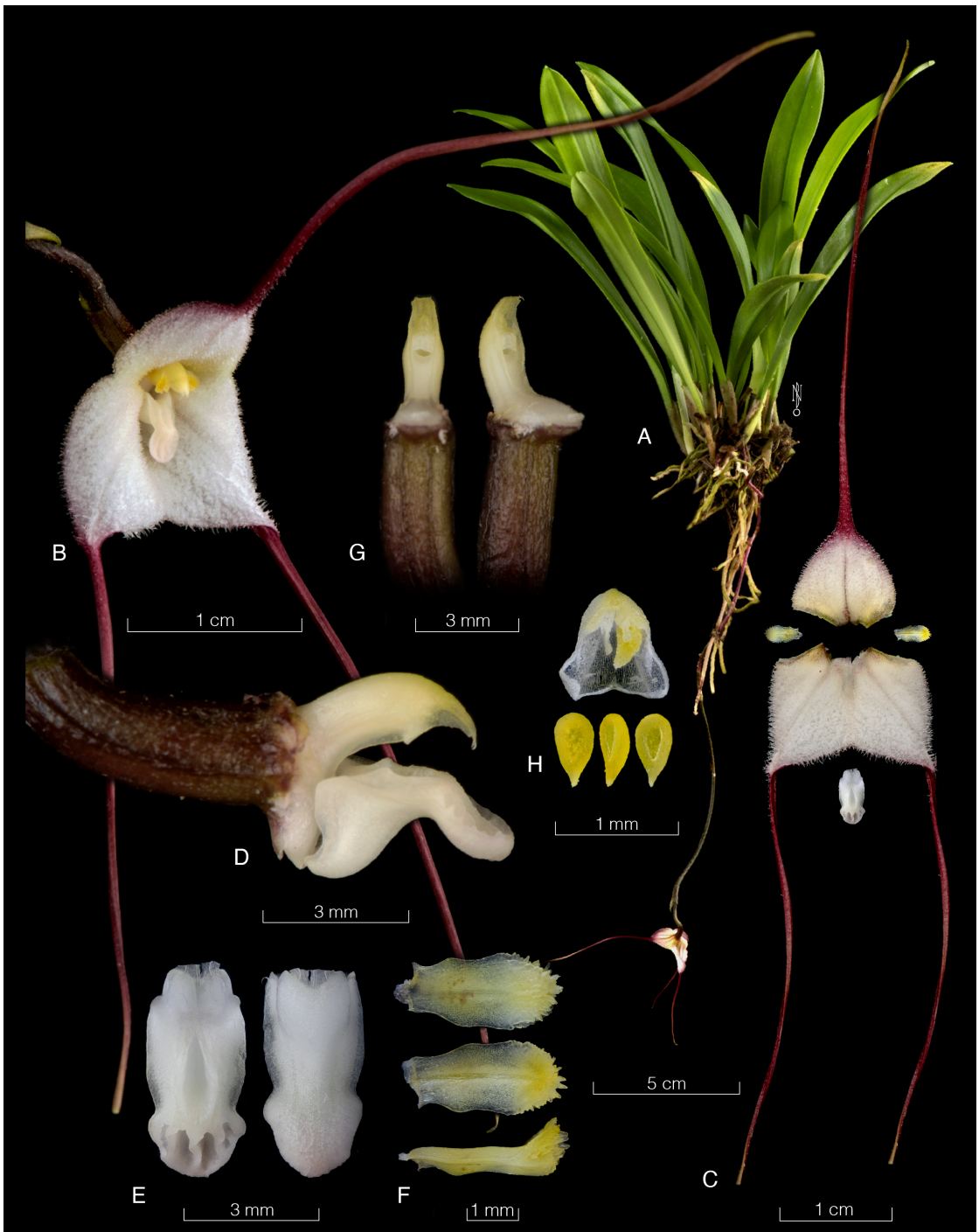

FIGURE 2. *Dracula maduroi* Luer. **A**. Habit. **B**. Flower. **C**. Dissected perianth. **D**. Column and lip in natural position, lateral view. **E**. Lip, ventral and dorsal views. **F**. Petal, ventral, dorsal and lateral views. **G**. Column, ventral and ¾ views. **H**. Anther cap and pollinarium. Photos by K. Gil-Amaya based on *N.Belfort-Oconitrillo 380*. LCDP prepared by K. Gil-Amaya and N. Belfort-Oconitrillo.

membrane, consisting of a deeply concave depression at the base, with erect, obtuse, marginal angles, cleft centrally; the epichile semicircular, 1.5–1.9 × 2.2 mm, obtuse, concave with slightly incurved margins becoming more evident when dehydrating, with 3 parallel, well-developed lamellae within, flanked by a few, vestigial, radiating carinae. *Column* arcuate, stout, semiterete, 3.7 mm long, with a stout foot *ca.* 2 mm long, at the end of the column, the clinandrium dorsally long hooded with a pair of small acute teeth. *Anther cap* cucullate, 2-celled, translucent white. Pollinarium composed of two *pollinia*, obovate, laterally flattened, ventrally depressed. *Fruit* not seen.

Etymology: Named for Andrés Maduro of Finca Dracula in the province of Chiriquí, Panama (Luer 2004).

Distribution: Known to occur in Costa Rica and Panama.

Habitat in Costa Rica: Epiphytic in secondary pluvial premontane and low montane forests along the Caribbean slope of the Cordillera Volcánica Central and northern foothills of the Cordillera de Talamanca, between 1150 and 1650 m.

Phenology: Blooming from July to February.

Costa Rican material studied: **Alajuela**: Sarchí, Bajos del Toro, Reserva Biológica Bosque de Paz, sendero Jaulares, 1540 m, bosque premontano en regeneración, creciendo como epífita sobre un árbol a una altura de *ca.* 3 m sobre el suelo, con una flor abierta, 27 jul. 2019, *N. Belfort-Oconitrillo 380 & K. Gil-Amaya* (JBL-A0520 spirit!, Fig. 2). **Cartago**: Paraíso, Orosi, Tapantí, Parque Nacional Tapantí, mar. 2021, *K. Gil-Amaya 246 & G. Villalobos* (JBL-B2286 spirit!). **Heredia**: Sarapiquí: Vara Blanca-Horquetas, camino al cráter del Cerro Cacho Negro, entre las riveras del Río Molejón y Río Cacho Negro, 1150 m, bosque pluvial montano bajo, epífitas en bosque primario a orillas del río, 10 abr. 2008, *D. Bogarín 4405 et al.* (JBL-D3523 spirit!).

The relatively small, densely pubescent white flowers and light-yellow petals distinguish this species among *Dracula* species present in Costa Rica. It can be compared to *Dracula olmosii* from Panama, but this species grows at a higher elevation, *ca.* 2000 meters, and exhibits slightly broader leaves and white petals. In comparison to its South American counterparts, it shares morphological similarities with the Colombian species *D. posadarum* Luer & R.Escobar and *D. sergioi* Luer & R.Escobar, but differs in having all-white, densely pubescent sepals with twice longer tails, and with the three lamellae of the epichile of the lip well-developed. Other Ecuadorian species with white sepals and purple sepaline tails include *D. lotax* (Luer) Luer, *D. papillosa* Luer & Dodson and *D. rezekiana* Luer & R.Hawley, but *D. maduroi* is distinguished by its expanded flowers, completely white sepals, short and dense pubescence, indistinctly bivalvate yellow petals, and the lip white with the epichile concave and the margins slightly incurved.

Dryadella Luer

Dryadella greenwoodiana Soto Arenas, Salazar & Solano, Icon. Orchid. (Mexico) 5–6: t. 550. 2002[2003].
TYPE: México. Oaxaca: Distrito de Ixtlán, km 46.7 del camino Ixtlán de Juárez-Talea de Castro, en la desviación a Tanetzé de Zaragoza y Juquila Quijanos, 2000 m, bosque de pino-encino-liquidámbar en filo de la loma; 25 mar. 2000, prensado de material cultivado, 2 jul. 2001, *M. Soto et al. 9439* (holotype, AMO).

Description: Based on *D. Bogarín 11108 et al.* and *A. P. Karremans 8870 & M. Contreras Fernández*.

Plant epiphytic, caespitose or shortly rhizomatous, to 3 mm tall; rhizome to 2 mm long. *Roots* slender, to 1 mm in diameter. *Ramicauls* erect, to 3 mm long, enclosed by 2–4 thin, tubular sheaths to 3 mm long, the annulus to 0.3 mm. *Leaves* suberect, very thick (to 2.5 mm thick), coriaceous, conduplicate, elliptic, subacute, emarginate with a short apiculus, green, abaxially purple, 0.6–2.1 × 0.3–0.7 cm, narrowing into a subpetiolate base. *Inflorescence* with successive multi-flowered coflorescences, each of them with flowers opened at once. *Pseudopeduncle* short, to 2–4 mm long, rachis to 5 mm, floral bracts thin, 2.5–3.0 × 2.2. *Ovary* to 1.8 mm long, smooth, angulate, keeled, articled to a pedicel 2–4

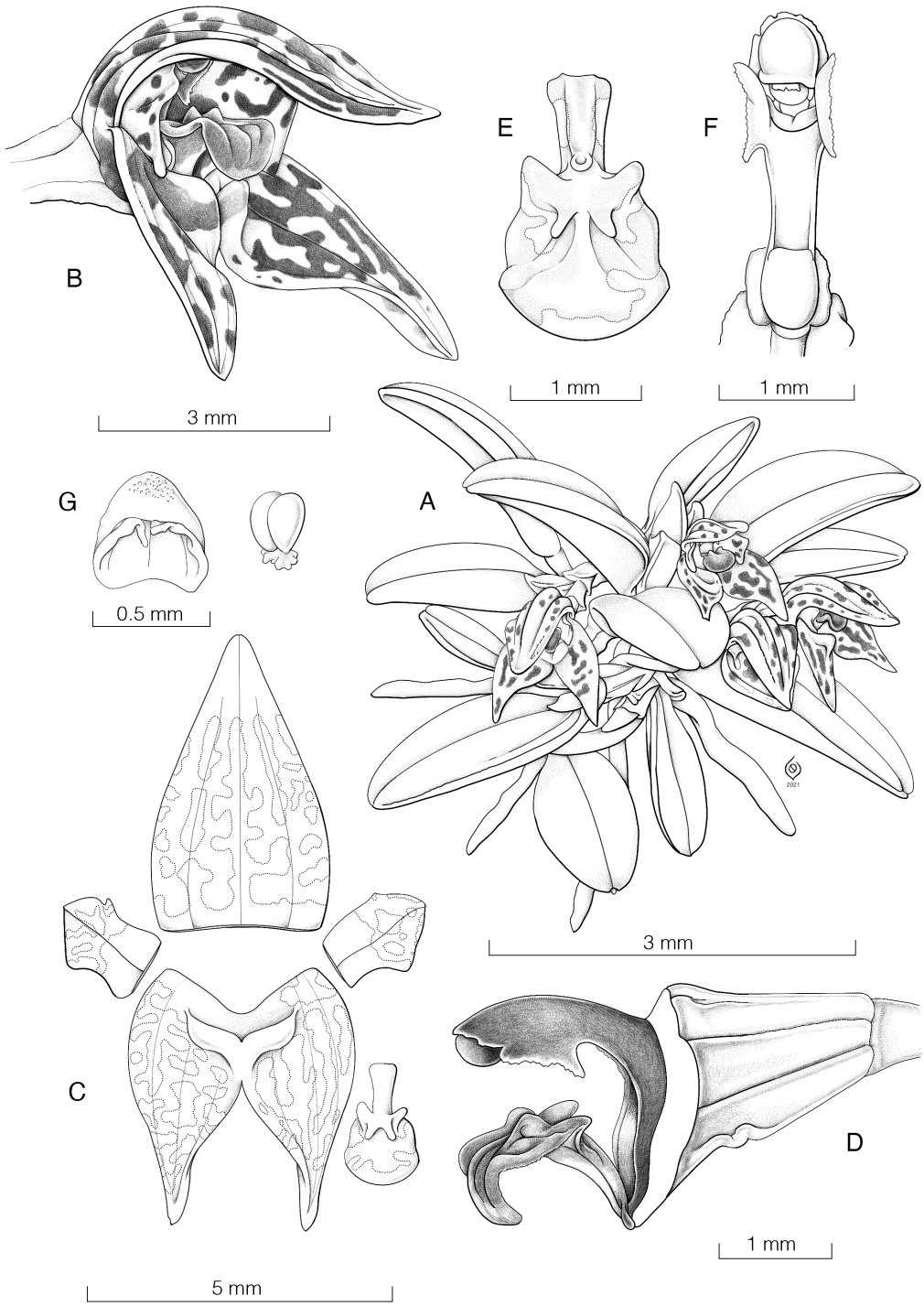

FIGURE 3. *Dryadella greenwoodiana* Soto Arenas, Salazar & R. Solano. **A**. Habit. **B**. Flower. **C**. Dissected perianth. **D**. Ovary, column and lip, lateral view. **E**. Lip, flattened. **F**. Column, ventral view. **G**. Anther cap and pollinarium. Drawn by D. Bogarín & L. Oses based on *D.Bogarín 11108* (JBL).

Figure 4. **A**. *Dryadella greenwoodiana* Soto Arenas, Salazar & R.Solano (*D.Bogarín 11108*). **B**. *Dryadella guatemalensis* (Schltr.) Luer (*A.P.Karremans 3642*). Photos by D. Bogarín (A) and G. Salguero (B).

mm long. *Flowers* the sepals greenish yellow with purple spots mostly along the veins, petals translucent greenish yellow with a red stain at the base and red spots towards the apex, the lip reddish. *Dorsal sepal* ovate, acute, concave, 4.5–4.7 × 2.6–2.8 mm, connate to the lateral sepals for 0.5 mm to form a sepaline cup. *Lateral sepals* ovate, acute to attenuate, thickened, connate for about 1.2 mm, 4.2–4.3 × 1.7–1.8 mm, with a transverse callus above the decurved base. *Petals* subpandurate to subhastate, acute with an obtuse angle on the upper margin and a subacute angle on the labellar margin, 1.7–1.8 × 1.2–1.3 mm. *Lip* unguiculate, arcuate, transversely ovate, hinged to the apex of the column-foot, 2.0–2.1 × 1.2–1.3 mm, rounded, decurved at the apex, the blade transversely obovate, auriculate, the disc with a pair of thick keels, the claw oblong, auriculate at the base, 8 mm long. *Column* subcylindrical, arcuate, erose at apex, to 3 mm long, with two acute, descending, stigmatic wings, with a conspicuous, canaliculate foot to 1.2 mm long, stigma ventral; anther subapical, anther cap cucullate, verrucose at the apex. Pollinarium composed of two *pollinia*, obovoid, with granulose caudicles. *Fruit* not seen.

Eponymy: Named after the Canadian Edward Warren Greenwood, one of the most influential contemporary orchidologists in Mexico.

Distribution: It has been recorded in Mexico, Guatemala, El Salvador, and Costa Rica.

Habitat in Costa Rica: Plants grow epiphytically in montane wet forest above 2400 m.

Phenology: Flowered in May and June in the wild and under cultivation.

Costa Rican material studied: **Alajuela**: Poás, San Juan, *ca.* 1 km antes de la entrada al Parque Nacional Volcán Poás, 2480 m, epífita en el tronco de un árbol aislado de *Calyptranthes pittieri* Standl. (Myrtaceae) en un potrero a orillas de la carretera, bosque pluvial montano, 19 may. 2014, *D. Bogarín 11108, M. Fernández & L. Sandoval* (JBL-illustration, Fig. 3–4A).

Dryadella comprises six species in Costa Rica. Among the species in the country, *D. greenwoodiana* differs by the elliptic, very thick (to 2.5 mm thick), co-

riaceous leaves in contrast to the other five species that show narrowly linear or elliptic, obovate leaves less than 1.5 mm thick. The plants are also recognized by their adaxially green and abaxially purple leaves, usually overlapping to form compact, dense, somewhat repent plants (Soto Arenas *et al.* 2002). A BLAST search using molecular data from the nrITS available in GenBank (https://www.ncbi.nlm.nih.gov/genbank/) suggests that *D. greenwoodiana* is related to *D. susanne* (Pabst) Luer from Brazil, which shows thick leaves, and both form compact plants with overlapping leaves.

In Costa Rica, the habitat of *D. greenwoodiana* is very different from that of the other species of the genus. *Dryadella greenwoodiana* inhabits the montane forests at high elevations above 2400 m, while the other species inhabit premontane and forests below 650 m. *Dryadella greenwoodiana* has been observed above Sacramento de Barva, towards Volcán Barva in Heredia, and in the vicinity of Madreselva, El Guarco in Cartago. However, we were unable to prepare vouchers of these specimens because they were infertile plants.

Isochilus R.Br.

Isochilus latibracteatus fo. ***albescens*** Karremans & Salguero, ***forma nova***

TYPE: Cartago. Turrialba: Santa Teresita, Guayabo, Monumento Nacional Guayabo, alrededores de los senderos principales, 1128 m, bosque muy húmedo, epífitas, 30 sep. 2015, floreció en cultivo, preparada el 2 jul. 2020, *A.P. Karremans 6720, N. Belfort-Oconitrillo & A. Morales* (holotype, JBL-J1069 spirit!) (Fig. 5).

Diagnosis: *A forma typica floribus albis versus lilacino-purpureos vel rubropurpureos recedit.*

Description: Based on *A .P. Karremans 6720.*

Plant, epiphytic, cespitose, erect, up to 45 cm tall. *Roots*, dense, thick, fleshy, brownish, 3–5 mm in diameter. *Rhizome*, short, scandent. *Stems*, numerous, erect, 2–4 mm wide, covered by brownish leaf-sheaths, verrucose, especially the basal sheaths. *Leaves*, distichous, linear to linear-lanceolate, erect, decreasing in length as they approach the apex, apex conspicuously cleft, asymmetrically bilobed, 3.2 cm × 4.0 mm, articulated with their sheaths, inconspicuously carinate in the back, green. *Inflorescence*, terminal, raceme, dense, 4–5 cm long, 5–10 successive flowers. *Floral bracts*, imbricated, scarious, tubular in the base, oblanceolate, obtuse, 10–13 mm long, pale brown. Ovary, with a short pedicel, subtrigonous, ventrally canaliculated, pale green, completely covered by bracts, 5.0–6.0 mm × 2.5–3.0 mm including the pedicel. *Flowers*, white, with a magenta linear spot on the middle of the lip, 7–10 mm long, tubular-campanulate. *Sepals*, connate in the first basal quarter, 9.0–10.0 × 3.5–4.5 mm. *Dorsal sepal*, oblong, obtuse to rounded. *Lateral sepals*, gibbous at base, lanceolate to oblong-laceolate, prominently carinate-winged dorsally. *Petals*, elliptical-rhombic, reflexed apically, 8–9 × 3–4 mm. *Lip,* linear-oblanceolate, 9.0–10.0 × 2.5–3.0 mm, slightly constricted near the middle, apex obtused to rounded, with a sigmoid, saccate claw of 0.7–1.0 mm. *Column* up to 6 mm long, with a short inconspicuous foot, subclavate, ventrally canaliculate, clinandrium with oblong to ovate lateral wings 0.8–1.0 mm and an oblong-triangular tooth in the middle of 0.5 mm long, stigmatic cavity ventral, rostellum liner-triangular, acuminate. *Anther cap*, white, terminal, operculate, suborbicular, dorsiventrally compressed, 4-celled, cordate in the base, 1.5 × 1.5 mm. Pollinarium composed of four *pollinia*, in subequal pairs, obovate, elongate, and lateral compressed, pale yellow to whitish, 0.9–1.0 × 0.3–0.4 mm, attached to ovate-lanceolate hyaline caudicles with a keel. *Fruit* not seen.

Etymology: From the latin *albēscēns* "becoming white, whitish" in reference to the white color of the flowers, which contrasts with the typical form of the species.

Distribution: Known only from Costa Rica.

Habitat in Costa Rica: Very wet humid premontane tropical forest.

Phenology: Flowering in June and July.

Most species of *Isochilus* have either purple- or orange-colored flowers. The white flowers of *Isochilus latibracteatus* fo. *albescens* contrast notoriously with the violet-red or magenta found in the typical form of this species. Only three species of *Isochilus* have been

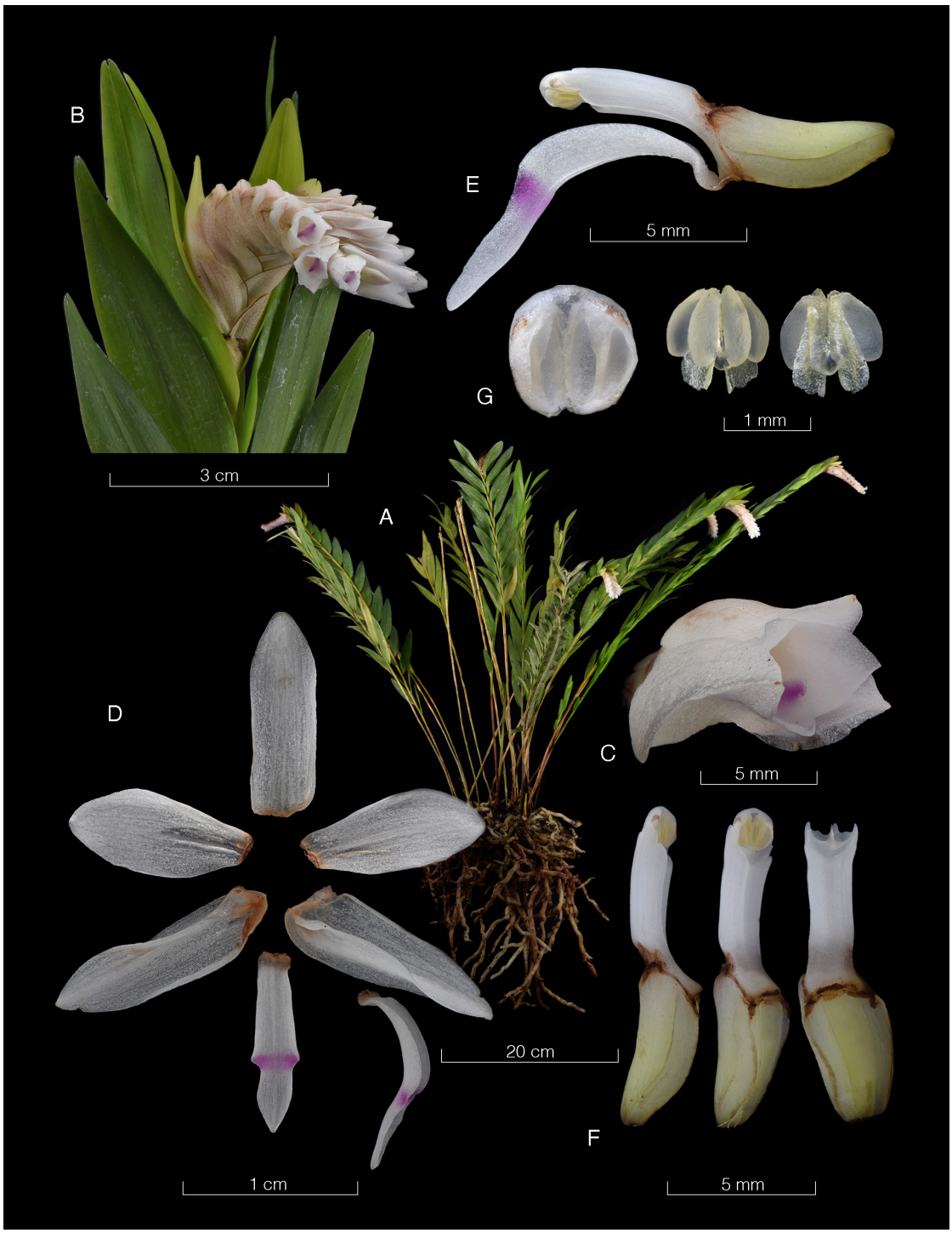

Figure 5. *Isochilus latibracteatus* fo. *albescens* Karremans & Salguero. **A**. Habit. **B**. Inflorescence. **C**. Flower. **D**. Dissected perianth. **E**. Lip and column in natural position, lateral view. **F**. Column in lateral, ¾ and ventral views. **G**. Anther cap and pollinarium. LCDP prepared by G. Salguero based on *A.P.Karremans 6720*.

formally reported to occur in Costa Rica: *I. linearis* (Jacq.) R.Br., *I. carnosiflorus* Lindl. and *I. chiriquensis* Schltr. (Dressler 2003). The reason why we want to describe formally this new form is because it's the only one known in Costa Rica, the typical form of *Isochilus lactibracteatus* is not known to occur yet in the country. Also, it is known that color polymorphism in orchids can have different ecological and evolutionary implications (Dormont *et al.* 2019).

The species is easily distinguished from *I. linearis* by the dark green leaves that are shorter toward the apex and, most important, the wide bracts that cover completely the pedicellate ovary. This new form has a very attractive white perianth and a magenta linear spot in the middle of the lip.

Lepanthes Sw.

Lepanthes acarina Luer, Phytologia 54(5): 326. 1983.
TYPE: Ecuador. Pichincha: epiphytic in cloud forest near Río Silante, Finca Canchacato, alt. *ca.* 2000 m, 28 oct. 1979, *C. Luer, J. Luer & A. Hirtz 4399* (holotype, SEL).

Description: Based on *D. Bogarín 12501* & *K. Gil-Amaya* and *K. Gil-Amaya 202*.

Plant minute, epiphytic, caespitose, erect herb, up to 2.3 cm tall. *Roots* filiform, flexuous, slender, 0.2 mm in diameter. *Ramicauls* slender, erect, 8–14 mm long, enclosed by 3–6, tightly fitting, scabrous, lepanthiform sheaths. *Leaves* coriaceous, elliptical to ovate, obtuse, conduplicate, apiculate, abaxially with purplish veins, 7.0–11.7 × 4.6–6.9 mm, the rounded base contracted into a petiole *ca.* 1 mm long, the apex obtusely shortly cuspidate, excise, with the tip of the central vein protruding abaxially within the sinus. *Inflorescence* developed beneath the leaf with successive multi-flowered coflorescences, 3.6–8.5 mm long, each of them distichous, successively flowered. *Pseudopeduncle* up to 6.3–8.0 mm long, as long or longer than the leaf. *Floral bracts* triangular-ovate, muriculate, yellowish brown, 0.8–1.0 mm long. *Pedicels* 1.0–1.5 mm long, persistent. *Ovary* to 1 mm long, with prominent, slightly spiculate ribs. *Flowers* with yellowish-white, translucent sepals, the apex of the dorsal sepal tinged with purple, petals and lip purplish pinkish. *Dorsal sepal* broadly ovate-triangular, subacute, serrulate-ciliate and dorsally carinate, connate to the lateral sepals for about 0.6 mm, 2.0–2.1 × 1.3–1.5 mm, 3-veined. *Lateral sepals* ovate, acute, serrulate, dorsally carinate-denticulate, connate for 0.8 mm, 1.7–1.9 ×1.0–1.1 mm, 2-veined. *Petals* bilobed, transversely oblong, minutely ciliate, 1.1–1.2 × 0.3–0.4 mm, upper lobes oblong, oblique, subtruncated, lower lobes narrowly oblong, obtuse, smaller than the upper lobes. *Lip* bilaminate, rounded, adnate to the column, the blades ovate, lunate, microscopically pubescent, 0.5–0.7 × 1.0–1.1 mm, connectives cuneate, up to 0.5 mm long; body narrow, connate to the base of the lip, appendix conspicuous for the genus, constricted above the middle, elliptic to oblong, the base concave, and the apex deflexed, pubescent. *Column* stout, terete, 1 mm long, with the anther dorsal, the stigma ventral. Pollinarium composed of two *pollinia*, ovoid, yellow. *Anther cap* cucullate, 1-celled. *Fruit* not seen.

Etymology: Named after the order of the mites Acarina which is derived from the Greek ακαρής, akarés, "tiny", in reference to the little, red, prickly flowers (Luer 1983).

Distribution: Costa Rica, Colombia, Ecuador, Peru, and Bolivia.

Habitat in Costa Rica: Epiphytic in humid lower montane forest on *Quercus* spp. (Fagaceae) and *Cupressus lusitanica* Mill. (Cupressaceae), between 1800–1900 m.

Phenology: Flowering between July and October.

Costa Rican material studied: **Cartago**: Quebradilla, cruce a Alto Mata de Caña, carretera entre Tablón y Copalchí, 1891 m, bosque húmedo montano bajo, epífita en bosque secundario, 11 oct. 2019, *D. Bogarín 12501 & K. Gil-Amaya* (JBL-illustration!; Fig. 6); same locality, 7 jul. 2019, *K. Gil-Amaya 202* (JBL-A0384 spirit!).

This species is widespread in the tropical Andes and is documented here for the first time in Southern Central America. *Lepanthes acarina* is the third species of the genus known to range from Costa Rica and Pan-

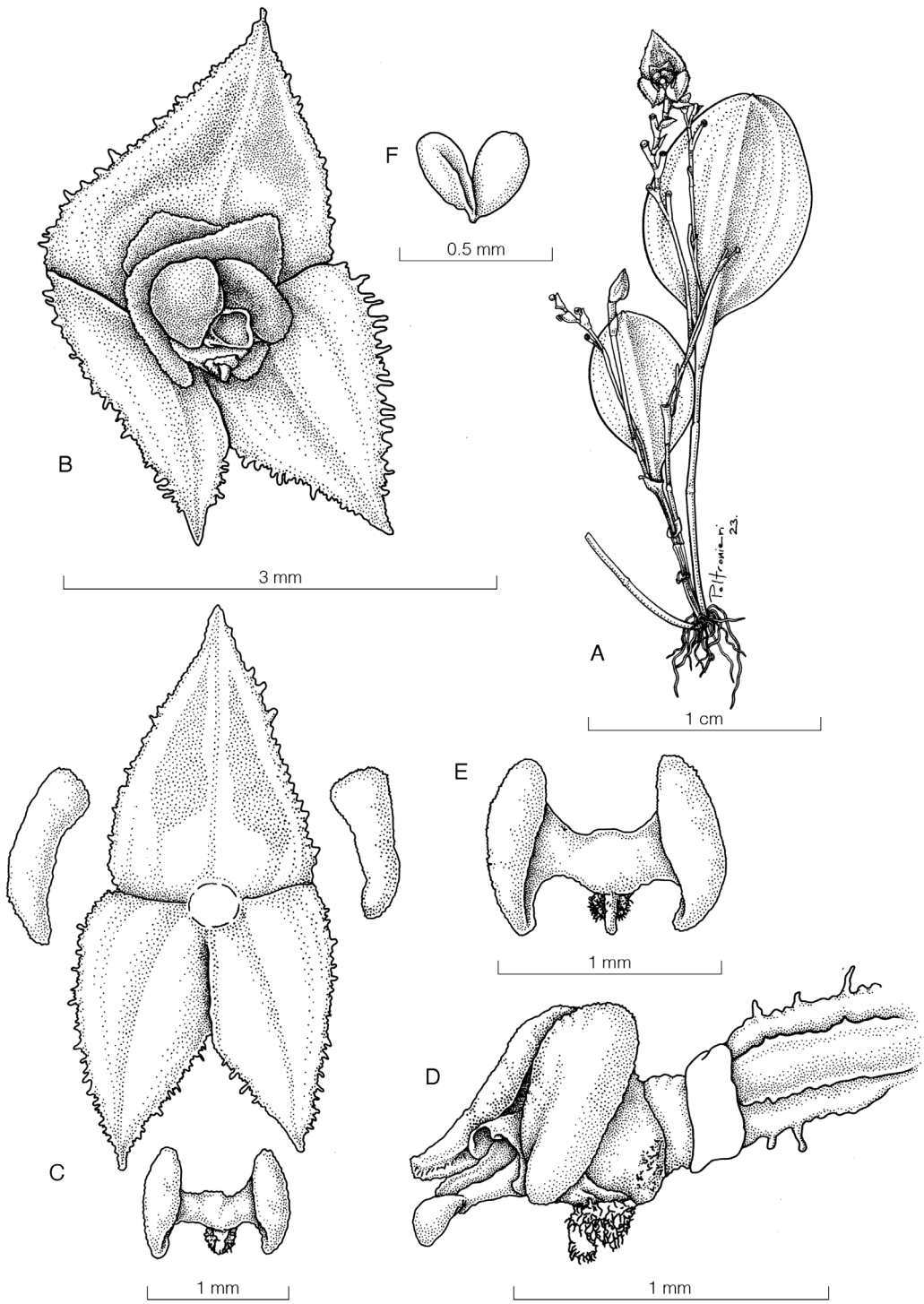

Figure 6. *Lepanthes acarina* Luer. **A**. Habit. **B**. Flower. **C**. Dissected perianth. **D**. Column and lip, lateral view. **E**. Lip, spread. **F**. Pollinia. Drawn by D. Bogarín, K. Gil-Amaya and S. Poltronieri based on *D.Bogarín 12501* (JBL-spirit).

ama to Colombia and Ecuador (Bogarín *et al.* 2016). It is easily distinguished by its diminutive habit (plants <3 cm tall), with inflorescences developed beneath the leaves, often longer than or as long as the leaves themselves. The flowers are minute, yellowish-white with purplish-pinkish petals and lip. The sepals are ciliate, with the dorsal sepal tinged with purple. The lunate lip blades embrace the column, and the appendix is conspicuous, constricted above the middle, with a concave base and a pubescent apex that is deflexed.

Within the populations, we observed cleistogamous plants, with some flowers opening occasionally. While *L. acarina* shares a similar plant habit with the widespread *L. eximia* Ames, which is often cleistogamous, they can be differentiated by the linear petals (as opposed to transversely bilobed, oblong petals in *L. acarina*) and the subquadrate, widely lobed lip with lobes extending far from the column (versus ovate, short lip blades in *L. eximia*). Plants of *L. acarina* typically grows on mossy twigs alongside other pleurothallids such as *Dracula erythrochaete* (Rchb.f.) Luer and *Stelis* spp.

Lepanthes pexa Luer, Lindleyana 2(4): 181. 1987.

TYPE: Panama. Prov. of Bocas del Toro: epiphytic in cloud forest between Fortuna and Chiriquí Grande, alt. 1000 m, 17 Feb. 1985, *C. Luer et al. 10622* (holotype, MO-5122325!, barcode 150103).

Description: Based on *D. Bogarín 8243*.

Plant epiphytic, caespitose, erect, up to 16 cm tall. *Roots* slender, flexuous, up to 2.3 cm long, 1 mm in diameter. *Ramicauls* slender, erect to suberect, 6.0–11.5 cm long, enclosed by 5–7 pale green to brownish with age, closely adpressed lepanthiform sheaths, the ostia microscopically ciliate, ovate, acute to obtuse. *Leaves* elliptical, emarginate, apiculate, coriaceous, papillose, green, lustrous, 4.1–5.7 × 2.1–2.4 cm, the obtuse base narrowing into a petiole *ca.* 5 mm long. *Inflorescence* born beneath the leaf with successive, distichous multiflowered coflorescences, up to 3.3 cm long, each of them shorter than the leaves, with successive flowers. *Pseudopeduncle* up to 2.4 cm long, rachis up to 8 mm long; *floral bracts* pale green to brownish with age, ovate, acute, muricate, pilose, 1.5–2.0 mm long; *pedicels* 2–3 mm long, persistent; *ovary* microscopically papillose, 1.0–1.5 mm long. *Flowers* with yellowish-green, translucent sepals, the petals light orange, basally vinaceous, the upper lobe deeply bordered with wine color, the lower lobe lightly vinaceous, the lip lilac, the column light orange to whitish. *Dorsal sepal* ovate, acute, abaxially 1-carinate, entire, connate to the lateral sepals for about 0.5 mm, 3.0 × 2.1 mm, 3-nerved. *Lateral sepals* obliquely ovate, acute, apically divergent, abaxially 1-carinate, connate for 1.1 mm, 2.8 × 1.4 mm, 2-nerved. *Petals* transversely bilobed, microscopically papillose, 1.3 × 4.0 mm, the upper lobe obliquely ovate, obtuse, converging, 2.2 mm long, the lower lobe narrow, obliquely ovate, obtuse, subcarinate along the vein, diverging at the apex, 1.8 mm long. *Lip* bilaminate, adnate to the column base, 1.5 × 2.0 mm, not exceeding the column length, the blades elliptic, obtuse, apically ciliate; the connective oblong, 0.5 × 1.0 mm; the body oblong, thick, adnate to the column base, 0.4 × 0.2 mm; the appendix cylindric, obtuse, pubescent, 0.15 mm long. *Column* cylindric, 1.3 mm long, exceeding the length of the lip; the anther apical; the stigma ventral. Pollinarium consisting of two *pollinia*, claviform, 0.55 × 0.28 mm, joined at the base by a rounded viscidium. *Anther cap*, subrounded, abaxially concave, 0.15 × 10 mm. *Fruit* not seen.

Etymology: From the Latin *pexus*, "combed", referring to the appearance of the densely distichous pedicels on the rachis (Luer 1987).

Distribution: The species is known from Costa Rica and Panama.

Habitat in Costa Rica: Plants were found growing as epiphytes on the trunks of *Cupressus lusitanica* (Cupressaceae) at the edge of the lower montane pluvial forest on the Pacific watershed of the Central Valley at 1484 m of elevation.

Phenology: Flowered in February and November under cultivation.

Costa Rican material studied: **San José**: Moravia, San Jerónimo, 1484 m, calle Carrillo y Tornillal, floreció en cultivo en el Jardín Botánico Lankester, preparado 18 Nov. 2010, *D. Bogarín 8243 &. D. Matamoros* (JBL-D4610 spirit!, Fig. 7–8).

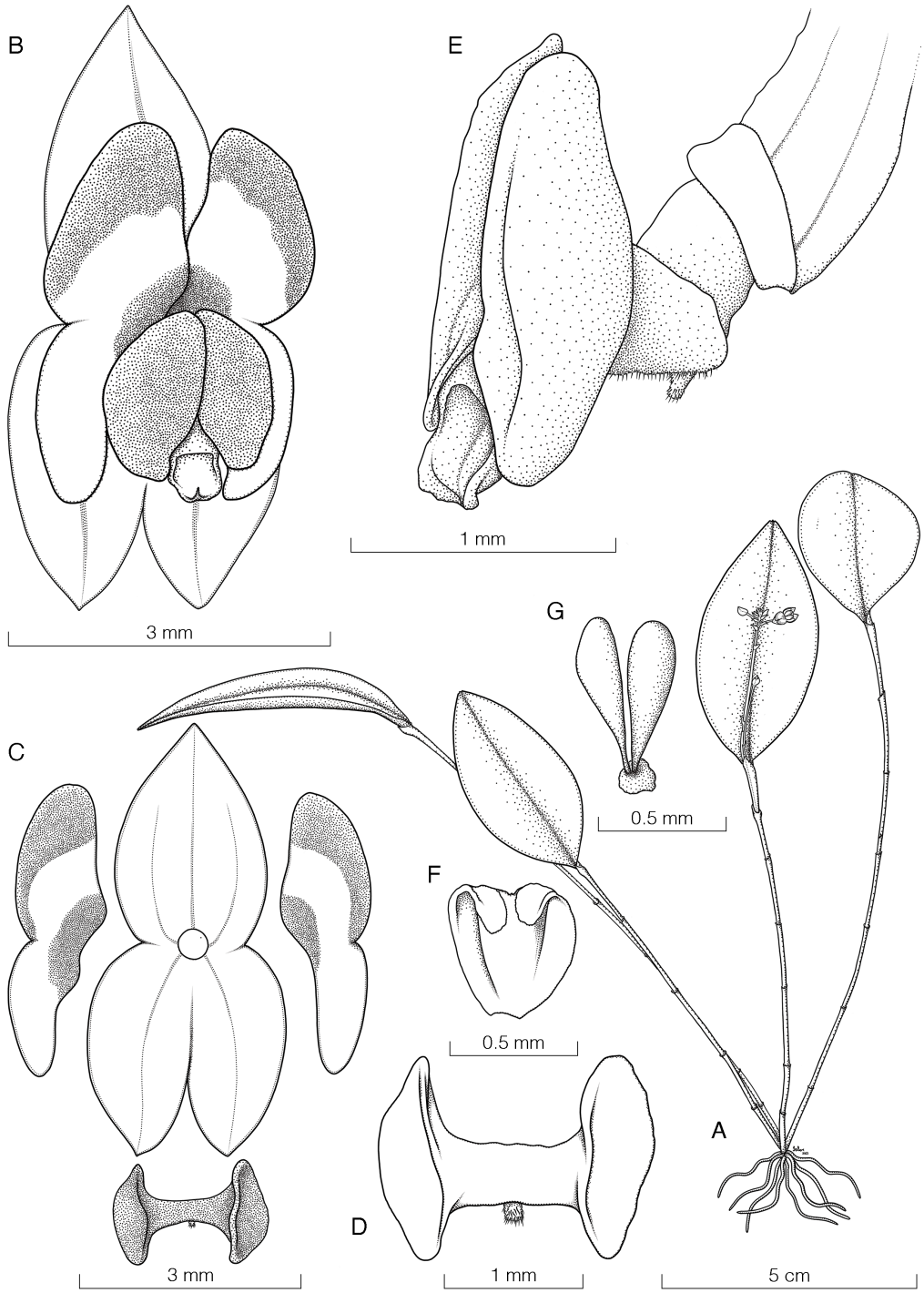

Figure 7. *Lepanthes pexa* Luer. **A**. Habit. **B**. Flower, in natural position. **C**. Dissected perianth, flattened. **D**. Close up of lip spread, adaxial view. **E**. Ovary, column and lip, oblique view. **F**. Anther cap, abaxial view. **G**. Pollinarium. Drawn by I. F. Chinchilla and D. Bogarín from *D.Bogarín 8243* (JBL spirit).

FIGURE 8. **A**. *Lepanthes acarina* Luer (*D.Bogarín 12501*). **B**. *Lepanthes pexa* Luer (*D.Bogarín 8243*). Photographs by D. Bogarín.

Lepanthes pexa is an erect herb with leaves shorter than the compact raceme. The petals have obliquely ovate lobes, while the lip, bilaminate in structure, does not exceed the length of the column. The lip consists of rose, elliptic blades with ciliate apices, an oblong body, a cylindric and obtuse appendix, and a short, cylindric column. The type specimen of *L. pexa* exhibits some differences in the petals compared to available Costa Rican material. For instance, its petals are acuminate at both proximal and distal ends (versus obtuse), while the labellum bears cilia at the apex of the blades (versus non-ciliate). Nevertheless, plants from Costa Rica share the characteristic rose lip, which is unusual within the genus in Costa Rica and Panama. We consider these differences variable characters until more material is available to assess morphological variation within populations.

According to Luer (1987), *L. pexa* resembles *Lepanthes turialvae* Rchb.f., a species found in Costa Rica and Panama. However, *L. pexa* can be distinguished by the carinate lower lobe of the petals (versus non-carinate) along the vein and the converging upper lobe (versus divergent).

MASDEVALLIA Ruiz & Pav.

Masdevallia smallmaniana Luer, Monogr. Syst. Bot. Missouri. Bot. Gard. 87: 505a. 2002. *Luzama smallmaniana* (Luer) Luer, Monogr. Syst. Bot. Missouri. Bot. Gard. 105: 10. 2006.

TYPE: Ecuador[?]. without locality, alt. 2000–2500 m, obtained from New World Orchids by the British National Collection of *Masdevallia*, flowered in cultivation at Royden Orchids in Grand Missenden, England, Feb. 2002, *R. Barrow RO11* (holotype, barcode MO-277324!).

Heterotypic synonyms: *Masdevallia driesseniana* Luer & Sijm, Harvard Pap. Bot. 23: 48. 2018. TYPE. Panama. Chiriquí: near Amistad, 1300 m, collected by P. Dubbeldam and A. Sijm, 2003, flowered in cultivation by Wiel Driessen in Panningen, The Netherlands, February 2013, *A.P. Sijm 20130208* (holotype: MO). *Masdevallia rostriflora* Luer & Sijm, Harvard Pap. Bot. 23(1): 50. 2018. TYPE: Panama. Chiriquí: near Amistad, 1800 m, collected by P. Dubbeldam and A. Sijm, 2003, flowered in cultivation by Wiel

Driessen in Panningen, The Netherlands, Feb. 2013, *A.P. Sijm 20130204* (holotype: MO).

Description: Based on *Bogarín 10767 et al*.

Plant up to 7.5 cm tall, epiphytic, caespitose; thick *roots*. *Ramicauls* slender, erect, 5.4–11 mm long, enclosed by one thin, tubular sheath papyraceous, 5–10 mm long. *Leaves* light green darkening towards the apex, erect, coriaceous, cuneate, oblanceolate, obtuse, 54–65 × 8.5–11.0 mm including a gradually narrowed indistinct petiole *ca*. 8–15 mm long. *Inflorescence* with semierect successive single-flowered coflorescences, up to 5 cm long. *Pseudopeduncle* light green, with light wine color spots from the base to the halfway, 2.7–4.0 cm long, with a tubular bract near the base; *floral bract* light green, tubular, 1 cm long; *ovary* light green, 5 × 2 mm wide, articled to a 6 mm long pedicel; sepals greenish white, lightly suffused with red-brown at the base, glabrous. *Dorsal sepal* oblong, 20 × 4 mm including the thick tail 9 mm long, connate to the lateral sepals for 6 mm into a cylindrical tube, the free portion triangular, acute, attenuate into an erect, light olive-green tail, more pigmented towards the apex. *Lateral sepals* oblong, oblique, acute, 20 × 8 mm, connate 8 mm, synsepal expanded, the free portions narrowly triangular, acute, with light olive green, more pigmented towards the apex, fleshy, decurved tails ca. 12 mm long. *Petals* light olive green, red-brown above the middle, obovate below the middle, contracted into a acuminate-subulate apex suffused with red-brown spots, 13 × 3 mm. *Lip* greenish, red-brown above the middle, protruding, 15 × 3 mm, oblong below the middle, contracted above the middle into narrowly linear-subulate apex, with a midline callus extending forward onto the apex. *Column* light green, semiterete, 7 mm long. Anther greenish white cucullate; *Pollinarium* composed of two pollinia. *Fruit* not seen.

Etymology: Named for Don Smallman of Halpringham, Norfolk, England, who cultivates this species in the British National Collection of *Masdevallia*.

Distribution: Costa Rica, Panama, and doubtfully in Ecuador.

Habitat in Costa Rica: Epiphytic in low montane rainforest and in isolated pasture trees on the Cordillera de Talamanca at 2162 m.

Phenology: Flowering in May and December.

Costa Rican material studied: **Puntarenas**: Coto Brus, Sabalito, Zona Protectora Las Tablas, 15 km al noreste de Lucha, Sitio Tablas, en potreros de la Finca Sandí-Hartmann "El Capricho", 2162 m, epífitas en árboles aislados en bosque pluvial montano bajo, 11 dic. 2013, *D. Bogarín 10767 et al.* (JBL-D6293 spirit!; Fig. 9).

In Costa Rica, certain populations of *Masdevallia cupularis* Rchb.f. exhibit individuals that bear flowers that never reach anthesis and are self-pollinated while still in bud. This phenomenon is often accompanied by the development of peloric buds and flowers, wherein the floral segments display aberrant morphology. Pelorism typically denotes an abnormality where flowers appear to revert to an earlier, ancestral form. The characteristic bilateral symmetry of orchid flowers is often lost in peloric flowers, resulting in actinomorphic individuals (Mondragón-Palomino & Theißen, 2009). Taxonomists have identified three such aberrant individuals as distinct species, named *M. smallmaniana* Luer, *M. driesseniana* Luer & Sijm, and *M. rostriflora* Luer & Sijm (Karremans *et al.* 2019; Karremans 2023). All three are peloric or pseudopeloric, representing individuals of a single species. Oses (2017) found individuals of *M. cupularis* and *M. smallmaniana* as sisters within the same clade. Whether the peloric individuals form a stable population and can be considered a distinct species from *M. cupularis* needs to be assessed through population genetics. Meanwhile, *M. smallmaniana* is formally recorded in the flora of Costa Rica to acknowledge the presence of these aberrant populations.

Masdevallia striatella fo. ***pallens*** Belfort, ***forma nova***
TYPE: Costa Rica. Alajuela: Sarchí, Bajos del Toro, Reserva Biológica Bosque de Paz, creciendo en el Jardín de Orquídeas Dr. Stephen Kirby, 1534 m, 29 oct. 2023, *N. Belfort-Oconitrillo 938* (holotype, JBL-spirit; LCDP voucher, Fig. 10).

Diagnosis: *A forma typica floribus albescentibus sepalibus venis rosaceis pallentis notatis, petalis labelloque plerumque albescentis (versus venas sepalorum atreopurpureas et labellum atropurpureum) recedit.*

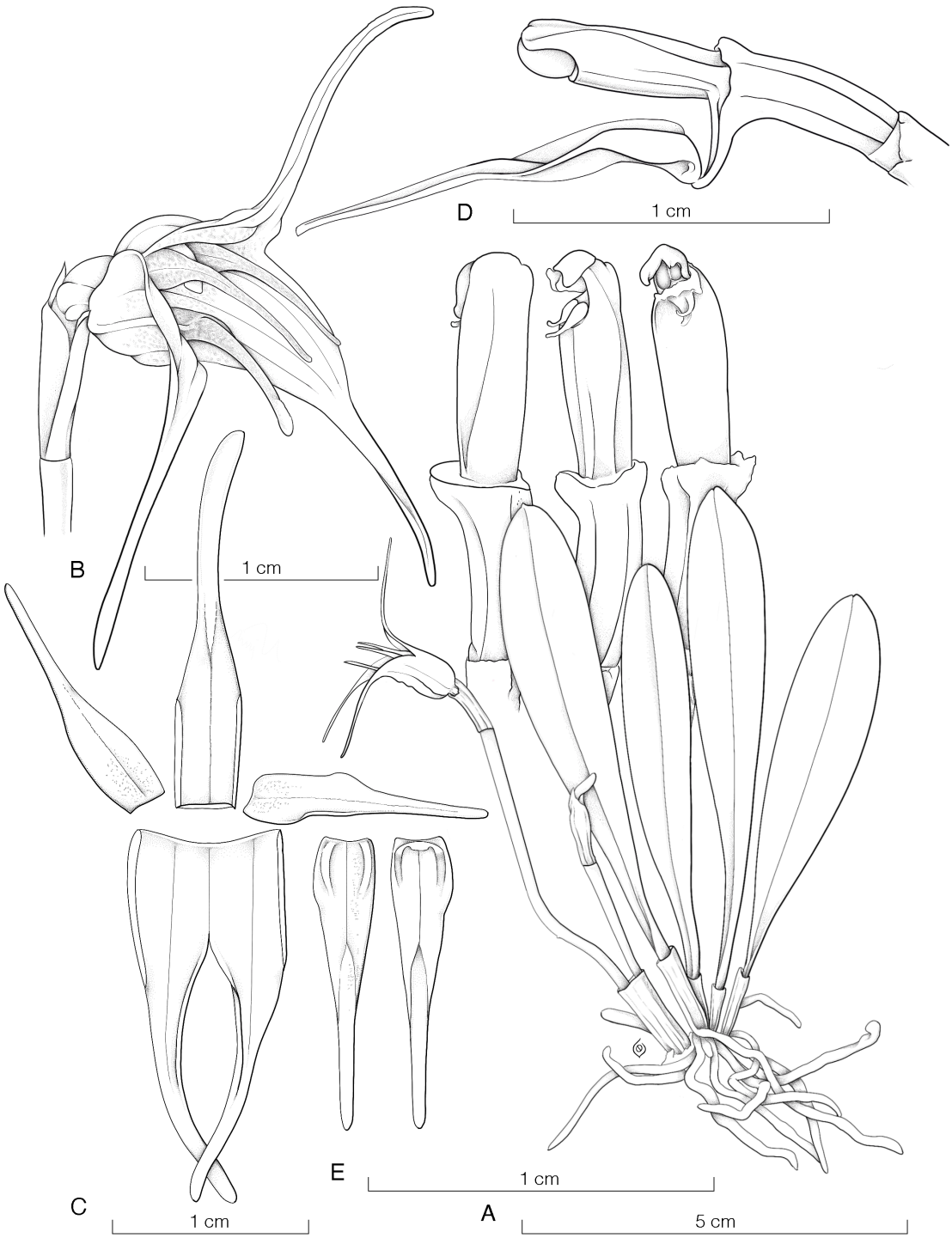

FIGURE 9. *Masdevallia smallmanniana* Luer. **A**. Habit. **B**. Flower. **C**. Perianth with ventral and dorsal view of the lip. **D**. Column, lip, and ovary lateral view. **E**. Column, ventral view. Drawn by L.Oses based on *D.Bogarín 10767* (JBL-spirit).

Epiphytic, caespitose, *herb*, 15–20 cm tall. *Ramicauls* green, terete, slender, erect to suberect, 5–10 cm long. *Leaves* obovate and subpetiolate, 6.7–14.1 × 0.7–1.0 cm. *Inflorescence* with successive multiflowered coflorescences, 7–13 cm long, producing up to two flowers. *Pseudopeduncle* 6–8 cm long, erect. *Pedicels* 7–10 mm long. *Ovary* cylindrical, 5 mm long, longitudinally channeled, with evident black dots. *Floral bract* triangular-ovate, brownish, membranaceous, acute, tubular, apically loose, involving most of the pedicel, 5–7 mm long. *Flowers* with sepals connate, tubular, white with nine veins light pink (three in each sepal), the sepaline tails green, the petals white with the middle vein pink, the lip pale with the base and the apex yellow, white column with light pink margins, white anther cap and yellow pollinarium. *Sepals* lanceolate, 2.01–2.18 × 0.57–0.62 cm, connate at the base for 0.7–0.8 cm, forming a tube 0.7–1.0 cm in diameter that opens towards the ends into three short sepaline tails of 5.5–6.0 mm long. *Petals* elliptical, narrow at the base, 6.5 × 2.5 mm, with an angle in the middle of the lower margin and with the apex mucronate, disposed on each side of the column, forming a narrow tunnel. *Lip* oblong, arched, 7.5 × 3.5 mm, base truncated, with two basal concave lobes and exudate as droplets in the central portion, with a minutely warty callus at the apex, bent slightly backward. *Column* elongated, straight, 6.5–6.7 mm long, shorter than the lip, with a foot of 3.5 mm long and a hook with a bifurcate apex, to which a thin layer of cells articulates the lip. *Anther cap* cucullate, white. Pollinarium composed of two *pollinia*, obovate, with a pair of whale-tail-shaped caudicles. *Fruit* not seen.

Etymology: From the Latin *pallēns*, meaning pale, in reference to the pale color of the flowers, especially due to the much lighter petals and lip.

Distribution: Known only from Costa Rica.

Habitat in Costa Rica: Premontane tropical forest in the Caribbean slope of the Cordillera Volcánica Central.

Phenology: Blooming from September to January, with a peak in November.

Masdevallia striatella Rchb.f. is known to occur in Costa Rica and Panama, representing one of the most common species of the genus and with the broadest geographical and ecological distribution (Luer 2006, Oses 2017). The typical form consists of whitish flowers with evident dark purple veins in the sepals, green or yellow-colored sepaline tails, and a dark purple lip with yellow in the base and the apex (Fig. 11). Although in the new form, the sepals still have purple veins but are much lighter, the most evident differences are the green tails, the white lip and the white petals with much pale, inconspicuous veins (Fig. 10C), contrasting with the dark purple lip and dark veins of the typical form (Fig. 11B). This new form became evident at Bosque de Paz Biological Reserve, where the pale form blooms synchronously with plants exhibiting the typical characteritics of the species.

Maxillaria Ruiz & Pav.

Maxillaria hennisiana Schltr., Orchis 6(7): 117–118. 1912.

TYPE: Colombia. Heimat wahrscheinlich Kolumbien, von H. Hennis in Hildesheim importiert, blühte in der Sammlung des Herrn Baron v. Fürstenberg im Juni 1911, *Herrn Baron von Fürstenberg s.n.* (B, destroyed); lectotype, **hic designatus**, the illustration in the protologue (Schlechter 1912): tab. 26, fig. 10–17. Fig. 12.

Heterotypic synonym: *Maxillaria shepheardii* Rolfe, Bull. Misc. Inform. Kew 83. 1917. TYPE: Colombia. Chocó: Río Condoto, *S. Shepeard s.n.* (holotype, K).

Description: Based on *L. Álvarez et al. 1229*, *L. Álvarez 499 & M. L. Morales*, and *L. Álvarez 335.*

An epiphytic, caespitose, pseudobulbous *herb* to 15 cm tall. *Roots* slender, flexuous, glabrous, *ca*. 1 mm in diameter. *Rhizome* with short internodes, covered by brown, nervous, papyraceous sheaths. *Pseudobulbs* transversely sub rectangular, thickly complanate, apically truncate, to 2.3 × 2.8 cm, monophyllous, covered at the base by 2–3 triangular, narrow, acute, glumaceous sheaths to 3 cm long, becoming dry-papyraceous with age. *Leaves* narrowly elliptic to oblong-elliptic, coriaceous, grass-green, acute to subobtuse, asimetri-

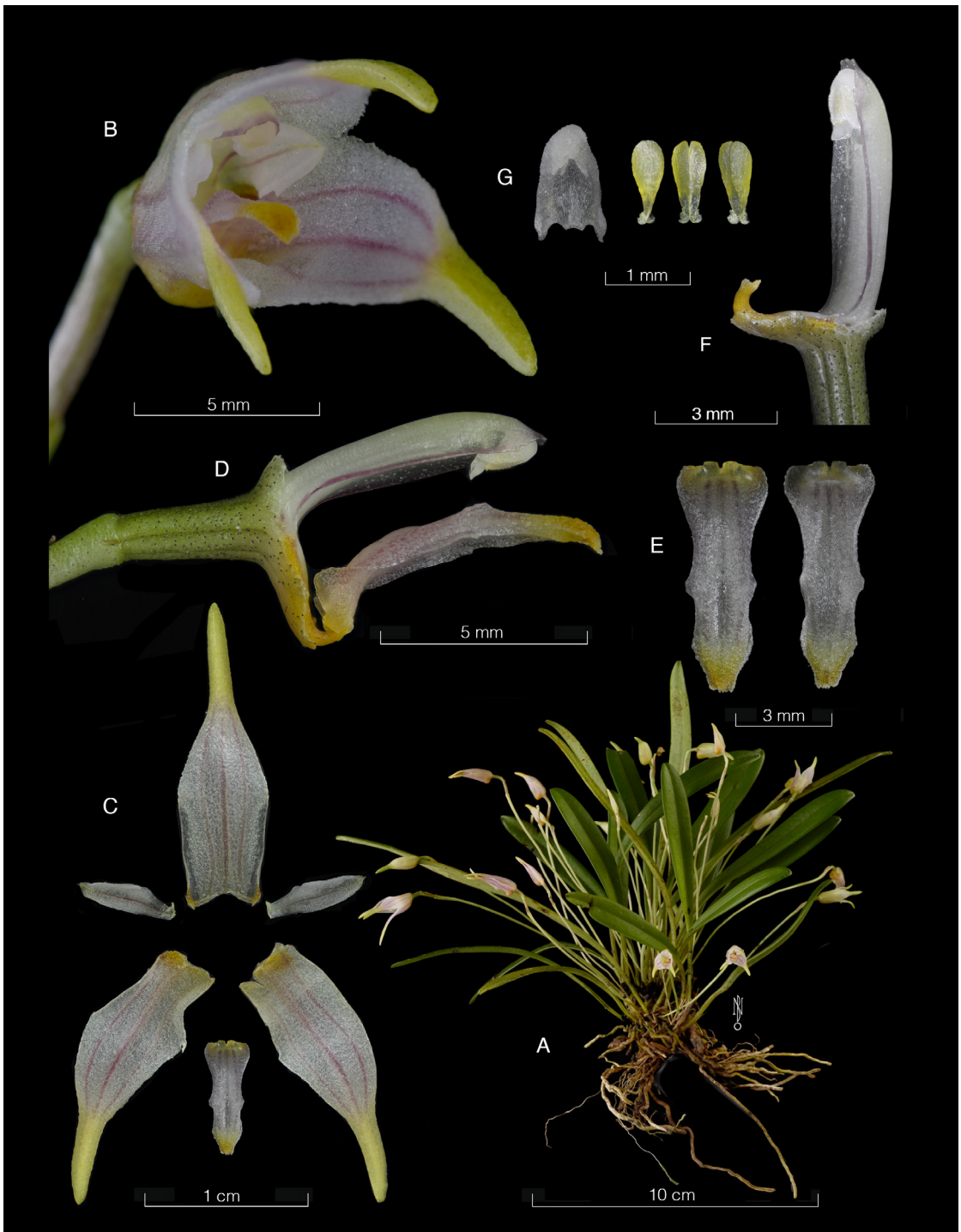

FIGURE 10. *Masdevallia striatella* fo. *pallens* Belfort. **A**. Habit. **B**. Flower. **C**. Dissected perianth. **D**. Ovary, column and lip, lateral view. **E**. Lip, adaxial and abaxial views. **F**. Column, ¾ view. **G**. Anther cap and pollinarium. LCDP prepared by N. Belfort-Oconitrillo based on *N.Belfort-Oconitrillo 938* (JBL-spirit).

Figure 11. Typical floral form of *Masdevallia striatella* Rchb.f. from Bosque de Paz Biological Reserve. **A**. Flower. **B**. Dissected perianth. **C**. Ovary, column and lip, lateral view. **D**. Lip in adaxial, ¾, lateral, and abaxial views. **E**. Column. **F**. Anther cap. **G**. Pollinarium. Plate prepared by N. Belfort-Oconitrillo based *N.Belfort-Oconitrillo 676* (JBL-spirit).

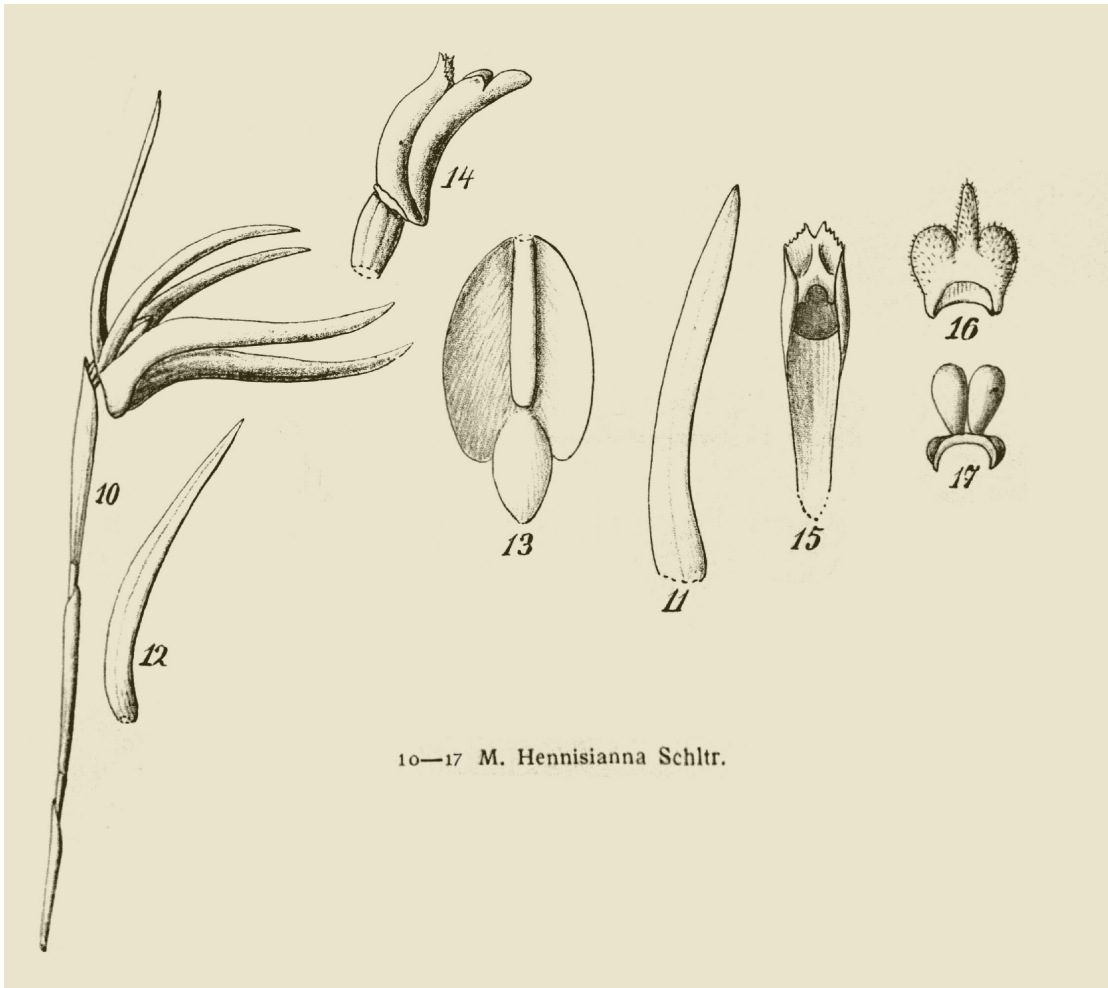

FIGURE 12. Original illustration of *Maxillaria hennisiana* Schltr. From Schlechter 1917: tab. 26, fig. 10–17.

cally bilobulate, distinctly keeled beneath, matte on both surfaces, 6.0–13.0 × 1.8–2.3 cm, narrowed at the base into a long, conduplicate-terete petiole to 3.5 cm long, *ca*. 0.5 cm wide. *Inflorescences* up to 8 per pseudobulb, each a single-flowered, erect raceme shorter than the leaves, 5–7 cm long, completely covered by 3–4 amplectent, tubular, apiculate, papyraceous, brown bracts to 2.8 × 0.8 cm. *Floral bract* glumaceous, brownish green, amplectant, obovate, acute, apically loose, strongly ancipitous, to 3 × 1 cm, completely covering the pedicel and ovary. Pedicellate *ovary* terete, rugulose, 3.0–3.2 cm long including the pedicel. *Flowers* with the sepals spreading, the petals porrect, the sepals yellow flushed brown toward the apex, the petal white, the lip yellow with orange midlobe, the column white, the anther reddish with dark purple crest. *Dorsal sepal* linear-ligulate, obtuse, carinate, the distal margins gently reflexed, 2.3–2.5 × 0.5–0.6 cm. *Lateral sepals* narrowly linear-ligulate, obtuse, shortly apiculate, weakly carinate, 2.4–2.6 × 0.5–0.6 cm, the bases forming a short mentum with the column foot. *Petals* obliquely narrowly lanceolate-subfalcate, subacuminate, porrect, the apex facing down, 1.7–2.0 × 0.4 cm. *Lip* 3-lobed, elliptic from a cuneate base, adnate to the base of the column foot, 1.2 × 0.6 cm, the disc provided with a ligulate, low callus *ca.* 5 mm long, extending almost to the insertion of the middle lobe; lateral lobes rounded, erect to flank the lower portion of the column; midlobe elliptic-subrounded, thickened, the margins crenulate. *Column* semiterete, thick, 1 cm long, dilated around the stigma,

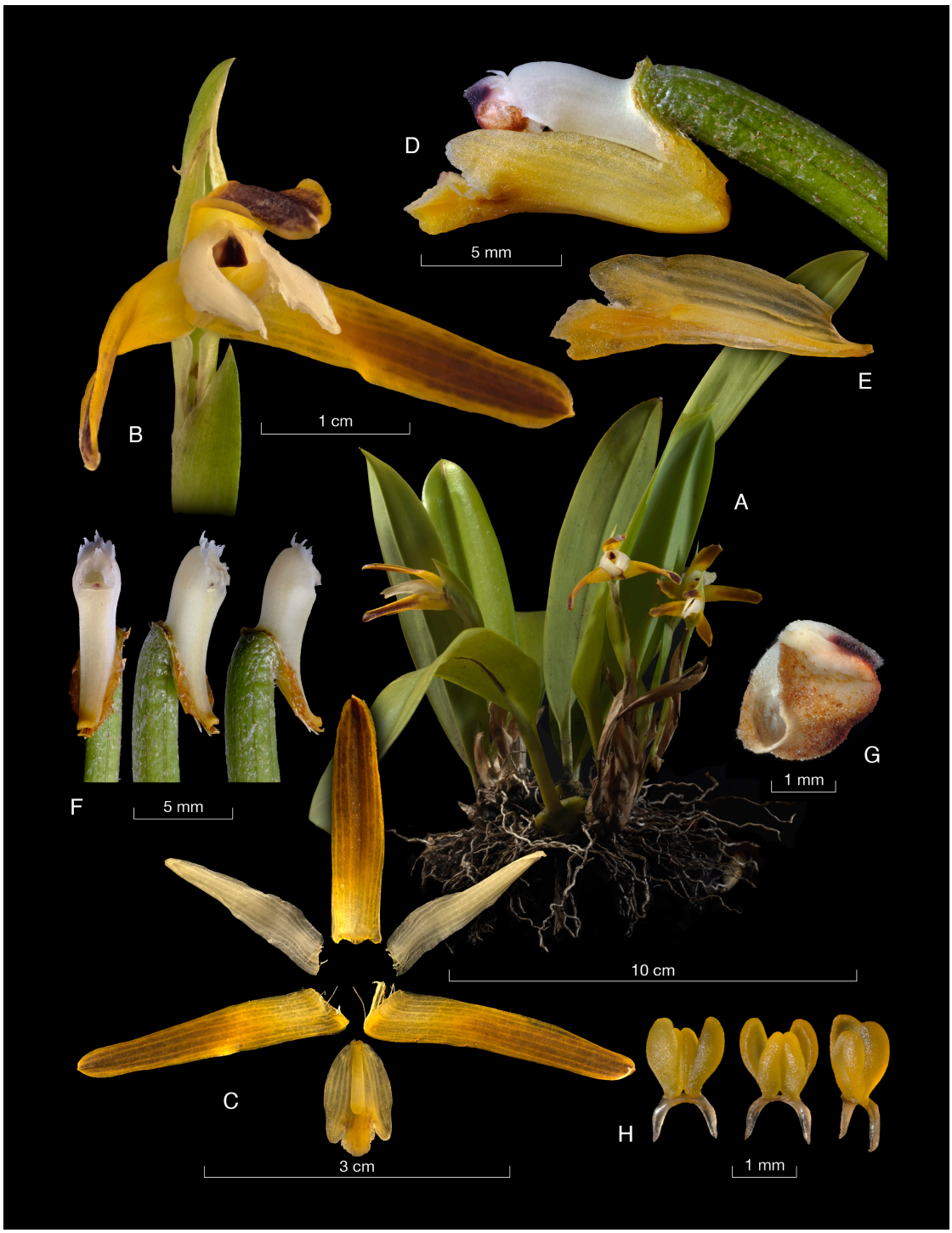

Figure 13. *Maxillaria hennisiana* Schltr. **A**. Habit. **B**. Flower. **C**. Dissected perianth. **D**. Column and lip, lateral view. **E**. Lip in longitudinal section. **F**. Column in several views. **G**. Anther cap. **H**. pollinarium in dorsal, ventral, and lateral views. LCDP prepared by F. Pupulin based on *L.Álvarez 499* (JBL).

FIGURE 14. Flowers of *Maxillaria hennisiana*. **A**. *Álvarez 335*. **B**. *Álvarez 1229*. Vouchers at JBL. Photographs by F. Pupulin.

Figure 15. Comparison of the pseudobulbs of *Maxillaria* species. **A**. *M. cryptobulbon* (*A.P.Karremans 6622*). **B**. *M. ringens* (*D.Bogarín 11479*). **C**. *M. angustisegmenta* (*F.Pupulin 461*). **D**. *M. brunnea* (*D.Bogarín 1575*). **E**. *M. porrecta* (*A.P.Karremans 6727*). **F**. *M. hennisiana* (*L.Álvarez 355*). Scale bar = 3 cm. All vouchers at JBL. Digital composite plate prepared by F. Pupulin.

extending at the base into a narrow, cuneate foot *ca.* 4 mm long; the clinandrium cucullate, lacerate; the stigma ventral, broadly subquadrate, flanked by two large, converging, membranous flaps; the anther incumbent. *Anther cap* deeply cucullate, ovate, obtuse, provided with a distinct, narrow crest on the upper part, 2-celled. Pollinarium consisting of four *pollinia*, ovoid-complanate, in two pairs of different size, dorsiventrally superposed, on a horseshoe shaped stipe, scarcely distinct from the subtended, brownish visicidium. *Fruit* not seen.

Etymology: Dedicated to Wilhelm Hennis (1856–1943), orchid grower in Hildesheim, who imported from Colombia the type plant later flowered in the collection of Baron Max (Maximilian) von Fürstenberg (1866–1925) in June 1911.

Distribution: Costa Rica to Ecuador.

Habitat in Costa Rica: The species has been observed so far exclusively in lowland, wet tropical forest in the Pacific region of Península de Osa, at elevation around 400 m, as an epiphyte in both primary and secondary vegetation.

Phenology: Flowering in February–March and in October–November.

Costa Rican material examined: **Puntarenas**: Golfito, Golfito, Parque Nacional Piedras Blancas, Fila Monge, 420 m. Bosque primario, con especies arbóreas predominantes como *Peltogyne purpurea, Pentagonia osaensis, Magnolia wetteri, Virola nobilis, Chaunochiton kappleri*, *Tachigali versicolor,* 17 mar. 2021, *L. Álvarez 499 & M. L. Morales* (JBL-B2626 spirit!) (Fig. 13). Golfito, Golfito, Parque Nacional Piedras Blancas, Fila San Josecito, 400 m, bosque muy húmedo tropical, bosque primario, 10 may. 2020, florecida en cultivo y preparada en el Jardín Botánico Lankester, 18 feb. 2022, *L. Álvarez 335* (JBL-A0616 spirit!) (Fig. 14A). Golfito, Golfito, Cerros de Golfito entrando por la Gamba, propiedad de Conservación Osa, 400 m, bosque secundario, 7 jun. 2023, flowered in cultivation and prepared at Jardín Botánico Lankester, 28 oct. 2023, *L. Álvarez 1229, M. J. Mata & F. Rodríguez* (JBL) (Fig. 14B).

Maxillaria hennisiana belongs to a species complex centered around the South American *M. porrecta* Lindl., the first species surely referable to this the group, which was described in 1838 from Rio de Janeiro (Lindley 1838). This complex includes other species such as *M. acostae* Schltr., *M. amparoana* Schltr., *M. angustisegmenta* Ames & C.Schweinf., *M. brunnea* Rchb.f., *M. colemanii* Carnevali & Fritz, *M. cryptobulbon* Carnevali & J.T.Atwood, *M. longiloba* (Ames & C.Schweinf.)

J.T.Atwood and *M. ringens* Rchb.f., among others. Christenson (2002) treated this complex as the section *Amazonicae* , excluding however *M. hennissiana* as a representative species. Morphologically, species whitin this group share characteristics with *Maxillaria* sect. *Arachnites* Christenson – distinguished primarily by the larger size of plants and flowers – and together they represent one of the largest and less studied groups in *Maxillaria*. In their classification of the subtribe Maxillariinae based on ITS molecular data, Szlachetko *et al.* (2012) recovered *M. hennisiana* within *Maxillaria sensu stricto*, forming a small clade with *M. longiloba, M. angustisegmenta, M. cryptobulbon*, and *M. brunnea* as the closest relatives. However, the phylogenetic analyses of *Maxillaria* s.s. by the authors revealed several polytomies and did not reflect recent attempts at sectional delimitations as those posthumously proposed by Christenson *et al*. (2013). Due to the difficulty in distinguishing between species of these groups, given their overall floral similarity and colors, it is unsurprising that *M. hennisiana* has been recorded as ranging from southern Mexico to Peru and Trinidad in the West Indies. According to the most recent reports, the species is likely restricted to Panama (Bogarín *et al.* 2015), Colombia, and Ecuador (Bernal *et al.* 2019). This is the first documented record of the species for the flora of Costa Rica.

Among similar species, *M. hennisiana* may be recognized by the compact plants with distinctly petiolate leaves and the peculiar shape of the pseudobulbs, which are transversely rectangular, thickly lenticular, and distinctly truncate apically (Fig. 15).

Maxillariella M.A.Blanco & Carnevali

Maxillariella guareimensis (Rchb.f.) M.A.Blanco & Carnevali. Lankesteriana 7(3): 528. 2007.

TYPE: Venezuela. *Wagener s.n.* (holotype, W-R?; isotype, G-00355233!). Syn.: *Maxillaria guareimensis* Rchb.f., Bonplandia 2: 16. 1854.

Description: Based on *Karremans 6671 et al.* and *Karremans 7285 et al.*

An epiphytic, cane-bearing *herb* to 1 m tall. Roots slender, flexuous, glabrous, *ca.* 1 mm in diameter. *Rhizome* with short internodes, covered by brown, papyraceous sheaths, up to 5 cm long between stems. *Stems* elongate, covered by foliaceous and papyraceous sheaths, 4.1–6.8 × 1.7–2.0 cm. *Pseudobulbs* not seen. *Leaves* narrowly elliptic, coriaceous, acute, asymmetrically bilobulate, distinctly keeled beneath, the blade 10.0–20.0 × 2.1–3.2 cm. Inflorescences from the base of the foliaceous sheath, several simultaneously appearing per stem, erect. *Floral bract* glumaceous, brown, amplectent, acute, apically loose, ancipitous, 1.0–1.5 cm, not covering the pedicel and ovary. *Pedicellate ovary* terete, rugulose, 2.5 cm long including the pedicel. *Flowers* concolorous yellow. *Dorsal sepal* elliptic, acute, shortly apiculate, 1.8–1.9 × 0.8 cm. *Lateral sepals* narrowly ovate, oblique, acute, shortly apiculate, apex revolute, 1.6–1.7 × 0.8 cm, the base forming a short mentum with the column foot. *Petals* narrowly ovate, acute, apex revolute, 1.5–1.6 × 0.8 cm. *Lip* linear-pandurate, hinged to the base of the column foot, 1.2 × 0.5 cm, the disc provided with a ligulate, low callus *ca.* 6 mm long, extending from the base to the center of the lip, apex truncate, slightly emarginate. *Column* semiterete, thick, 0.8 cm long, clavate, extending at the base into a narrow, cuneate foot *ca.* 3.5 mm long; the clinandrium cucullate, glandular; the stigma ventral, broadly subquadrate, flanked by two large, converging, membranous flaps; the anther incumbent. *Anther cap* deeply cucullate, ovate, obtuse, 2-celled. *Pollinarium* composed of four *pollinia*, ovoid-complanate, in two pairs of different size, dorsiventrally superposed, on a horseshoe shaped stipe, scarcely distinct from the subtended, brownish viscidium. *Fruit* not seen.

Etymology: The name presumably honors mount Guareima, close to Caracas in Venezuela.

Distribution: Trinidad and Tobago, Costa Rica, Venezuela, Colombia, Ecuador, Peru, Bolivia, Brazil.

Habitat in Costa Rica: Very wet premontane tropical forest.

Phenology: Blooming at least in June.

Costa Rican material examined: **Cartago**: Turrialba, Santa Teresita, Guayabo, Monumento Nacional Guayabo, alrededores de los senderos principales, 1128 m, bosque muy húmedo, epífitas, 20 jun. 2015, *A.P. Karremans 6671 et al.* (JBL-J0622 spirit!, Fig. 16). Tur-

Figure 16. *Maxillariella guareimensis* Rchb.f. **A**. Habit. **B**. Flower. **C**. Dissected perianth. **D**. Lip and column in natural position, lateral view. **E**. Lip, longitudinal section. **F**. Column, ¾ and ventral views (emasculate on the left). **G**. Pollinarium in abaxial, adaxial and lateral views, and anther cap. LCDP prepared by F. Pupulin based on *A.P.Karremans 6671* (JBL).

rialba, Santa Teresita, Guayabo, Monumento Nacional Guayabo, potreros al lado de la calle, a orillas del Río Lajas, 1.5 km Norte de la entrada principal, 1270 m, bosque muy húmedo, epífitas, 5 jun. 2016, *A.P. Karremans 7285, G. Rojas-Alvarado & Orquideología UCR-2016* (CR, USJ).

This seems to be a rather poorly known species despite its broad distribution. In Costa Rica, this rather voluminous orchid had somehow eluded decades of botanical exploration until recently discovered growing at the Monumento Nacional Guayabo, in Turrialba. *Maxillariella guareimensis* forms large masses, composed of multiple elongate stems, high on the thick tree trunks along the Lajas river that crosses the small natural reserve. Its cupped, yellow flowers are reminiscent of *Maxillariella diuturna* (Ames & C.Schweinf.) M.A.Blanco & Carnevali, a species with a significantly smaller plant stature and floral dimensions which occurs in the same area. Besides its large size, the newly recorded species can also be distinguished by the lack of pseudobulbs along the stem, and the neatly ordered, dense set of leaves.

Mormolyca Fenzl

Mormolyca gracilipes (Schltr.) Garay & M.Wirth, Canad. J. Bot. 37(3): 482. 1959. Bas. *Cyrtoglottis gracilipes* Schltr., Repert. Spec. Nov. Regni Veg. 7: 182. 1920.
TYPE: Colombia. Cauca: c. 1200 – Madero s.n. [holotype, B, destroyed; lectotype (**hic designatus**), Schlechter's floral analysis published by Mansfeld (1929: Pl. 65, No.250)]. Colombia. Cauca: c. 1000 – Lehmann, F. C. 813 [neotype, AMES (Garay & M.Wirth 1959), here rejected and selected as epitype]. Note: We follow Pupulin *et al*. (2022) in recognizing Schlechter's floral analysis reproduced by Mansfeld as original material and therefore reject Garay & M. Wirth neotype in favor of a lectotype. Article 9.12 of the Shenzhen code (Turland *et al.* 2018).

Description: Based on *Bogarín 13092 & A. Acuña*.

Plant epiphytic, cespitose, erect, up to 27 cm tall. *Roots* scatered, thick, fleshy, whitish, 0.5–1.5 mm wide. *Rhizome* short, creeping. *Pseudobulbs* clustered, oblong-ovoid, strongly complanate, unifoliate at the apex, with distichous, evanescent sheaths at the base, 2.5–5.5 × 0.8–1.3 cm. *Leaves* green, elliptic-oblong, acute, 5.5–11.0 × 1.0–1.5 cm. *Inflorescences* two or more, from the base of the pseudobulb, 1-flowered, elongate surpassing the leaf, erect, slender, peduncle about 3.0–6.0 cm long, with 3–4, brown, tubular sheaths. *Flowers* large for the plant, orange yellow. *Dorsal sepal* lanceolate-ovate, long-acuminate with the upper margin involute, concave, 2.1–2.8 × 0.8–1.3 cm. *Lateral sepals* lanceolate, long acuminate, with the upper margin involute, larger than the dorsal sepal, 2.4–3.5 × 0.8–1.0 cm. *Petals* much shorter than the sepals, linear, sharply acute, vertically disposed, touching each other, 1.2–1.4 × 0.1–0.15 cm. *Lip* short, strongly convex in natural position, rhombic-obovate when expanded, with an indistinct indentation on each side, about the middle, abruptly acute, hairy at the tip, about 9.0–1.1 × 0.5–0.6 cm, with the central part very thickened. *Column* green, with brown-purple spots ventrally and at the base, small, slender, arcuate, clavate, footless, up to 0.7–1.0 cm long. *Anther cap*, orange, terminal, operculate, 2-celled, cordate at the base 1.6–1.8 × 1.2–1.4 mm. Pollinarium composed of four *pollinia*, in two subequal pairs, obovate, laterally compressed, yellow, 0.5–0.7 × 0.3–0.4 mm, attached to a wide horseshoe-shaped viscidium. *Fruit* not seen.

Etymology: From the Latin *pedis* "foot" and the Latin *gracilis* "slender, thin, slim", probably alluding to the slender shape of the column.

Distribution: Costa Rica, Venezuela, Colombia, Ecuador, Perú, and Bolivia.

Habitat in Costa Rica: Very humid premontane tropical forest, in moderately warm climates.
Phenology: Flowering in November.

Costa Rican material studied: **Limón**: Siquirres, La Alegría, San Bosco, Calle La Iberia, cerca de orillas del río Destierro, límite entre La Alegría y Pocora de Guácimo, 350 m, bosque muy húmedo tropical transición a premontano, epífitas, 22 ago. 2020, *D. Bogarín 13092 & A. Acuña,* floreció en cultivo en JBL, 26 nov. 2020 (JBL-K0121!, JBL-L0029!; LCDP voucher, Fig. 17).

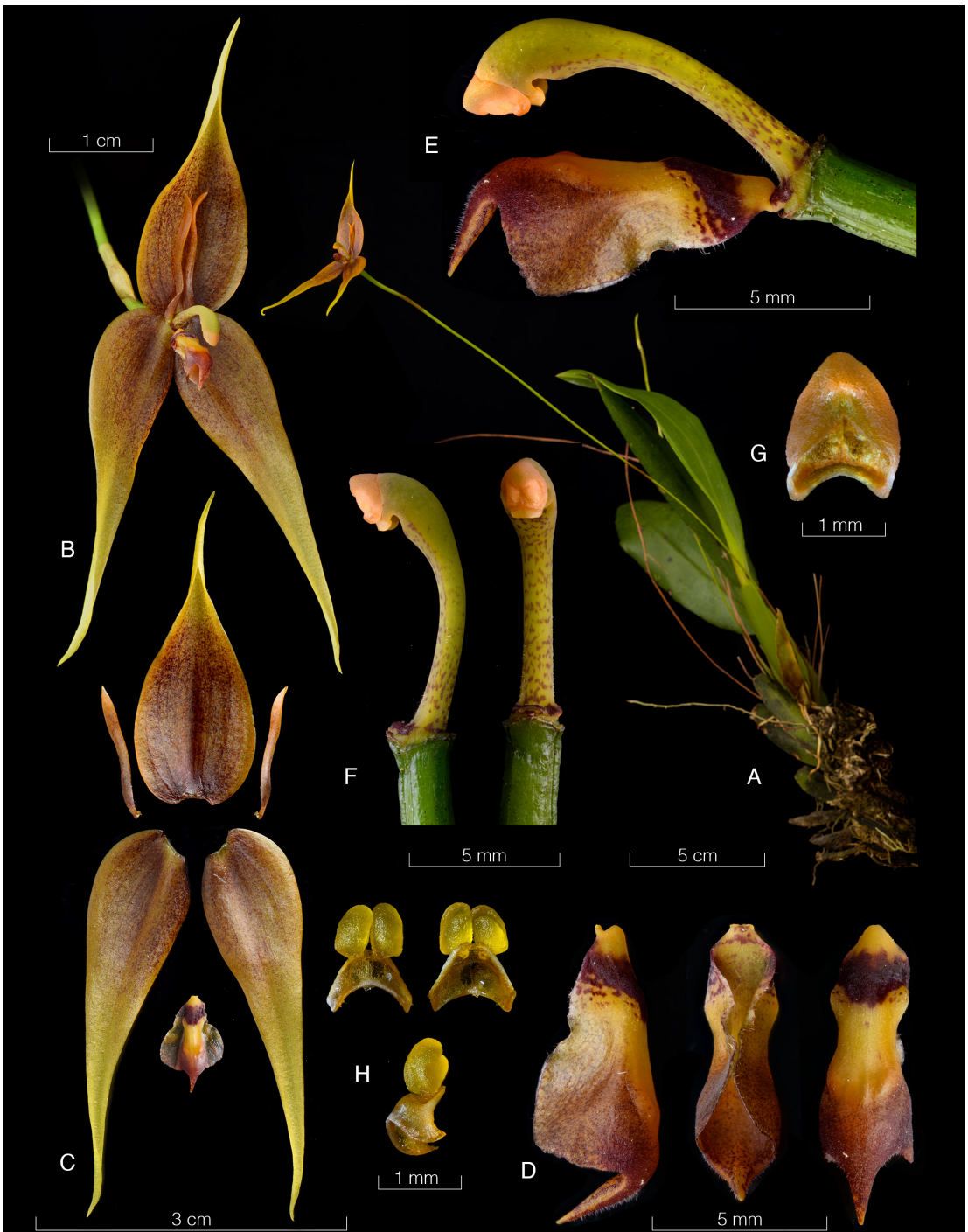

Figure 17. *Mormolyca gracilipes* (Schltr.) Garay & Wirth. **A**. Habit. **B**. Flower. **C**. Dissected perianth. **D**. Lip in lateral, abaxial, and adaxial views. **E**. Lip and column in natural position, lateral view. **F**. Column in lateral and ventral views. **G**. Anther cap. **H**. Pollinarium in abaxial, adaxial and lateral views. LCDP prepared by D. Bogarín and F. Pupulin based on *D.Bogarín 13092* (JBL).

Mormolyca gracilipes was initially described as *Cyrtoglottis gracilipes* by Schlechter in 1920, based on a Colombian specimen to describe a new genus. Schlechter recognized the similarity with the genus *Mormolyca* at that time. However, he considered that the shape of the flower with its long and pointed floral parts, in addition to its geographical disjunction, showed that it was a different genus (Garay & Wirth 1959). The geographical separation between both was lost with the discovery of *M. peruviana* C.Schweinf. (Schweinfurth 1944), which extended the range of the genus *Mormolyca* from Central America to South America. For this reason and considering a new species with intermediate characteristics, *Mormolyca polyphylla* Garay & Wirth (1959), concluded that there were not enough reasons to separate the genera. Thus, becoming synonyms.

Mormolyca gracilipes could be easily confused at first sight with *M. schweinfurthiana* Garay & Wirth, however, it is distinguished by its simple (*vs*. trilobed), fleshy and convex labellum (*vs*. broadly obovate or rhombic-obovate when expanded) and its linear-obovate petals, erect, and directed upwards, parallel to the dorsal sepal (Dodson 1980, Vázquez & Dodson 1982).

The distribution known for this species has been from Venezuela to Bolivia, from 800 m (Dodson 1980) to 2700 m (Schweinfurth 1960) in elevation. Here it is reported at 350 m, expanding its geographical and elevational range.

Phalaenopsis Blume

Phalaenopsis stuartiana Rchb.f., Gard. Chron., n.s. 16(415): 748. 1881.

TYPE: [Philippines]. "Tropical Asiatic plant. Named in July last in honour of Mr. Stuart Low, of the old firm of Hugh Low & Co., is now in flower at Upper Clapton", *S. Low s.n.* (holotype, W-R). Homotypic synonym: *Phalaenopsis schilleriana* var. *stuartiana* (Rchb.f.) Burb., Garden (London 1871–1927) 22: 119. 1882.

Heterotypic synonyms: *Phalaenopsis schilleriana* var. *vestalis* Rchb.f., Gard. Chron., n.s., 17: 330. 1882. *Phalaenopsis schilleriana* subvar. *vestalis* (Rchb.f.) A.H.Kent in H.J.Veitch, Man. Orchid. Pl. 7: 37. 1891. TYPE: The Philippines, hort. *Low. s.n.* (holotype, W). *Phalaenopsis schilleriana* var. *alba* Roebelen, Gard. Chron., ser. 3, 7: 459. 1890, TYPE: The Philippines, hort. *Low. s.n.* (holotype, W).

Description: Based on *F. Pupulin 9082*.

An epiphytic, fan-shaped, pseudobulbless, pendent *herb* to 22 cm tall excluding the inflorescence. *Roots* thick, flexuous, glabrous, distinctly flattened where adhering to the substrate, 3–7 mm in diameter, silvery white with orange-brown vegetative tips, occasionally forming plantlets on the upper surface. *Stem* short, the upper part completely enveloped by the sheathing bases of the leaf, the base sometimes exposed, about 2 cm wide, partially covered by the papyraceous, dry-fibrous, brownish white remnants of the leaf-sheaths. *Leaves* elliptic to oblong-elliptic, obtusely unequally bilobed, pendent, softly coriaceous to elastic, reddish green mottled with silvery gray, purple on the underside, 8.0–17.0 (40) × 3.3–5.2 cm, narrowed at the base into a short, broad conduplicate petiole less than 1 cm long, articulate with the conduplicate, short leaf-sheath. *Inflorescence* lateral, exerted from the axil of the lower leaves, a simple or paniculate, few- (2) to many- (over 100) flowered raceme, borne erect and becoming arched-pendent at flowering, distinctly longer than the leaves, 17–30 (80) cm long; peduncle terete, slender, purplish brown, to 25 cm long, completely covered by several tightly amplectent, triangular, obtuse, papyraceous, brown bracts to 3 × 3 mm; rachis slightly fractiflex. *Floral bract* papyraceous, pale brown, triangular, acute, *ca*. 5 × 3 mm. Pedicellate *ovary* terete, glabrous, gently curved, white, 3.0–3.6 cm long including the pedicel. *Flowers* spreading, faintly scented, the sepals and petals white, the labellar half of the lateral sepals pale greenish yellow spotted and blotched with brownish red, the lip white with base of the lobes yellow spotted and blotched with brownish red; the column white, the anther white flushed rose. *Dorsal sepal* elliptic to narrowly obovate, obtuse, 2.3–2.7 × 1.2–1.5 cm. *Lateral sepals* asimmetrically lanceolate, obtuse to subacute, 2.4–2.6 × 1.5–1.8 cm, the basal labellar margin reflexed to allow the insertion of the column foot between the sepals. *Petals* rhombic from a narrow cuneate base, obtuse-rounded to subtruncate, narrowly lanceolate-subfalcate, subacuminate, porrect, the apex facing down, 2.4–2.7 × 2.0–2.2 cm. *Lip*

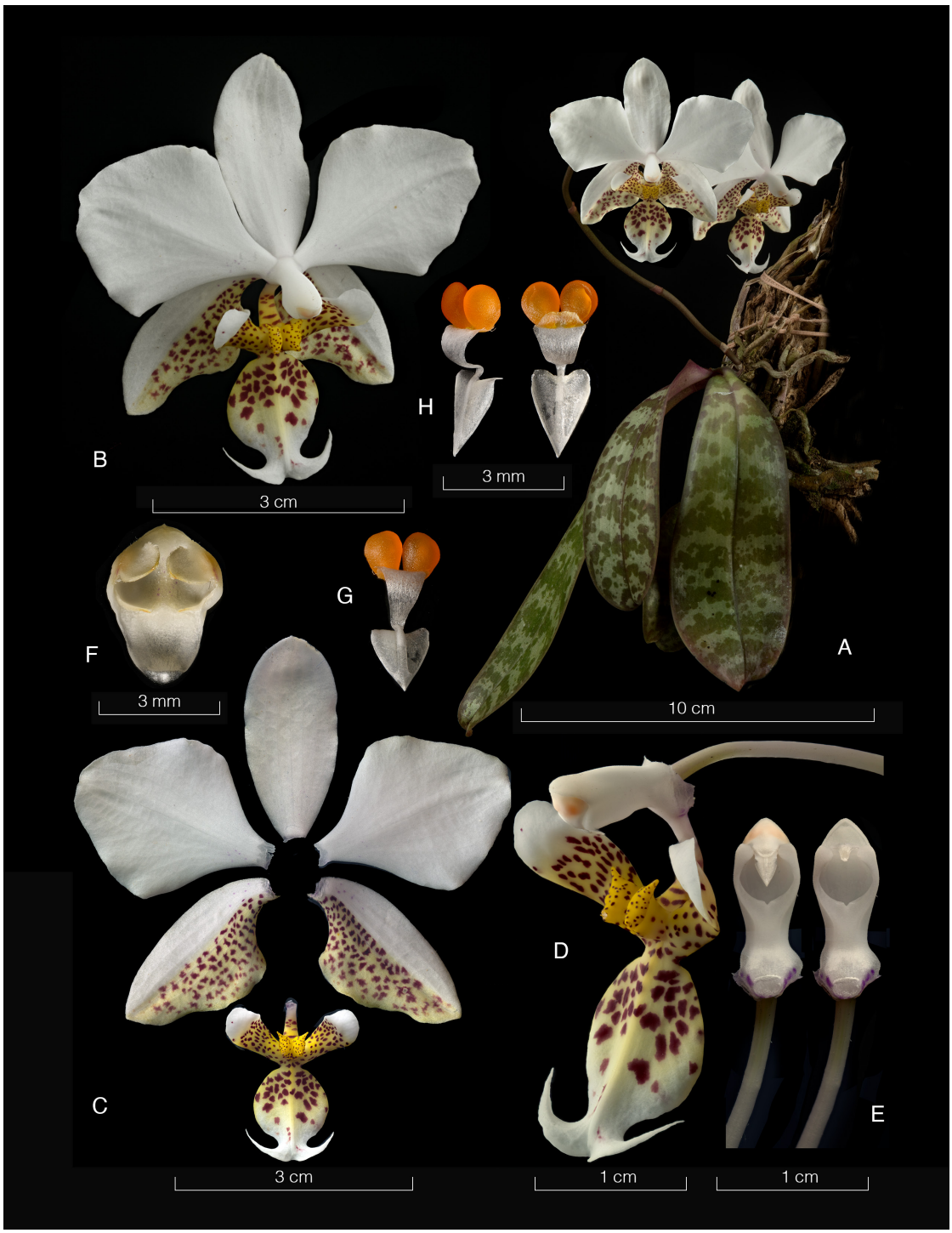

Figure 18. *Phalaenopsis stuartiana* Rchb.f. **A**. Habit. **B**. Flower. **C**. Dissected perianth. **D**. Column and lip, ¾ view. **E**. Column, ventral view (emasculate on the right). **F**. Anther cap. **G**. pollinarium, dorsal view. **H**. Pollinarium, ¾ and ventral views. LCDP prepared by F. Pupulin based on *F.Pupulin 9082* (JBL).

Figure 19. *Phalaenopsis stuartiana* Rchb.f. photographed *in situ* at Bocas del Toro, Panama, on 7 March 2014. Photograph by Jindřiška Vančurová.

3-lobed,1.8–2.0 cm long, 1.6–1.8 cm wide across the lateral lobes; lateral lobes oblong, rounded, erect, *ca*. 1.0 × 0.5 cm; midlobe rounded, with a low longitudinal keel, ending into 2 narrowly triangular, digitiform-falcate, acuminate, retrorse extensions (cirrhi) 7 mm long, 1 mm wide at the base; the disc provided with a umbonate, erect, bilobed, high callus *ca.* 3 × 3 mm, the two halves elliptic, extending toward the rear into a short, pointed apicule *ca*. 1 mm long. *Column* semiterete subclavate, fleshy, 1 cm long, dilated in the middle around the stigma, extended at the base into a narrow, cuneate foot *ca.* 8 mm long; the rostellum a triangular, biparted teeth; the clinandrium triangular, shallow, entire, with a lower rim; the stigma ventral, broadly rounded, deep; the anther incumbent. *Anther cap* deeply cucullate, semi-ovoid, obtuse, 2-celled, the cells protected by subcircular, membranous flaps. Pollinarium composed of two *pollinia*, ovoid, hard, deeply cleft, bright orange, attached by small, lenticular caudicles to a triangular, attenuate, basally truncate, hyaline stipe apically adnate to the cordate-peltate, hyaline visicidium. *Fruit* not seen.

Eponymy: Named in honor of Mr. Stuart Henry Low (1826–1890), of the firm of Hugh Low & Co., at Upper Clapton, England, where the species flowered for the first time in Europe.

Distribution: Native from the island of Mindanao in the Philippines, the species has become naturalized in tropical America, where it has been recorded from the Atlantic coasts of Costa Rica and Panama (Central America), and Suriname (South America).

Habitat in Costa Rica: So far known exclusively from the wet tropical forests of the Caribbean plains, close to the border with Panama, where naturalized populations have been observed growing in secondary vegetation.

Phenology: Flowering in February and March.

Costa Rican material examined. **Limón**: Talamanca, Cahuita, west of Cahuita National Park, between Cahuita and Puerto Vargas, Hone Creek, vicinities of Cacao Trails Tayku, *ca.* 70 m, growing epiphytically (spontaneous) on the trunk of *Cinnamomum sp*. (Cinnamon) tree (Lauraceae), tropical rain forest, secondary vegetation with remnant trees of primary forest, flowered in cultivation and prepared 7 Mar. 2023, *F. Pupulin 9082* & A. Mesén (JBL) (Fig. 18).

Native from the lowlands of the island of Mindanao in the Philippines, where it is endemic, *Phalaenopsis stuartiana* has been anecdotally known for a long time from the Caribbean coast of western Panama, where it escaped from cultivation, and it reproduces from seed in the wild. It was reported from Isla Colón in Bocas del Toro Archipelago (Bogarín *et al*. 2015) and, apparently, from the mangrove vegetation in Bocas del Toro lowlands (*W. M. Whitten 3332*, FLAS; *A. Maduro & E. Olmos 251*, MO 5892639). Only recently, however, photographs of wild specimens of *P. stuartiana* were photographed *in situ* (Hoskovec 2015) (Fig. 19), and the species was formally documented from a specimen collected from a natural population in Bocas del Toro Archipelago (Z. Sarracín, pers. comm. 2019). At least another wild collected plant of *P. stuartiana* is known from the Atlantic coast of South America, where B. B. Teunissen collected it in 1971 at Paramaribo, Suriname, in the framework of a survey carried out by the Suriname Forest Service (*Teunissen LBB12998*, U, with flowers in spirit). This is the first record of a naturalized population of *P. stuartiana* naturalized in Costa Rica. The plant was originally collected by Armando Mesen in hills close to Cahuita, where it belonged to a group of more than 20 plants living epiphytically on several close trees. Flowering in the wild has been recorded in February to May.

Pleurothallis R.Br.

Pleurothallis trigyna Pupulin, ***sp. nov.***

TYPE: Costa Rica. San José: Pérez Zeledón, Páramo, Berlín, Fila Temblor, *ca.* 4 km north of Berlín, road towards the highest part of the Fila, 1807 m, rain premontane forest, epiphytic in secondary vegetation, 4 March 2011, flowered in cultivation and prepared 14 Sep. 2021, *D. Bogarín 8427 et al.* (holotype, JBL) (Fig. 20).

Diagnosis: *Inter speciebus Pleurothallorum sectionis Macrophyllarum-Fasciculatarum, plantae robustae floribus flavis pallentibus labello bicolori, basi rosea pallente apice flavo fulgido, minutae guttulae transparentibus in basi labelli munitis, facile distinguenda.*

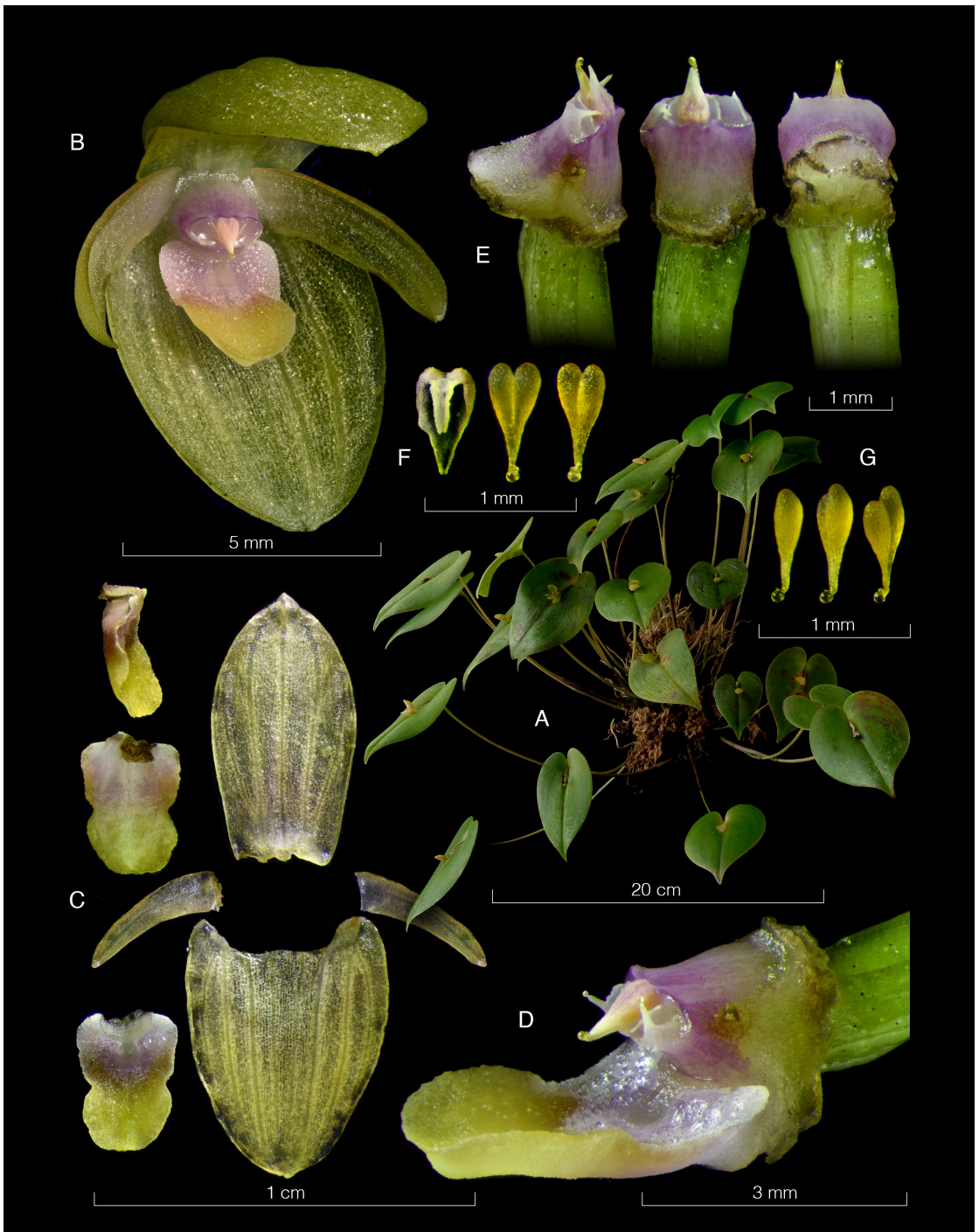

FIGURE 20. *Pleurothallis trigyna* Pupulin. **A**. Habit. **B**. Flower. **C**. Dissected perianth (the lip in ventral, dorsal, and lateral views). **D**. Column and lip, lateral view. **E**. Column in lateral, dorsal, and ventral views. **F**. Anther cap and pollinarium in dorsal and ventral views. **G**. Pollinarium in three lateral views. LCDP prepared by F. Pupulin based on *D.Bogarín 8427* (JBL).

Figure 21. *Pleurothallis* species from Costa Rica that produces droplets at the base of the lip. **A**. *A.P.Karremans 6077*. **B**. *Díaz 237*. **C**. *P. trigyna* (*D.Bogarín 8427*). **D**. *D.Bogarín 9091*. **E**. *D.Bogarín 8739*. Scale bar = 5 mm. All the vouchers at JBL. Photographs by F. Pupulin.

Epiphytic, tall, caespitose *herb*, to about 20 cm tall. *Roots* slender, flexuous, ca. 1.5 mm in diameter. *Ramicauls* 11–18 cm long, enclosed by 2 tubular, obtuse, tightly adpressed, papyraceous, brown sheaths, the first one basal, ca. 2 cm long, the second inserted in the lower third of the ramicaul, 4–5 cm long. *Leaves* coriaceous, pale green, ovate or lanceolate, abruptly acute, the apex minutely excised, 6–8 × 5–6 cm, deeply cordate at the conduplicate base, the basal margins not overlapping, the midvein slightly decurring on the stem. *Inflorescence* with single-flowered coflorescences, exerted from a narrow rectangular, obliquely acute, brown, papery, prostrate spathaceous bract 1.5 cm long; *pseudopeduncle* filiform, ca. 1 cm long. *Floral bract* triangular-ovate, subacute, glumaceous, to 2 mm long. *Pedicel* terete, to 2.5 mm long. *Ovary* terete-subclavate, rounded, stout, to 2.5 mm long. *Flowers* bilabiate, not completely spreading, with the sepals pale yellow, the petals pale yellow faintly suffused with rose at the base, the lip yellow from a pale rose base, the column pink from a greenish white base, the anther white, flushed pink at the base. *Dorsal sepal* oblong, obtuse, abruptly acutiuscule at the apex, with a rounded apicule, 7 × 4 mm, 5-veined. *Lateral sepals* fused into an ovate, obtuse, rounded-apiculate, 7-veined synsepal, 7.0 × 5.5 mm. *Petals* ligulate-down curved, acute with the apex minutely rounded, 4.5 × 1 mm, 1-veined, the base thickened into a low, semircircular callus. *Lip* three-lobed, subrectangular-subpandurate, concave, 3.5 × 2.7 mm, the base subtruncate with a central, semicircular depression, the lateral lobes rectangular-elliptic, papillose, the papillae decurring to the base of the midlobe, the median lobe transversely hemielliptic-ovate, truncate, ca. 2.0 × 2.5 mm; disc with a rounded glenion ca. 0.5 × 0.5 mm, flanked by subacute, protruding calli. *Column* short, thick, conical, dorsiventrally flattened, 1.5 mm long, the clinandrium 3-toothed, the anther dorsal, the stigma apical, bilobed, with two parastigmatic, triangular, acuminate lobes ending in spherical viscidia. *Anther cap* lanceolate, cucullate, minutely papillose, 2-celled. *Pollinarium* composed of two fusiform pollinia, apically attenuate-recurved, and a spherical viscidium. *Fruit* not seen.

Etymology: From the Greek words τρία (*tría*), three, and γυνή (*gunḗ*), female, in allusion to the three rostella and viscidia, which are produced from the stigmatic lobes of the gynostemium.

Distribution: Only known from Costa Rica.

Ecology: The species is known to inhabit the rain and wet premontane and lower montane forests of the Pacific drainage in the Cordillera de Talamanca, at elevations around 1800 m.

Phenology: Flowering from June to October.

FIGURE 22. Column of *Pleurothallis trigyna* Pupulin showing the three rostella with viscidia, only one of which associate to a fertile anther. Photomacrography by F. Pupulin based on *D.Bogarín 8427*.

DISTINGUISHING FEATURES: *Pleurothallis trigyna* can be recognized by the comparatively tall plants for its group, reaching about 20 cm, the very coriaceous-thickened leaves, the solitary flowers not completely spreading, pale yellow, with a pandurate, bicolored lip (basally pale rose, apically bright yellow), the small, rounded glenion flanked by subacute, protruding calli, and the production of a large amount of transparent droplets at the base of the lip. All the flowers of the type specimen, even in different flowering times, are characterized by a gynostemium producing three rostella, each one topped by a spherical viscidium.

During the preparatory work aimed at a systematic revision of the small-flowered *Pleurothallis* of sect. *Macrophyllae-Fasciculate* (Pupulin *et al*. in prep.), one of the most curious novelties to appear was the species proposed here as *P. trigyna*. It belongs to a group of still unpublished species that mostly inhabit premontane and montane forests close to 2000 m elevation. The group is characterized by rather large plants with fleshy leaves and small, often ringent flowers, provided with a rectangular to pandurate lip. Close to its base and around the glenion, the ventral surface of the lip produces a copious number of droplets made of a clear, transparent substance that we have not determined yet as to its chemical properties. Other examples of species in this group are the specimens *M. Díaz 237*, *A.P. Karremans 6077*, *D. Bogarín 9091*, and *D. Bogarín 8739* (all vouches in JBL), which in all probability belongs to another four different taxa (Fig. 21). Among them, *P. trigyna* may be recognized by the pandurate lip, unique in species of *Macrophyllae-Fasciculatae* in Costa Rica, which is pale rose at the base and bright yellow at the apex. The unique characteristic of the specimen used to prepare the holotype of the new species is that the column presents three rostella, each one ending into a spherical viscidium. Only one of the viscidia is completely functional, as it is associated with a fertile anther, from which the apexes of the two pollinia elongate until they become connected to the viscidium, making the pollinarium available for removal by a pollinator (Fig. 22). As we do have only this single specimen available for study,

we refrain from consider this feature as characteristic of the species *per se*, but nonetheless all the flowers of the specimen *Bogarín 8427* present a trigynous column, indicating that this character is genetically controlled.

Specklinia Lindl.

Specklinia echinata (L.O.Williams) Soto Arenas & Solano, Icon. Orchid. (Mexico) 5–6: t. 670. 2002 (2003). Bas. *Pleurothallis fuegi* var. *echinata* L.O.Williams, Ann. Missouri Bot. Gard. 33(1): 120. 1946.

TYPE: Panama. Chiriquí: Volcán de Chiriquí, alt. about 2720 m, 15 Jul. 1938, *M.E. Davidson 981* (holotype, AMES!).

Description: Based on *Karremans 5600* and *Karremans 8822 & I. Chinchilla*.

Plant small, epiphytic, caespitose, up to 5 cm tall including the inflorescence. *Roots* slender, 1 mm wide. *Ramicauls* erect, minute, up to 5–6 mm long, enclosed by 2 thin tubular sheaths. *Leaf* erect, coriaceous, obovate to broadly elliptic, gradually narrowed into a petiolate base, obtuse, apiculate, apically bilobed, 1.2–1.5 × 0.5–0.6 cm. *Inflorescence* with erect, thin, loose, sub-secund, successively muti-flowered flowered coflorescences, up to 4.5 cm long including the pseudopeduncle up to 3.5 cm long; born from the apex of the ramicaul. *Floral bracts* imbricate, involving the ovary and rachis, membranaceous, apiculate, 1 mm, pedicel cylindrical, bent, ovary 0.8 mm long, tricarinate, covered in transparent filiform glands. *Flowers* dimorphic, transparent white with purplish veins and lip or yellow with purplish veins. *Sepals* membranaceous, carinate, glabrous, the dorsal sepal elliptic-oblong, 7.5–9.2 × 2.3–2.5 mm, 3-veined, acute, contracted into a thickened narrow tail. *Lateral sepals* connate to near the middle into a bifid synsepal, each lateral sepal ovate, 7.5–9.5 × 1.8–2.0 mm, 2-veined, acute, narrowing into a thickened tail. *Petals* oblanceolate, obtuse, rounded at the apex, 2.9–3.0 × 0.9–1.1 mm, 1-veined. *Lip* oblong, subtrilobed, rounded-truncate apically, 2.7–3.8 × 1.6–1.8 mm, with a pair of median elevated lobes, delicately hinged to the column foot. *Column* with a pair of subquadrate apical lobes, 2 mm long, the foot as long as the body, stigma ventral. *Anther cap* incumbent, cucullate, white. Pollinarium composed of two *pollinia*, naked flattened. *Fruit* not seen.

Etymology: From the Latin *echinatus*, "spiny like a hedgehog", alluding to the ovary.

Distribution: Known to occur from Mexico to Panama.

Habitat in Costa Rica: Epiphytic on the Pacific watershed of the Cordillera de Talamanca growing in primary oak forest from 2300 to 2500 m.

Phenology: Flowering between June and August.

Costa Rican material studied: **San José**: Dota, Distrito de Copey, Parque Nacional Los Quetzales, 3 km sobre el camino a Providencia desde Ojo de Agua, 2500 m, bosque nuboso montano, 4 ago. 2012, *A.P. Karremans 5600* (JBL-D6073 spirit!; Fig. 23). Dota, Distrito de Copey, Parque Nacional Los Quetzales, 3.5 km sobre el camino a Providencia desde Ojo de Agua, 2300 m, bosque nuboso montano, 25 jun. 2021, *A.P. Karremans 8822 & I. Chinchilla* (JBL-A0780 spirit!; Fig. 24).

Luer (2006) treated *Specklinia echinata* as a synonym of *S. fuegi*. Soto Arenas & Solano (2003) separated the two names based on the larger plants and flowers, reddish, less arcuate, not so neatly 3-lobed lip and shorter claw. Based on the original illustration and description by Reichenbach, it seems that *S. fuegi* has a glabrous ovary and shorter, thicker tails, whereas *S. echinata* has an echinate ovary and long, narrow tails. We follow Karremans *et al.* (2016) in recognizing the two taxa as distinct. Both *S. echinata* and *S. fuegi* have been reported to occur in Mexico, Guatemala, Honduras, El Salvador, Nicaragua and Panama, and although Karremans & Vieira-Uribe (2020) included a photo of the latter from Costa Rica, neither had been formally recorded for the country's flora with a voucher. Here *S. echinata* is described and illustrated based on materials collected on the Pacific slope of the Cordillera de Talamanca. In Costa Rica, plants with smaller yellow flowers grow on the same branch, with plants bearing larger whitish with purple flowers. No specimens agreeing with *S. fuegi* (*sensu* Soto Arenas & Solano 2003) have been recorded for the country.

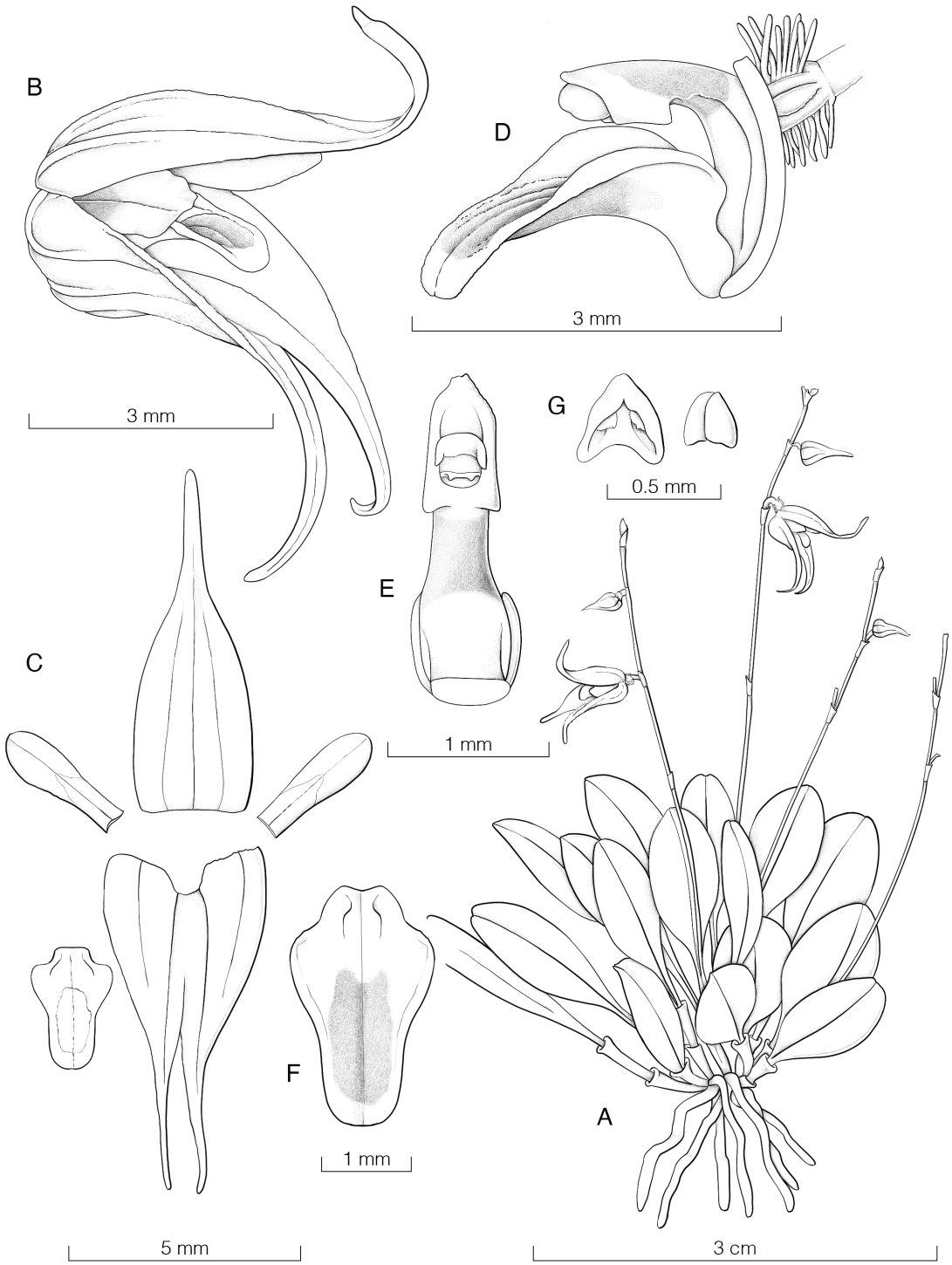

FIGURE 23. *Specklinia echinata*. **A**. Habit. **B**. Flower. **C**. Dissected perianth. **D**. Ovary, column and lip, lateral view. **E**. Column, ventral view. **F**. Lip. **G**. Anther cap and pollinia. Drawn by D. Bogarín and L.Oses based on *A.P.Karremans 5600*.

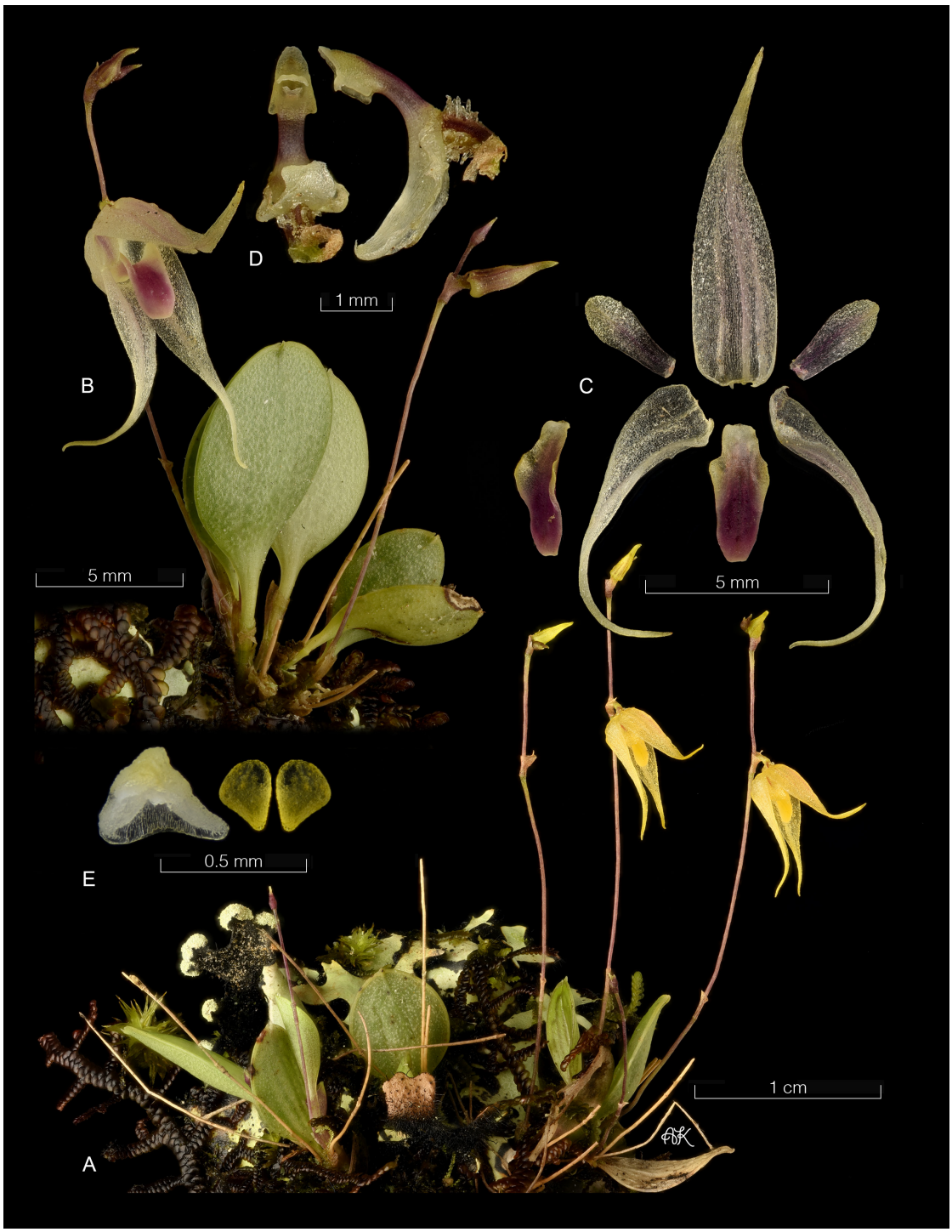

Figure 24. *Specklinia echinata* (L.O.Williams) Soto Arenas & Solano. **A**. Habit with three inflorescences. **B**. Habit with an open flower. **C**. Dissected perianth. **D**. Column and ovary in ventral and lateral views. **E**. Anther cap and pollinia. LCDP prepared by A.P. Karremans based on *A.P.Karremans 8823* (A) and *A.P.Karremans 8822* (B–E).

This species belongs to *Specklinia* subgen. *Sylphia* (Luer) Karremans, a little group of five species which in Costa Rica is represented by *S. absurda* Bogarín, Karremans & Rincón, *S. echinata* and *S. turrialbae* (Luer) Luer (Bogarín *et al.* 2013, Karremans *et al.* 2016).

Stelis Sw.

Stelis veraguasensis Luer, Selbyana 22(2): 126. 2001. TYPE: Panama. Veraguas: alt. *ca.* 500 m, 5 Sep. 1976, *C. Luer & R. Dressler 1235* (holotype, SEL-001096).

Description: Based on *D. Bogarín 10490*

Plant epiphytic, caespitose, erect, up to 32 cm tall. *Roots* slender, flexuous, up to 3.5 cm long, 2 mm in diameter. *Ramicauls* erect, stout, 6–15 cm long, enclosed by 2–3 loose, tubular, obtuse sheaths, 3–5 cm long. *Leaf* elliptic, obtuse, coriaceous, green, 13–18 × 2–5 cm, including the cuneate base narrowing into a petiole 1–2 mm long. *Inflorescence* with erect, compact, distichous, multi-flowered coflorescences, with several flowers open simultaneously, up to 22.5 cm long including the pseudopeduncle 7.8 cm long, from an annulus below the apex of the ramicaul, rachis up to 13.8 mm long. *Floral bracts* greenish to pale beige with age, infundibular, obtuse, 0.3–0.7 mm long. *Ovary ca.* 3 mm long, pedicel 3–4 mm long. Flowers bilabiate, the sepals cream, slightly tinged with fuchsia, the petals fuchsia with a light yellowish-green hue, vinous at the base, the lip vinous, edged in yellowish-green, the yellowish-green, lustrous glenion, the column vinous. *Dorsal sepal* elliptic, obtuse, convex, microscopically papillose, margins microscopically ciliate, connate to the lateral sepals for about 3 mm, 12 × 12 mm, 7-nerved. *Lateral sepals* asymmetrically ovate, obtuse, connate for 10 mm into a broadly ovate broadly ovate, concave synsepal, 11 × 13 mm, 9-nerved. *Petals* broadly overlapping above the column, ovate, cordate, acute, the base narrowly concave, 2.5 × 2.8 mm, 1-nerved. *Lip* ovate, truncate, obtuse, thickened along the margin, the base transversely thickened with a large glenion 1.1 × 0.6 mm, lanceolate, obtuse in contour, hinged to the base of the column, 1.6 × 1.8 mm, 3-nerved. *Column* porrect, stout, non-foot, 1.3 × 1.7 mm, with the anther apical, the stigma apical, bilobed. Anther cap, ovate, abaxially concave, 0.20 × 0.15 mm. Pollinarium composed of two *pollinia*, ovoid, *ca.* 0.10 × 0.07 mm, joined at the base by a rounded viscidium. *Fruit* not seen.

Etymology: Named for Veraguas, the Panamanian province where the type specimen was collected.

Distribution: The species is known from Costa Rica and Panama.

Habitat in Costa Rica: Plants were found growing as epiphytes on the Pacific basin lower montane rain forest, west of the Talamanca Mountain Range, in Las Tablas Protective Zone at 1778 m.

Phenology: Flowered in November under cultivation.

Costa rican material studied: **Puntarenas**: Coto Brus, Sabalito, Zona Protectora Las Tablas, 13 km al noreste de Lucha, sitio Coto Brus, Finca de Miguel Sandí, 1778 m., floreció en cultivo en el Jardín Botánico Lankester, preparado 19 nov. 2013, *D. Bogarín 10490 & D. Jiménez* (JBL-D6150 spirit!, Fig. 25–26).

Stelis veraguasensis is a large, robust plant with a long, multiflowered raceme of large, bilabiate, shell-shaped flowers that open simultaneously. According to Luer (2001), it is similar to *S. lankesteri* Ames, a species from Costa Rica and Panama. However, *S. veraguasensis* is distinguished by having a larger habit (ca. 32 cm *vs.* 20–22 cm) with generally broader leaves (4.0–5.5 cm *vs.* 2.0–2.5 cm), larger sepals (11–12 × 12–13 mm *vs.* 8.0–9.0 × 7.0–7.5 mm), larger petals (2.5 × 2.8 mm *vs.* 2.0 × 2.0 mm), ovate, cordate (*vs.* rhombic) and larger lip (1.6 × 1.8 mm *vs.* 1.0 × 2.0 mm), with a thick v-shaped apical margin, and a short, rounded apiculum.

Telipogon Kunth

Telipogon memoria-rodulfii Pupulin & Bogarín, ***sp. nov.***

TYPE: Costa Rica. Cartago: Casamata del Guarco, 1930 m, epiphytic on short trees in pasture, mostly *Quercus* spp. (Fagaceae), montane cloud forest, 26 March 2002, *F. Pupulin 3557 et al.* (holotype, USJ). (Fig. 27, 28A).

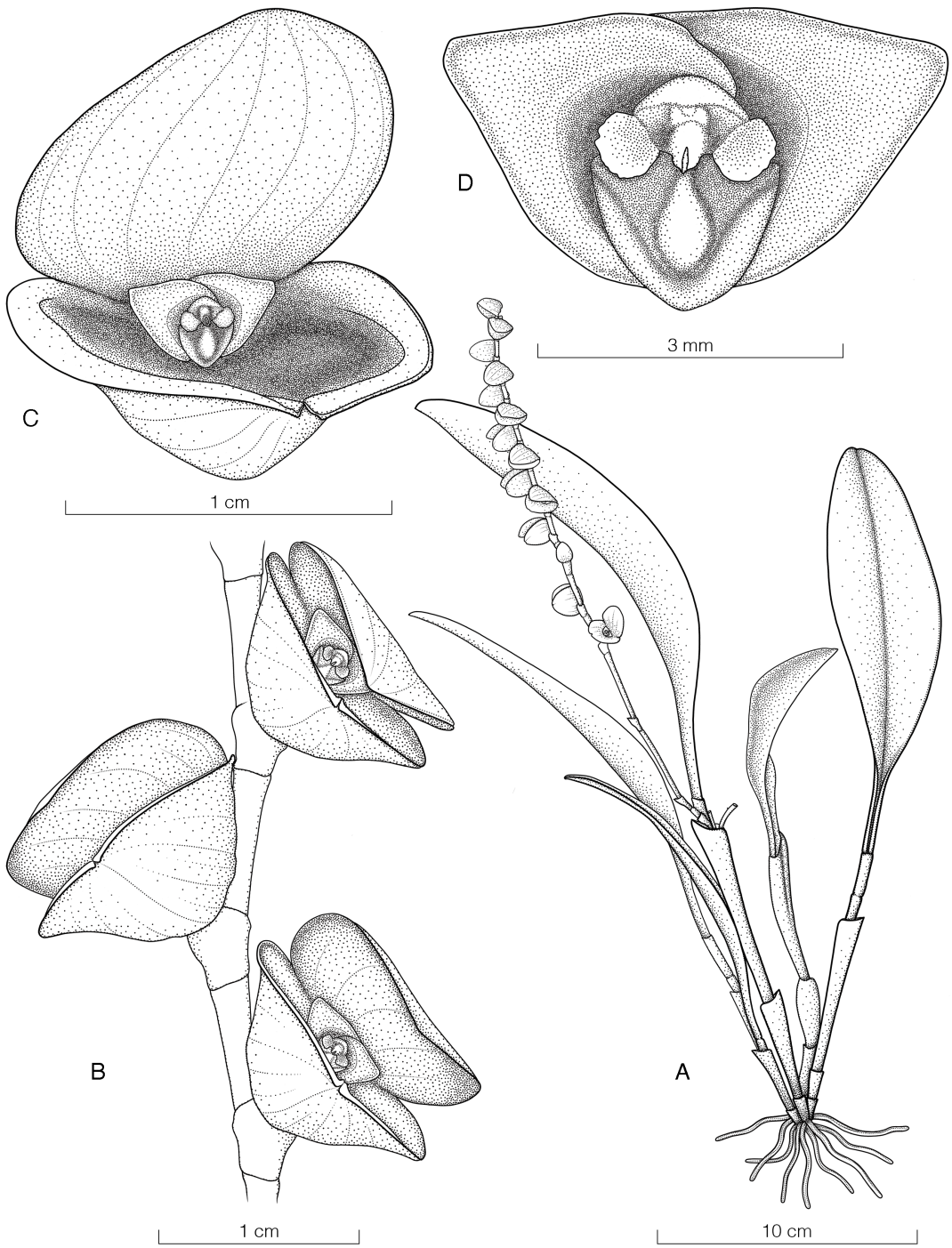

Figure 25. *Stelis veraguasensis* Luer. **A**. Habit. **B**. Portion of inflorescences showing three flowers. **C**. Flower, in natural position. **D**. Sepals, petals, lip and column, frontal view. Drawn by I. F. Chinchilla from *D.Bogarín 10490* (JBL-spirit).

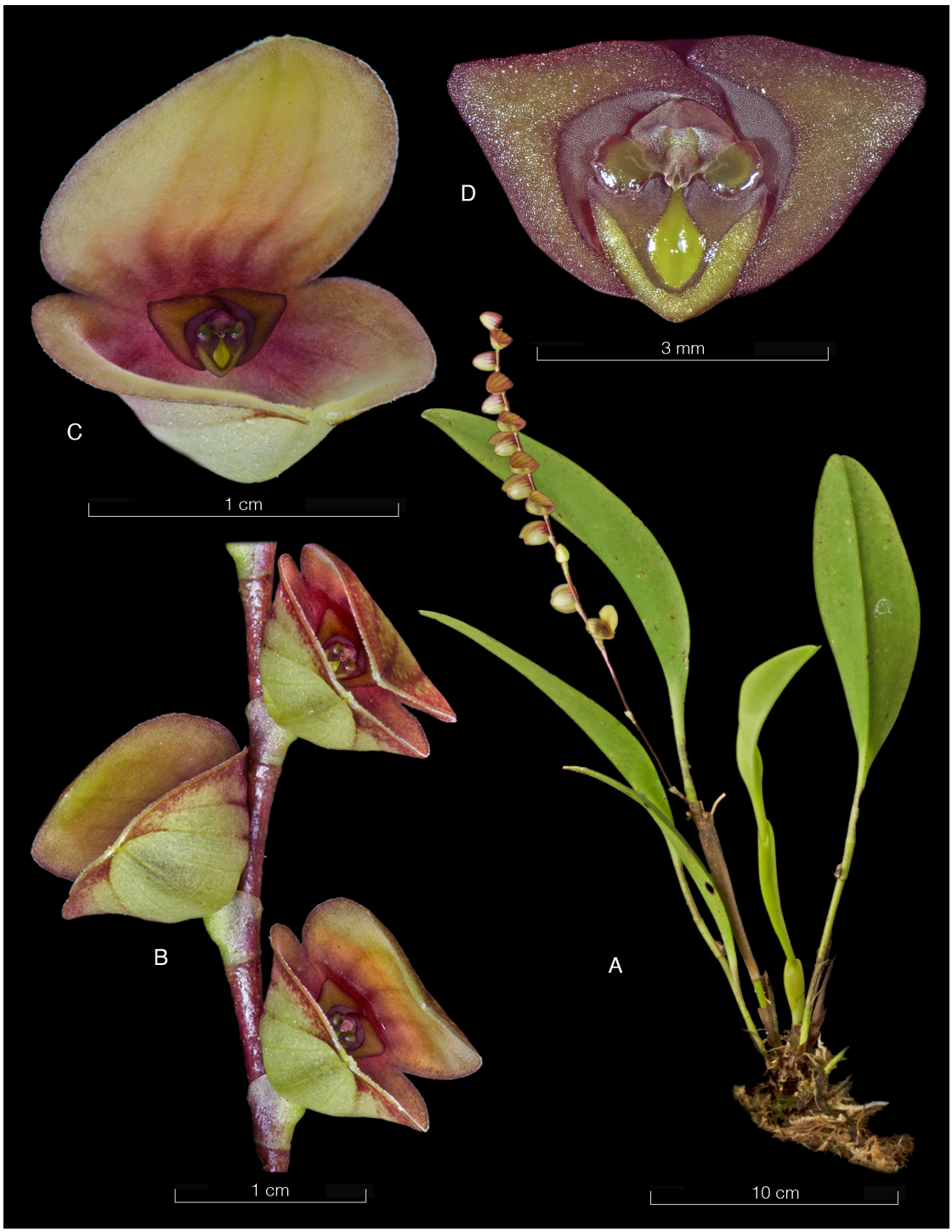

FIGURE 26. *Stelis veraguasensis* Luer. **A**. Habit. **B**. Portion of inflorescences showing three flowers. **C**. Flower, in natural position. **D**. Sepals, petals, lip and column, frontal view. LCDP prepared by I. F. Chinchilla from *D.Bogarín 10490* (JBL-spirit).

Diagnosis: *A Telipogon fortunae Dressler floribus duplo maioribus rosaceis brunneo striatis recedit.*

Epiphytic, small, monopodial *herb* to 5 cm long, including the inflorescence. *Roots* flexuous, numerous, short, to 1.5 mm in diameter, with green apices. *Stem* abbreviated, completely concealed by the base of the amplectant leaf-sheaths. *Leaves* 2, elliptic, acute, gently ribbed on the underside, 4.8–6.6 × 1 mm, sometimes deciduous at flowering. *Inflorescence* lateral, from the base of the stem, a successively 2–3-flowered raceme to 5 cm long, sometimes with a branch about 2.5 cm long in the upper half; the peduncle born terete, slender, becoming dorsiventrally flattened-ancipitous toward the apex, the flattened internodes provided with a triangular, obtuse, weakly keeled, pale green, glumaceous bract at the apex, decurrent on the peduncle; the rachis subtrigonous, straight. *Floral bract* triangular, acute, rigid, strongly conduplicate-keeled, *ca.* 1.5 × 1.0 mm. Pedicellate *ovary* terete-subclavate, rounded in section, 2.5 mm long including the pedicel. *Flowers* non-resupinate, pale rose, the sepals darker, the petals and lip longitudinally striped with pale yellowish brown, the column purple, the anther cap red. *Dorsal sepal* triangular-lanceolate, acute, reflexed, the margins shortly inflexed, 3.5 × 1.4 mm, 3-veined. *Lateral sepals* adpressed, triangular-lanceolate, acute, lightly falcate at apex, 3.3 × 1.0 mm, 1-veined, the margins lightly involute to become adpressed to the apex of the lip. *Petals* lanceolate, acute, 8 × 3 mm, 3-veined. *Lip* lanceolate, acute, slightly reflexed, 6.2 × 2.4 mm. *Column* semiterete, 2.5 mm long, the stigma recessed under a long, narrowly triangular stigmatic lobe, the anther dorsal (facing down in natural position), the rostellum long-attenuated, dilated at apex, far surpassing the apex of the stigmatic lobe. *Anther cap* cucullate, cordate, acute, with two large flaps protecting the pollen. Pollinarium composed of four *pollinia*, discoid-complanate, in two pairs of different size, on a triangular, conduplicate, hyaline stipe and a hook-shaped, brown viscidium. *Fruit* not seen.

Eponymy: From the Latin *memoria*, remembrance, and *Rodulfus*, Rudolf, in the memory of our dear friend, untimely passed away, Rudolf Jenny (1953–2021).

Distribution: Only known from Costa Rica.

Habitat in Costa Rica: The species is known from the Caribbean watershed of the northern portion of the Talamanca Cordillera in Costa Rica, where it inhabits the premontane rain and wet forest around the Tapantí National Park.

Phenology: Flowering in March, May, and October.

Costa Rican material studied: **Cartago**: Cartago, San Francisco, Muñeco, 4.5 km south of Muñeco, road to Alto Belén, 1968 m, premontane rain forest, epiphtic in secondary vegetation and trees in open areas, 27 May 2009, *D. Bogarín 6582 et al.* (USJ) (Fig. 28B). Paraíso, Orosi, Tapantí, Parque Nacional Tapantí, *ca.* 9 km after the gate of the view point, road to Tapantí Hydroelectric Project, *ca.* 100 m after the waterfall, 1694 m, premontane rain forest, epiphytic on twigs of *Saurauia montana* (Actinidiaceae), 26 Aug. 2021, *D. Bogarín 13425 & G. Villalobos* (JBL) (Fig. 28C).

Telipogon memoria-rodulfii is another species belonging to *Stellilabium* sect. *Rhamphostele sensu* Dressler (1999). It is most similar to *T. fortunae* (Dressler) N.H.Williams & Dressler, but the latter has much smaller flowers (all the tepals approximately half in size), and the flowers are yellow or purple (Dressler 1999).

Trichopilia Lindl.

Trichopilia olmosii Dressler, Selbyana 22(1): 11–12. 2001.

TYPE: Panama. Bocas del Toro: region of Culebra, 1000–1200 m, collected by Erick Olmos; flowered in cultivation 4 Aug. 2000, *R. L. Dressler 6288* (holotype, barcode MO-1005420!).

Description: Based on *F. Pupulin 9118.*

An epiphytic, caespitose, pseudobulbous *herb* to 17 cm tall. *Roots* slender, flexuous, glabrous, *ca*. 1.5 mm in diameter. *Rhizome* with short internodes, covered by brown, nervous, papyraceous sheaths. *Pseudobulbs* ovate-oblong, markedly compressed sublenticular, ancipitous, 3.3–4.8 × 1.5–2.1 cm, monophyllous, covered at the base by 2–3 triangular, acute, imbricating sheaths to 3.8 cm long, born

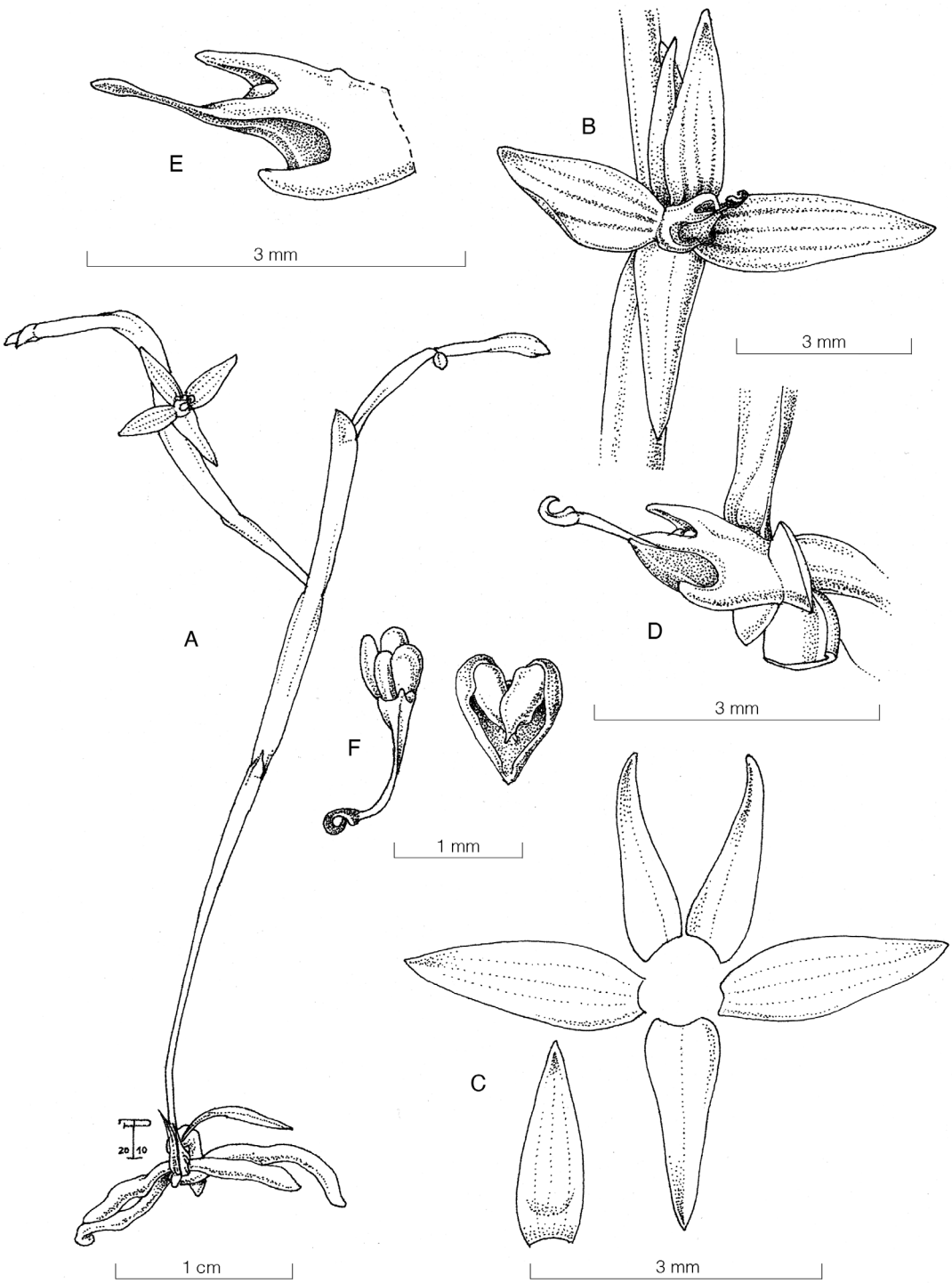

FIGURE 27. *Telipogon memoria-rodulfii* Pupulin & Bogarín. **A**. Habit. **B**. Flower. **C**. Dissected perianth. **D**. Column, lateral view, showing the bases of sepals, petals, and lip. **E**. Column in lateral view, emasculate. **F**. Anther cap and pollinarium. Drawn by F. Pupulin based on *F.Pupulin 3557* (USJ).

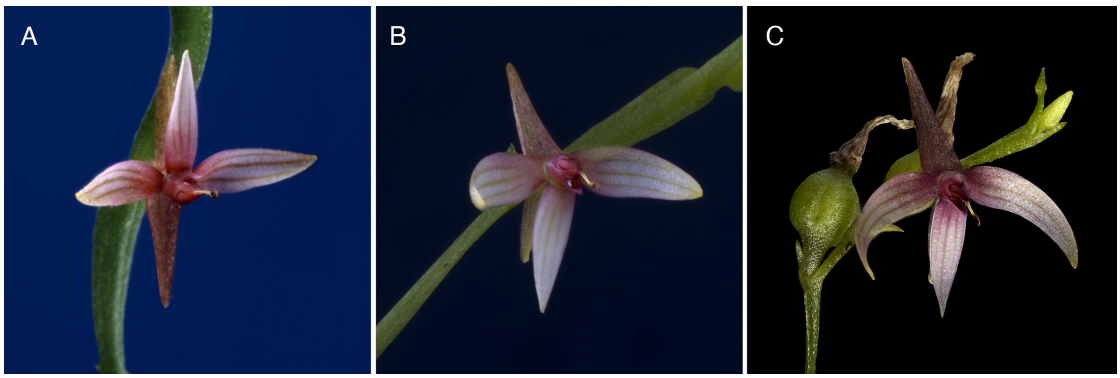

Figure 28. *Telipogon memoria-rodulfii* Pupulin & Bogarín. Vouchers: *F.Pupulin et al. 3557* (A), *D.Bogarín et al. 6582* (B), and *D.Bogarín 13425 & Villalobos* (C).

glumaceous and becoming dry-papyraceous with age, eventually becoming lacerate and dissolving. *Leaves* oblong-elliptic, grass-green, acute to subobtuse, weakly keeled beneath, matte on both surfaces, 10–12 × 3–4 cm, the margins slightly undulated and sometimes recurved, narrowed at the base in a short, folded petiole to 2 cm long, ca 0.5 cm wide. *Inflorescence* a few-flowered (2–5), pendent raceme 6–10 cm long, covered near the base by an amplectent, somewhat loose, glumaceous, tubular bract to 1.7 × 0.5 cm, brownish spotted dark brown. *Floral bracts* glumaneous, greenish brown, narrowly ovate, acute, carinate, 1.4–1.9 × 0.9–1.2 cm. Pedicellate *ovary* terete-subclavate, with deep intercarpellar grooves, 2.4– 2.9 cm long including the pedicel. *Flowers* spreading, with greenish yellow to pale whitish-green spells, the lip white with bright yellow blotches on the callus and the osmophores. *Dorsal sepal* narrowly elliptic, acute, weakly carinate, 2.3–2.7 × 0.5–0.6 cm. *Lateral sepals* narrowly elliptic-subfalcate, short acuminate, weakly carinate, 2.5–2.7 × 0.4–0.5 cm, shortly connate at the base for about 5 mm. *Petals* elliptic-lanceolate, acute-subapiculate, carinate in the distal third, recurved to gently reflexed in natural position, 2.3–2.8 × 0.5–0.6 cm. *Lip* 3-lobed, broadly ovate from a cuneate base, 1.8–2.1 × 1.7–2.0 cm, basally connate to the column for *ca.* 5 mm, the disc provided with a distinct keel *ca.* 8 mm long, reaching the middle of the blade; lateral lobes rounded, erect, encircling the column; midlobe excise, divided in 2 distinct, rounded subquadrate lobes, with slightly waved margins. *Column* terete, abruptly dilated around the stigma, ca. 1.3 × 0.6 cm; the clinandrium cucullate, lacerate; the stigma ventral, broadly elliptic, large, with a distinct rim; the anther incumbent. *Anther cap* cucullate, ovate-subquadrate, obtuse, 2-celled. *Pollinium* composed of two *pollinia*, ovoid, slightly complanate, hard, deeply cleft, on a narrowly triangular, basally marginate, hyaline stipe and an elliptic, orange viscidium. *Fruit* not seen.

Costa Rican material examined. **San José**: Vázquez de Coronado-Moravia, Jesús-San Jerónimo, from Alto La Palma to Bajo La Hondura, *ca.* 10°02'N 83°59'W, 1500 m, premontane rain forest, flowered in cultivation at Jardín Botánico Lankester and prepared 21 Sep. 2023, *F. Pupulin 9118 & G. Villalobos* (JBL, Fig. 29).

Dressler (2001) noted that *Trichopilia olmosii* is morphologically similar to both *T. maculata* Rchb.f. from Panama, and the Costa Rican *Trichopilia turialbae* Rchb.f. *Trichopilia maculata* is easy to distinguish for its oblong-subquadrate pseudobulbs that are closely appressed to the substrate (Dressler 2001), as well as the single-flowered inflorescence, and even though this name has been applied to plants from Costa Rica, El Salvador, and Guatemala, we have never seen a true specimen of *T. maculata* in Costa Rica. We suspect that the species is indeed endemic to central Panama. *Trichopilia turrialbae*, and the similar *T. endresiana* Dressler & Pupulin, have much larger flowers, with lateral sepals connate to about the half of their length, and the lip of both species is distinctly convex in lateral view, unlike the almost straight lip of *T. olmosii*.

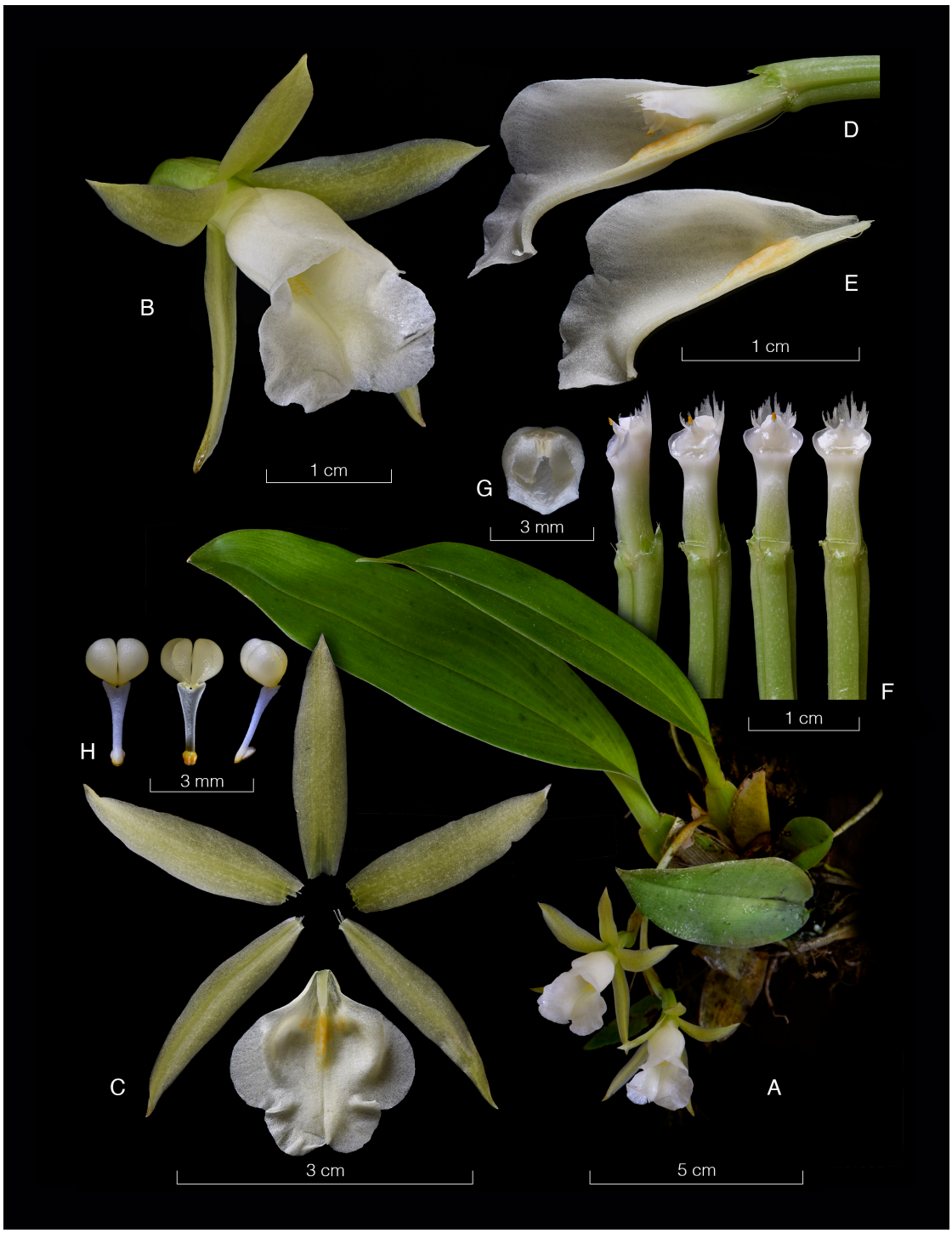

FIGURE 29. *Trichopilia olmosii* Dressler. **A**. Habit. **B**. Flower. **C**. Dissected perianth. **D**. Column and lip, lateral view (the lip in longitudinal section). **E**. Lip section. **F**. Column in several views. **G**. Anther cap. **H**. Pollinarium in dorsal, ventral, and lateral views. LCDP prepared by F. Pupulin based on *F.Pupulin 9118* (JBL).

Additions and corrections regarding the orchid flora of Costa Rica

Omissions and taxa described after the publication of the most recent Costa Rican orchid catalogue (Pupulin *et al.* 2023) are discussed here. The orchid flora of Costa Rica now includes 1695 species and nine forms.

Funkiella valerioi (Ames & C.Schweinf.) Salazar & Soto Arenas, Acta Bot. Mex. 97: 52. 2011.
Bas.: *Spiranthes valerioi* Ames & C.Schweinf., Schedul. Orchid. 10: 8. 1930.
Spiranthes parasitica var. *valerioi* (Ames & C.Schweinf.) L.O.Williams, Ceiba 1: 186. 1950.
Schiedeella valerioi (Ames & C.Schweinf.) Szlach. & Sheviak, Rhodora 92: 16. 1990.
Voucher: *P.C. Standley & J. Valerio 43952* (AMES).
Note: Inadvertently, *Funkiella valerioi* (Ames & C.Schweinf.) Salazar & Soto Arenas and *Schiedeella valerioi* (Ames & C.Schweinf.) Szlach. & Sheviak were listed as accepted names. However, they refer to the same species. The accepted name here is *F. valerioi.*

Karma pusilla (Kunth) Karremans, Harvard Pap. Bot. 28: 67. 2023.
Dendrobium peruvianum F.Dietr. in Neu. Nachtr. Vollst. Lex. Gärtn. 3: 354. 1834., nom. superfl.
Dendrobium pusillum Kunth in F.W.H.von Humboldt, A.J.A.Bonpland & C.S.Kunth, Nov. Gen. Sp. 1: 357. 1816.
Humboltia pusilla (Kunth) Kuntze in Revis. Gen. Pl. 2: 668. 1891.
Pleurothallis pusilla (Kunth) Lindl. in Edwards's Bot. Reg. 28(Misc.): 82. 1842.
Specklinia pusilla (Kunth) Lindl. in Edwards's Bot. Reg. 21: t. 1797. 1835.
Trichosalpinx pusilla (Kunth) Luer in Phytologia 54: 397. 1983.
Tubella pusilla (Kunth) Archila in Revista Guatemalensis 3(1): 62. 2000 publ. 2009.
Voucher: *M. Fernández et al. 911* (JBL-spirit).
Note: This species was previously recorded for Costa Rica but omitted in the catalogue (Pupulin *et al.* 2023). Here we cite a Costa Rican voucher.

Karma todziae (Luer) Karremans, Harvard Pap. Bot. 28: 68. 2023.
Trichosalpinx todziae Luer in Lindleyana 11: 111. 1996.
Tubella todziae (Luer) Archila in Revista Guatemalensis 3(1): 66. 2000 publ. 2009.
Voucher: *C. Todzia 344* (CR).
Note: This species was described from Costa Rica but omitted in the catalogue (Pupulin *et al.* 2023).

Malaxis dressleriana Chinchilla, Karremans & M.A.Blanco, Orchids (West Palm Beach) 92: 609. 2023.
Voucher: *I. Chinchilla et al. 3209* (JBL-spirit).
Note: This species was described after the publication of the catalogue (Pupulin *et al.* 2023).

Maxillariella ponerantha (Rchb.f.) M.A.Blanco & Carnevali, Lankesteriana 7: 529 .2007.
Maxillaria ponerantha Rchb.f., Bonplandia (Hannover) 2: 17. 1854.
Voucher: *P.H. Allen 5328* (SEL).
Note: This species was previously documented in Costa Rica but was unintentionally excluded from the catalogue (Pupulin *et al.* 2023). Although the populations in Costa Rica differ from the original type specimen based on Venezuelan material (*Wagener s.n.*, W), we treat this species under *M. ponerantha* until this taxonomic concept is thoroughly reviewed.

Sarcoglottis woodsonii (L.O. Williams) Garay, Bot. Mus. Leafl. 28(4): 355. 1980[1982].
Voucher: *R. Acuña et al. 3282* (USJ, JBL-spirit).
Note: This species was first documented in Costa Rica by Acuña-Castillo *et al.* (2024).

Telipogon fortunae (Dressler) N.H.Williams & Dressler, Lankesteriana 5: 169. 2005.
Voucher: *I. Chinchilla et al. 3209* (JBL-spirit).
Note: This species was previously recorded for Costa Rica but omitted in the catalogue (Pupulin *et al.* 2023). Here we cite a Costa Rican voucher.

Telipogon lateritius Pupulin, Lankesteriana 24(1): 71–73. 2024.
Voucher: *F. Pupulin et al. 4186* (USJ).
Note: This species was described after the publication of the catalogue (Pupulin *et al.* 2023).

Telipogon muntzii Bogarín, O.Pérez & Pupulin, Lankesteriana 24(1): 73–76. 2024.

Voucher: *D. Bogarín et al. 14185* (JBL-spirit).

Note: This species was described after the publication of the catalogue (Pupulin *et al.* 2023). The epithet honors Dr. Robert Muntz. In the eponymy, the surname was originally stated as Robert Müntz (Bogarín *et al.* 2024), but it should be spelled as Muntz without the umlaut.

Trichosalpinx orbicularis (Lindl.) Luer, Phytologia 54: 396. 1983.

Humboltia orbicularis (Lindl.) Kuntze in Revis. Gen. Pl. 2: 668. 1891.

Pleurothallis orbicularis (Lindl.) Lindl. in Edwards's Bot. Reg. 28(Misc.): 79. 1842.

Specklinia orbicularis Lindl. in Edwards's Bot. Reg. 25(Misc.): 31. 1839.

Voucher: *M. Fernández et al. 65* (JBL-spirit)

Note: This species was previously recorded for Costa Rica but omitted in the catalogue (Pupulin *et al.* 2023). Here we cite a Costa Rican voucher.

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BULBOPHYLLUM LAMPADION (SECTION *MONANTHES*), A NEW SPECIES FROM NEW GUINEA

Jaap J. Vermeulen[1, 4], Malcolm Perry[2] & André Schuiteman[3]

[1]Jk.art and science, Lauwerbes 8, 2318 AT Leiden, The Netherlands.
[2]Malcolm Perry, 298 Park Lane, Bristol, BS36 2BL, United Kingdom.
[3]Herbarium, Royal Botanic Gardens, Kew, Richmond, TW9 3AE, United Kingdom.
[4]Author for correspondence: jk.artandscience@gmail.com

Abstract. *Bulbophyllum lampadion* from New Guinea is herein described and illustrated based on herbarium specimens and cultivated material. This high-elevation species belongs to section *Monanthes*, of which sect. *Oxysepala* is here considered to be a synonym.

Keywords/Palabras clave: Hotspot, Indonesia, Papua New Guinea, sectional classification, sect. *Oxysepala*

Introduction. New Guinea is a remarkable hotspot of *Bulbophyllum* diversity, with approximately 690 recorded species, accounting for nearly a third of the genus' total diversity (De Vogel *et al.* 2024). New species continue to be described (e.g., Saputra *et al.* 2023, Vermeulen & Schuiteman 2021, Vermeulen *et al*. 2018, 2020), with many more expected as previously inaccessible areas are surveyed.

The tiny but colorful and floriferous species to be described below was apparently first collected by Tom Reeve and Tim Rees in 1981 in the Enga Province of Papua New Guinea. It has since been found on a few occasions in other localities in the Enga and Southern Highlands Provinces (Fig. 1). Specimens allegedly from Indonesian New Guinea have entered trade channels.

The sectional classification of *Bulbophyllum* is still in flux. Sampling for phylogenetic studies has been uneven and often insufficient, particularly for groups predominantly found in New Guinea (Vermeulen *et al.* 2014). Based on morphological characters, the new species would be classified in sect. *Monanthes* (Blume) Aver. This classification is primarily based on the trait set, '1-flowered inflorescences with small flowers, connate lateral sepals, absence of node displacement at the base of the pedicel (pedicel node level with the floral bract attachment) and the presence of 2 pollinia (versus 4)'. While connate lateral sepals distinguish this section from sect. *Oxysepala* (Wight) Benth. & Hook.f., this trait is variable in other sections of *Bulbophyllum*. Therefore, following Vermeulen *et al.* (2015), we consider the distinction between sections *Monanthes* and *Oxysepala* to be artificial and prefer to unite them in a single section, for which the name *Monanthes* has priority. In this broader sense, sect. *Monanthes* (long known as sect. *Polyblepharon* Schltr.) includes over 150 provisionally accepted species.

Vermeulen *et al.* (2014) provide a key to the sections of *Bulbophyllum*, where members of sect. *Oxysepala* key out under *Bulbophyllum* sect. *Monanthes*. Vermeulen *et al.* (2015) overlooked that sect. *Monanthes* had priority, and used the name *Oxysepala*, providing descriptions of sect. *Monanthes* (as *Oxysepala*) and its Bornean species, which together offer an impression of the various morphologies within the section. Although members of this section range from the Himalayas to the West Pacific Islands and Australia, most of the species are endemic to the island of New Guinea (De Vogel *et al.* 2024).

De Vogel *et al.* (2024) summarize the published information on the New Guinean species of the section (under section names *Monanthes* and *Oxysepala*). They divide the species with adnate lateral sepals in four convenient, but probably not monophyletic species-groups. These groups are based on combinations of two characters: rhizome creeping versus patent, and presence/absence of auricles near the base of the lip (sect. *Monanthes*, species-groups b to e).

The species described here is classified as a member of sect. *Monanthes* following Vermeulen *et al*. (2014), and according to De Vogel *et al*. (2024) would be placed in species-group c of this section (rhizomes creeping; lip without auricles near the ligament), a species-group with a taxonomy that is complex and largely unresolved.

ORCID of the Author: JJV, AS
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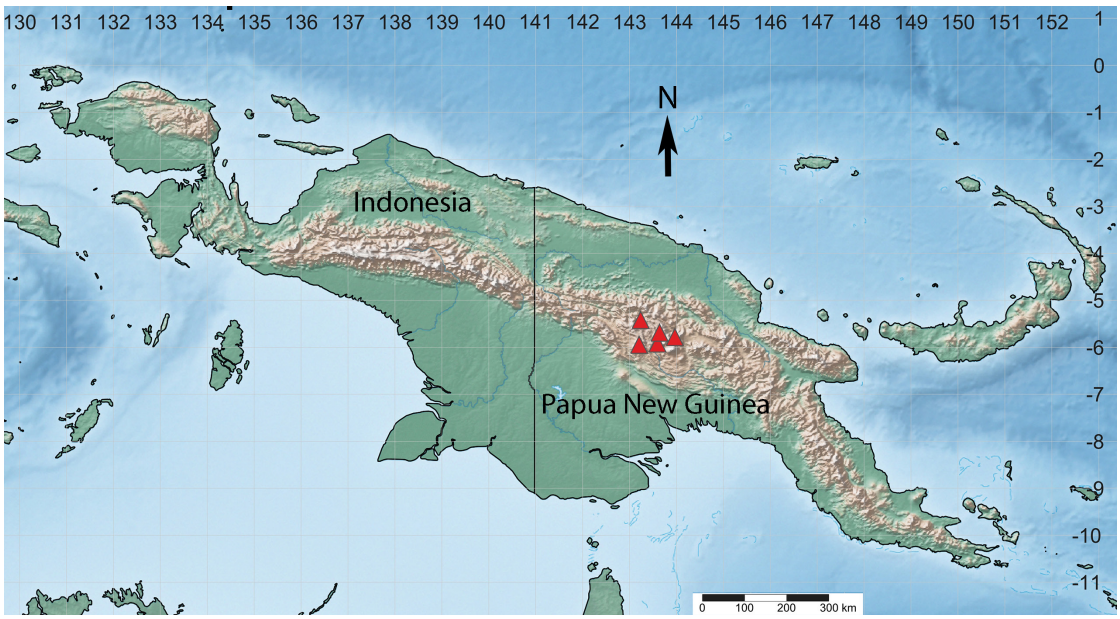

FIGURE 1. Known distribution of *Bulbophyllum lampadion* J.J.Verm., M.Perry & Schuit. in New Guinea.

TAXONOMIC TREATMENT

Bulbophyllum lampadion J.J.Verm., M.Perry & Schuit., ***sp. nov.***

TYPE: Papua New Guinea. Enga Province: Mt. Wambup (S of Laiagam) near Crater Lake, 3450 m, 22 X 1981, *Rees & Reeve 222* (holotype K! K001881923). Fig. 2–4.

DIAGNOSIS: The new species belongs to a small species-group within section *Monanthes* characterized by a creeping rhizome, adnate lateral sepals and the absence of auricles at the base of the lip. Within this species-group, only *B. vutimenaense* B.A.Lewis from Vanuatu shares the combination of a slender peduncle and a minutely papillose lip with *B. lampadion*; the latter differs in particular by the lip, which is not callous distally.

Rhizome creeping or shortly ascending, sparsely branched, 0.8–1.0 mm in diameter, sections between pseudobulbs 1.5–3.8 mm long, rhizome scale fibers not persistent. *Pseudobulbs* minute, (ellipsoid-)cylindrical, 3.5–7.0 × 1.8–2.4 mm, distally grooved but not angular. *Leaves* elliptic to obovate, 0.8–2.4 × 0.24–0.62 cm, ratio length/width 2.6–4.4; acute(-apiculate); petiole 1–2 mm long. *Inflorescences* fasciculate, forming dense, broom-like clusters over time, 1.6–4.4 cm long, 1-flowered. *Peduncle* 1.2–3.7 cm long, scale 1, basal, *ca*. 1.8 mm long. *Floral bract ca*. 2 mm long. *Flowers* non-resupinate; sepals and petals white, distally bright orange; lip yellow, orange-yellow distally; column and anther white. *Pedicel-with-ovary* 0.8–1.2 mm long, basal node level with the floral bract attachment. *Dorsal sepal* free, thin, distally thickened, somewhat recurved, ovate-triangular, *ca*. 3.7 × 1.2 mm, ratio length/width 3.0–3.1; acute, margins entire; glabrous, 3-veined. *Lateral sepals* recurved, adnate along their lower margins, as the median but slightly oblique, *ca*. 3.6 × 1.1 mm, ratio length/width 3.2–3.3. *Petals* thin, distally thickened, porrect or somewhat recurved, ovate, *ca*. 2.8 × 1.1 mm, ratio length/width 2.5–2.6; acute, margins entire, minutely papillose distally, surface glabrous; 1–3-veined. *Lip* curved, sometimes strongly so, particularly halfway along its length, thick, elliptic-ovate, *ca*. 1.2 × 0.7 mm, ratio length/width *ca*. 1.7 (without spreading); obtuse, minutely papillose towards the apex, margins without proximal auricles; adaxially slightly con-

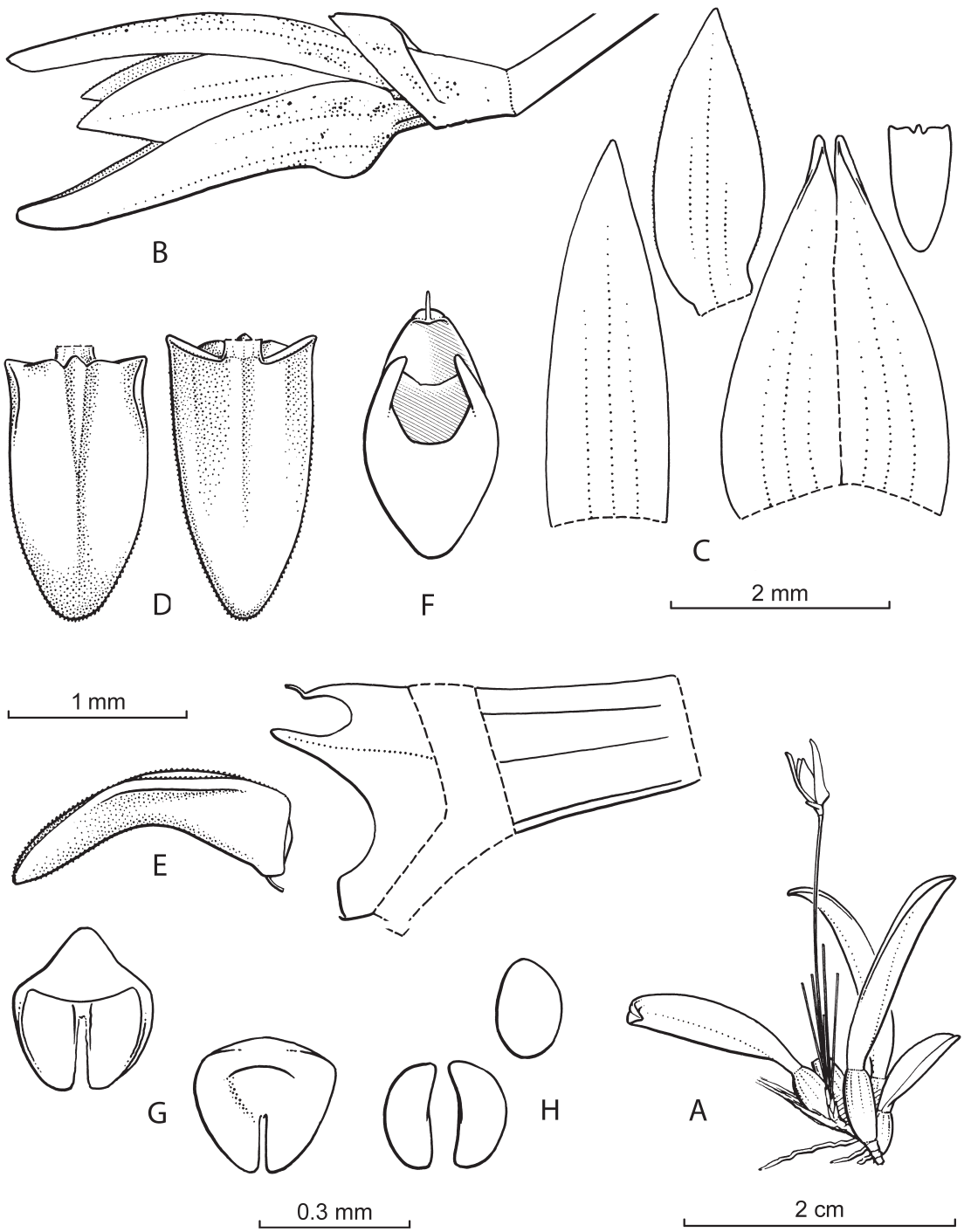

Figure 2. *Bulbophyllum lampadio*n J.J.Verm., M.Perry & Schuit. **A**. Habit. **B**. Flower. **C**. Flower analysis, from left to right: median sepal, petal, lateral sepals, lip. **D**. Lip, left: adaxial side, right: abaxial side. **E**. Column and lip, lateral view. **F**. Column, frontal view. **G**. Anther, left: adaxial side, right: abaxial side. **H**. Pollinia, above: a single pollinium, below: a pair. Illustration by Jaap J. Vermeulen based on spirit material of *Perry 655*.

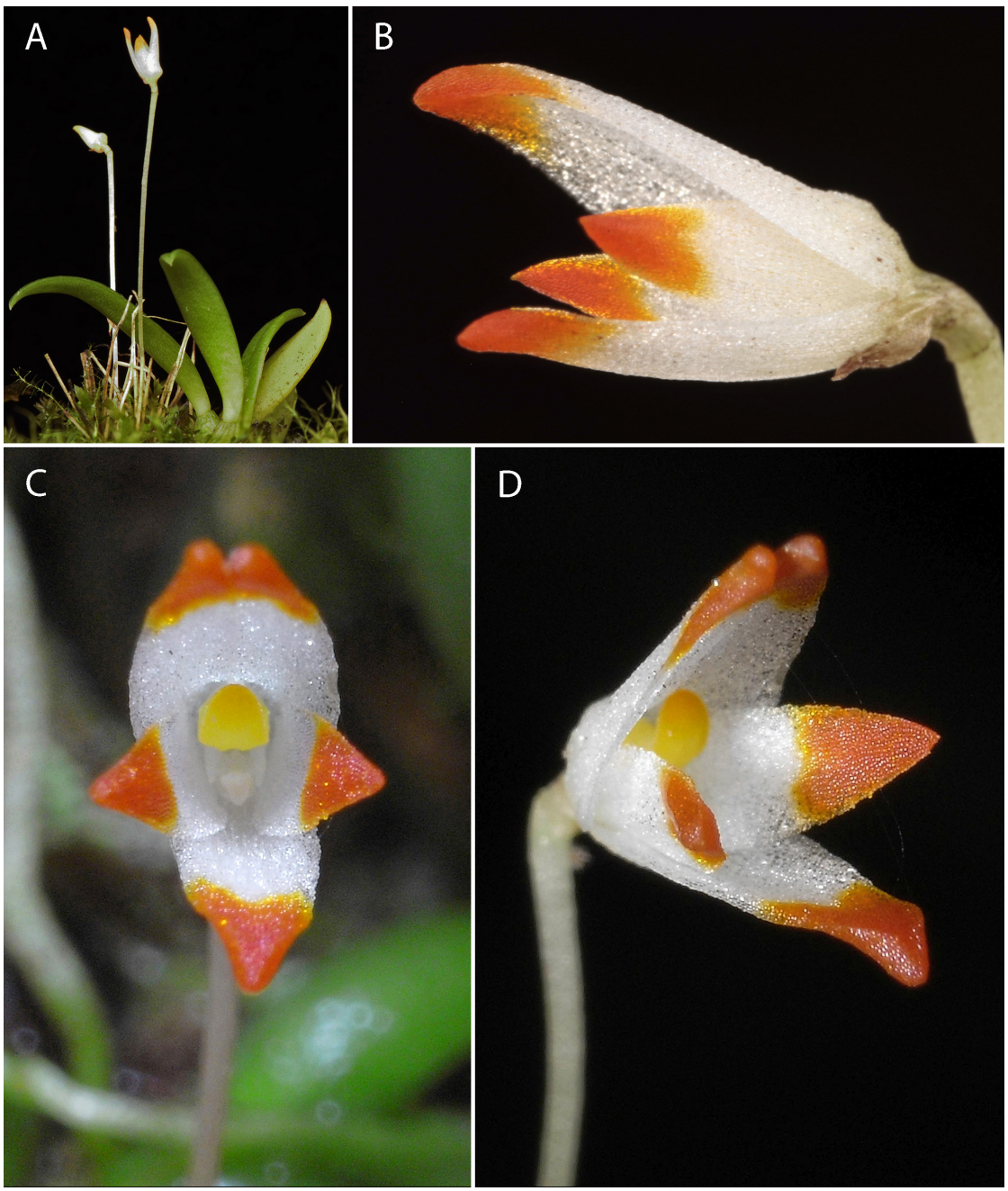

FIGURE 3. *Bulbophyllum lampadion* J.J.Verm., M.Perry & Schuit. **A**. Plant. **B–D**. Flower. From *Perry 655* (A, B), and *Kumul Lodge cult. s.n.* (C, D). Photographs by Malcolm Perry (A, B) and Graham Corbin (C, D).

cave and with a low, obtuse median ridge towards the base, slightly convex towards the apex; abaxially convex near the base, approximately flat elsewhere. *Column* including stelidia *ca*. 0.7 mm long, stigma approx. circular, foot short, not thickened. Stelidia porrect, *ca*. 0.3 mm long, subulate, subacute. *Pollinia* 2 [description mainly after *cult. M. Perry* 655].

FIGURE 4. *Bulbophyllum lampadion* J.J.Verm., M.Perry & Schuit., detail of holotype specimen, *Rees & Reeve 222* (K001881923). Reproduced with permission of the Board of Trustees of the Royal Botanic Gardens, Kew.

ETYMOLOGY: Derived from the diminutive of λαμπάς (ancient Greek) = torch, referring to the brightly colored flowers.

DISTRIBUTION: Papua New Guinea (Enga and Southern Highlands Provinces) and allegedly Indonesia (Papua Province); endemic in New Guinea.

Additional material studied: Papua New Guinea. **Enga Province**: Kandep Range, Laiagam–Kandep Road, 3000 m, 2 VIII 1982, *Reeve 4776* (K! K001881920, LAE); Mt. Maip, Laiagam, Porgera Road, 2700 m, 30 IX 1983, *Reeve 6782* (K! K001881921, LAE); Tomba Pass, *cult. Kumul Lodge s.n.* (photographs by Graham Corbin!). **Southern Highlands Province**: Tari Gap, 2800 m, *cult. Tineke Roelfsema s.n.* (photographs by André Schuiteman!). ?Indonesia. **Presumably Papua Province**: *cult. M. Perry 655* (K!, spirit material).

Habitat and ecology: Epiphyte in upper montane forest margins and on trunks of tree ferns (*Sphaeropteris atrox* (C.Chr.) R.M.Tryon) in subalpine grassland. It occurs at elevations of 2700 to 3450 m.

Phenology: Flowering observed in the wild during August, September, and October.

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Author contributions. JJV and AS wrote the text, JJV created the line drawing, AS created the distribution map, MP provided spirit material and photographs, and commented on the manuscript.

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A NEW SPECIES OF *DENDROBIUM* SECT. *CRINIFERA* (DENDROBIEAE) FROM THAILAND

Henrik Æ. Pedersen[1,2,4] & Somran Suddee[3]

[1]Natural History Museum of Denmark, University of Copenhagen, Gothersgade 130, DK-1123 Copenhagen K, Denmark.

[2]Herbarium, Science, Royal Botanic Gardens, Kew, Richmond TW9 3AE, United Kingdom.

[3]Forest Herbarium, Department of National Parks, Wildlife and Plant Conservation, Chatuchak, Bangkok 10900, Thailand.

[4]Author for correspondence: henrikae@snm.ku.dk

Abstract. A new species of *Dendrobium* sect. *Crinifera* is described from Thailand. The late Peter O'Byrne is appropriately credited for his important preparatory work for our study and for coining the name of the new species, *D. krabiense*. Apparently endemic to southern Thailand, *D. krabiense* is similar to *D. pardalinum* but differs in the lip mid-lobe being distinctly clawed and in the lip ornaments only consisting of two lateral keels that extend from near lip base to claw of mid-lobe. *Dendrobium krabiense* is also similar to *D. phuketense* but differs in having larger, spotted flowers with a proportionally longer mentum. The material here referred to *D. krabiense* was previously misidentified as *Flickingeria pallens* (now considered a synonym of *D. pardalinum*).

Keywords / Palabras clave: *Dendrobium krabiense*, endemism, endemismo, *Flickingeria*, Orchidaceae, sistemática, systematics, taxonomía, taxonomy

Introduction. *Dendrobium* sect. *Crinifera* Pfitzer of 1889 (Pfitzer 1888–1889) was first described as *Desmotrichum* Blume in 1825 (Blume 1825–1826). However, noting that Blume's name was illegitimate, Hawkes (1961) proposed the new generic name *Flickingeria* A.D.Hawkes for this group of species that are distributed from India to Samoa (Lavarack *et al.* 2000). For the next many years, the group was almost consistently recognised as genus *Flickingeria*, but following a series of DNA-based phylogenetic studies demonstrating *Flickingeria* to be nested in *Dendrobium* Sw. (e.g., Burke *et al.* 2008, Yukawa *et al.* 1993, 2000), Schuiteman (2011) advocated the resurrection of *Dendrobium* sect. *Crinifera* to accommodate all the species previously treated under *Flickingeria*. This solution was implemented in Genera Orchidacearum (Pridgeon *et al.* 2014).

Ridley (1896) published a description and proposed the name *Dendrobium pallens* Ridl. for a new species based on material in SING, probably originating from Thailand (for details, see O'Byrne 2019: 55). The species name was illegitimate due to the existence of *D.* ×*pallens* Lawr. ex B.S.Williams of 1894, but Kränzlin (1910) legitimised the epithet when formally recognising Ridley's species as *Desmotrichum pallens* Kraenzl. Hawkes (1961: 457) published the new combination *Flickingeria pallens* (Kraenzl.) A.D.Hawkes. This name became widely accepted for many years, but the true taxonomic identity of Ridley's plant remained unresolved until O'Byrne (2019), based on a thorough morphological analysis of comprehensive material from Peninsular Malaysia, convincingly referred it to *Dendrobium pardalinum* Rchb.f. of 1885.

However, O'Byrne (2019) also realised that Seidenfaden's (1980) interpretation of *F. pallens* was in conflict with the type material and the protologue. He concluded that the more recent collections from Thailand on which Seidenfaden (1980) had based his description and illustrations should be described as a new species. We discussed this issue with Peter O'Byrne shortly before his passing in 2018, and during our correspondence, O'Byrne proposed the name *Dendrobium krabiense* for the new species. Based on our discussion with O'Byrne and our own examination of relevant herbarium material, we agree in his taxonomic finding, considering the undescribed species most morphologically similar to *D. pardalinum* and *D. phuketense* Schuit. & Peter B.Adams. Consequently, we here describe the new species, appropriately crediting O'Byrne for his important preparatory work and for coining the name.

ORCID of the Author: HÆP, SS

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Materials and methods. We examined all material of *Flickingeria pallens* sensu Seidenf. in herbaria BK, BKF, C and K. For checking and characterising the delimitation of the newly described species, we also examined material of *Dendrobium pardalinum* in the same range of herbaria and *D. phuketense* in C and K. Using a ruler and an object micrometer under a low-power binocular microscope for measuring vegetative and floral organs, respectively, we prepared a morphological description of the new species. As a supplement to the herbarium studies, we consulted Seidenfaden's unpublished sketches of relevant taxa in the archive of the Natural History Museum of Denmark.

Taxonomic treatment

Dendrobium krabiense P.O'Byrne ex H.A.Pedersen & Suddee, ***sp. nov.*** (Fig. 1–2).

TYPE: THAILAND. Krabi province: Laem Nang, 16 February 1966, flowering in cultivation 25 June 1977, *Seidenfaden & Smitinand GT 6465* (holotype: C).

Diagnosis: *Dendrobium krabiense* is similar to *D. pardalinum* but differs in the lip mid-lobe being distinctly clawed (*vs*. sessile) and in the lip having two lateral keels extending from near lip base to claw of mid-lobe (*vs*. one median and two lateral keels extending from near lip base to near mid-lobe apex). *Dendrobium krabiense* is also similar to *D. phuketense*, but differs in having larger, spotted flowers with a mentum that is proportionally longer in relation to the dorsal sepal.

Plant lithophytic or epiphytic; rhizome creeping, 1.5–3.2 mm in diameter, with 1–2 internodes, each 3–4 mm long; stems branched, glabrous. *Pseudobulbs* oblong to fusiform, slightly compressed, 2.5–5.5 cm long, 0.5–1.2 cm in maximum diameter, sometimes longitudinally furrowed. *Foliage leaves* subsessile, oblong-lanceolate to lanceolate, 6.5–9.0 × 1.5–2.5 cm, coriaceous, glabrous, apex obtuse and minutely retuse. *Inflorescence* arising adaxially, 1-flowered; peduncle 4–6 mm long, glabrous, enveloped by several scale-like sheaths. *Flower* lasting less than a day; sepals, petals and mentum pale greenish yellow, with purplish markings near base on the dorsal surface, lip white with small purple markings scattered on disk and side lobes, column pale yellow with red dots around the stigmatic cavity, ovary and pedicel yellow. *Sepals* spreading, recurved; dorsal sepal oblong, subacute to obtuse, 10.0–12.5 × 2.5–3.0 mm, glabrous; lateral sepals ovate-lanceolate, subacute to obtuse, 11–13 × 3–4 mm, glabrous, base oblique and broad; mentum at a right angle to ovary, 5–6 mm long, *ca.* 0.5 times as long as dorsal sepal, obtuse. *Petals* spreading, recurved, linear-lanceolate, (sub)acute, 8–10 × 1.5–2.0 mm, entire, glabrous. *Lip* porrect, trilobed, 10–12 mm long, glabrous; disk ornamented with a pair of lateral keels extending from near lip base to claw of mid-lobe where they become undulate lamellae; side lobes erect, incurved, obliquely triangular-ovate, obtuse, entire, apices 6.0–6.5 mm apart when folded down; mid-lobe distinctly clawed (claw broader than long), 7.5–8.0 mm in maximum width, bilobulate with obliquely obovate-oblong lobules measuring 2.9–3.2 × 2.6–3.0 mm, entire, basal margins strongly undulate. *Column* subterete, slightly incurved, *ca.* 3.0 mm long; column foot *ca.* 5.0 mm long. *Ovary* with pedicel semi-fusiform-terete, 3–5 mm long, glabrous.

Additional material examined: THAILAND. **Krabi province**: Koh Ngai. 11 February 1966, flowering in cultivation 26 February 1980, *Seidenfaden & Smitinand GT 6430* (C). Koh Jum. 14 February 1966 (flowering in cultivation 2 October 1966, 26 October 1979), *Seidenfaden & Smitinand GT 6461* (C). Laem Nang. 16 February 1966 (flowering in cultivation 23 June and 26 October 1979, 22 March 1980), *Seidenfaden & Smitinand GT 6465* (C). **Nakhon Si Thammarat province**: Khao Luang. 750–1000 m, 25 January 1966, flowering in cultivation 16 May and 26 October 1979, *Seidenfaden & Smitinand GT 6276* (C). 1000–1350 m, 26 January 1966, flowering in cultivation 30 January 1980, *Seidenfaden & Smitinand GT 6327* (C). Thung Song. 13 February 1929, *Put 2375* (BK, C, K). **Phangnga province**: Takua Pa. 400–500 m, 26 September 1963, *Smitinand & Sleumer 1293* (K). **Satun province**: Satun. *ca.* 50 m. 27 December 1927, *Kerr 464* (BK, K). **Surat Thani province**: Khao Rahu. 1 July 1966, *Sakol 1175* (BK). Tha Kanon. *ca*. 300 m, 15 March 1927, *Kerr 0394* (C, K).

Distribution: Apparently endemic to peninsular Thailand and small nearby islands (Fig. 3). However, as *D. krabiense* occurs close to Thailand's southern border in Satun province, it should also be searched for in the northern part of Peninsular Malaysia.

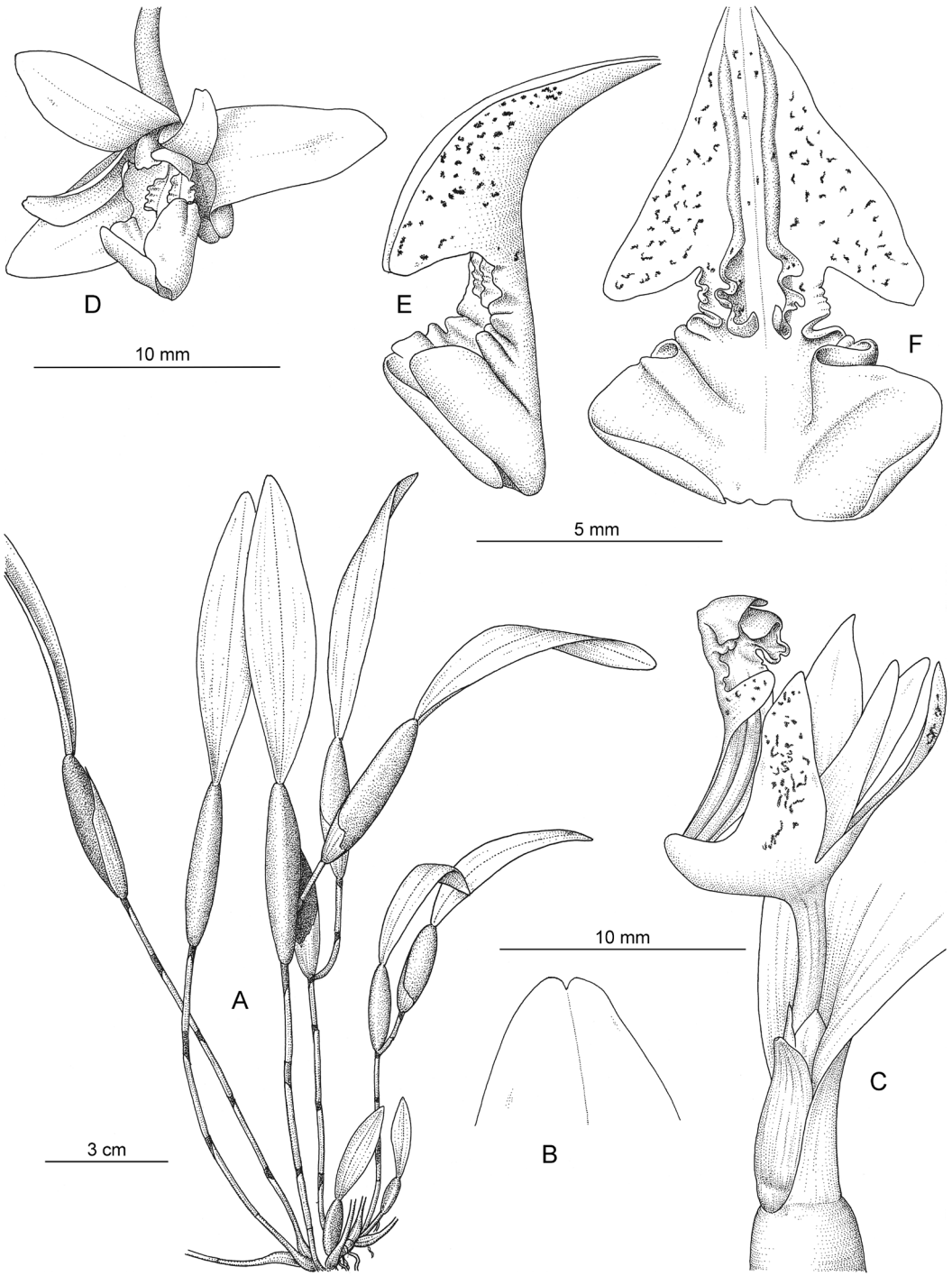

Figure 1. *Dendrobium krabiense* P.O'Byrne ex H.A.Pedersen & Suddee. **A**. Habit. **B**. Leaf tip. **C**. Inflorescence. **D**. Flower. **E**. Lip in side view. **F**. Lip in ventral view, side lobes artificially spread out. Drawn from the type *Seidenfaden & Smitinand GT 6465* (C), *Seidenfaden & Smitinand GT 6327* (A–B) and *Seidenfaden & Smitinand GT 6276* (D–F). Illustration by Poul Juul; previously published in Dansk Botanisk Arkiv 34(1): 38 (1980).

FIGURE 2. *Dendrobium krabiense* P.O'Byrne ex H.A.Pedersen & Suddee. Flower of *Seidenfaden & Smitinand GT 6461*. Photograph by Gösta Kjellsson; previously published in Dansk Botanisk Arkiv 34(1): 96 (1980).

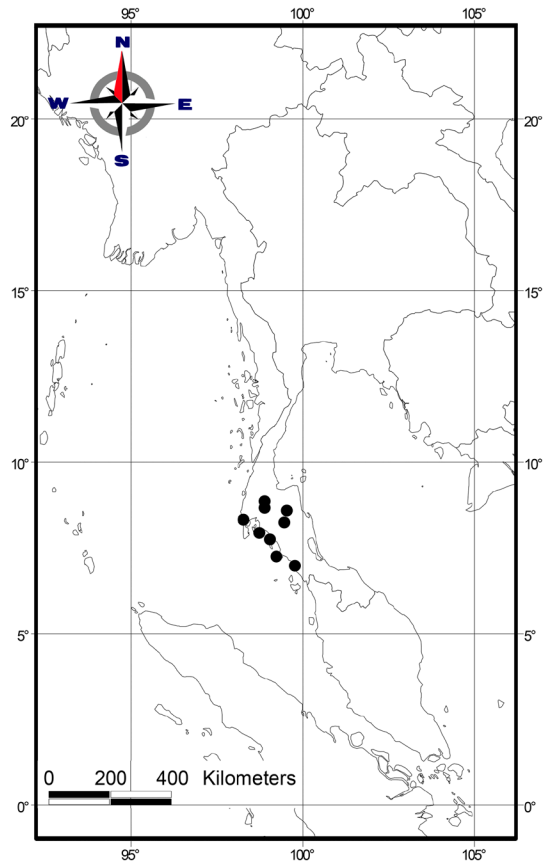

FIGURE 3. The known distribution of *Dendrobium krabiense* P.O'Byrne ex H.A.Pedersen & Suddee. Filled circles indicate individual occurrences documented by herbarium collections.

ECOLOGY: *Dendrobium krabiense* occurs in tropical evergreen rainforest from near sea level to *ca.* 1000 m in elevation. Here, it grows as an epiphyte on trees and as a lithophyte on limestone rocks.

PHENOLOGY: Probably flowering all the year round (flowering recorded in February, March, July, September and December in the wild – in cultivation also in January, May and October).

ETYMOLOGY: Named for Krabi province, the type locality.

ACKNOWLEDGEMENTS. We are indebted to the late Peter O'Byrne for sharing his initial findings and for inviting us to describe the new species. We are also grateful to the curators and staff of herbaria BK, BKF, C and K for their help and hospitality during our studies, and to Anne Lif Lund Jacobsen for facilitating access to the archive of the Natural History Museum of Denmark. Reproduction of Fig. 1 and 2 is in accordance with copyright agreements between the Botanical Museum (now part of the Natural History Museum of Denmark) on the one side and Poul Juul and Gösta Kjellsson on the other.

AUTHOR CONTRIBUTIONS: HÆP conducted supplementary herbarium studies, consulted archive material, participated in the interpretation of the results, prepared the first draft of the manuscript and edited the illustrations. SS conducted most of the herbarium studies, participated in the interpretation of the results, prepared the distribution map and improved the manuscript.

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ADDITION OF FIVE ORCHID SPECIES TO THE FLORA OF BHUTAN

Phub Gyeltshen[1,3], Kinley Rabgay[2], Phuentsho[1], Kezang Tobgay[1] & Pema Namgyel[2]

[1]National Biodiversity Centre, Ministry of Agriculture and Livestock, Serbithang, Thimphu-11001, Bhutan.

[2]Department of Forest and Park Services, Ministry of Energy and Natural Resources, Bhutan.

[3]Author for correspondence: gyeltshenforest@gmail.com

Abstract. Bhutan, situated in the eastern part of the Himalaya Biodiversity Hotspot, is renowned for its rich flora and fauna. This biodiversity is attributed to the country's multiple biogeographic origins, diverse topography, ecological complexity, and varied climatic and soil conditions. However, much of the flora remains under-collected, with many taxa yet to be discovered. From June 2022 to March 2024, floristic studies were conducted in Bhutan, leading to the discovery of five orchid species not previously recorded in the country: *Bulbophyllum crabro*, *B. rigidum, Cymbidium tortisepalum* var. *longibracteatum*, *Galeola cathcartii*, and *Liparis kumokiri*. These species are scientifically documented for the first time in Bhutan. Detailed descriptions, type information, updated global distribution, ecology, and colour plates of the recorded species are provided.

Keywords / Palabras clave: Biodiversidad, biodiversity, distribución, distribution, Orchidaceae, Punakha, taxonomía, taxonomy, Trongsa

Introduction. Bhutan, nestled in the eastern part of the Himalaya Biodiversity Hotspot, harbours a rich flora and fauna. Due to its multiple biogeographic origins, diverse topography, ecological complexity, and a wide range of climatic and soil conditions, it supports a diverse range of floristic complexes (Gyeltshen *et al*. 2023). However, the Bhutanese flora remains under-collected, and many species have yet to be discovered. Numerous plants found in neighbouring regions are not yet recorded in Bhutan, highlighting a significant gap in our knowledge of the country's diverse flora (Gyeltshen *et al*. 2023). Recent advancements in plant systematics call for further investigation into Bhutan's flora.

The checklist of Orchids of Bhutan initially included 369 species, incorporating records from the neighbouring states of Darjeeling and Sikkim in India (Pearce & Cribb 2002). Subsequently, Gurung (2006) published "An Illustrated Guide to the Orchids of Bhutan", listing 419 species. Recent publications, such as "A Century of New Orchid Records in Bhutan" by Dalstrom *et al.* (2017, 2021), have increased the count to 462 species, excluding five uncertain locations and two cases of mistaken identity. There has also been a notable increase in the number of orchid species due to recent discoveries of species new to science and new records for Bhutan. For instance, eight new species (C.Gyeltshen *et al*. 2019, N.Gyeltshen *et al.* 2017, 2020, P.Gyeltshen *et al.* 2020, 2023, Ghalley *et al.* 2022) and 26 new records (Chaida & Tashi 2020, Dechen *et al.* 2020, Dorji *et al*. 2023, P.Gyeltshen *et al.* 2021, Rabgay & Kumar 2019, Rabgay *et al.* 2021, Tobgay *et al*. 2024, Zangpo *et al.* 2021) have increased Bhutan's orchid species count to 493. With the addition of five more species from the current study, the total now stands at 498 orchid species in Bhutan.

Materials and methods. This paper results from floristic assessments conducted in Bhutan between June 2022 and March 2024. While identifying the material, we consulted literature on the regional orchid flora (Averyanov 2011, Chen & Liu 2003, Chen *et al.* 2009, Clayton 2017, Dorji 2008, Gurung 2006, Hooker 1894, King & Pantling 1898, Lucksom 2007, Maekawa 1936, Pearce & Cribb 2002, Seidenfaden 1986, Shankar 2021, Tetsana *et al*. 2019, Vermeulen *et al*. 2014), and we found five orchid species not previously reported from Bhutan. The abbreviation of the author's citation followed the International Plant Names Index

ORCID of the Author: PPG, KR, P, KT, PN

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(IPNI 2024), and the circumscription and terminology adopted for the morphological descriptions followed Pearce & Cribb (2002) and Beentje (2024).

Measurements of the vegetative and reproductive parts were taken *in situ* from at least 5 to 10 randomly chosen flowers of the species. Geographical details such as elevation and geo-coordinates were collected using a Garmin GPS (eTrex 40), and photographs were taken using a digital camera. Micro images were photographed using a Z-stacking microscope at the National Biodiversity Centre in Thimphu, Bhutan. The coloured plates were prepared and edited using Adobe Photoshop software. Distribution data were plotted on a map using QGIS software version 3.16.2 (QGIS Development Team, 2022), and the collected specimens were deposited at the Bhutan National Herbarium (THIM). Descriptions, distribution maps, habitat characteristics of all five species, and colour photographs are provided to aid in accurate species identification and practical conservation efforts.

Taxonomic treatment

Bulbophyllum crabro (C.S.P.Parish & Rchb.f.) J.J.Verm., Schuit. & de Vogel, Phytotaxa 166: 106. 2014. *Monomeria crabro* C.S.P.Parish & Rchb.f., Trans. Linn. Soc. London 30(1): 143 (1874). Lectotype, (designated by Clayton 2017): Fig. 1.
Monomeria barbata Lindl., Gen. Sp. Orch. 61. 1830. *Epicranthes barbata* Rchb.f., Ann. Bot. Syst. (Walpers) 6(2): 265. 1861. Lectotype, (designated by Shankar, 2021): Nepal. Toka, 1821, *Wallich 1978* (K [K000974273 digital image!]: Isolectotype, K [K000974243, K001114839 digital images!]; G [G00434759 digital image!]).

Plant epiphytic or lithophytic, up to 45 cm long. *Rhizome* creeping, stout, woody, 5–7 mm in diam., sympodial, rooting from both current pseudobulbs and rhizomes. *Pseudobulbs* spaced on rhizome by 4–10 cm, ovoid, lemon green, c. 3–5 cm in height, 2.0–3.5 cm in diam., green, shiny when new, moderately shrivelled after flowering, getting flaccid with age. *Leaf* single at apex; petiole, 6–8 cm long; lamina oblong, 16–24 × 3.2–4.0 cm, leathery, glabrous, apex emarginate (mostly symmetrical), base attenuated into petiole. *Inflorescence* racemose, 30–35 cm long, up to 10-flowered, arising laterally from base of pseudobulbs, stout, ascending, dark purple; peduncle, 9–15 cm long, with 2–3 sheaths, 8–10 × 5.5–6.0 mm; floral bracts lanceolate, 4.5–5.0 × 2.0–2.5 mm, glabrous, persistent; pedicel and ovary, 1–2 cm long, ovary grooved, flushed with dark purple colour. *Flower* laxly arranged on inflorescence, 1–2 cm apart; *dorsal sepal* lanceolate, 10–12 × 5.4–5.0 mm, cucullate, adaxially surface brownish colour, abaxial surface yellowish, margin recurved, apex narrowly acute or acuminate, incurved or recurved, 7-veined; *lateral sepals* connate at base, oblong, 15–20 × 6.8–7.5 mm, pineapple-yellow, tinged with brown dots, veined, adaxially densely hispid, abaxially glabrous, margins recurved, apex acute or acuminate, yellow without tinge, base oblique; *petals* oblanceolate, 6–10 × 5–7 mm, adnate to base of column and extended other half adnation to posterior side of foot, margin fimbriate, yellowish with maroon spots or flushed with dark purple. *labellum* panduriform, *ca.* 8 × 5 mm, 3-lobed, deflexed about middle; lateral lobes narrowly falcate (horn-like), *ca.* 3 mm long, yellowish or dark purple; mid-lobe oblong when flattened, *ca.* 5 × 4 mm, glaucous, adaxial surface 4-keeled, base of outer keels merged with lateral lobes and apex with mid lobe, base of inner keels visible at base of labellum, apex converge and connate on mid lobe forming warty structure, flushed with maroon or dark purple, abaxial surface with prominent midrib impression, yellowish-white with pink spots, apex retuse. *Column* rectangular, *ca.* 5 × 4 mm, dilated at the base, obtuse, wings yellow spotted with maroon; column foot rectangular, *ca.* 9 × 4 mm, yellow spotted with maroon; stelidia triangular, *ca.* 2.5 mm long, yellow. *Anther cap* subglobose, *ca.* 2 × 2 mm, abaxially papillose, yellow, apex rounded. *Pollinia* 4, in 2 pairs; stipe terete, *ca.* 0.5 mm long, reddish-orange; viscidium ovoid, *ca.* 0.5 mm long, yellow; pollinarium ovoid, *ca.* 1 mm long, golden yellow.

Phenology: Flowering from September to November.

Habitat: *Bulbophyllum crabro* grows on boulders and as an epiphyte on the main trunks of *Lyonia ovalifolia* (Wall.) Drude, *Rhododendron arboreum* Sm. (Ericaceae), *Quercus griffithii* Hook.f. & Thom-

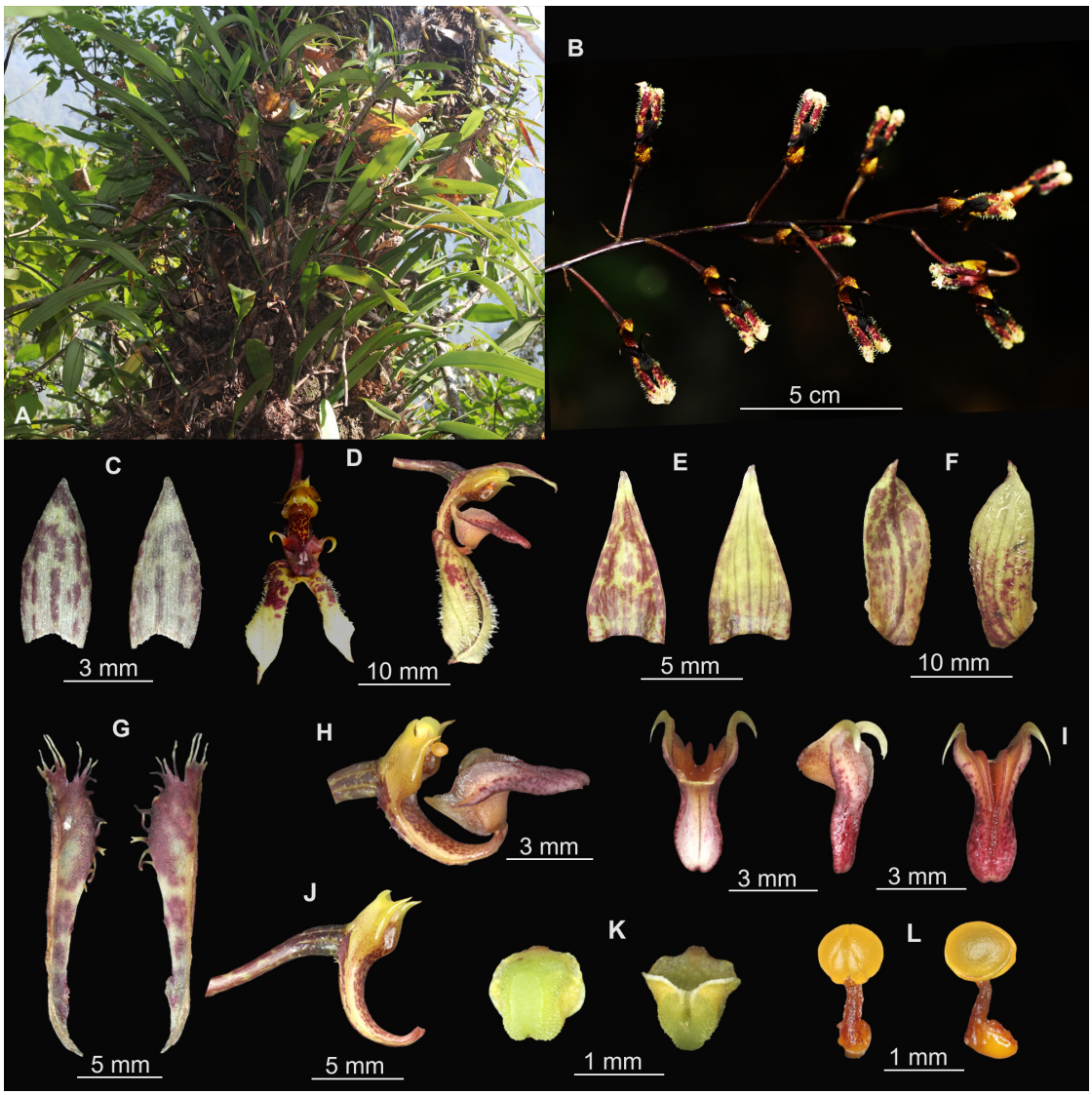

Figure 1. *Bulbophyllum crabro* (C.S.P.Parish & Rchb.f.) J.J.Verm., Schuit. & de Vogel. **A**. Habit. **B**. Inflorescence. **C**. Bracts (abaxial and adaxial view). **D**. Flower (front & lateral view). **E**. Dorsal sepal (abaxial and adaxial view). **F**. Lateral sepals (abaxial and adaxial view). **G**. Petals (abaxial and adaxial view). **H**. Column with labellum and gynoecium attached. **I**. Labellum (abaxial, lateral & adaxial view). **J**. Column. **K**. Anther caps (abaxial and adaxial view). **L**. Pollinia with stipe and viscidium (abaxial and lateral view). Photographs by Kinley Rabgay (A & B) and Phub Gyeltshen (C–L). Illustration assembled by Phub Gyeltshen.

son ex Miq., and *Quercus lanata* Sm. (Fagaceae) in warm broadleaved forests at elevations around 1500–1700 m.

Distribution: The species is distributed in India, China, Malaysia, Myanmar, Nepal, Thailand, Vietnam, and Bhutan (Punakha, Woku-Damchi) (Fig. 6).

Specimen examined: Bhutan. Punakha District: Kabesa Gewog, Woku-Damchi, 17 November 2023, *P. Gyeltshen, D.D. Lama & K. Rabgay 121* (THIM22552!, THIM22553!, THIM22554!, THIM22555!).

Notes: According to Vermeulen (2014), *Bulbophyllum crabro* belongs to *Bulbophyllum* sect. *Monome-*

ria, which is characterized by a creeping rhizome, pseudobulbs that become longitudinally wrinkled with age, racemose inflorescences, flowers with a long column-foot to which the sepals are attached in the apical half, 1-veined, ciliate to erose-fimbriate petals, a mobile and auriculate labellum, stelidia with a winged upper margin, and pollinia attached to a stipe. *Bulbophyllum crabro* differs from other known *Bulbophyllum* species by having spotted petals that are longer than wide, twisted lateral sepals, and long triangular stelidia resembling horns on the column.

Bulbophyllum rigidum King & Pantl., Ann. Roy. Bot. Gard. (Calcutta) 8: 169. 1898. *Bulbophyllum conchiferum* auct. non Rchb.f.: Hooker, Fl. Br. Ind. 1894. TYPE: India. Sikkim, *W.Griffith 5291* (holotype: K-Dist.-image not seen). Fig. 2.

Plant epiphytic, 18–20 cm tall. *Rhizome* thick, covered with fibrous sheaths, 10–13 × 4–5 mm. *Roots* inserted along the rhizome. *Pseudobulbs* small, conical, attenuate. *Leaf* 1; petiole 3–6 cm long; lamina oblong–elliptic, 10–20 × 2.0–3.2 cm, thick, leathery, margin entire, base slightly attenuate, apex subacute. *Inflorescence* erect, arising from the rhizome at the base of the inconspicuous pseudobulbs, laxly 10 to 17 flowered; peduncle slender, 10–13 cm long, deflexed at distal portion while blooming; sheathed, glabrous; sheath lanceolate, 10–14 × 4–5 mm; rachis glabrous, 6–8 cm long. *Flowers* opening from base; *floral bracts* lanceolate, 5–6 × 2–3 mm, pale green, apex narrowly acuminate, glabrous; pedicel and ovary, 2–3 mm long; *dorsal sepal* lanceolate, 5–6 × 4–5 mm, cucullate, broadly acuminate, glabrous, 3-veined*; lateral sepals* oblong, 5.5–7.0 × 2.5–3.0 mm, lower margin connate towards the base, 3-veined, base oblique, apex obtuse; *petals* oblong-lanceolate, 3–4 × 1.0–1.5 mm, margin obscurely denticulate, apex broadly acuminate, 1-veined, 1-lateral short vein. *Labellum* simple, ovate-elliptic, 3.5–4.0 × 2.5–3.0 mm, deflexed in the middle, glabrous, base grooved, apex obtuse. *Column* stout, 1.0–1.3 mm long, pale yellowish-green; *stelidia* 2, unevenly bilobed; column foot, rectangular, *ca*. 2 × 2 mm, adaxially maroon, abaxially pale yellowish-green; anther cap bilobulate 1.0 × 1.4 mm long, depressed. *Pollinia* 2, ovoid, 0.5 mm long. *Seed capsules* unknown.

Phenology: Flowering from September to November.

Habitat: *Bulbophyllum rigidum* is found in warm broadleaved forests at an elevation of 1640 m.

Distribution: The species is distributed in India, Nepal, and Bhutan (Punakha, Rimchu) (Fig. 6).

Specimen examined: Bhutan. Punakha District: Goenshari Gewog, Rimchu,1640 m, 20 November 2023, *P. Gyeltshen, D.D. Lama & K. Rabgay 129* (THIM22564!).

Notes: Pearce & Cribb (2002) included this species in the Orchids of Bhutan based on its occurrence in the neighbouring states of India. The occurrence of the species in Bhutan was highlighted following the publication of *A Century of New Orchid Records in Bhutan* by Dalstrom *et al.* (2017, 2021), but without voucher specimens. Our field survey and specimen collection now provide a detailed description and habitat information for this species in Bhutan.

Bulbophyllum rigidum is most similar to *Bulbophyllum cornu-cervi* King & Pantl. but differs by having a larger habit, ≥ 18 cm tall (*vs*. ≤ 6.5 cm), larger leaves, 8.5–22 × 2–3.4 cm (*vs*. smaller leaves 2–3 × 1–2 cm), lanceolate dorsal sepal (*vs*. oblong), oblong petals (*vs*. lanceolate), and column 1.0–1.9 mm long (*vs*. 0.3–0.4 mm long).

Cymbidium tortisepalum var. ***longibracteatum*** (Y.S.Wu & S.C.Chen) S.C.Chen & Z.J.Liu, Acta Phytotax. Sin. 41(1): 81. 2003. *Cymbidium longibracteatum* Y.S.Wu & S.C.Chen, Acta Phytotax. Sin. 11(1): 31. 1966. *Cymbidium goeringii* var. *longibracteatum* (Y.S.Wu & S.C.Chen) Y.S.Wu & S.C.Chen, Acta Phytotax. Sin. 18(3): 300. 1980. TYPE: China. Sichuan: Cult. Pt., *Y. L. Fee* 2064 (holotype: PE, destroyed). Neotype (designated by Chen & Liu, 2003): China. W. Sichuan, Dujiangyan, *Z.J. Liu 22318* (PE, not seen). Fig. 3.

Plant terrestrial, 30–85 cm tall. *Pseudobulbs* ovoid, 1.5–2.5 × 1.0–1.3 cm, enclosed in leaf bases, and bladeless sheaths. *Roots* thick, 4–8 mm in diam. *Leaves* 5–7, young flexuous, old stiff, lorate, 26–63 × 0.7–1.2 cm, not articulate at the base, margin ser-

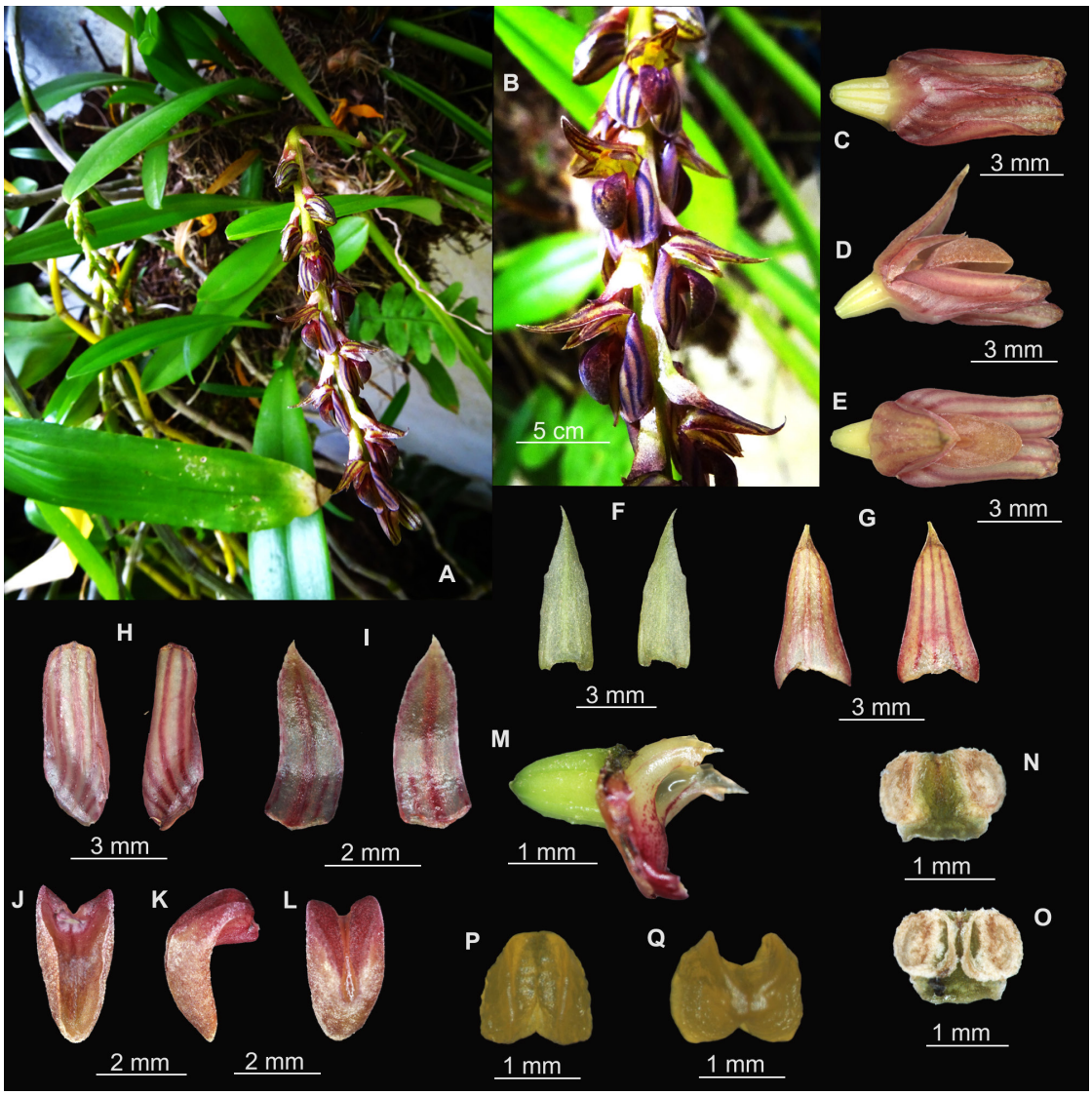

FIGURE 2. *Bulbophyllum rigidum* King & Pantl. **A**. Habit. **B**. Section of inflorescence. **C–E**. Flower (abaxial, lateral & adaxial view). **F**. Floral bract (abaxial & adaxial view). **G**. Dorsal sepal (abaxial & adaxial view). **H**. Lateral sepal (abaxial & adaxial view). **I**. Petal (abaxial & adaxial view). **J–L**. Labellum (abaxial, lateral & adaxial view). **M**. Column and pedicel (diagonal view). **N** & **O**. Anther cap (abaxial & adaxial view). **P** & **Q**. Pollinia (abaxial & adaxial view). Photographs by Kezang Tobgay (A & B) and Phub Gyeltshen (C–Q). Illustration assembled by Phub Gyeltshen.

rulate, apex acuminate. *Inflorescence* arising from near base of pseudobulb, erect, 21–25 cm long; peduncle 12–18 cm long, with several sheaths; rachis 5–8 cm long, 2–5-flowered. *Floral bracts* linear-lanceolate, 28–45 × 4–7 mm, exceeding ovary. *Flowers* scented sepals and petals light pink, labellum creamy with orange-red spots adaxially, glabrous; pedicel and ovary 2.0–2.5 cm long. *Dorsal sepal*, elliptic-lanceolate, 30–35 × 7–8 mm, margin entire, apex acuminate, 7-veined. *Lateral sepals* oblong-lanceolate, 32–35 × 5–6 mm, apex acuminate, 7-veined. *Petals* lanceolate, 23–26 × 8–9 mm, sometimes slightly twisted, apex broadly acuminate or acute, 7–9 veined. *Labellum* not fused to basal

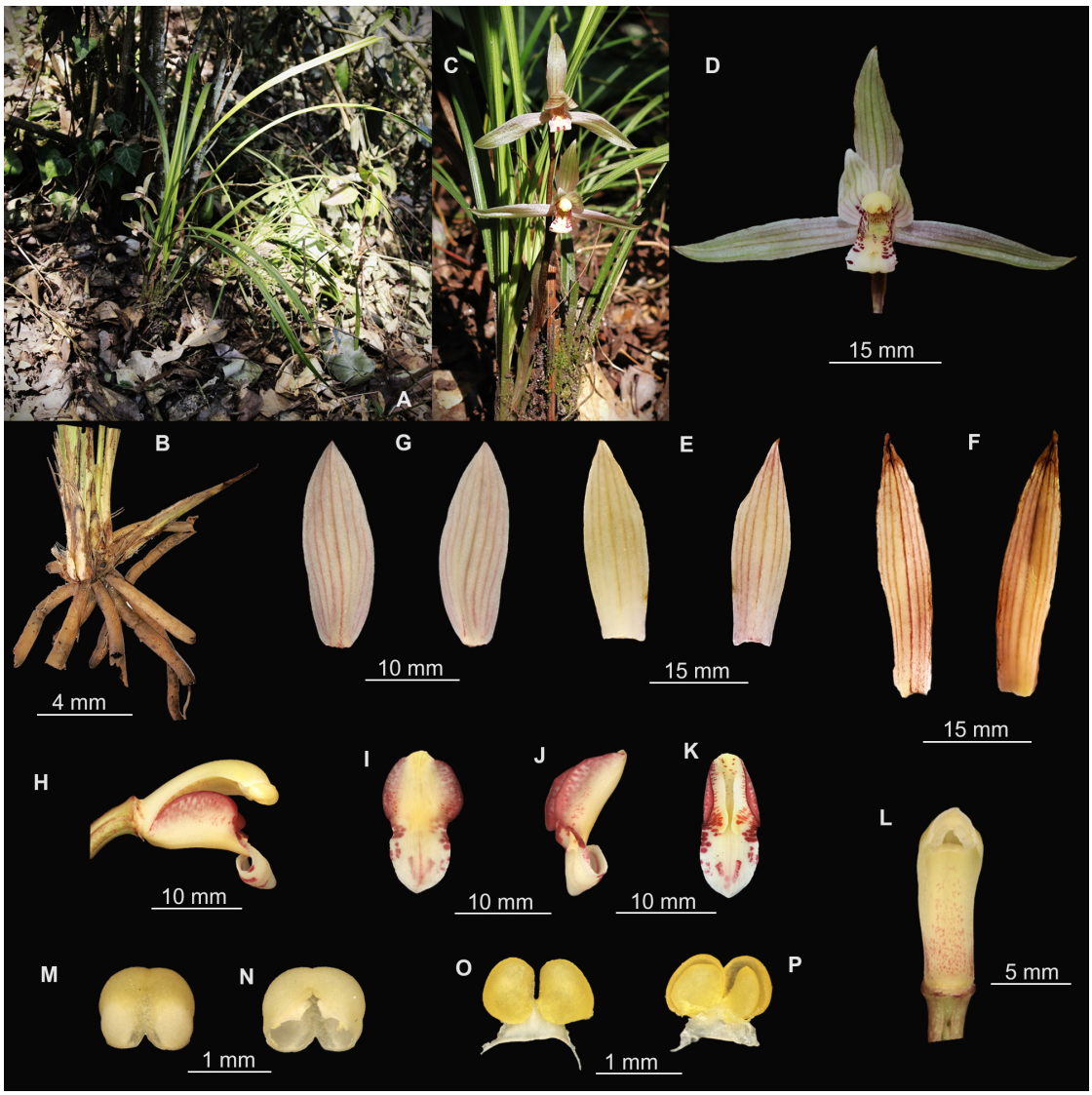

FIGURE 3. *Cymbidium tortisepalum* var. *longibracteatum* (Y.S.Wu & S.C.Chen) S.C.Chen & Z.J.Liu. **A**. Habitat. **B**. Roots. **C**. Inflorescence. **D**. Flower (front view). **E**. Dorsal sepal (abaxial & adaxial view). **F**. Lateral sepals (abaxial & adaxial view). **G**. Petals (abaxial & adaxial view). **H**. Column with labellum and gynoecium attached. **I–K**. Labellum (abaxial, lateral & adaxial view). **L**. Colum (front view). **M** & **N**. Anther cap (abaxial & adaxial view). **O** & **P**. Pollinia (abaxial & adaxial view). Photographs by Kezang Tobgay (A), Kinley Rabgay (C & D) and Phub Gyeltshen (B & E–P). Illustration assembled by Phub Gyeltshen.

margins of column, 3-lobed; mid-lobe broadly ovate or elliptic, 17.0–18.6 × 10–12 mm, recurved in the middle, apex obtuse; lateral lobes small, rounded, incurved; disk with 2 longitudinal callus extending from near the base of lip to the base of mid-lobe. *Column* sub-rectangular and incurved, 13–15 × 3–5 mm, ventrally flat, with minute purplish striations on abaxial surface, apex slightly broadened, with 2 small wings. *Anther cap* suborbicular, 2 × 3 mm, surface colliculate, light yellow. *Pollinia* 4, in 2 pairs, pollinium ovoid, 1.0–1.5 × 1 mm, attached to short and triangular viscidium with elastic caudicles.

PHENOLOGY: Flowering occurs from September to November.

HABITAT: *Cymbidium tortisepalum* var. *longibracteatum* grows in association with *Cymbidium lancifolium* Hook. in warm broadleaved forests at an elevation of 1920 m.

DISTRIBUTION: The species is distributed in China and Bhutan (Punakha, Gangtharmo). Fig. 6.

SPECIMEN EXAMINED: Bhutan. Punakha District: Talo Gewog, Gangtharmo, 1920 m, 15 March 2024, *P. Gyeltshen, K. Tobgay & K. Rabgay 255* (THIM22866!, THIM22867!).

NOTES: *Cymbidium tortisepalum* var. *longibracteatum* is most similar to *Cymbidium cyperifolium* var. *szechuanicum* (Y.S.Wu & S.C.Chen) S.C.Chen & Z.J.Liu but differs in several morphological characteristics. The leaves of *C. tortisepalum* var. *longibracteatum* are not articulate towards the base, whereas those of *C. cyperifolium* var. *szechuanicum* are articulate towards the base. Additionally, the floral bracts of *C. tortisepalum* var. *longibracteatum* exceed the ovary, in contrast to usually exceeding only half the length of the ovary in *C. cyperifolium* var. *szechuanicum*. The sepals and petals of *C. tortisepalum* var. *longibracteatum* are light pink, unlike the dull greenish-yellow or grey-green sepals and petals of *C. cyperifolium* var. *szechuanicum*. It should be noted that *Cymbidium faberi* var. *szechuanicum* is considered a synonym of *C. cyperifolium* var. *szechuanicum* (Chen & Liu 2003)

Galeola cathcartii Hook.f., Fl. Brit. India [J. D. Hooker] 6(17): 89. 1890. *Galeola kerrii* Rolfe ex Downie, Bull. Misc. Inform. Kew 1925(10): 409. 1925. *Galeola siamensis* Rolfe ex Downie, Bull. Misc. Inform. Kew 1925(10): 410. 1925. TYPE: India. Sikkim, icon. *Cathcart s.n.* (holotype: CAL; image of type, K, not seen). Fig. 4.

Plant climbing vine, up to 6 m long. *Stem* fibrous, 0.9–1.5 cm in diameter, rooting at nodes with triangular stem scales, fleshy, 2–3 × 2.0–3.5 cm. *Rhizome* woody; scales ovate to ovate-oblong or triangular scales 2 × 1.5–2.5 cm. *Inflorescence* branching, with branches 16–60 cm long, laxly bearing many flowers, flowering in succession from lowest to the tip, flower buds rusty hairy. *Pedicel and ovary* 1.5–5.0 cm long, rusty hairy. *Floral bracts* fleshy, triangular, 9–12 mm long, apex acute. *Flowers* do not open widely, *ca*. 2.5 cm across, yellow, lip with orange-red veins on sidewalls inside, petals and sepals recurved, apex obtuse, adaxial surface yellow, glaucous, abaxial surface fainted with rusty hairs, petals glaucous. *Floral bracts* triangular, 0.5–1.5 × 0.7–2.5 cm, apex acute. *Dorsal sepal* oblong to oblong-elliptic, *ca*. 20 × 4 mm, apex obtuse. *Lateral sepals*, similar to dorsal sepals, larger, 2.0–2.6 cm long, 0.4–0.6 cm wide. *Petals* oblanceolate, *ca*. 23 × 4 mm, slightly undulate along the upper margin or entire apex obtuse. *Labellum* broadly obovate, 1.6–1.8 × 0.8–1.0 cm, strongly concave, adaxial surface hairy, abaxial surface glabrous, margin irregularly incised and undulate upper half portions, with somewhat rounded or obtuse apex and without short callus near the base. *Column* clavate, 8–10 mm long, nearly straight. *Anther cap* 2 mm wide, reddish-orange. *Pollinia* 2, *ca*. 1 mm long, grooved. *Seed capsules* unknown.

PHENOLOGY: Flowering occurs from June to July.

HABITAT: In Bhutan, *Galeola cathcartii* is found in the semi-shaded area of warm broadleaved forest at elevations between 1400 and 2000 m. Associated include *Ageratina adenophora* (Spreng.) R.M.King & H.Rob. (Asteraceae), *Acer oblongum* Wall. ex DC. (Sapindaceae), *Casearia glomerata* Roxb. (Salicaceae), *Chloranthus erectus* Sweet (Chloranthaceae), *Daphne sureil* W.W.Sm. & Cave (Thymelaeaceae), *Elatostema lineolatum* Wight, *Elatostema platyphyllum* Wedd. (Urticaceae), *Eriobotrya hookeriana* Decne. (Rosaceae), *Neolitsea cuipala* (D.Don) Kosterm. (Lauraceae), *Oplismenus compositus* (L.) P.Beauv. (Poaceae), *Persicaria chinensis* (L.) H.Gross (Polygonaceae), *Piper betleoides* C.DC., *Piper pedicellatum* C.DC. (Piperaceae), as well as *Blumea* sp. (Asteraceae), *Boehmeria* sp. (Urticaceae), *Diplazium* sp. (Athyriaceae) and *Pteris* sp. (Pteridaceae).

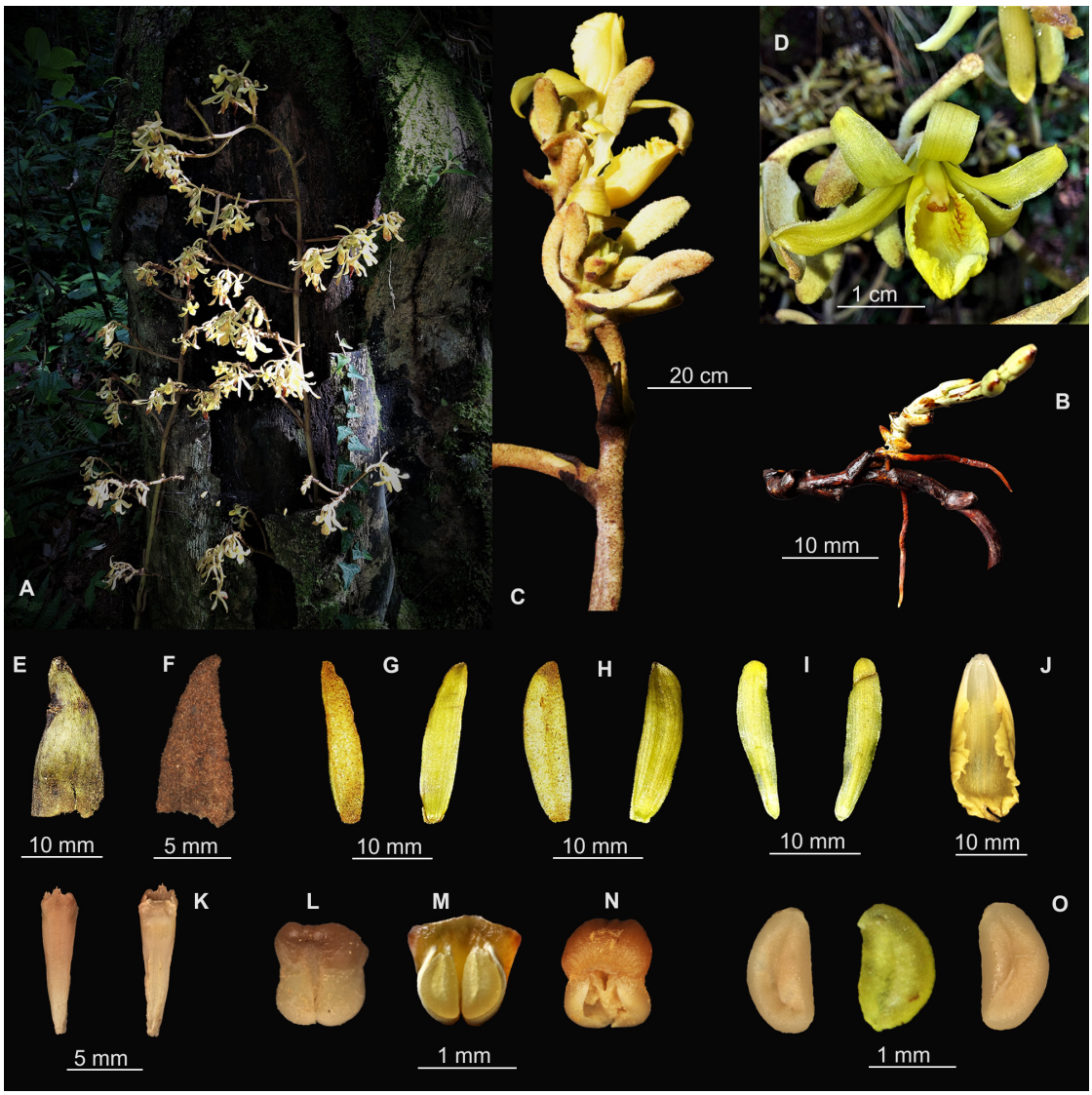

Figure 4. *Galeola cathcartii* Hook.f. **A**. Habit. **B**. Rhizome with inflorescence shoot and roots. **C**. Inflorescence. **D**. Flower (front view). **E**. Stem bract (dorsal view). **F**. Floral bracts (Dorsal view). **G**. Dorsal sepal (abaxial and adaxial view). **H**. Lateral sepals (abaxial and adaxial view). **I**. Petals (adaxial view). **J**. Labellum (adaxial view). **K**. Column (Abaxial and adaxial view). **L–N**. Anther cap (abaxial, adaxial with pollinia attached and adaxial view). **O**. Pollinia. Photographs by Phuentsho (A–E, G–J, M, O-middle) and Kezang Tobgay (F, K, L, N & O). Illustration assembled by Phub Gyeltshen.

Distribution: *Galeola cathcartii* is distributed in India, Thailand, and Bhutan (Trongsa, Wangling). Fig. 6.

Specimen examined: Bhutan. Trongsa Distrct: Langthel, Wangling, 1662 m, 20 July 2022, *Phuentsho & P. Namgyal BTN682* (THIM15891!, THIM15892!, THIM15893!, THIM15894!, THIM15895!, THIM15896!, THIM15897!, THIM15898!, THIM15899!).

Notes: *Galeola cathcartii* is similar to *Galeola nudifolia* Lour. but differs in having oblong sepals (*vs.* lanceolate sepals) and an obovate labellum with a cuneate base (*vs*. suborbicular, cordate).

FIGURE 5. *Liparis kumokiri* F.Maek. **A**. Habitat. **B**. Pseudobulb. **C**. Inflorescence. **D**. Inflorescence (top view). **E** & **F**. Flower (dorsal & lateral view). **G**. Dorsal sepal (Ventral view). **H**. Lateral sepals (dorsal view). **I**. Petals (lateral view). **J**. Labellum (dorsal view). **K**. Column (lateral view). **L**. Anther caps (dorsal and ventral view). **M**. Pollinia (lateral view). Photographs and illustration assembled Phub Gyeltshen.

Liparis kumokiri F.Maek., J. Jap. Bot. 12(2): 95. 1936. *Liparis auriculata* var. *kumokiri* (F.Maek.) M.Hiroe, Orchid Flowers 2: 78 (1971). TYPE: Japan. Hondo: Hitachi Province, Mount Tsukuba, 13 July 1895, *C. Owatari s.n.* (holotype: TI- not seen). Fig. 5.

Plant terrestrial, up to 15 cm tall. *Pseudobulbs* aggregated, ovoid, 2–3 × 2 cm, distally 2-leafed, enclosed several membranaceous sheaths; sheaths ovate-lanceolate, 1–3 cm long, apex shortly subacute. *Leaf* 2; petiole base sheathing, enclosing peduncle, winged, 3–9 cm long; lamina elliptic or ovate-elliptic, 8.5–10.0 × 4.5–5.6 cm, conduplicate, plicate, green, apex obtuse, margin undulate, glabrous. *Inflorescence* terminal, racemose, 5–9 flowered; peduncle slender, 15–18 cm long, green, glabrous. *Floral bracts* trian-

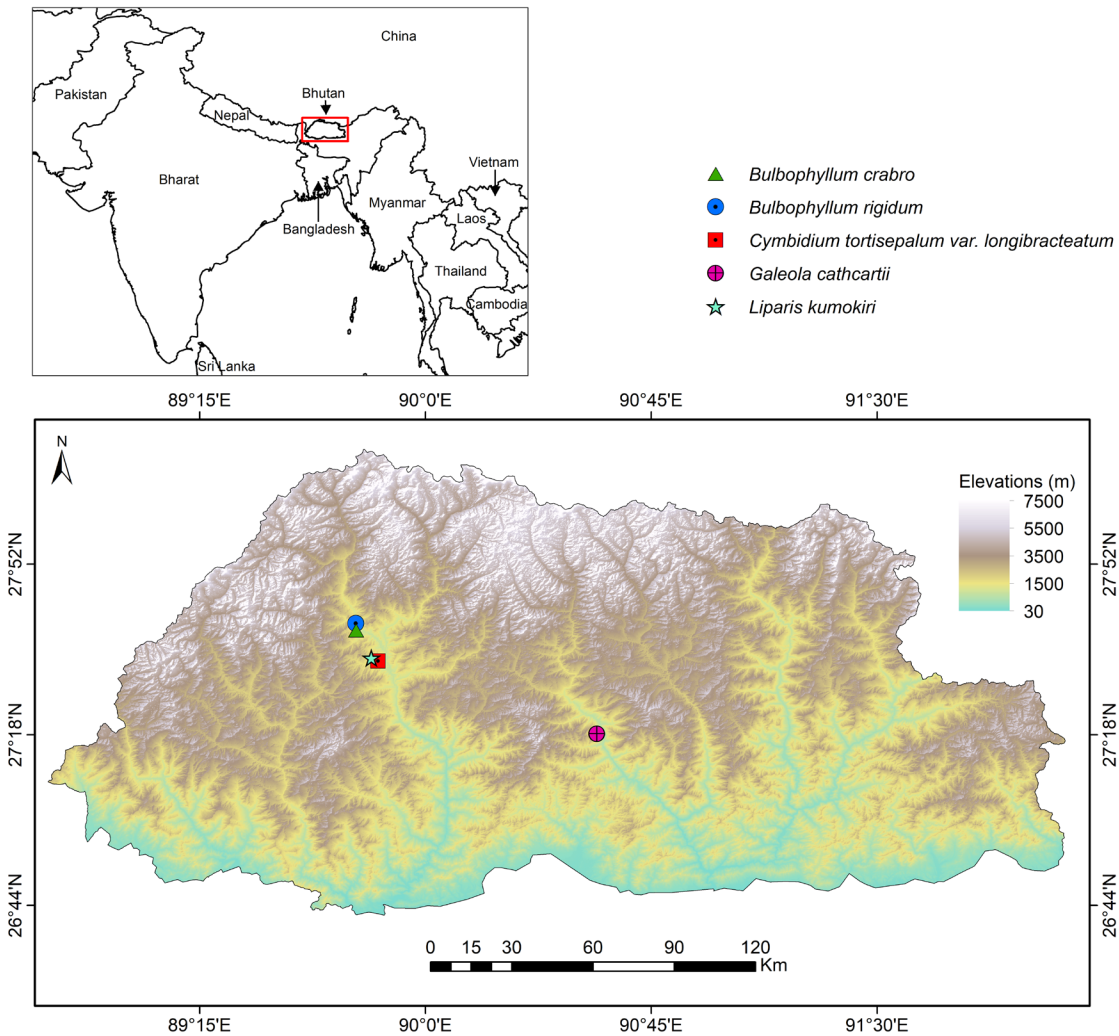

FIGURE 6. Distribution map of *Bulbophyllum crabro*, *Bulbophyllum rigidum, Cymbidium tortisepalum* var. *longibracteatum*, *Galeola cathcartii* and *Liparis kumokiri* in Bhutan. Illustration by Phub Gyeltshen.

gular, *ca.* 2 mm long, apex acute or narrowly acute, green. *Pedicel and ovary* twisted at base, 1.0–1.7 cm long, green. *Flowers* yellowish-green, widely open, labellum green or purple especially in middle. *Dorsal sepal* oblong-lanceolate, *ca.* 10 × 3 mm, apex subacute or obtuse, strongly revolute, yellowish-green. *Lateral sepals* oblong-lanceolate, *ca.* 10 × 3 mm, yellowish-green, slightly oblique, apex subacute, strongly revolute. *Petals* falcate, obscurely oblanceolate when flattened, 9–10 × 1.0–1.5 mm, greenish, apex obtuse, margin strongly revolute, pendulous. *Labellum* obovate, *ca.* 8 × 7 mm, narrowed toward base, apex roundly truncate and mucronate, inconspicuously clawed, strongly recurved from the middle, green. *Column ca.* 5 mm long, incurved, with obtuse wings at apex, much dilated at base, pale-green to white towards the base. *Anther cap* suborbicular, 1.3 × 1.6 mm, 2-celled, cells surrounded by a whitish rim, apex obtuse, not beaked, pale green. *Pollinia* 4 in 2 pairs, ovoid, waxy, yellow. *Seed capsules* clavate, 10–15 × 4–5 mm.

PHENOLOGY: Flowering occurs from June to July, and fruiting from July to September.

Habitat: *Liparis kumokiri* is found in shaded areas of cool broadleaved forests at an elevation of 2400 m.

Distribution: The species is distributed in Russia, Korea, Japan, and Bhutan (Punakha, Pangkarpo) (Fig. 6).

Specimen examined: Punakha District: Talo Gewog, Pangkarpo, 2400 m, 20 June 2022, *P.Gyeltshen & K.Rabgay 136* (THIM22575!).

Notes: *Liparis kumokiri* is most similar to *Liparis cathcartii* Hook.f. but differs by having longer floral bracts *ca.* 2 mm long (*vs*. *ca.* 0.5 mm long), lateral sepals not appressed to lower surface of the labellum (*vs*. appressed to lower surface of the labellum), and a green labellum that is strongly recurved in the middle (*vs.* purple, not curved or slightly curved at the base). It is also similar to *Liparis deflexa* Hook.f. but differs by having an obtuse or subacute leaf apex (*vs.* acuminate) and small erect triangular floral bracts (*vs.* deflexed, lanceolate floral bracts).

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Author contributions. *Research concept and design*. P.Gyeltshen and K.Tobgay. *Collection and/or assembly of data*. P.Gyeltshen, K.Rabgay, Phuentsho, K.Tobgay & P.Namgyel. *Data analysis and interpretation*. P.Gyeltshen, K.Rabgay & K.Tobgay. *Writing the article*. P.Gyeltshen, K.Rabgay, Phuentsho, K.Tobgay & P.Namgyel. *Critical revision of the article*. P.Gyeltshen & K.Tobgay. *Final approval of article*. P.Gyeltshen, K.Rabgay, Phuentsho, K.Tobgay & P.Namgyel.

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Outer floral bract. E. Inner floral bract. F. Petal. G. Column, profile view (left) and 3/4 dorsal view (right). H. Pollinarium. (Drawn from the holotype). Illustration by Who Nobody. Figure 2. *Luisia inedita*. A. Habit. B. Fruit (Somebody 567, CR). Illustration by Who Nobody. Note that labels on the figure ("A") should be in upper case and match that on the legend. Italicize the collector's name and number.

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LANKESTERIANA, the International Journal on Orchidology, has been dedicated to publishing articles focused mainly (today exclusively) on orchid science, spanning a wide variety of topics, including anatomy, ecology, evolution, history, physiology, phylogenetics, and systematics. Founded in 2001, LANKESTERIANA is hosted by the University of Costa Rica. The first issue published on the 15th of May, 2001, with the support of Jorge Warner, former Director of Lankester Botanical Garden, and Franco Pupulin, its inaugural Editor in Chief, was funded by Brian Holley from Cleveland Botanical Garden. The journal's early years were marked by enthusiasm and rapid growth despite initial challenges in distinguishing itself from other botanical journals. However, it quickly gained recognition within the scientific community, largely due to contributions from prominent figures in orchid science, including James Ackerman, Germán Carnevali, Phillip Cribb, Stig Dälstrom, Mark Chase, Calaway H. Dodson, Robert L. Dressler, Eric Hágsater, Günter Gerlach, Alec Pridgeon, Gerardo Salazar, and Norris H. Williams.

Initially not exclusively focused on orchids, LANKESTERIANA shifted its scope to solely cover orchid-related research in 2007, filling a gap in orchidology left by the discontinuation of other recognized journals in the field, such as Lindleyana, Orquídea, Orquideología, and Selbyana. With the continuous support of the Vice-Rectorate for Research at the University of Costa Rica and the incorporation of Diego Bogarín, Adam P. Karremans, and Melissa Díaz as Associate and Managing Editors and Noelia Belfort-Oconitrillo as Technical Editor, the journal maintained a steady flow of high-quality publications. Today, LANKESTERIANA is the only scientific journal dedicated exclusively to publishing original research articles on orchid science, along with correspondence, comments, corrigendum, opinions, obituaries, special issue contributions, conference proceedings, checklists, and reviews.

The journal continues to assert its influence within the field of orchidology, evidenced by its high citation in orchid-related literature worldwide and its inclusion in well-recognized indexes such as Scimago and Scopus. LANKESTERIANA is a peer-reviewed, electronic, open-access journal that still distributes printed copies to over 50 institutions worldwide.

Aims and scope: LANKESTERIANA, the International Journal on Orchidology, is an international scientific journal published by the Lankester Botanical Garden Research Center – University of Costa Rica. The journal is globally recognized for its specialization and contributions to the knowledge of the orchid family. In addition to research articles, LANKESTERIANA is dedicated to facilitating scholarly communication and exchange by publishing a comprehensive array of content, including book reviews, checklists, comments, conference proceedings, correspondence, corrigendum, obituaries, opinions, reviews, and special issue contributions.

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